

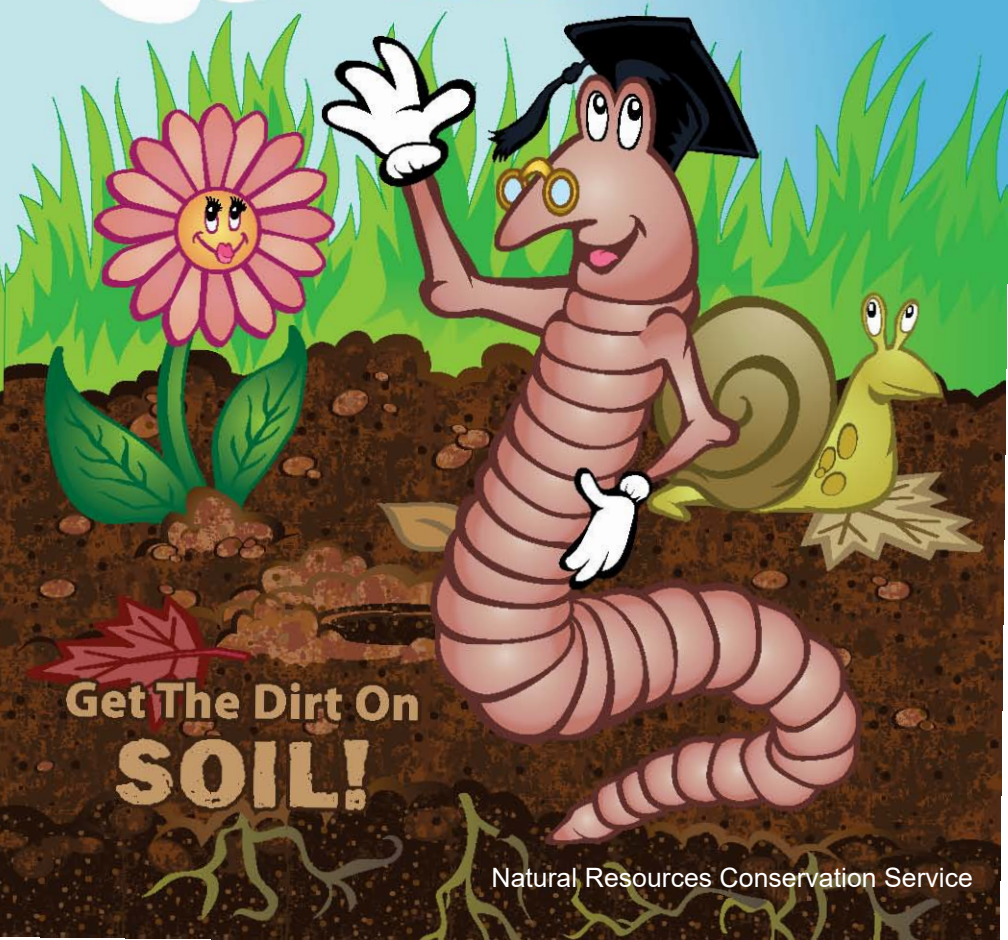
EXPLORE

S. K. WORM'S

AMAZING

UNDERGROUND WORLD

ACTIVITY BOOK



Get The Dirt On
SOIL!

**Is this land we farm our own?
Or is it from above on loan?**

**Received from father passed to son,
this soil resource is never done.**

**Producing crops with increased yields,
demanding more from fragile fields.**

**As we labor with great toil,
let us not forget the soil.**

**Help to build and not deplete,
the soil resource under our feet.**



HI, I'M S. K. WORM, THE OFFICIAL ANNELID, OR WORM, OF THE U.S. DEPARTMENT OF AGRICULTURE'S NATURAL RESOURCES CONSERVATION SERVICE. IT'S MY JOB TO MAKE YOU NATURALLY RESOURCEFUL ABOUT NATURAL RESOURCES. THIS ACTIVITY PAD IS FILLED WITH FUN GAMES, PUZZLES AND TRIVIA TO TEST AND EXPAND YOUR KNOWLEDGE OF OUR MOST PRECIOUS RESOURCE... **SOIL!**



This book is made available to you by
Natural Resources Conservation Service

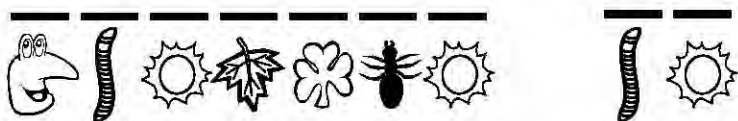
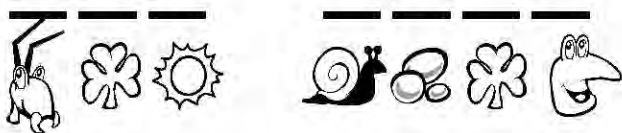
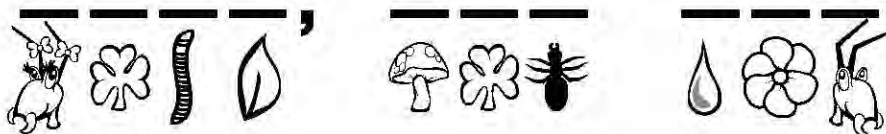
ERIE BASIN
RESOURCE
CONSERVATION
& DEVELOPMENT

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DECODER

Use the code key below to help S. K. Worm and his trusty side-kick to crack the code and reveal a soil truth.



CODE KEY

A C G H I



L N O R



S T U W Y



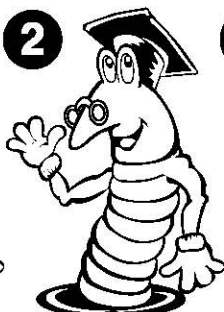
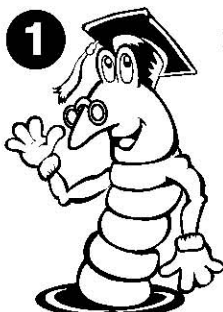
SEEING DOUBLE!!!

S. K. Worm is judging a Look-A-Like Contest. A number of his worm friends have dressed up like S. K. Worm. The eight finalists are below. Each looks a lot like S. K. Worm but only one looks exactly the same. Study the real S. K. Worm and look very closely at the contestants to find the worm that is an exact match and award him the prize!

**THE REAL
S. K.
WORM**



THE LOOK-A-LIKE CONTESTANTS



TYPES OF SOIL EROSION

EROSION is a process that removes soil and carries it away from farmer's fields to bodies of water or other areas of land. Erosion results in the loss of valuable soil and the important nutrients that crops need to grow. There are two primary kinds of erosion: **WIND** and **WATER**.

WIND EROSION occurs when wind blows and spreads soil particles across the land. It is a problem in areas where the land is especially flat or dry.

WATER EROSION occurs gradually during rainfall or when winter snow melts, or suddenly during floods.

TILLAGE - The way a farmer tills the land impacts how much soil loss occurs from wind and water erosion. The kind of equipment used, how often the farmer tills the fields, and how the farmer manages the fields during winter affect how much soil may be lost. Heavy machinery, frequent tilling, and lack of soil cover during winter months contributes to soil erosion.

CONSERVATION PRACTICES MATCHING

Match the Conservation Practice with the correct definition.

CONSERVATION TILLAGE ①

CONTOUR FARMING ②

TERRACING ③

WINDBREAK ④

GRASSED WATERWAY ⑤

A A belt of trees or shrubs.

B Earthen steps constructed across a slope.

C A sod strip to control gully erosion.

D Plowing, planting and harvesting across a slope.

E Planting crops into the residue of the last crop.

There are four factors that effect SOIL EROSION.

LAND SLOPE

SOIL TYPE

CLIMATE

LAND MANAGEMENT

Circle the ones above that people can have an impact on.

TYPES OF WATER EROSION

RAIN SPLASH erosion is caused by the impact of water striking the surface. Rain splash erosion generally takes place in two steps. As precipitation is absorbed by the surface it fills the pore spaces, loosening soil particles and driving them apart. The impact of subsequent rain drops hitting the surface splash the particle away from the point of impact. The effect is to give the surface a dimpled-like appearance.

Surface runoff forms when the rainfall intensity exceeds the soil's ability to absorb the water. **SHEET EROSION** is caused by the unconfined flow of water running across the surface. The effects of sheet erosion are often hard to distinguish because such thin layers of soil are being removed. It isn't until several years later that significant degradation is perceived.

RILL EROSION is caused by water concentrating into closely-spaced small channels. Left unchecked, rills can cut vertically and horizontally eventually join to form gullies.

GULLY EROSION - Gullies are steep-sided trenches formed by the coalescence of many rills. Once started they are difficult to stop.



CARE TO TRY A SOIL BURGER?

Everything we eat comes from the soil or is connected to it.

LETTUCE, PICKLES, ONIONS and **TOMATOES** are all from plants that began life in the soil.

HAMBURGERS and **CHEESE** both come from cows which eat plants which get food and water from the soil.

BREAD comes from grains like wheat, oats and rye which grow in the soil. Even sesame seeds come from plants that grow in soil.

How many other burger toppings can you think of that are tied to soil?



Plants Need The Soil - Soil Needs The Plants!

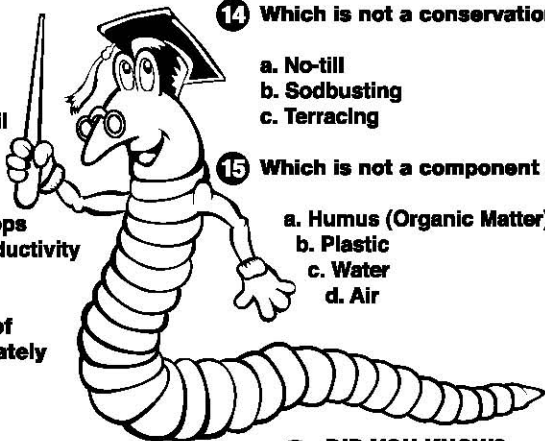
Soil has a lot of the things that plants need. The plant's roots take water and nutrients from the soil which feed the plant and allows it to grow. The soil also helps the roots to support the plant and keep it anchored in place.

In turn, plants are important to the soil as well. Plant roots keep soil in place, preventing wind and water erosion. Roots leave pores in the soil that allow much needed water and air to enter. When the soil gets too dry, roots draw up water from the ground water table. When the soil is too wet, roots drain excess water from the soil. Roots help make soil, too. They split rocks into pieces that later further break down and become new soil. Also, when a plant dies it decays, adding nutrients to the soil and making it dark and rich.

SOIL CONSERVATION QUIZ

How much do you know about soil?

- 1** Soil is formed from rocks and decaying plants and animals?
- a. True b. False
- 2** How many tons of castings can earth worms deposit on one acre?
- a. Less than one ton
b. 100 tons c. 15 tons
- 3** How many worms can be found in an acre of soil?
- a. one hundred b. one thousand
c. one million
- 4** Which is not a type of water erosion?
- a. Sheet b. Gully
c. Sediment d. Rill
- 5** What is not a factor in soil erosion?
- a. Soil type b. Rain
c. Land slope d. Clouds
- 6** How many types of soils have been identified in the U.S.?
- a. Over 70,000
b. Less than 15,000
c. 37,953
- 7** What harm can soil erosion cause?
- a. Pollutes water
b. Burles young crops
c. Lowers crop productivity
d. All of the above
- 8** What percentage of farmland is adequately protected from soil erosion?
- a. 10% b. 40% c. 80%
- 9** A raindrop hits the Earth at about what speed?
- a. 5 mph b. 15 mph c. 50 mph
- 10** A ton of soil spread over an acre would be how thick?
- a. The thickness of your big toe
b. 12 inches
c. The thickness of a dime
- 11** A rill becomes a gully when...
- a. A tractor can no longer cross it
b. It becomes navigable by boat
c. Birds refuse to fly over it
- 12** Where did the 1939 dust bowl occur?
- a. Mojave desert b. California
c. Great Plains d. Salt Lake City
- 13** What caused the dust bowl?
- a. Plowing fragile soil
b. Drought and wind
c. Grasshopper plague
d. All of the above
- 14** Which is not a conservation practice?
- a. No-till
b. Sodbusting
c. Terracing
- 15** Which is not a component of soil?
- a. Humus (Organic Matter)
b. Plastic
c. Water
d. Air



DID YOU KNOW?

The composition of the soil in an area has a direct effect on the plant and animal life there.

BURROW SWEET BURROW

Worms are not the only animals you will find in the soil. In fact, many animals live in the soil. Circle the animals below that call the soil home.



**GARTER
SNAKE**

**PRAIRIE
DOG**

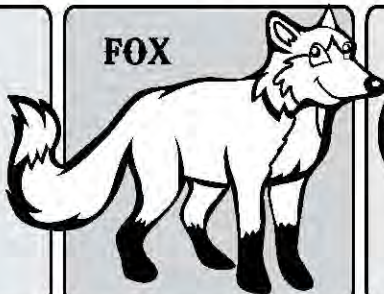


TARANTULA



CICADA

FOX



BADGER



WEASEL

**KANGAROO
RAT**

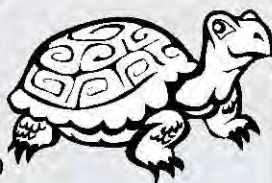


SKUNK



**FRESHWATER
CLAM**

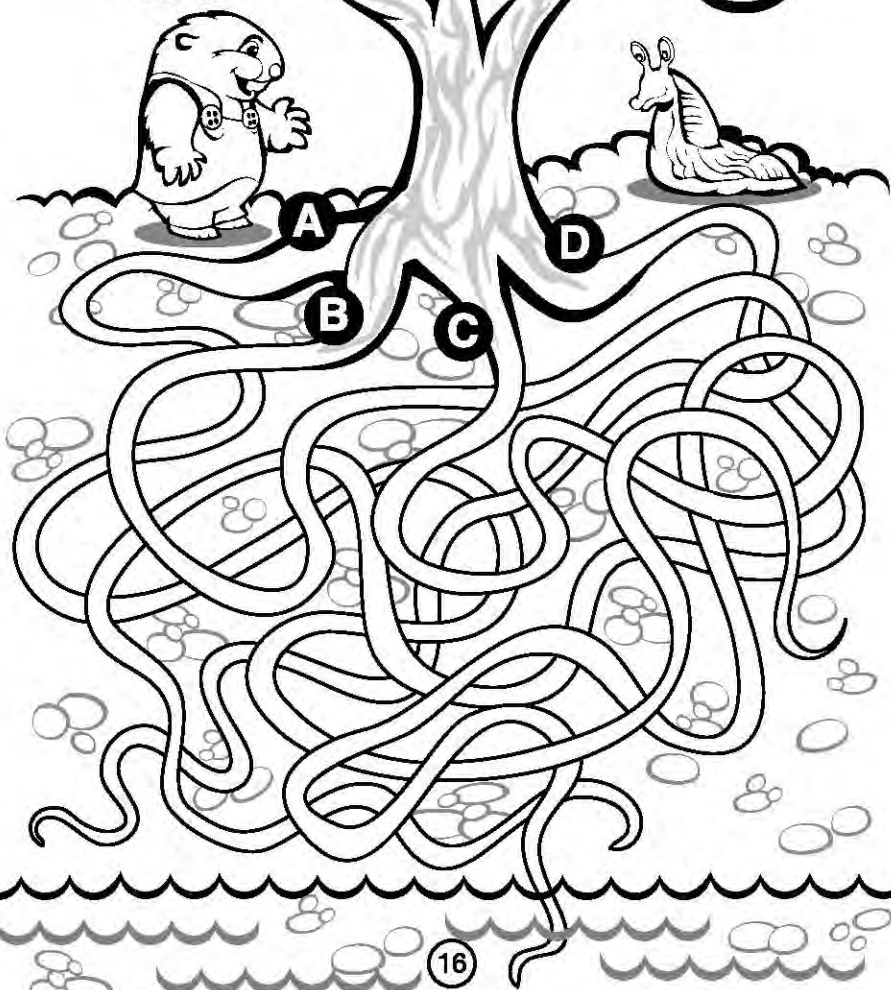
AARDVARK



**DESERT
TORTOISE**

TANGLED ROOTS

Large amounts of water is stored within the soil. This water saturated area of the soil is called the ground water table. Tree roots penetrate deep into the soil to reach this important water source. Can you track the tree roots to see which one has reached the ground water table.

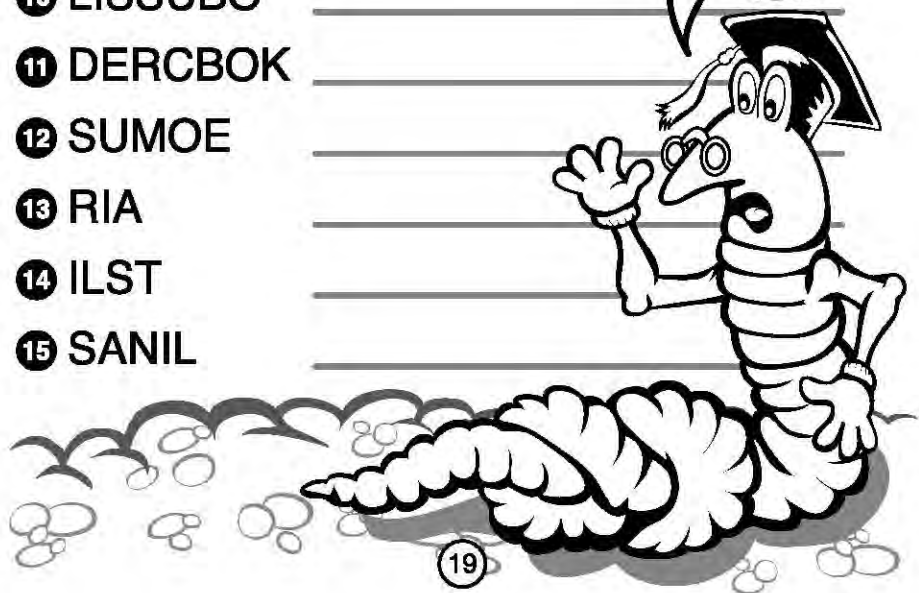


Word Scramble

Unscramble the letters below to form words.
HINT: All the words are items found in soil.

- 1 TEWRA _____
- 2 MROWS _____
- 3 UMUSH _____
- 4 BEBSELP _____
- 5 ALCY _____
- 6 STAN _____
- 7 LEOM _____
- 8 TOROS _____
- 9 GSLU _____
- 10 LISSUBO _____
- 11 DERCBOK _____
- 12 SUMOE _____
- 13 RIA _____
- 14 ILST _____
- 15 SANIL _____

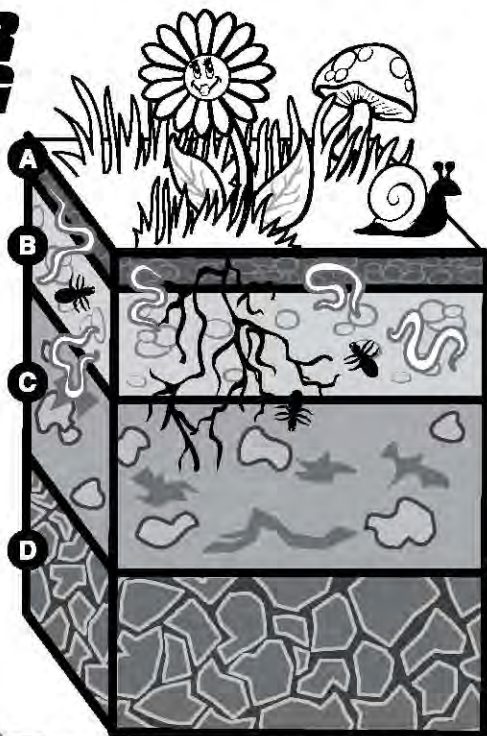
LOOKS
LIKE THESE
WORDS ARE
AS TWISTED
UP AS ME!
CAN YOU
UNSCRAMBLE
THEM WHILE I
WORK OUT
THIS KNOT?



SOIL LAYER MATCHING

Label each soil layer correctly.

- **BEDROCK**
A layer of dense rocks that no plants or animals penetrate.
- **SUBSOIL**
Less humus but rich in minerals.
- **TOPSOIL**
Rich in humus and ideal for growing plants.
- **PARENT MATERIAL**
Composed of weathered rocks with little plants or animals on this level.



SOIL FACT OR FICTION

Read each statement and determine if it is Soil FACT or FICTION!

circle the correct answer

- 1** Five to ten tons of animal life can be found in an acre of soil.

FACT OR FICTION

- 2** Clay, silt and sand are three types of minerals. Most soils have a blend of all three of these.

FACT OR FICTION

- 3** It is impossible to stop soil erosion.

FACT OR FICTION

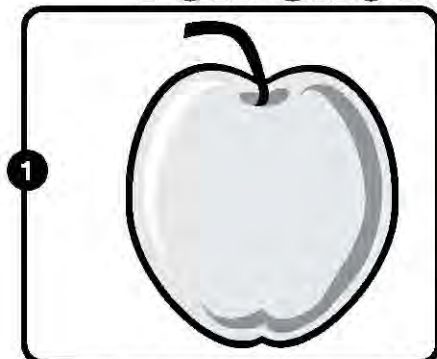
- 4** It can take up to 1,000 years to form one inch of soil.

FACT OR FICTION

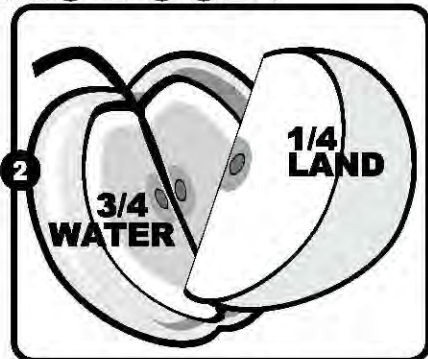
- 5** One shovel full of soil has more living organisms in it than there are people on the Earth.

FACT OR FICTION

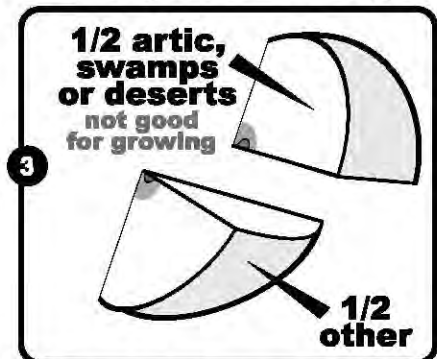
HOW MUCH SOIL IS THERE FOR GROWING FOOD?



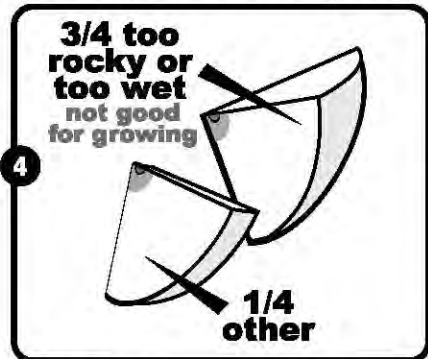
To show you how much soil is available we will compare the Earth to an apple.



Since $\frac{3}{4}$ of the Earth is covered in water we need to remove that portion.



$\frac{1}{2}$ of this is artic, swamps and desert areas which are not ideal for growing.



$\frac{3}{4}$ of the remainder is too rocky, too wet, or too poor for crops.



And of what is left only the outer most part is soil.



MAKING SOIL

Did you know you can make soil by composting? It is also a great way to recycle, while reducing waste. Check out the four easy steps below and learn how you can help make soil, one of our most precious resources.

STEP 1 SELECT A SPOT FOR A COMPOST PILE

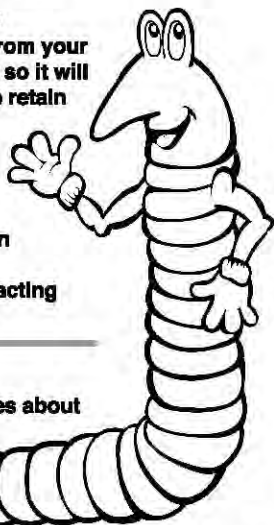
Choose a place that is flat and a bit away from your house so it is not a nuisance. Be sure the place is well shaded so it will not dry out in the hot sun. A container is optional, but can help retain water and be easier to keep the pile contained.

STEP 2 BUILD YOUR COMPOST PILE

Build your pile with an equal amount of nitrogen-rich "GREENS" (wet & soft materials) and high carbon "BROWNS" (dry & woody). Be sure to keep the pile cool and damp. Place food scraps at the bottom of the pile to avoid attracting pests. Turn the pile with a pitchfork on occasion to let in air.

STEP 3 SIT BACK AND WAIT

Making soil takes time so be patient. It takes about 6-24 months to make soil. You'll know when your soil is ready, when all the ingredients have broken down completely and you are left with rich, dark soil.



TO COMPOST OR NOT TO COMPOST

Circle the items below that can be composted.



banana peel



apple core



styrofoam cup



egg shells



grass clippings



cheese



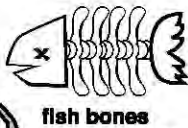
old light bulb



newspaper



leaf litter



fish bones



twigs



moldy bread



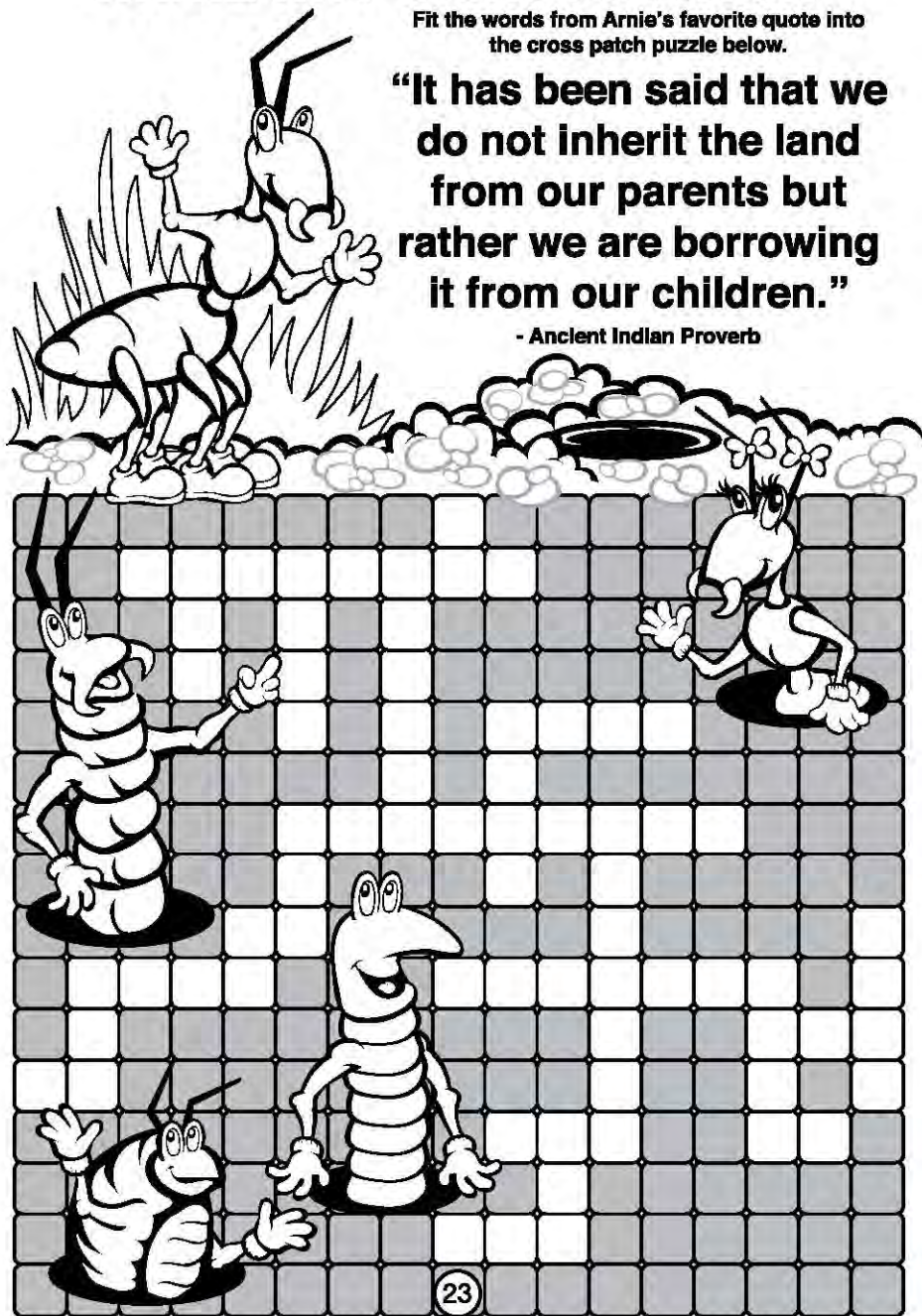
coffee grounds

ARNIE ANT'S CROSS PATCH

Fit the words from Arnie's favorite quote into the cross patch puzzle below.

"It has been said that we do not inherit the land from our parents but rather we are borrowing it from our children."

- Ancient Indian Proverb



JOKE BOOK

Q: What did the teacher say to the 3rd grade worm when he was late to school?

A: Where in earth have you been!

Q: What reads and lives in the soil?

A: A book worm!

Q: Why are glow worms good to pack in your book bag?

A: They lighten your load!

Q: What did the policeman say to the glow worm?

A: "Halt! Who glows there?"

Q: Why did Noah not let the worms come onto the ark in an apple?

A: He said that they had to come in "pears" (pairs)!

Q: What do you get if you cross a worm and a young goat?

A: A dirty kid!

Q: What do you get when you cross a worm with an elephant?

A: Very BIG worm holes!

Q: Where do worms go when they lose their tails?

A: They go to the "re-tail" shop!

THIS IS
ONETIME IT'S
OK TO TELL
'DIRTY' JOKES.

Q: What games do elephants play with worms?

A: Squash!

Q: What is full of holes but holds water and air?

A: The soil.

Q: Why did the worm NOT cross the road on the way back?

A: He didn't want to be a dirty, double-crosser!

Q: Why won't a worm listen to you when it is in a cornfield?

A: It goes in one ear and out the other.

Q: Where can you always be sure to find earthworms?

A: In the dictionary.

Q: Where do soil bacteria go on vacation?

A: "Germ"any.

WHAT'S THE BEST
ADVICE YOU CAN
GIVE A WORM?

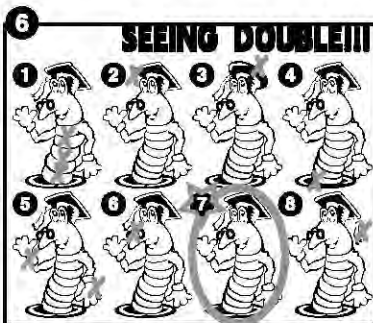
SLEEP IN!

ANSWERS

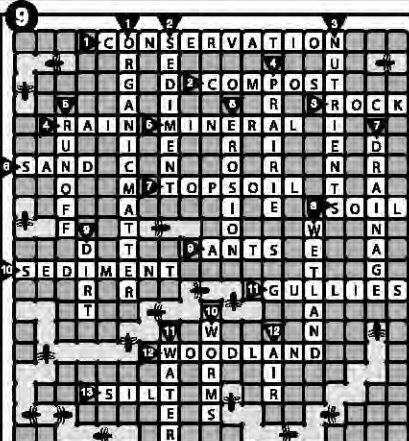
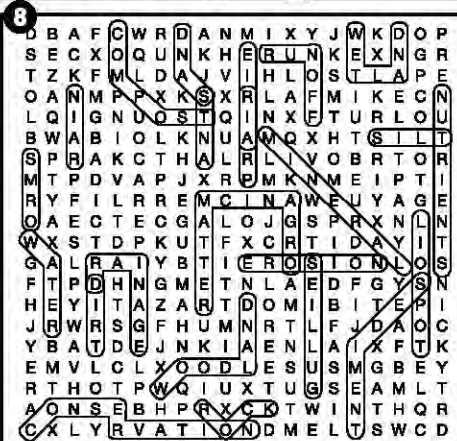


4 **DECODER"**
"SOIL YOU
CAN NOT
GROW
WITHOUT IT"

5 **HOW MANY
WORMS? 14**



7 **CONSERV. PRACT. MATCHING: 1E, 2D, 3B, 4A, 5C**
The **SOIL EROSION** factors that can be affected by man
are: **LAND SLOPE, CLIMATE, LAND MANAGEMENT**



12 **SOIL BURGER TOPPINGS**
pepper, salt, avacado, bacon,
spinach, sprouts, peppers,
jalepeno, mushrooms, garlic,
pesto, any cheese type, fried
egg, chili, spices, sour
cream, mayo, mustard,
ketchup... no matter how you
like your burger, most likely
the toppings are tied to soil.

13 **CONSERVATION QUIZ:**
1A, 2C, 3C, 4C, 5D, 6A, 7D,
8A, 9B, 10C, 11A, 12C, 13D,
14B, 15B



ANSWERS

14

DIGGING IN THE DIRT - SECRET MESSAGE ANSWER:

WORMS CANNOT SEE OR HEAR

15

BURROW SWEET BURROW ANSWER:

ALL OF THE ANIMALS BURROW IN THE SOIL.

16

TANGLED ROOTS

ROOT "C" reached the water

17

HOW MANY WORDS

SAVE, OIL, SIN, SEAT, CRAVE, STEAR, SILICON, LORE, TRANSE, LINE, RIVET, LATE, TRAIN, CANE, VAN, ON, CON, RAVE, NEAT, RAT, NEAR, STORE, LAIR, NOSE, VINE, RATE, SILT, VAIN, LANE, INSANE, TON, SON, VASE, LEASE, TEAR, CARE, CORE, VAT, ROSE, NINE, RITE, STAIN, VEIN, RAIN, SANE, CAN, TAN, RAN, ION, ORION, LOIN, LION, NILE... (and more)

18

DIGGING FOR WORMS



19

WORD SCRAMBLE

- 1) WATER 2) WORMS 3) HUMUS
4) PEBBLES 5) CLAY 6) ANTS 7) MOLE
8) ROOTS 9) SLUG 10) SUBSOIL
11) BEDROCK 12) MOUSE 13) AIR
14) SILT 15) SNAIL

20

SOIL LAYER MATCH

D = BEDROCK, B = SUBSOIL,
A = TOPSOIL, C = PARENT MATERIAL

SOIL FACT OR FICTION

- 1 = FACT
2 = FACT
3 = FICTION
4 = FACT
5 = FACT

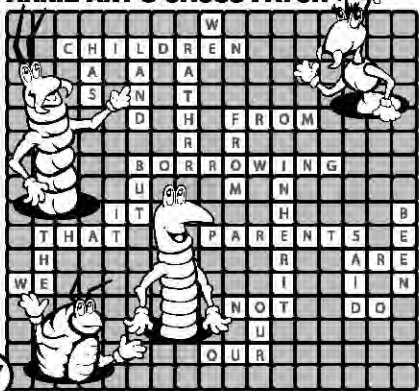
22

IDEAL TO COMPOST

BANANA PEEL, APPLE CORE,
LEAF LITTER, TWIGS, EGG SHELLS,
MOLDY BREAD, GRASS CLIPPINGS,
COFFEE GROUNDS

23

ARNIE ANT'S CROSS PATCH



27