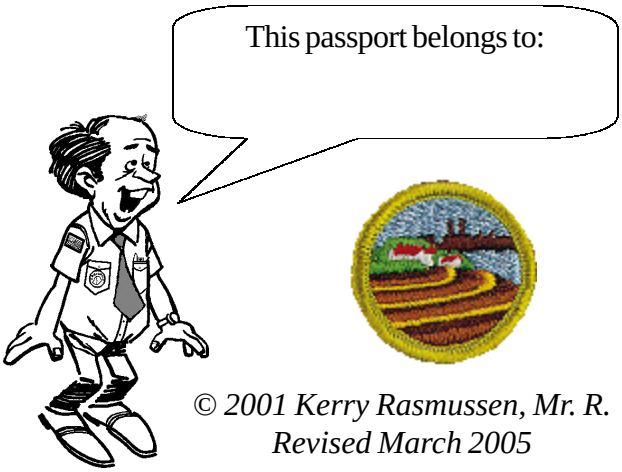
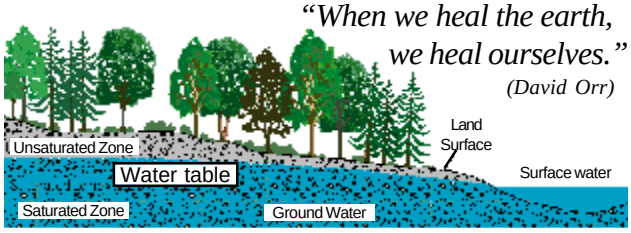
Visit the "Scouting with Mr. R." web site at
www.relia.net/~thedane/scouting.html



http://ga.water.usgs.gov/edu/earthgwaquifer.html

"When we heal the earth, we heal ourselves."
(David Orr)



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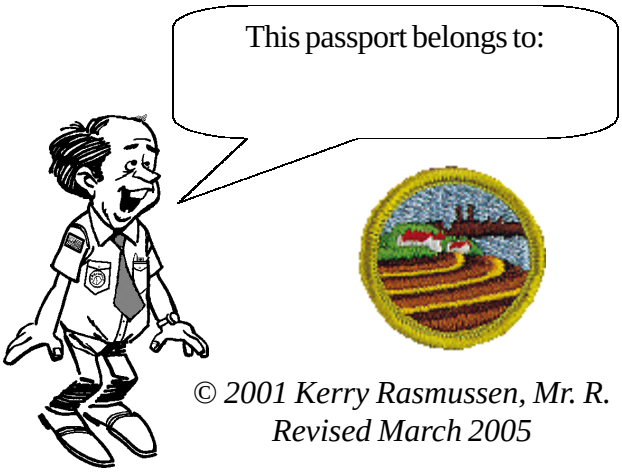

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Revised March 2005

Soil & Water Conservation Passport -📖- 1

http://ga.water.usgs.gov/edu/earthgwaquifer.html

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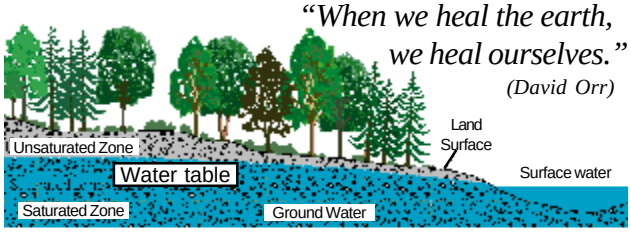


SOIL (1)

a. What is soil?: _____

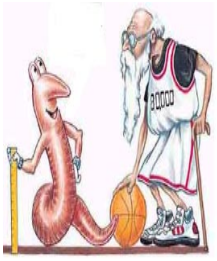
_____

How is it formed? _____

_____

_____

_____



It can take 1,000 years to form one-inch of soil. If people grew that slowly it would take 80,000 years to grow a basketball player. Incredible! How about a little one-on-one?

http://www.nhq.nrcs.usda.gov/CCS/squirm/skQ11.html

Describe three kinds of soil. Tell how they are different.

Soil Types	Grain Size	Texture	Location
	0.002mm or less		
	0.002mm-0.05mm		
	0.05mm - 2.0mm		

SOIL & WATER CONSERVATION

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

CONSERVATION
CONTOUR
EROSION
EVAPORATION
GRAIN
HORIZON
NUTRIENT
PERCOLATION
POLLUTION
PROFILE
SOIL
TRANSPIRATION
TREATMENT
WATERSHED

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SOIL (1)

a. What is soil?: _____

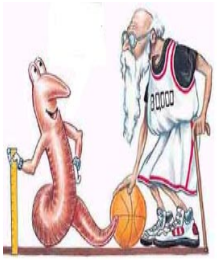
_____

How is it formed? _____

_____

_____

_____



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Soil Types	Grain Size	Texture	Location
	0.002mm or less		
	0.002mm-0.05mm		
	0.05mm - 2.0mm		

Soil & Water Conservation Passport -📖- 27

SOIL & WATER CONSERVATION

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

CONSERVATION
CONTOUR
EROSION
EVAPORATION
GRAIN
HORIZON
NUTRIENT
PERCOLATION
POLLUTION
PROFILE
SOIL
TRANSPIRATION
TREATMENT
WATERSHED

Soil Profile

Horizon & Thickness

O inches thick

A inches thick

B inches thick

C inches thick

The bottom "R" layer is the solid rock.

Attach a 4" strip of 1"-wide carpet tape here.

Measure the average depth of each horizon and record it on the chart.

Attach carpet tape. Slowly peel back tape backing from the top to expose about a 1" sticky area.

Carefully spread some of the "O" litter on it. Peel back a little more and spread on some "A" layer. Repeat with all the other layers.

Place wax paper between pages to keep them from sticking!

http://soils.usda.gov/education/resources/k_12/lessons/profile/

Perform a simple mud pie test.
(1) Take a handful of soil.
(2) Add just enough water to form a mud pie, working it until it is like playdough.
(3) Roll it back and forth in your hands trying to form a long snake about the thickness of a pencil.
If you can form a long snake, your soil is mostly **clay**l. If your snake breaks apart at 1"-3" intervals, your soiil is mostly **silt**. If you can't form a snake or a mud pie, your soil is mostly **sand**.

What type of soil do you have? _____

NOTE: The 3 numbers on fertilizer bags tell us how much of each nutrient it contains.

c. List the **three** main plant nutrients found in fertile soil. Tell how they can be put back when used up.

Type of Nutrient	How can it be returned to the soil?

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Soil Profile

Horizon & Thickness

O inches thick

A inches thick

B inches thick

C inches thick

The bottom "R" layer is the solid rock.

Attach a 4" strip of 1"-wide carpet tape here.

Measure the average depth of each horizon and record it on the chart.

Attach carpet tape. Slowly peel back tape backing from the top to expose about a 1" sticky area.

Carefully spread some of the "O" litter on it. Peel back a little more and spread on some "A" layer. Repeat with all the other layers.

Place wax paper between pages to keep them from sticking!

http://soils.usda.gov/education/resources/k_12/lessons/profile/

Soil & Water Conservation Passport -📖- 3

Perform a simple mud pie test.
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NOTE: The 3 numbers on fertilizer bags tell us how much of each nutrient it contains.

c. List the **three** main plant nutrients found in fertile soil. Tell how they can be put back when used up.

Type of Nutrient	How can it be returned to the soil?

SOIL EROSION (2)

a. Definition: _____

_____

b. Why is soil erosion important?_____

_____

_____

How does it affect you?_____

_____

_____

c. Name **three** kinds of soil erosion. Describe each.

Type of Erosion	Description

Problem 3_____

_____

Correction: _____

_____

_____

_____

Problem 4_____

_____

Correction: _____

_____

_____

_____

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SOIL EROSION (2)

a. Definition: _____

_____

b. Why is soil erosion important?_____

_____

_____

How does it affect you?_____

_____

_____

c. Name **three** kinds of soil erosion. Describe each.

Type of Erosion	Description

Soil & Water Conservation Passport -📖- 25

Problem 3_____

_____

Correction: _____

_____

_____

_____

Problem 4_____

_____

Correction: _____

_____

_____

_____

Problem 1_____

_____

Correction: _____

_____

_____

_____

Problem 2_____

_____

Correction: _____

_____

_____

_____

Take or draw pictures of **two** types of soil erosion.

Type of erosion: _____

Type of erosion: _____

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Problem 1_____

_____

Correction: _____

_____

_____

_____

Problem 2_____

_____

Correction: _____

_____

_____

_____

Soil & Water Conservation Passport -📖- 5

Take or draw pictures of **two** types of soil erosion.

Type of erosion: _____

Type of erosion: _____

CONSERVATION PRACTICES (3)

a.What is meant by Soil Conservation Practices?

_____

_____

_____

_____

_____

b. In the following boxes, list **three** kinds of erosion-control practices. Describe the effects of each one. Take or draw pictures of these erosion-control practices.

Type of control practice : _____

Effect: _____

_____

☐ c. Seed an area of at least one-fifth acre for some worthwhile conservation purposes, using suitable grasses or legumes alone or in a mixture.

☐ d. Study a soil survey report. Describe the things in it. Using tracing paper and pen, trace over any of the soil maps; and outline an area with three or more different kinds of soil. List each kind of soil by full name and map symbol.

☐ e. Make a list of places in your neighborhood, camps, school ground, or park having erosion, sedimentation, or pollution problems. Describe how these could be corrected through individual or group action. (Use the following two pages).

☐ f. Carry out any other soil and water conservation project approved by your merit badge counselor.

Project: _____

_____ _____

Signature of Adult Leader Date

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Soil & Water Conservation Passport -🕮- 23

CONSERVATION PRACTICES (3)

a.What is meant by Soil Conservation Practices?

_____

_____

_____

_____

_____

b. In the following boxes, list **three** kinds of erosion-control practices. Describe the effects of each one. Take or draw pictures of these erosion-control practices.

Type of control practice : _____

Effect: _____

_____

☐ c. Seed an area of at least one-fifth acre for some worthwhile conservation purposes, using suitable grasses or legumes alone or in a mixture.

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☐ f. Carry out any other soil and water conservation project approved by your merit badge counselor.

Project: _____

_____ _____

Signature of Adult Leader Date

IMPROVEMENTS (7)

Do **TWO** of the following:

☐ a. Make a trip to two of the following places. Write a report of more than **500** words about the soil and water and energy conservation practices you saw.

1. An agricultural experiment.
2. A managed forest or a woodlot, range, or pasture.
3. A wildlife refuge or fish or game management area.
4. A conservation-managed farm or ranch.
5. A managed watershed.
6. A waste-treatment plant.
7. A public drinking water treatment plant.
8. An industry water-use installation.
9. A desalinization plant.

☐ b. Plant 100 trees, bushes and/or vines for a good purpose.

Type of control practice : _____

Effect: _____

_____

Type of control practice : _____

Effect: _____

_____

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Soil & Water Conservation Passport -🕮- 7

IMPROVEMENTS (7)

Do **TWO** of the following:

☐ a. Make a trip to two of the following places. Write a report of more than **500** words about the soil and water and energy conservation practices you saw.

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2. A managed forest or a woodlot, range, or pasture.
3. A wildlife refuge or fish or game management area.
4. A conservation-managed farm or ranch.
5. A managed watershed.
6. A waste-treatment plant.
7. A public drinking water treatment plant.
8. An industry water-use installation.
9. A desalinization plant.

☐ b. Plant 100 trees, bushes and/or vines for a good purpose.

Type of control practice : _____

Effect: _____

_____

Type of control practice : _____

Effect: _____

_____

WATERSHED (4)

a. Explain what a **watershed** is: _____

_____

_____

_____

_____

☐ b. Outline the smallest watershed that you can find on a contour map.
☐ c. Outline, as far as the map will allow, the next larger watershed which also has the smaller one in it.

d. Explain what a **river basin** is: _____

_____

_____

_____

Why should all people living in a river basin be concerned about land and water use in it?

_____

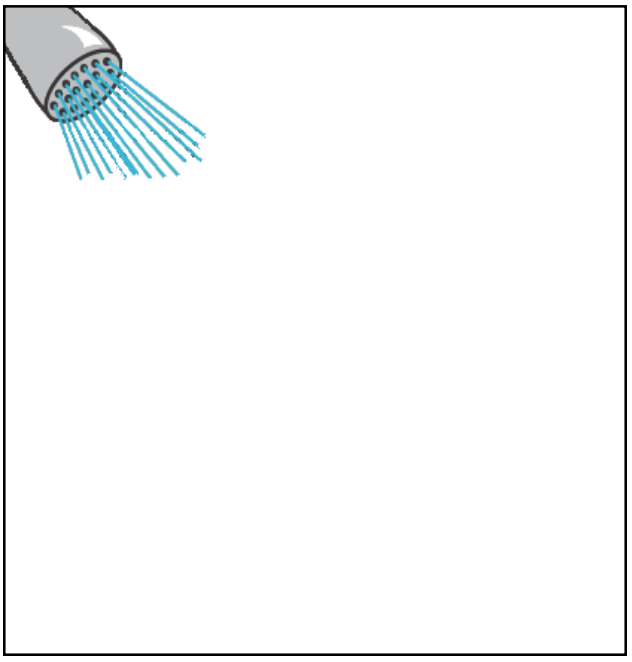
_____

_____

biochemical oxygen demand?_____

_____

_____



d. Make a drawing showing the principles of complete waste treatment.

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WATERSHED (4)

a. Explain what a **watershed** is: _____

_____

_____

_____

_____

☐ b. Outline the smallest watershed that you can find on a contour map.
☐ c. Outline, as far as the map will allow, the next larger watershed which also has the smaller one in it.

d. Explain what a **river basin** is: _____

_____

_____

_____

Why should all people living in a river basin be concerned about land and water use in it?

_____

_____

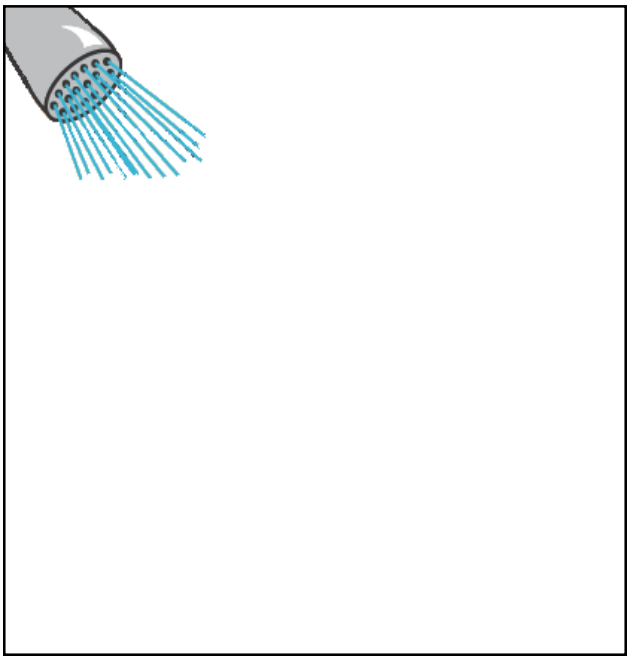
_____

Soil & Water Conservation Passport -📖- 21

biochemical oxygen demand?_____

_____

_____



d. Make a drawing showing the principles of complete waste treatment.

WATER PROBLEMS (6)

a. Definition:_____

_____

b. List common sources of water pollution and their affects:

source 1: _____
effect: _____

source 1: _____
effect: _____

source 1: _____
effect: _____

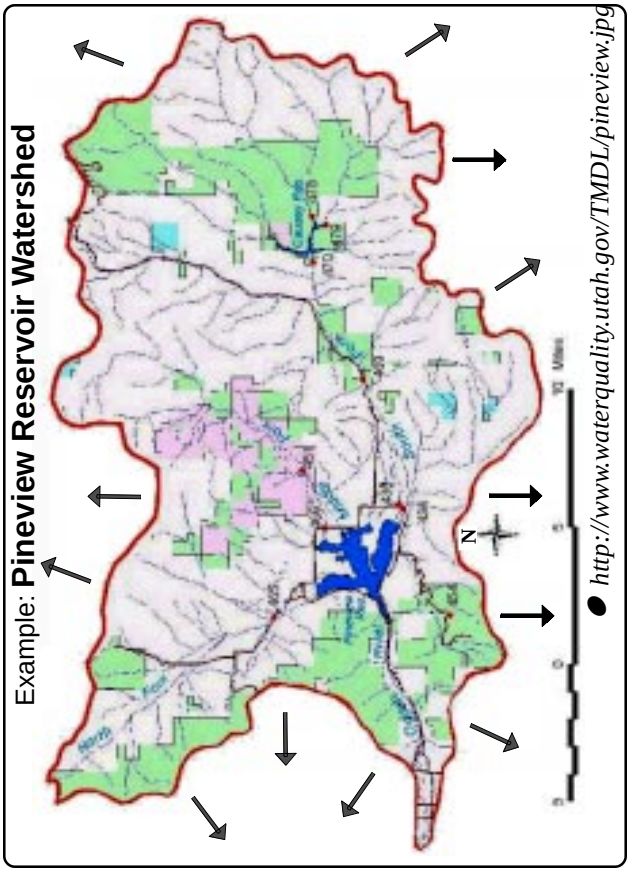
c. What is meant by the following?:

primary water treatment_____

_____

secondary waste treatment?_____

_____



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WATER PROBLEMS (6)

a. Definition:_____

_____

b. List common sources of water pollution and their affects:

source 1: _____
effect: _____

source 1: _____
effect: _____

source 1: _____
effect: _____

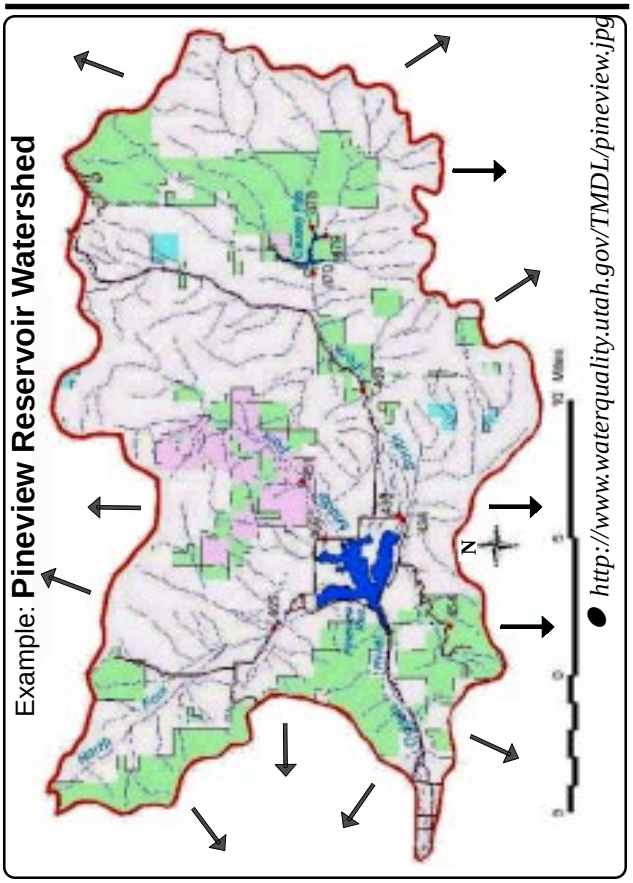
c. What is meant by the following?:

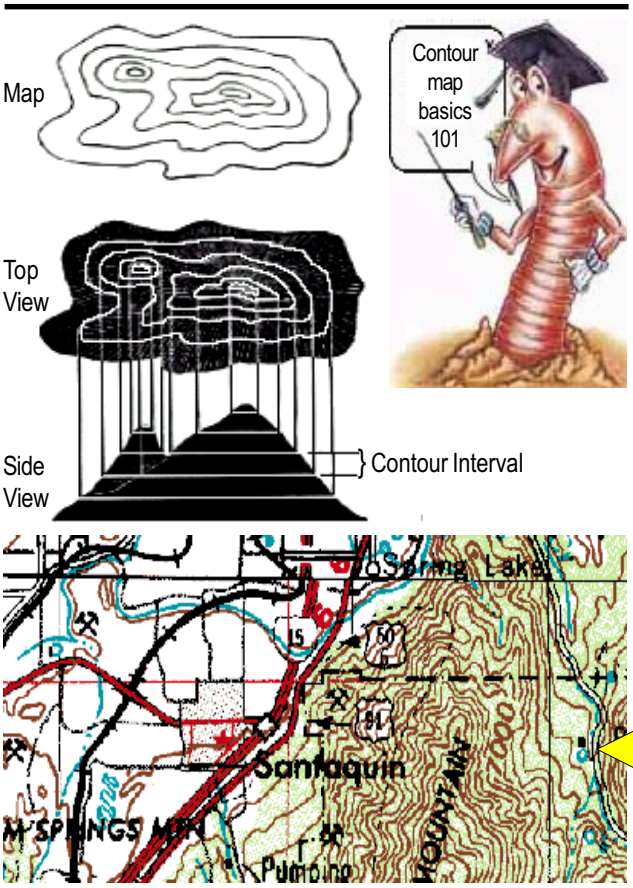
primary water treatment_____

_____

secondary waste treatment?_____

_____



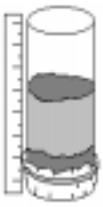


SOIL CAPILLARY ACTION

☐ Cover one end of a plastic tube with a square of cloth and fasten in place with a rubber band.

☐ Turn tube over; fill 3/4 full with **dry sand**.

☐ Place filled tube in a shallow pan which contains about 3/4" water.



☐ With a ruler and watch, keep a record of how long it takes the water to move up 1 cm, 2 cm, etc. in the tube.

☐ Repeat the experiment with **dry clay soil** and then **dry topsoil**.

Soil Type	Times				
	1cm	2cm	3cm	4cm	5cm
sand					
	Observations				
clay					
topsoil					

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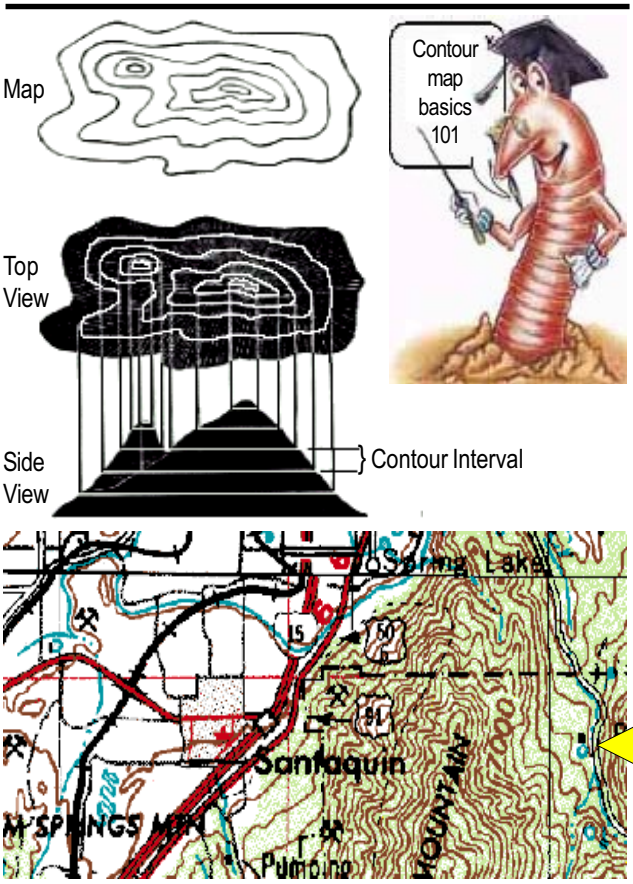


Soil & Water Conservation Passport -🕮- 19

SOIL CAPILLARY ACTION

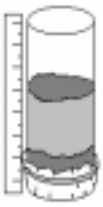
☐ Cover one end of a plastic tube with a square of cloth and fasten in place with a rubber band.

☐ Turn tube over; fill 3/4 full with **dry sand**.

☐ Place filled tube in a shallow pan which contains about 3/4" water.

☐ With a ruler and watch, keep a record of how long it takes the water to move up 1 cm, 2 cm, etc. in the tube.

☐ Repeat the experiment with **dry clay soil** and then **dry topsoil**.



Soil Type	Times				
	1cm	2cm	3cm	4cm	5cm
sand					
	Observations				
clay					
topsoil					

SOIL EVAPORATION

☐ In three tuna fish cans place equal amounts of soil (all taken from the same source).

☐ Water each can well, pouring off any excess water.

☐ With a kitchen scale, weigh each can. Add a little water until each can weighs exactly the same.

☐ Place the cans in three areas (where they will be undisturbed): **sun**, **partial sun**, **shade**.

☐ Each day (same time) weigh & record their weights.

☐ At the end of the experiment, calculate and record the amount of water lost in each can.

(Subtract the ending weight from the beginning weight.)

WEIGHT	Day1	Day2	Day3	Day4	Amt. Water Lost
Sun					
Partial Shade					
Shade					

Water evaporated from which cans:

☐ sun ☐ partial shade ☐ shade

What else affects evaporation rates?

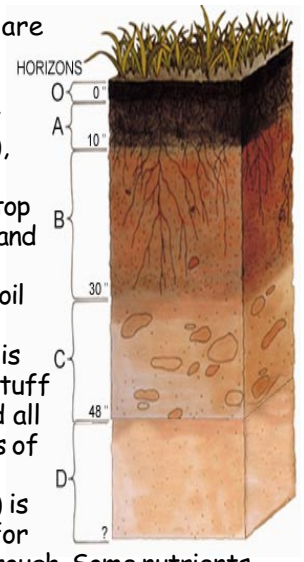
_____ _____

_____ _____

Soil Profile

● *http://soils.usda.gov/education/resources/k_12/lessons/profile/*

Did you know that there are horizons in the soil? They're named ***O***, ***A***, **B**, ***C***, and **R**. Those who study these layers (soil profiles), are called **pedologists**.



"O" (organic litter) is the top horizon--about an inch thick and made up of dead stuff which breaks down and keeps the soil healthy.

The ***"A"*** horizon (topsoil) is alive with roots, tiny microstuff like bacteria and fungi, and all kinds of critters. It has lots of nutrients.

The **"B"** horizon (subsoil) is harder and more difficult for plants and animals to get through. Some nutrients leach through from the A horizon so it can support some hardy plant life.

Horizon ***"C"*** (substratum) has hardly any living stuff. It has just recently been ground from the original rock and has very few nutrients.

The bottom **"R"** horizon is not soil at all, but the original rock. Other than a few strong plant roots, no living matter lives there.

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SOIL EVAPORATION

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(Subtract the ending weight from the beginning weight.)

WEIGHT	Day1	Day2	Day3	Day4	Amt. Water Lost
Sun					
Partial Shade					
Shade					

Water evaporated from which cans:

☐ sun ☐ partial shade ☐ shade

What else affects evaporation rates?

_____ _____

_____ _____

Soil & Water Conservation Passport -📖- 11

Soil Profile

● http://soils.usda.gov/education/resources/k_12/lessons/profile/

Did you know that there are horizons in the soil? They're named O, A, B, C, and R. Those who study these layers (soil profiles), are called pedologists.

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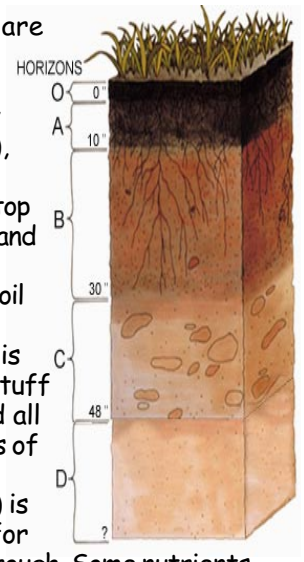
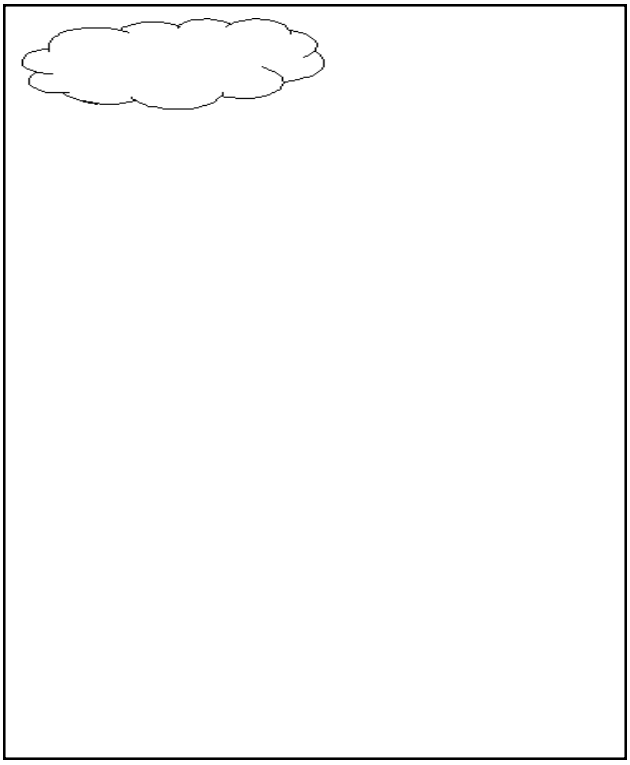


WATER SUPPLY (5)



a. Make a drawing to show the hydrologic cycle.

WEIGHT	Day1	Day2	Day3	Day4	Day5	Day6	Day7
Can 1							
Weight of water added to can 1							
Can 2							
Can 3							

Amounts of water lost:

Can1	Can2	Can3
vegetation receiving precipitaion	vegetation NOT receiving precipitaion	Evaporation from a body of water

Why did #1 drink more than #2?_____

_____

What could the adding of water to #1 be compared to?

_____

What would happen if the precipitation was a lot more than the evapotranspiration?

_____

What else affects evapotranspiration rates?

_____ _____

_____ _____

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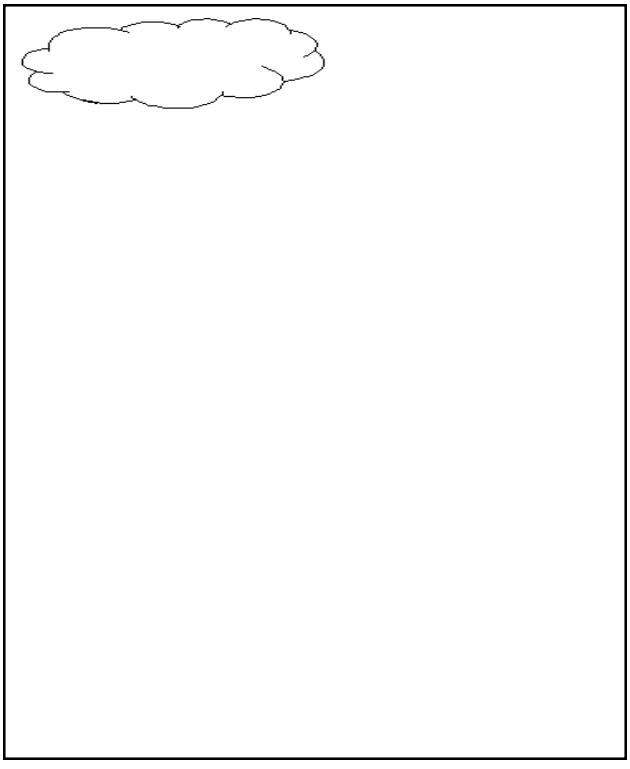
WATER SUPPLY (5)



a. Make a drawing to show the hydrologic cycle.

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WEIGHT	Day1	Day2	Day3	Day4	Day5	Day6	Day7
Can 1							
Weight of water added to can 1							
Can 2							
Can 3							

Amounts of water lost:

Can1	Can2	Can3
vegetation receiving precipitaion	vegetation NOT receiving precipitaion	Evaporation from a body of water

Why did #1 drink more than #2?_____

_____

What could the adding of water to #1 be compared to?

_____

What would happen if the precipitation was a lot more than the evapotranspiration?

_____

What else affects evapotranspiration rates?

_____ _____

_____ _____

SOIL TRANSPIRATION

☐ In two tuna fish cans place a plug of grass. By pressing down hard while rotating the can it will cut a ring in the grass. Carefully pull out the grass and set in the cans.

☐ Water each can well, pouring off any excess water.

☐ With a kitchen scale, weigh each can. Add a little water until both weigh exactly the same.

☐ In a third can, add water until it weighs the same as the grass cans.

☐ Place all three in a sunny spot.

☐ Each day, weigh each can and record their weights.

☐ ADD enough water to can #1 each day, bringing it back to its original weight.

☐ At the end of the experiment, calculate the amount of water lost in each can.

For can1 add up the daily amounts of water added. For can2 and can 3, subtract the ending weight from the beginning weight.

Transpiration is the loss of water by plants. The rate of this loss depends upon temperature, humidity and wind speed conditions near the leaves of plants. Since plants draw water from the soil, transpiration rates can greatly effect soil moisture content. Soil water loss resulting from both transpiration and evaporation is called **Evapotranspiration**.

c. Explain how removal of vegetation will affect the way water runs off a watershed.

_____

_____

d. Tell how uses of forest, range land, and farmland affect usable water supply.

forest_____

_____

range land _____

_____

farmland _____

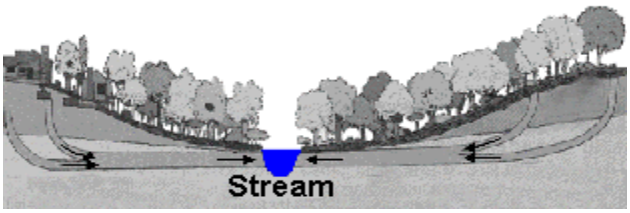
_____

e. Explain how industrial use affects water supply.

_____

_____

_____



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SOIL TRANSPIRATION

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c. Explain how removal of vegetation will affect the way water runs off a watershed.

_____

_____

d. Tell how uses of forest, range land, and farmland affect usable water supply.

forest_____

_____

range land _____

_____

farmland _____

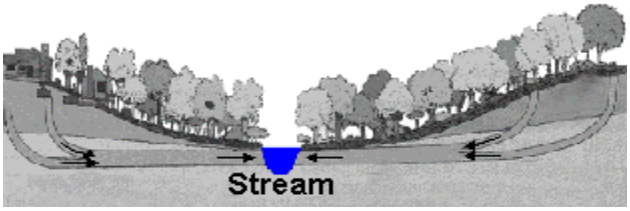
_____

e. Explain how industrial use affects water supply.

_____

_____

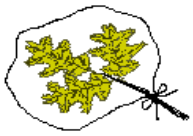
_____



EXPERIMENTS (5b)

Do **TWO** of the following experiments:

WATER TRANSPIRATION



☐ Find a branch of a tree that is in sunlight most of the day, and where it will be left undisturbed.
☐ Place a large, clear plastic bag over a branch containing a number of leaves.
☐ Tie a string tightly around the end of the bag (tight enough to seal but not damage the tree).
☐ Let the bag sit for 24 hours. Upon returning, note any changes noticed within the bag.
☐ Option: Weigh the bag before and after to see how much water transpired.

Type of tree_____

Observations_____

_____

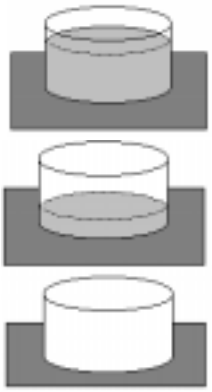
Weight (or amount) of water collected:_____

Transpiration is the loss of water by plants. The rate of this loss depends upon temperature, humidity and wind speed conditions near the leaves of plants. Since plants draw water from the soil, transpiration rates can greatly effect soil moisture content. Soil water loss resulting from both transpiration and evaporation is called **Evapotranspiration**.

SOIL PERCOLATION

☐ Remove the top and bottom of a large can.
☐ Place the can on top of some **sandy soil**, rotating it back and forth until ½"-1" of the can is beneath the soil.
☐ Have someone ready to time how long it takes for ***all*** the water to ***completely*** penetrate the soil.
☐ Quickly pour an entire **quart** of water in the can and start timing.
☐ Record the time in the following chart and explain why you feel it took this amount of time.

☐ Repeat with **dry clay soil** and **dry topsoil**.



Soil Type	Time	Observations
sand		
clay		
topsoil		

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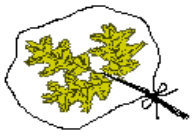
EXPERIMENTS (5b)

Do **TWO** of the following experiments:

WATER TRANSPIRATION



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☐ Tie a string tightly around the end of the bag (tight enough to seal but not damage the tree).
☐ Let the bag sit for 24 hours. Upon returning, note any changes noticed within the bag.
☐ Option: Weigh the bag before and after to see how much water transpired.

Type of tree_____

Observations_____

_____

Weight or amount of water:_____

Transpiration is the loss of water by plants. The rate of this loss depends upon temperature, humidity and wind speed conditions near the leaves of plants. Since plants draw water from the soil, transpiration rates can greatly effect soil moisture content. Soil water loss resulting from both transpiration and evaporation is called **Evapotranspiration**.

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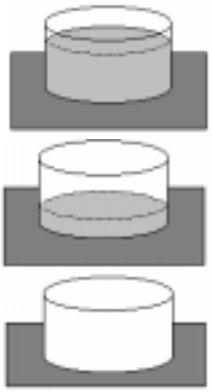
SOIL PERCOLATION:

☐ Remove the top and bottom of a large can.
☐ Place the can on top of some **sandy soil**, rotating it back and forth until ½"-1" of the can is beneath the soil.
☐ Have someone ready to time how long it takes for ***all*** the water to ***completely*** penetrate the soil.
☐ Quickly pour an entire **quart** of water in the can and start timing.
☐ Record the time in the following chart and explain why you feel it took this amount of time.

☐ Repeat with **dry clay soil** and **dry topsoil**.



Soil Type	Time	Observations
sand		
clay		
topsoil		