TN Department of Environment & Conservation

environmental education initiative

Educating Tennessee for a More Sustainable Future

knowledge • action • change

Environmental Education Activity Booklet

Office of Policy and Sustainable Practices

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https://www.tn.gov/environment/program-areas/opsp-policy-and-sustainable-practices.html

What is Sustainability?

Sustainability is taking steps to avoid depleting natural resources in order to maintain an ecological balance.

In this booklet, you will find several topics directly related to sustainability:

1. Pollinators, pages 1-8

2. Food Waste and Composting, pages 9-16

3. General Environmental Stewardship, pages17-29

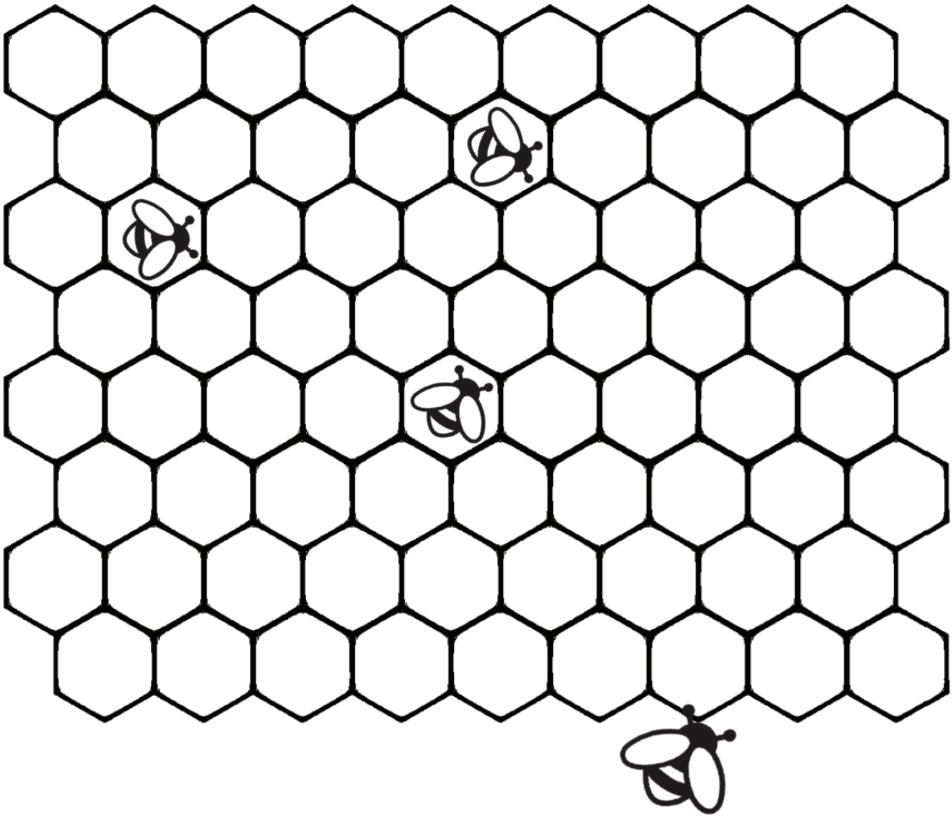
4. Radon, pages 31-34

If you are sustainable:

"You leave the world better than you found it. You take no more than you need. You try not to harm life or the environment, and you make amends if you do."

- Paul Hawken, *The Ecology of Commerce*

Color the honeycomb!



Bees pollinate flowers, which helps us grow food! They also produce honey from the nectar and pollen they collect and take back to their hive. The honey is stored in a structure called a honeycomb.

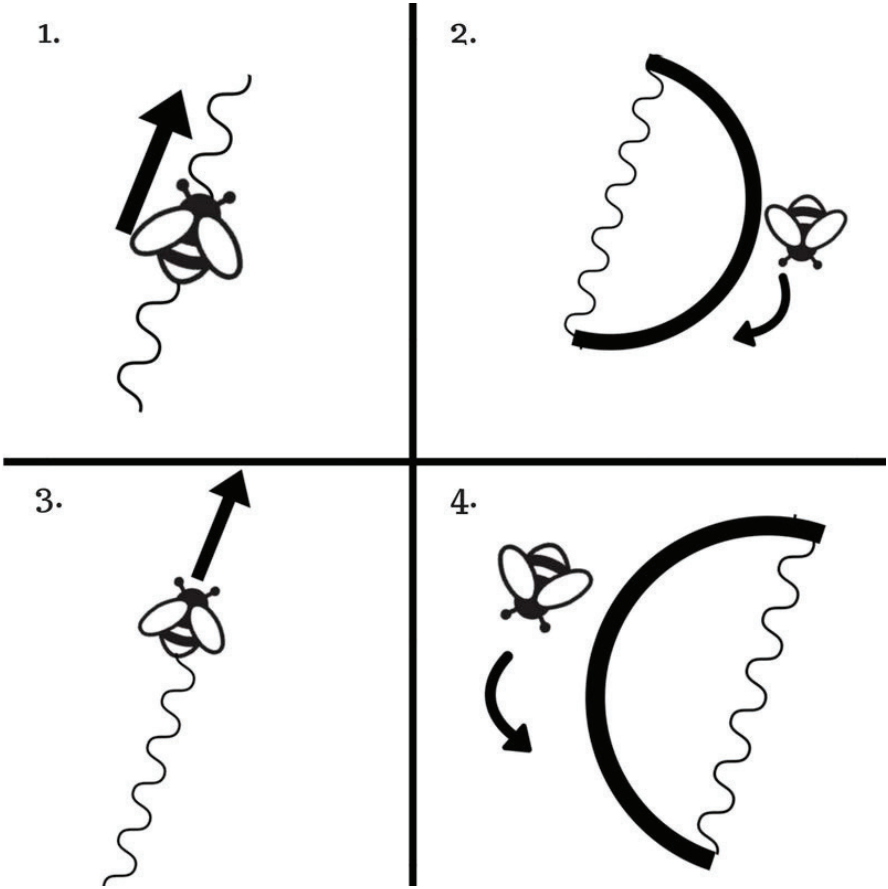
What is all the BUZZ about?

Honey bees can flap their wings around 200 times per second.
The average worker bee lives about 5 to 6 weeks.

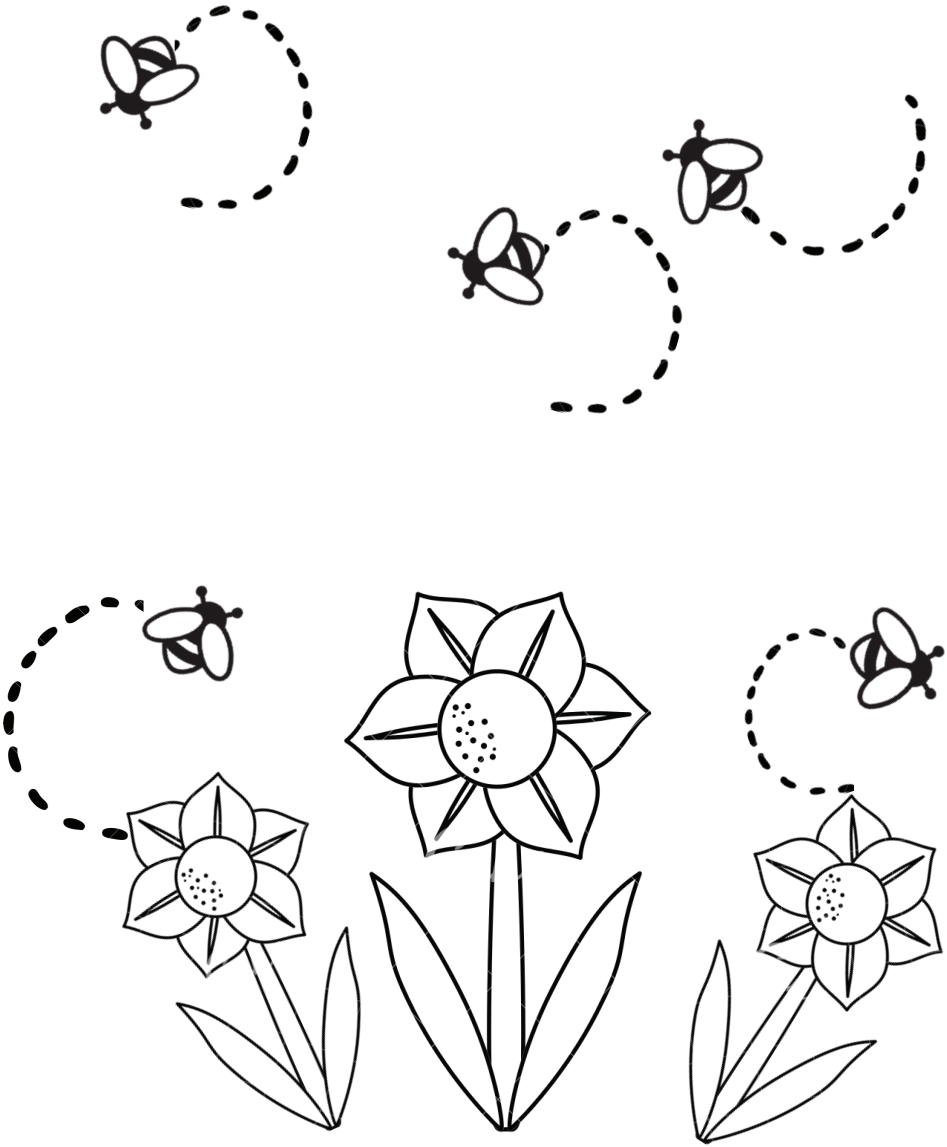
The queen bee can live up to 5 years. She can also lay 2,500 eggs a day during the summer. How many eggs can the queen lay during a summer week?

ANSWER:_____

Honey bees do a dance called the "waggle dance" to tell other members of the hive where food is located. Below is an example of a waggle dance.



Can you do the waggle dance?



What is pollination?

When a female worker bee collects nectar and pollen from the flower of a plant, some pollen sticks to the hairs of her body. When she visits the next flower, some of this pollen is rubbed off onto that flower. This is pollination.

What is all the BUZZ about?

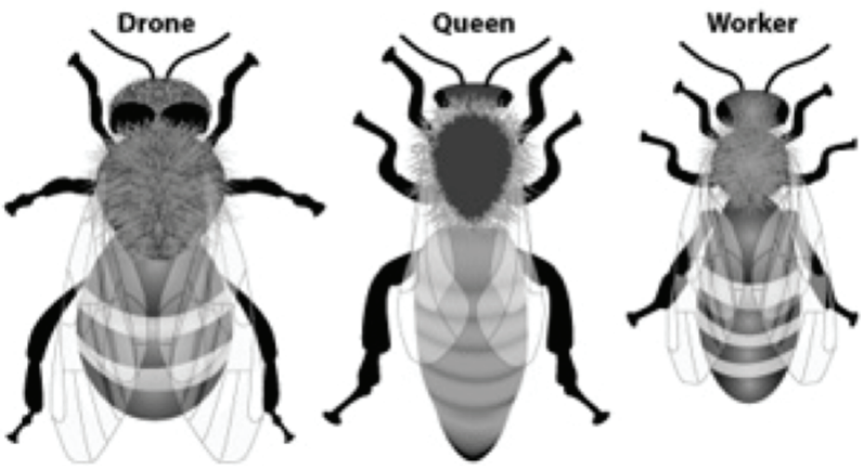
Honey bees live in groups called hives or colonies. The members of the hive are divided into three types:

Queen - The queen runs the whole hive. Her job is to lay the eggs that will become the hive's next generation.

Workers - The worker bees are all female and their roles are to forage for food (pollen and nectar from flowers), build and protect the hive, and clean and circulate air by beating their wings. Workers are the bees you see flying around outside the hive.

Drones - These are the male bees, and their purpose is to mate with the new queen. When winter comes, the hive goes into survival mode and kick the drones out!

Honey bee colonies consist of a single queen, hundreds of male drones, and 20,000 to 80,000 female worker bees.



Picture courtesy of New Jersey Dept. of Environmental Protection

https://www.state.nj.us/dep/parksandforests/forest/bees.html

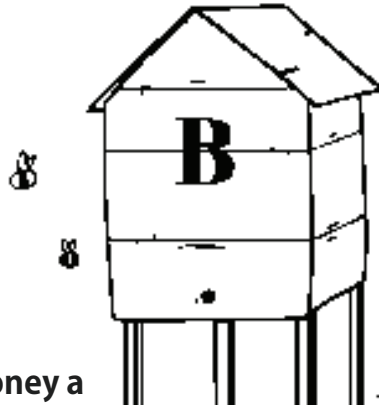
Bees and other pollinators are very important for agriculture. It is estimated that one out of every three things we eat each day relies on pollination, mainly by bees.

Activity: Fill the farm with crops that bees help pollinate!

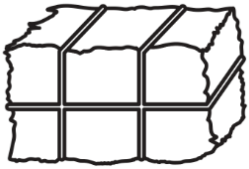
Pollinator Health

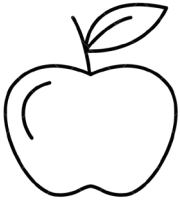
On a separate sheet of paper, create a graph to answer the question. What is the total amount of honey that both hives produced between April and September?

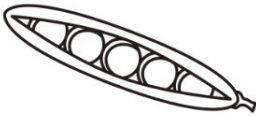
Bee hive "A" makes 3 pounds of honey every month from April through August, and 1 pound in September.



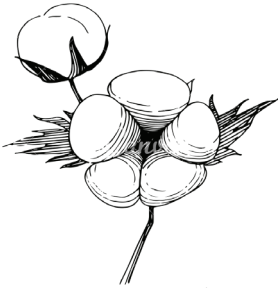
Bee hive "B" makes 2 pounds of honey a month from April through June, and 3 pounds of honey per month from July through September.





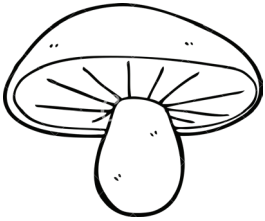


Soybeans
Cotton
Corn
Wheat
Hay
Tomatoes
Green beans
Apples
Peaches
Mushrooms



These are the most common agricultural products grown in Tennessee.

Can you match the word to the picture? Color the picture too!



Name: _____

Honey Bee Word Search

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

Find the following words in the puzzle.
Words are hidden → ↓ and ↘ .

GREEN BEANS
APPLES
COLONY
HIVE
SQUASH
CUCUMBERS
WINGS
FLOWERS

FOOD
AGRICULTURE
HAY
CORN
HONEY
MUSHROOMS
WORKER
PEACHES

POLLEN
DRONE
TOMATOES
POLLEN
SOYBEANS
WAGGLE
QUEEN
WHEAT

WORKER
COTTON
SOY

Created by TDEC - OPSP using Word Search Generator on
Super Teacher Worksheets (www.superteacherworksheets.com)

Don't Waste Food!

Try not to throw food in the trash. When it goes to landfills, it can't break down and return to soil.

It is best for food to be eaten or composted!

You can always donate food that you are not going to eat!

The Food Recovery Hierarchy is meant to be a guide to help people figure out what to do with their food waste.

Fill in the Blank

Use page 10 to help fill in the blanks! You will not use all of the words in the word bank.

Reduction	Soil	Food Waste
Composting	Donated	Canning
Trash	Animals	Plants

1. The best way to stop food waste from occurring is source _____.

2. If food waste can't be reduced, it should be _____.

3. Feeding _____ is the next best way to handle food waste, if it can't be donated to people.

4. _____ is better than landfilling, because it creates a soil amendment.

5. There are a number of different ways to handle _____ that are better than landfilling.

Write a short paragraph about how you will help reduce food waste.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Compost!

Composting is a natural decomposition process that breaks down organic materials. To compost, combine "brown" and "green" matter, and then let it breakdown. The resulting mixture can then be used to add nutrients back into soil.

Take this page home with you so you and your family members can compost!

3 parts BROWN + 1 part GREEN + air + water = COMPOST

Browns (Carbon Rich)	Greens (Nitrogen Rich)
Dead Leaves	Green Leaves
Shredded Cardboard	Fruit Scraps
Shredded Paper	Vegetable Scraps
Paper Towels	Bread and Grains
Straw and Hay	Tea Grounds/Leaves
Wood Shavings	Coffee Grounds
Wood Chips	Fresh Grass Clippings
Sticks and Branches	Plant Prunings
Wood Ash	Hair (from hairbrush)
Dry Pine Needles	Pet Fur (from shaving or shedding)
Nut Shells	Algae and Aquarium Water (fresh water)
Corn Stalks	Manure (herbivore animals only)
Egg Shells	

Backyard Composting

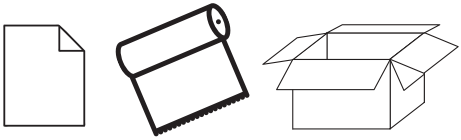
Do Compost!

Fruit and Vegetable Scraps

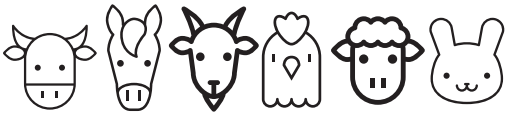
Coffee Grounds and Tea Bags

Grass, Leaves, and Sticks

Egg Shells and Stale Bread

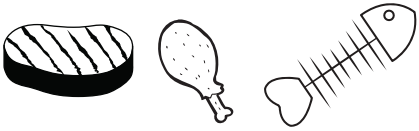


Paper and Cardboard (Shred)



Manure and Bedding from Cows, Horses, Goats, Sheep, Chickens, and Rabbits

Don't Compost!



Meat, Bones, and Fish

Dairy

Weeds

Whole Eggs

Feces from Other Animals

Fats, Oils, and Grease

Take this page home with you so you and your family members can compost!

What is the Problem?

1. Assuming the average elementary school student wastes 1 ¼ pounds of food per 5 day school week, how much does he or she waste in a day?

2. Christina started composting! She needs to know how many buckets of "brown" materials to add to her 4 buckets of "green" materials. If she needs 3 times the volume of "brown" material as "green" material to make proper compost, how many buckets of "brown" material does she need?

Compost Uses

Four of the most common uses for compost are:

1. Mulching material - When compost is used as a mulch around trees, shrubs, and landscaping, it helps the ground underneath it retain moisture. When it rains, the water will also carry nutrients from the compost down to the soil below it.

2. Soil amendment - When compost is used as a soil amendment, it is added into the soil at planting time by digging anywhere from 2 to 4 inches down. The compost is then mixed in with the soil. This will provide nutrients to plants at the root-level.

3. Compost tea - Compost tea refers to the liquid matter released by the compost. Sometimes, compost produces the tea naturally, but it can also produced conveniently and easily by steeping a shovel full of compost in a 5 gallon bucket for
a few days. When it is ready to go, simply just pour it on the flowers or plants you wish to use it on.

4. Lawn top dressing - When compost is used as a top dressing, anywhere from 1 to 3 inches of compost is added to the lawn. It can then be raked and watered. The compost will eventually settle into the soil and disappear, leaving much healthier soil that also holds water better. Adding compost to lawns reduces the need to use fertilizers, which can be harmful if they make their way to bodies of water.

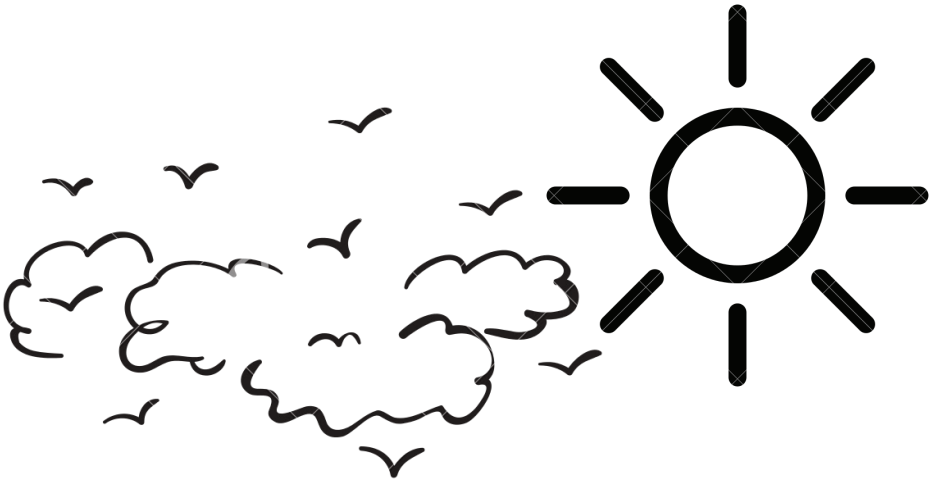
https://www.compostinstructions.com/how-to-use-compost-in-your-yard-and-garden/

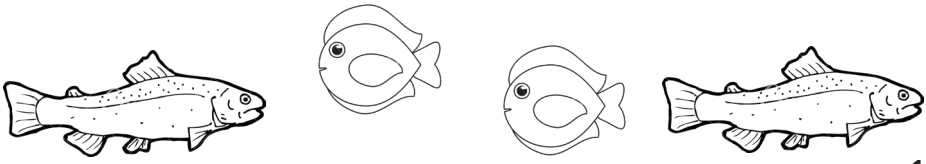
True or False

1. True or False - Compost can add nutrients to soil
2. True or False - Compost can be added to lawns, gardens, and landscaping
3. True or False - Compost should be fed to animals
4. True or False - Compost can help soil hold more water
5. True or False - Compost and fertilizer are the same thing

You can help take care of Tennessee's environment!

Color this healthy environment and/or draw yourself in it!





Sustainable Vocabulary

Use the words in the word bank to complete the sentences.

Nonrenewable	Habitats	Food chain
Carbon dioxide	Natural Gas	Ecosystem
Extinct	Resources	Renewable
Conservation	Composted	Pollutant
Donated	Coal	Oxygen
	Oil	

1. _____ resources, like _____, nuclear, _____, and _____ are available in limited supplies. This is usually due to the long time it takes for them to be replenished.

2. _____ resources are replenished naturally and over relatively short periods of time.

3. Trees and plants absorb _____ and release _____ into the air.

4. Fruit and vegetable scraps can be _____ instead of thrown in the garbage.

5. _____ is the protection and preservation of natural environments and _____.

6. Uneaten or unopened food can be _____ to food pantries and homeless shelters.

7. A _____ is a substance or material that damages the natural environment.

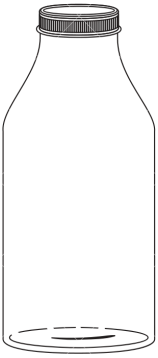
8. Animals may become _____ if their natural _____ are destroyed.

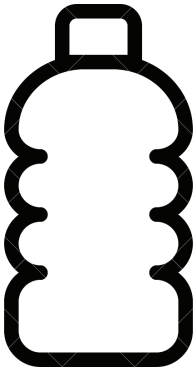
9. The _____ is the order in which organisms in an ecosystem eat one another.

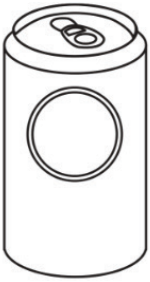
10. An _____ is the complex system of relationships between living things and their environment.

Recycle!

Commonly recycled items include products that are made from paper, plastic, aluminum, and steel.







Reduce, Reuse, Recycle

1. _____ means to use less of something.

a. Reduce
b. Recycle

2._____ means to use something more than once.

a. Reduce
b. Reuse

3. Maggie is cleaning out her desk. She should throw her old papers in the _____ bin.

a. reducing
b. recycling
c. trash

4. Steve sold his toy trucks to his friend Joey at a yard sale. Joey is _____ the toy trucks.

a. eating
b. reusing
c. reducing

5. Sofia is peeling carrots and potatoes. She composts these peelings. She is _____ the amount of food that ends up in the landfill.

a. reducing
b. reusing
c. increasing

6. Caleb's skateboard broke. He took it to the shop and had it fixed. Caleb decided to _____ his skateboard instead of buying a new one.

a. reduce
b. reuse
c. trash

7. Kelsey's family is moving into a new house. Her family has been keeping old cardboard boxes so they can use them to pack! These cardboard boxes are being _____.

a. loved
b. reused
c. reduced

8. After Kelsey's family moves into their new home, they will _____ the cardboard boxes instead of throwing them in the trash.

a. recycle
b. relocate
c. reduce

Don't Litter!

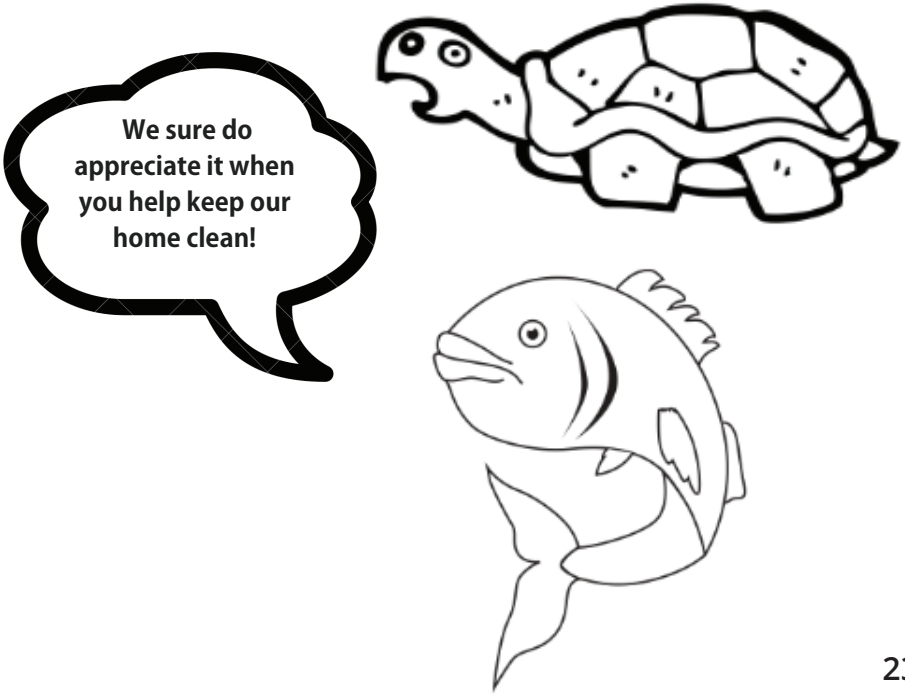
Make sure trash goes into trash cans and not on the ground.

Litter is bad for the environment! It can pollute land and water. It can also cause injury or death to wildlife. This table provides an estimate of how long it takes for common items to decompose.

Material	Time It Takes to Decompose
Glass Bottle	1 million years
Fishing Line	600 years
Plastic Bottles	450 years
Disposable Diapers	450 years
Aluminum Cans	80-200 years
Boot Sole	50-80 years
Styrofoam Cup	50 years
Tin Can	50 years
Leather	50 years
Nylon Fabric	30-40 years
Plastic Film Canister	20-30 years
Plastic Bag	10-2000 years
Cigarette Filter	1-5 years
Wool Sock	1-5 years

Keep Water Clean!

If you litter, it can make its way to ponds, rivers, lakes, and oceans. This can kill fish and other creatures that live in or near the water.



Name: _____

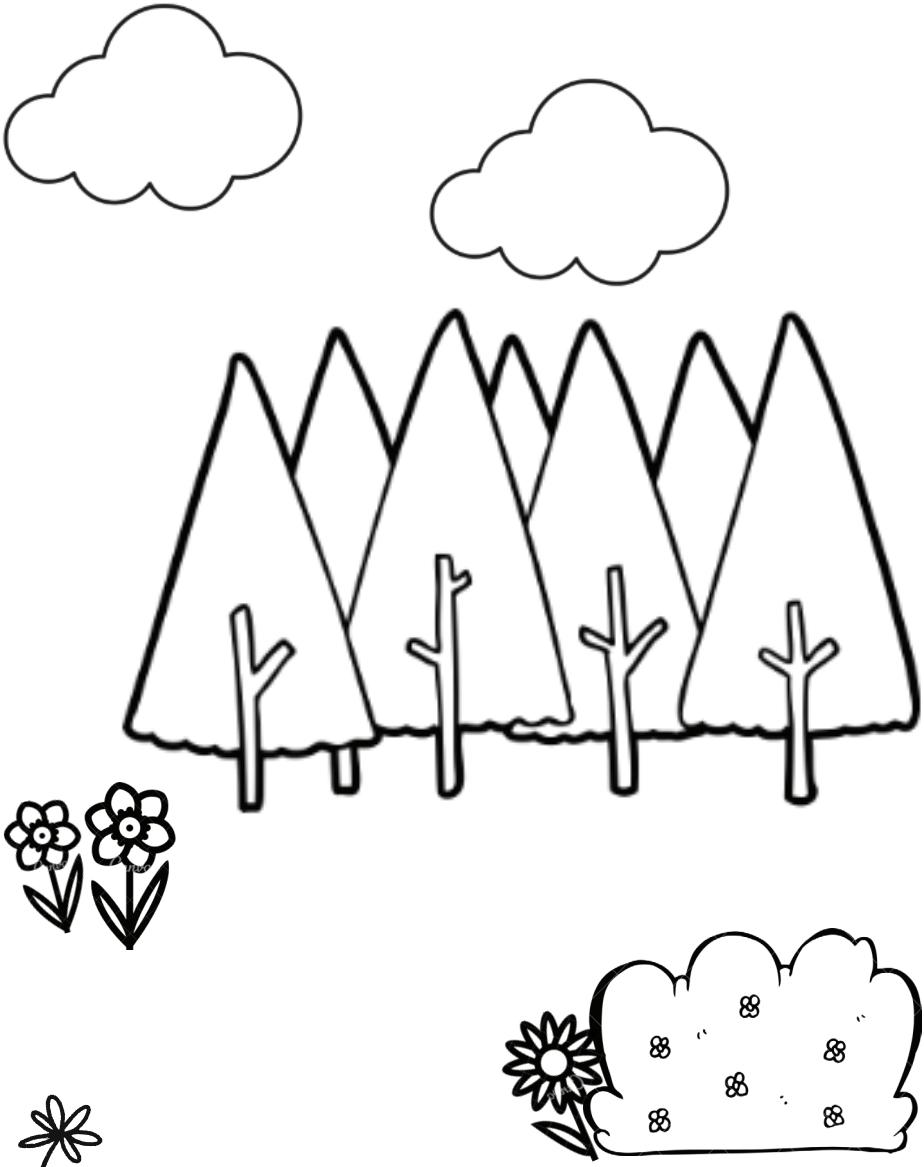
Common Water Pollutants

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

Find the following words in the puzzle.
Words are hidden → ↓ and ↘ .

CIGARETTE BUTTS
CLEANING SUPPLIES
FERTILIZERS
HERBICIDES
INDUSTRIAL WASTE
MANURE
NITROGEN
OIL
PESTICIDES
PHOSPHORUS
PLASTICS
RUNOFF
SEDIMENT
SOAP
STYROFOAM
WRAPPERS

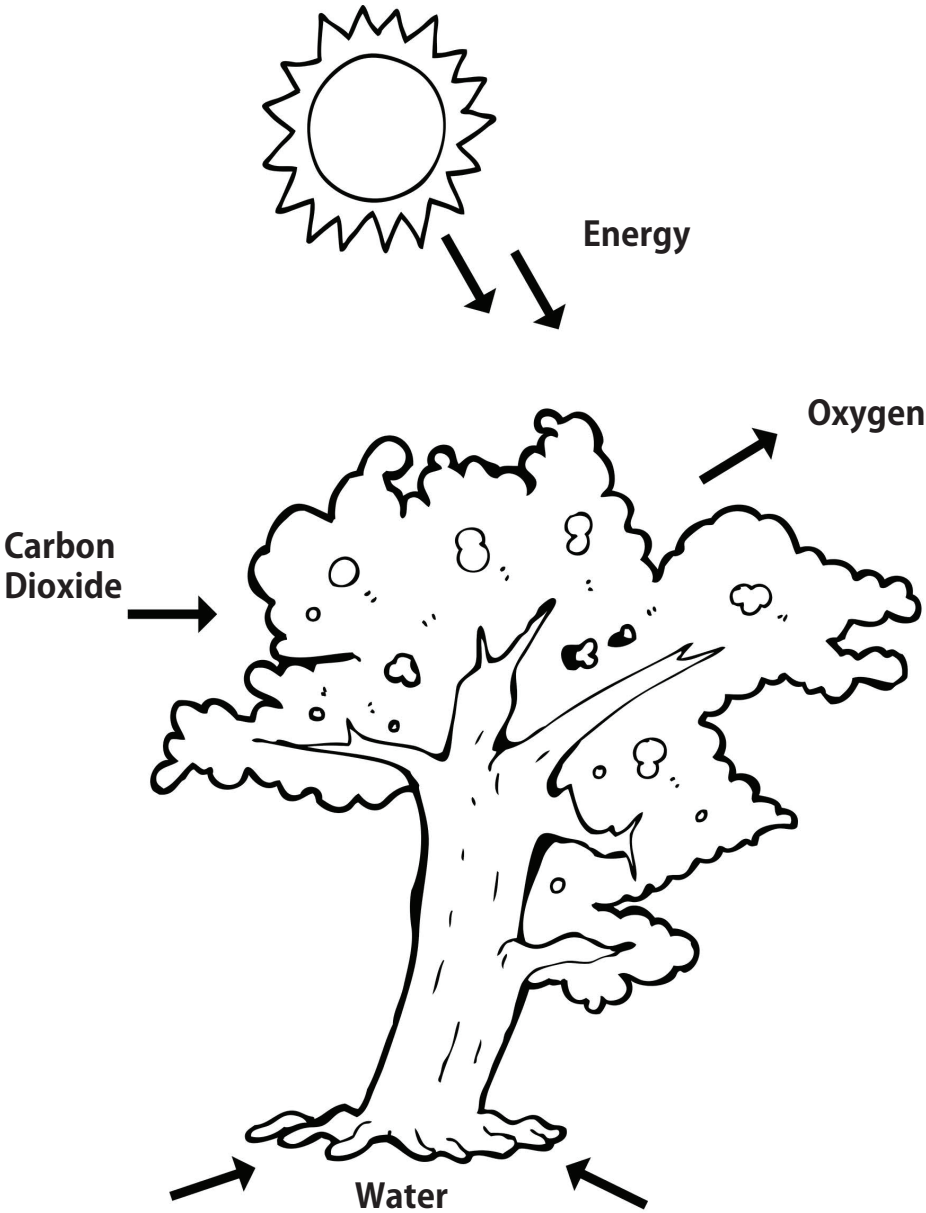
Created by TDEC - OPSP using Word Search Generator on
Super Teacher Worksheets (www.superteacherworksheets.com)



Plant Trees and Plants!

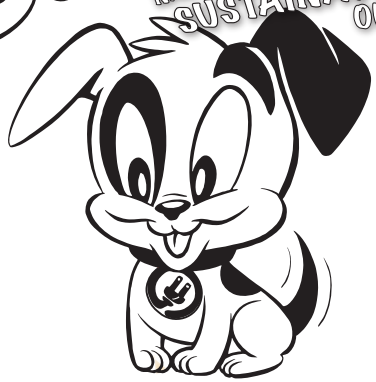
Trees, shrubs, flowers and other plants help keep our air clean and healthy for us to breathe .

Plants clean our air when they convert carbon dioxide we exhale into their food for them and release oxygen back into the air. They do this by using energy from the sun and water from their roots! This process is called <u>Photosynthesis</u>.



MEET SOCKET!

NASHVILLE'S SUSTAINABILITY OUTLET



SOCKET SINGS A HAPPY TUNE WHEN WE SAVE WATER AND REDUCE WASTE.

HELP SOCKET SAVE ENERGY.

NOW IT'S YOUR TURN!

CAN YOU THINK OF ALL THE WAYS YOU CAN HELP SOCKET BE SUSTAINABLE?

_____

_____

_____

_____

_____

_____

_____

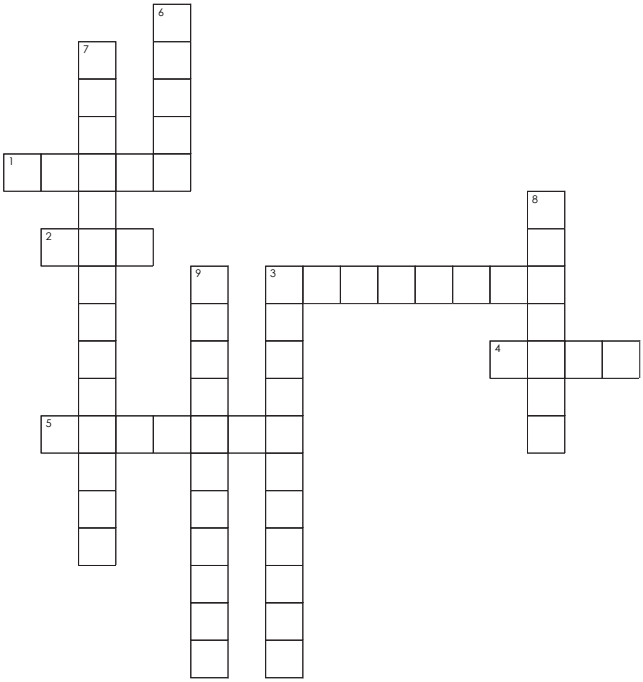
_____

socket
Nashville's Sustainability Outlet

Socket is the interactive sustainability education program of the Division of Sustainability for Metro Nashville's Department of General Services. Visit socket.nashville.gov to learn more.

Name: _____

Crossword Puzzle



Across: →

1. drink it and swim in it
2. take a deep breath of this
3. coke cans are made from this
4. can be donated or composted
5. don't use these bags at the grocery store

Down: ↓

3. farming industry
6. read it, draw on it, recycle it
7. protecting & helping the world as a whole
8. good for soil
9. most light bulbs work because of this

Word Bank:

AGRICULTURE	AIR	ALUMINUM
COMPOST	ELECTRICITY	FOOD
PAPER	PLASTIC	SUSTAINABILITY
WATER		

Created by TDEC - OPSP using the Crossword Puzzle Generator on Super Teacher Worksheets (www.superteacherworksheets.com)

Circle all the things you can do to help the environment!

Throw Trash Into Ponds, Rivers, Lakes, and Oceans

Recycle Used Printer Paper and Aluminum Cans!

Waste Food

Chop Trees Down

Donate Food

Plant Trees, Shrubs, and Flowers

Compost Fruit and Vegetable Scraps

Pick Up Litter and Make Sure It Goes Into the Trash!

Sustainability: Write a Story

On a separate sheet of paper, write a short story about something you learned from this activity booklet. You can use this sheet to map your story!

Characters:

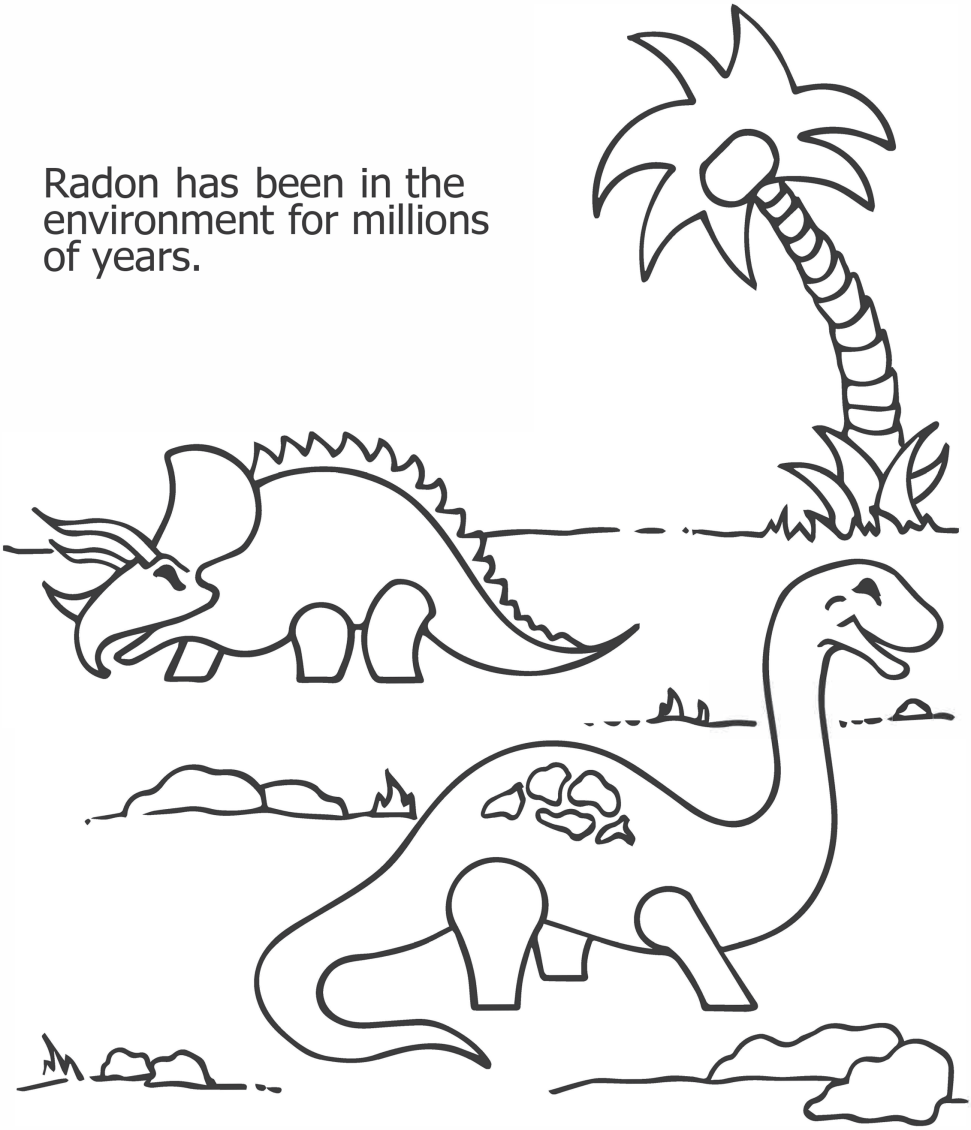
Setting:

Problem:

What else happened?

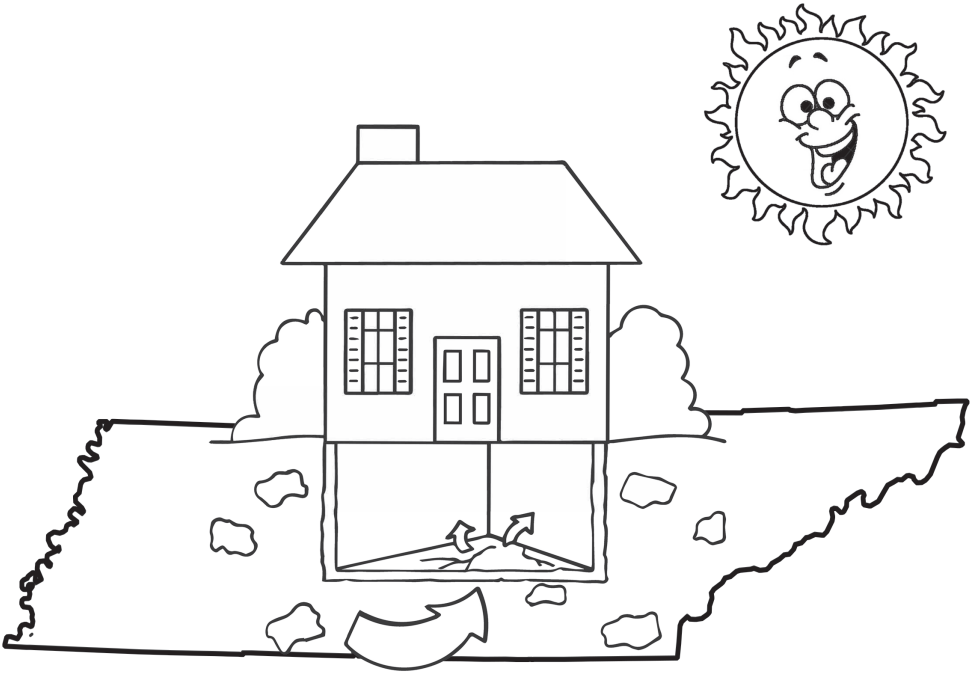
Solution:

Radon has been in the environment for millions of years.



Radon comes from the breakdown of uranium in the soil. It is naturally occurring and can be harmful to your lungs. Radon is colorless, odorless, and tasteless.

The most common entries for radon include cracks in foundations and openings around pipes and drains.

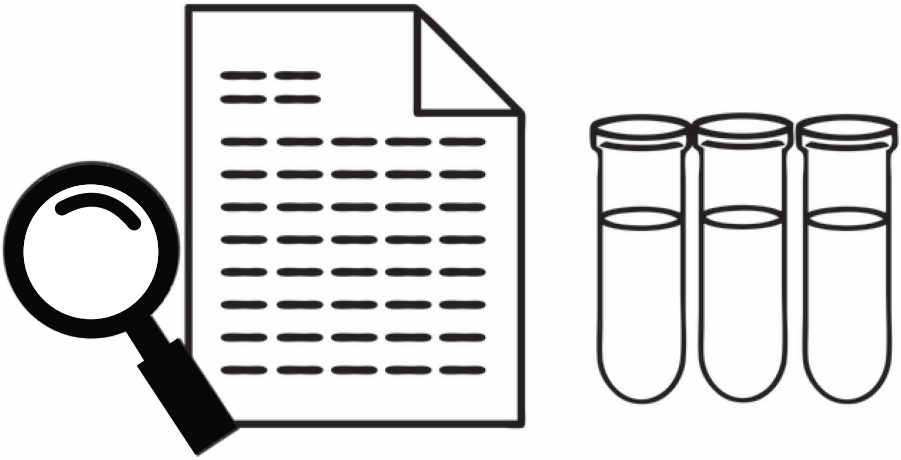


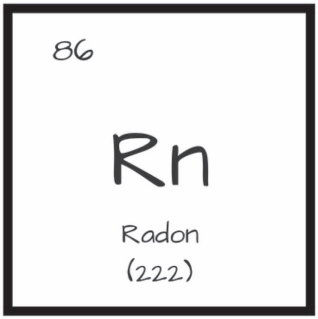
High levels of Radon gas have been found in many parts of the world, including right here in Tennessee.

The only way to be sure if your home is free of Radon gas is to test for Radon using a test kit.

You can get a free test at:
tn.gov/environment/radon

Follow the test kit instructions carefully and send your kit to the lab for analysis.





Notes:

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Answer Key:

Page 2 - What's All the Buzz About
Answer: 2500 x 7 = 17,500 eggs

Page 6 - Pollinator Health
Question 1 Answer: Hive A produces 16 pounds of honey
3+3+3+3+3+1=16 OR (3x5)+1=16

Question 2 Answer: Hive B produces 15 pounds of honey
2+2+2+3+3+3=15 OR (2x3)+(3x3)=15

TOTAL Answer: 31 pounds of honey
15+16=31

Page 11 - Food Recovery Hierarchy
1. Reduction
2. Donated
3. Animals
4. Composting
5. Food waste

Page 15- What is the Problem?
Question 1 Answer: 1/4 a pound of food

$$\frac{5}{4} \times \frac{1}{5} = \frac{5}{20} = \frac{1}{4}$$

Question 2 Answer: 12 buckets of green materials

$$\frac{3B}{1G} \times 4G = 12$$

Page 16 - True/False
1.T 2.T 3. F 4.T 5.F

Page 18 - Sustainable Vocabulary
1. Nonrenewable, Oil/Coal/Natural
2. Renewable
3. Carbon Dioxide, Oxygen
4. Composted
5. Conservation, Resources
6. Donated
7. Pollutant
8. Extinct, Habitat
9. Food Chain
10. Ecosystem

Page 20 - Reduce, Reuse, Recycle
1. a 2. b 3. b 4. b 5. a 6. b 7. b 8. a

Page 28 - Crossword Puzzle

Across	Down
1. Water	3. Agriculture
2. Air	6. Paper
3. Aluminum	7. Sustainability
4. Food	8. Compost
5. Plastic	9. Electricity

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Nashville's Sustainability Outlet

TN Department of Environment & Conservation

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