



Watershed Watch

a Citizen Science Investigation of the Radcliffe Creek Watershed

Student Field Notebook *and* Radcliffe Creek Field Guide

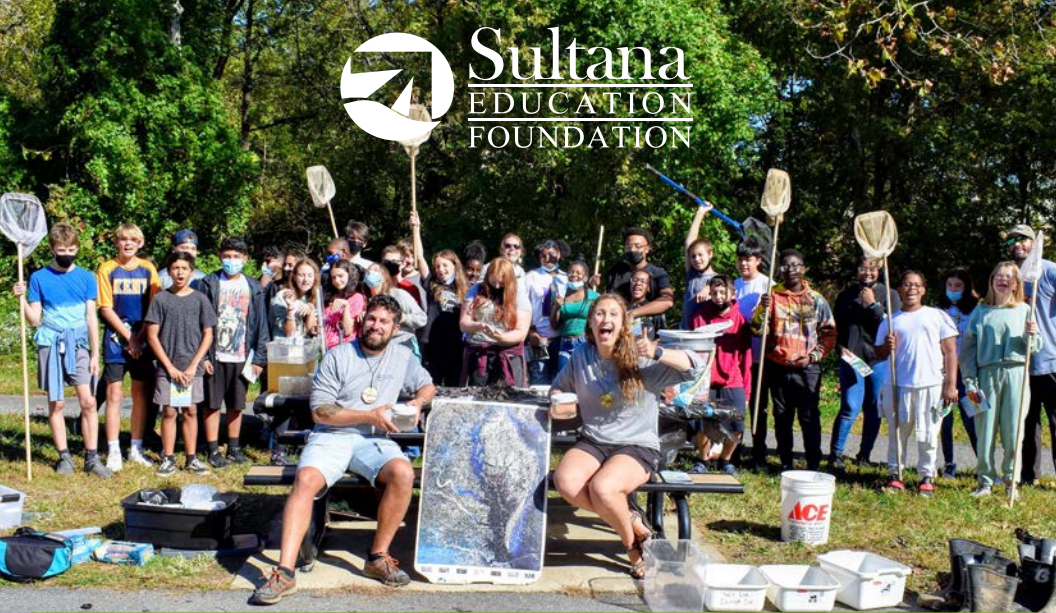
student name _____

school name _____





Sultana
EDUCATION
FOUNDATION



ABOUT WATERSHED WATCH

In 2018, the Sultana Education Foundation (SEF), Kent County Public Schools, Kent School, and Radcliffe Creek School established a long-term study, monitoring, and restoration program known as *Watershed Watch* focusing on Radcliffe Creek, a tributary of the Chester River and Chesapeake Bay.

Students and teachers participating in the program will conduct year-long examinations of the Radcliffe Creek Watershed in Kent County in order to learn 1) how watersheds function, 2) how human activity impacts water quality downstream, and 3) how communities and individuals can implement specific practices to improve water quality and environmental health locally and throughout the Chesapeake region.

Implemented on a county-wide scale, the goal of *Watershed Watch* is to measurably improve understanding of watershed-related issues in Kent County, and encourage students to participate in action projects that lead to improved water quality in Radcliffe Creek and the Chester River.

Partner Schools



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WELCOME TO WATERSHED WATCH

Welcome to the *Watershed Watch* program. Throughout the school year you will be working with your teachers and staff from Sultana Education Foundation (SEF) to complete a scientific investigation of the Radcliffe Creek Watershed.

The sections found in this field notebook correspond to different activities you will participate in over the course of the program. Use the pages provided to record data, make observations, and answer questions. There are also pages provided at the end of each module for a personal reflection. Questions to consider when writing a personal reflection include:

- What did you do today?
- What was the focus of the day's activities?
- What was your favorite part of the activity?
- What did you learn about Radcliffe Creek and its watershed?

We look forward to seeing you soon!

Sincerely,

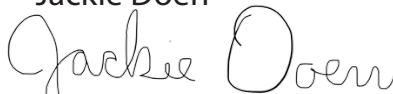
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STUDENT FIELD NOTEBOOK DEVELOPMENT TEAM

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ABOUT RADCLIFFE CREEK

Radcliffe Creek is a tributary of the Chester River that winds gently along the southern boundary of the town of Chestertown. The tidal portion of the creek is navigable by canoe or kayak for approximately one mile, entering the Chester just beyond Quaker Neck Bridge on the Kent County side of the river.

Radcliffe Creek's watershed extends well into Chestertown. Land use within the drainage basin includes large-scale commercial development, residential development, and agricultural land. Additional land cover includes marshes, swamps, forests, and non-tidal wetlands. This incredibly diverse ecosystem provides students with a unique opportunity to examine how land uses within a local watershed impact the water quality of natural systems downstream.

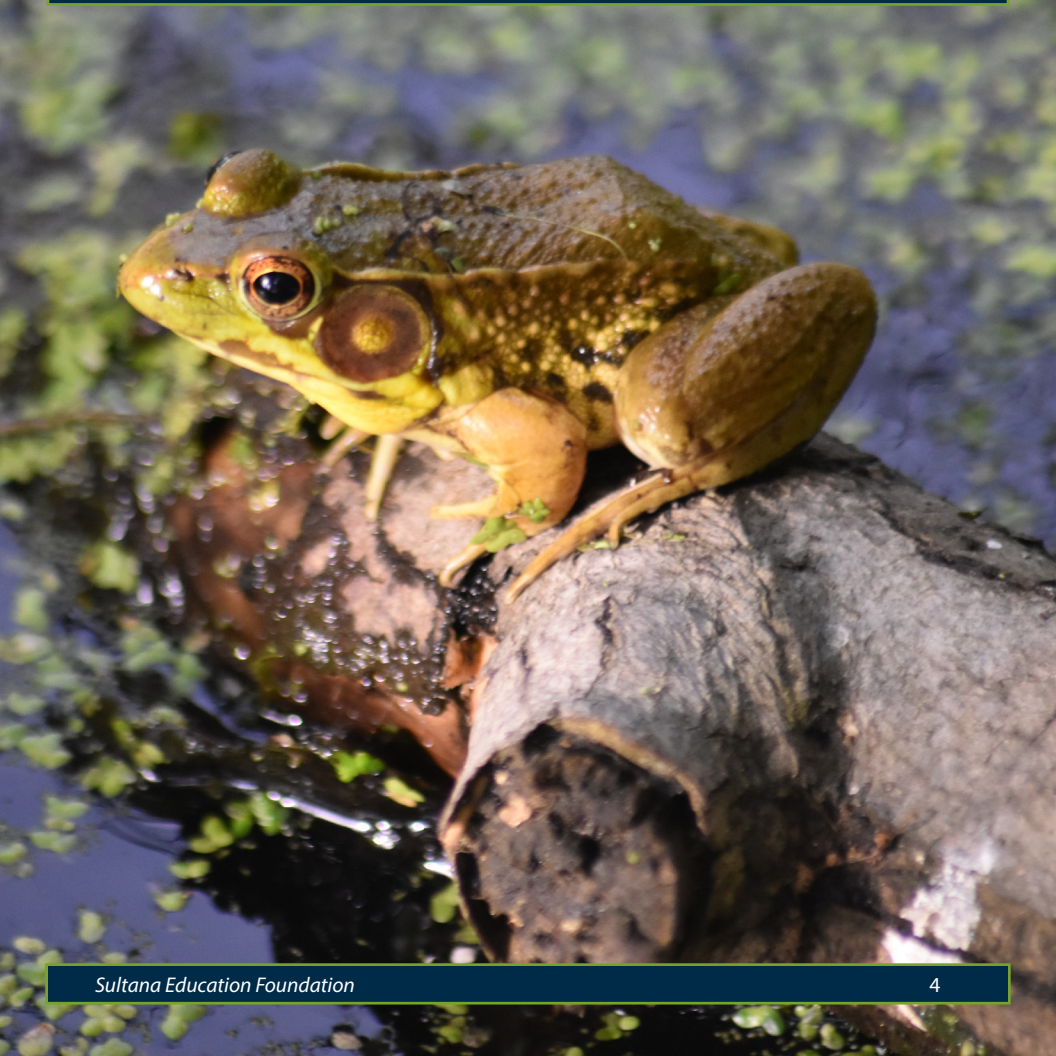


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Students are introduced to the concept of a watershed and identify sources of pollution from land uses within the Radcliffe Creek watershed. Students use online mapping resources to delineate the watersheds of the Chesapeake Bay, Chester River, and Radcliffe Creek.

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Students participate in a classroom session where they learn how to use test kits to monitor water quality parameters and sample macroinvertebrates as a way to gauge stream health.

Module 3: Radcliffe Creek Headwaters..... 28

Students visit Gateway Park to conduct water quality tests, sample aquatic life, identify macroinvertebrates, and survey land use at the headwaters of Radcliffe Creek to assess the health of the stream.

Module 4: Land Use and Water Quality..... 40

At Sultana's Holt Education Center, students conduct water quality tests, examine the historic and current land uses within the Radcliffe Creek Watershed, and dissect crayfish to learn about the anatomy of a local macroinvertebrate.

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Students identify an organism found in the Radcliffe Creek ecosystem and conduct a research project to become the resident expert on that animal.

Module 6: Lower Radcliffe Creek..... 50

While canoeing, students evaluate the health of the tidal portion of lower Radcliffe Creek and teach their peers about the organism they researched during Module 5.

Module 7: What Does it all Mean?..... 54

Students analyze Radcliffe Creek water quality data, use their findings to assign a grade to the stream's health, and compare their assessment to grades assigned to the creek by local scientists.

Module 8: Take Action!..... 66

Students identify an issue affecting the health of Radcliffe Creek, then design and implement an action project to address that issue.

Module 9: Presenting Your Work..... 70

Students present their findings and explain their action project to community members, elected officials, parents, and local stakeholders.

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MODULE 1: WATERSHED MAPPING

Location: At Your School

A. Watershed Models

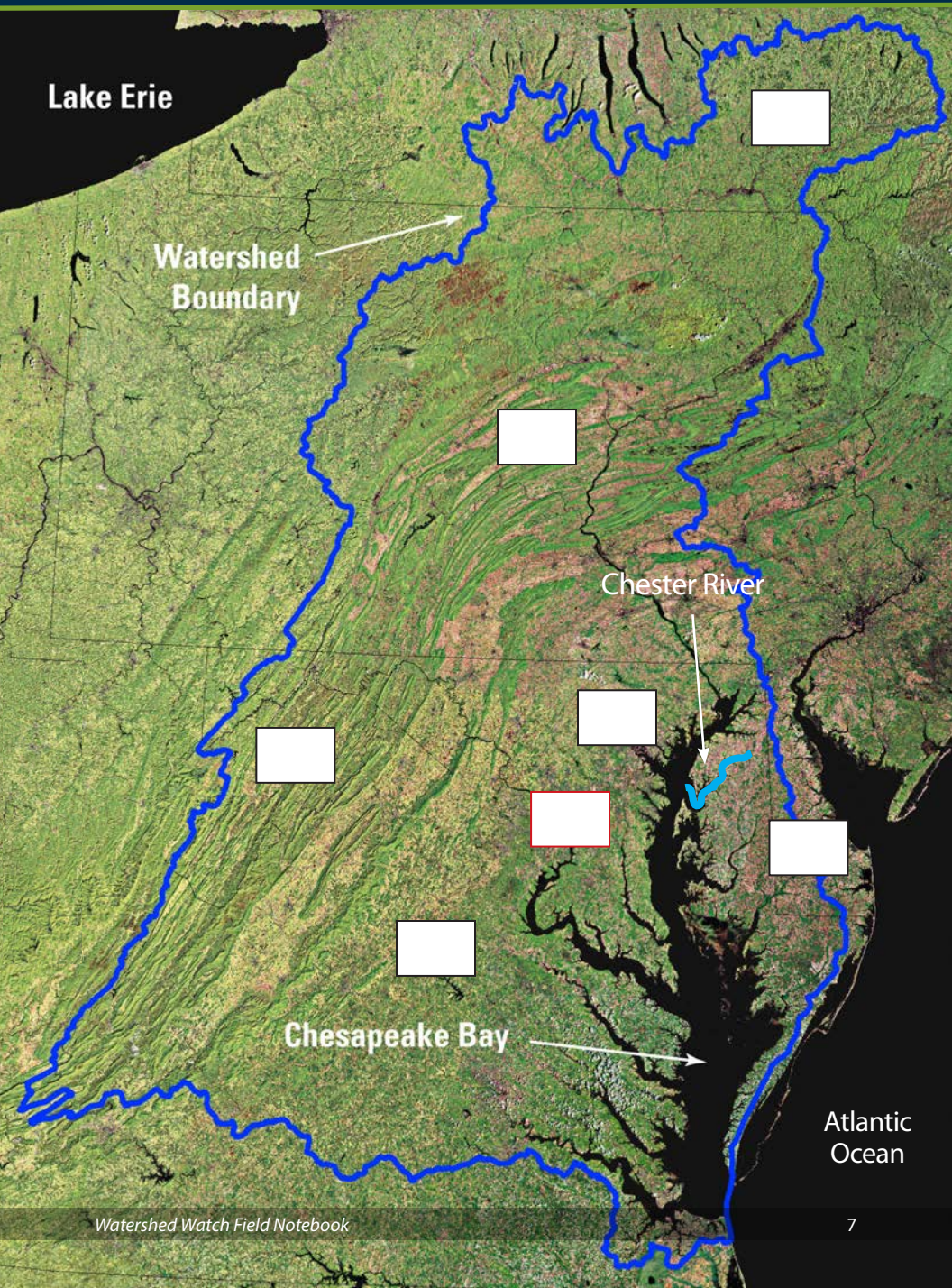
Activity: Working with your classmates, use the Chesapeake Bay Watershed tarp and ping pong balls to model how water moves throughout the watershed. Record your observations:

Activity: Repeat the activity using the Radcliffe Creek Watershed tarp. Record your observations:

Question: Based on your models, how would you define a watershed?

CHESAPEAKE BAY WATERSHED

Exercise #1 - Work with your teachers to identify the six states and our nation's capital in the Chesapeake Bay Watershed. (NY, MD, WV, VA, PA, DE, D.C.)



CHESTER RIVER WATERSHED

Radcliffe Creek

[Redacted]

[Redacted]

[Redacted]



Exercise #2 - Use Wikiwatershed.org to Map Chester River Watershed

Visit wikiwatershed.org and map the Chester River Watershed. Using information from wikiwatershed.org mark the approximate location of major towns and tributaries in the Chester River Watershed on the map above.

RADCLIFFE CREEK WATERSHED

Exercise #3 - Use Wikiwatershed.org to Map Radcliffe Creek Watershed

Visit wikiwatershed.org and map the Radcliffe Creek Watershed. Using information from wikiwatershed mark the approximate location of major points of interest in the Radcliffe Creek Watershed. Use the full image of the Radcliffe Creek Watershed found on this page, as well as the section of the Radcliffe Creek Watershed found on the following page.

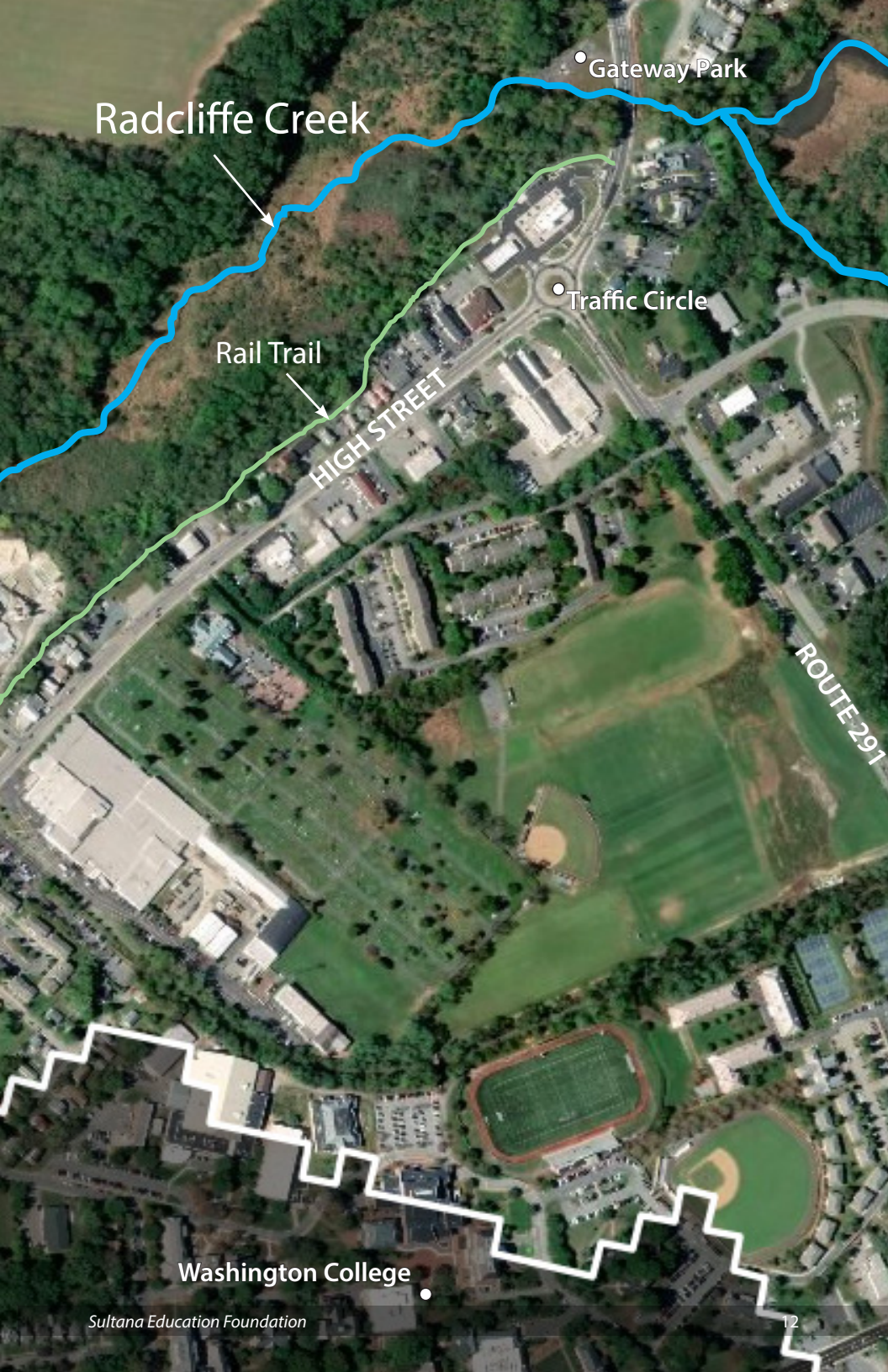




Coventry Farms

School

Christian Academy



Radcliffe Creek

Gateway Park

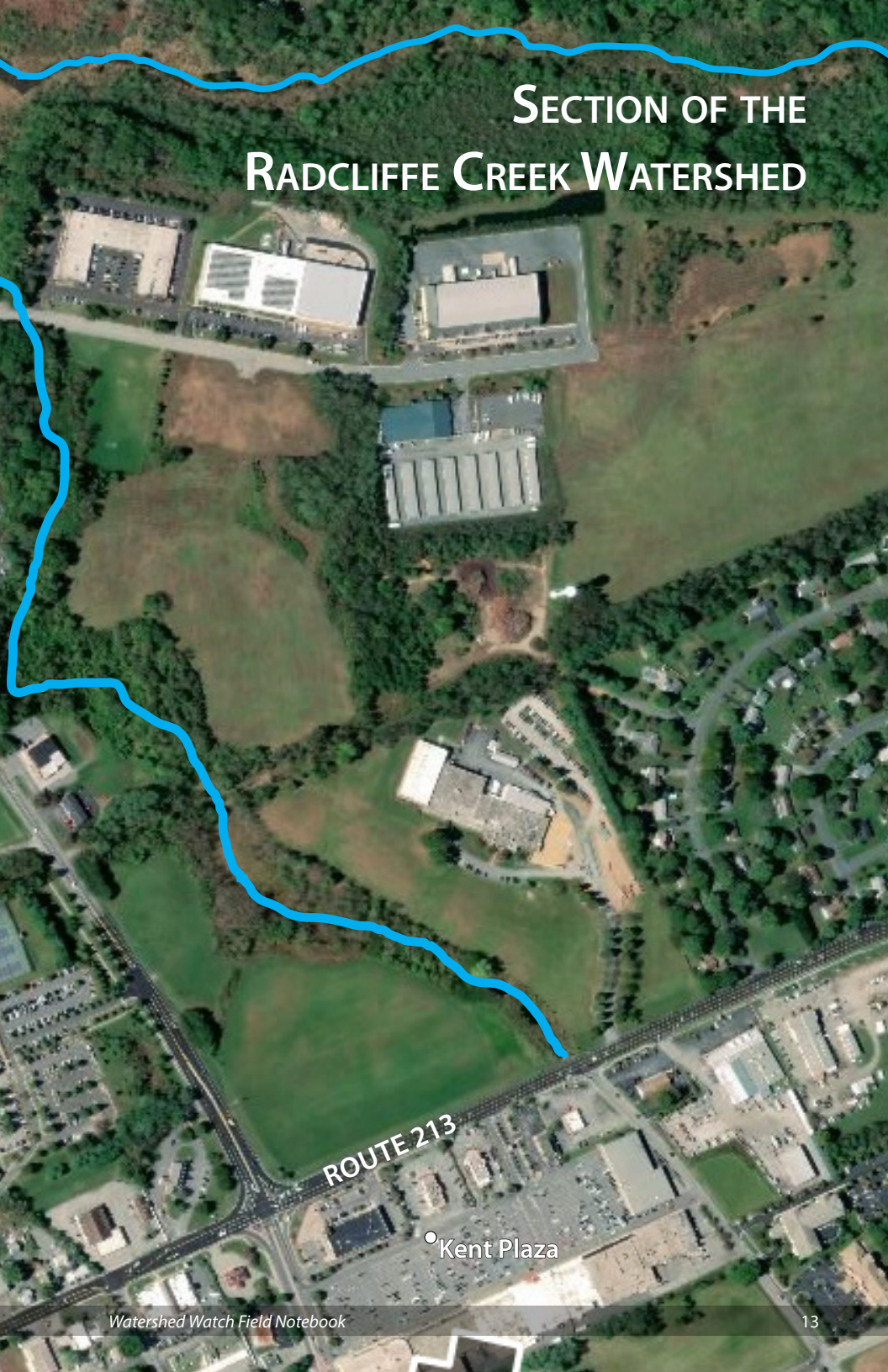
Traffic Circle

Rail Trail

HIGH STREET

ROUTE 291

Washington College

An aerial photograph showing a section of the Radcliffe Creek Watershed. A blue line outlines the watershed boundary, which runs from the top left, curves around several large industrial buildings and parking lots, then turns south and east, crossing a major road. The landscape includes green fields, dense forests, and various commercial structures. The text 'SECTION OF THE RADCLIFFE CREEK WATERSHED' is overlaid in white at the top. 'ROUTE 213' is labeled on the road, and 'Kent Plaza' is marked with a dot in the lower right.

SECTION OF THE RADCLIFFE CREEK WATERSHED

ROUTE 213

• Kent Plaza

B. The Health of Radcliffe Creek

Question: What are two sources of pollution in the Radcliffe Creek Watershed. Where do they originate?

Question: What are four types of land use found in the Radcliffe Creek Watershed?

Question: How does land use within the watershed affect the health and quality of Radcliffe Creek?

Question: Why does this matter? Why should we care about the health of Radcliffe Creek?

Make a Prediction: Based on the land use patterns you identified within the Radcliffe Creek Watershed, make a prediction about the water quality you will find on your field trip to the headwaters of the stream. Do you think the water will be clear and clean? Cloudy and polluted? Somewhere in between? Be sure to explain your hypothesis.

C. Module 1 Reflection

MODULE 2: INTRO TO FIELD SAMPLING

Location: At Your School

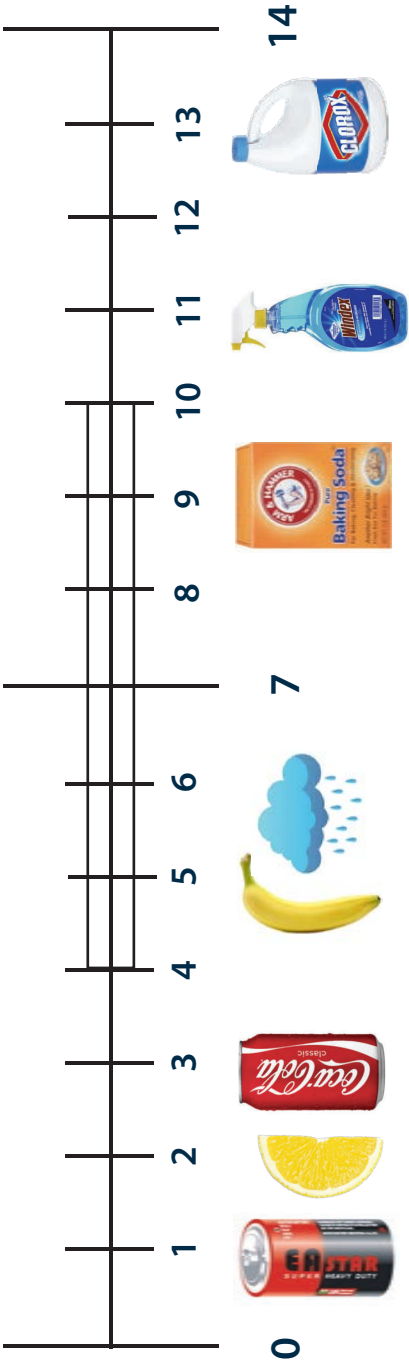
A. Warm-up Questions

Question: What are some water quality indicators scientists could measure to assess the water quality of Radcliffe Creek?

Question: The indicators we will use during Watershed Watch to explore the health of Radcliffe Creek include:

PH SCALE

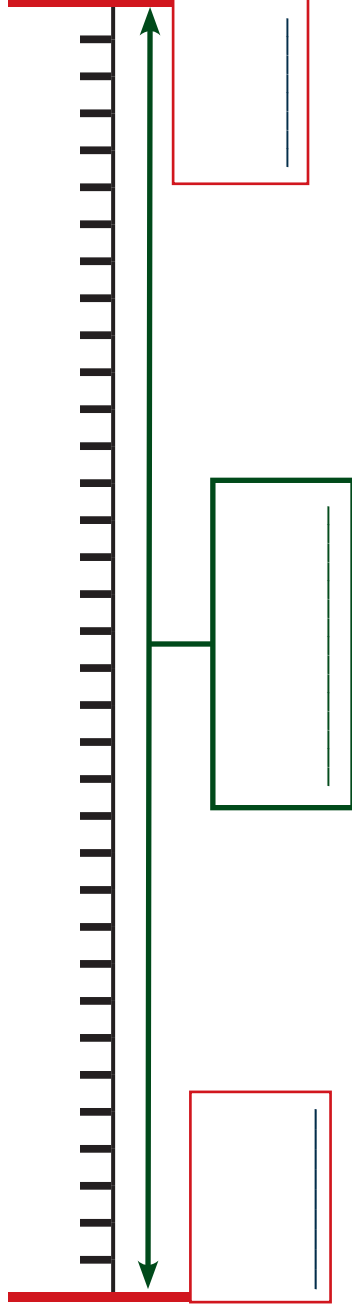
(label this scale according to instructions from your teacher)



SALINITY SCALE

(label this scale according to instructions from your teacher)

PPT = Parts Per Thousand



DISSOLVED OXYGEN NEEDS OF VARIOUS ORGANISMS

(label this scale according to instructions from your teacher)

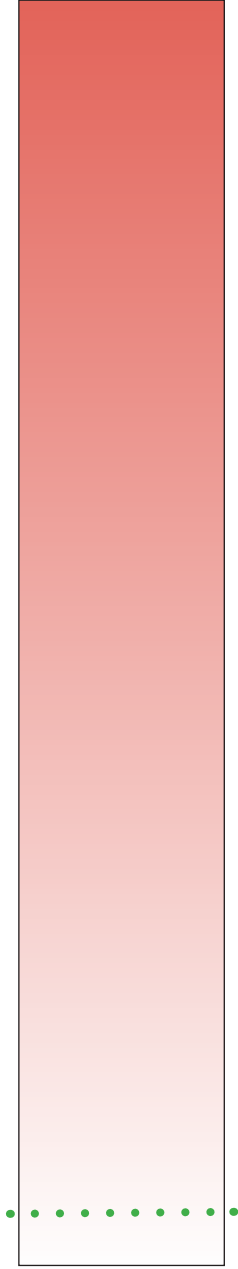
PPM = Parts Per Million

	 Striped bass
	 White perch  Yellow perch
	 Alewife
	 Blue crab
	 Spot
	 Bloodworm

NITRATE SCALE

(label this scale according to instructions from your teacher)

PPM = Parts Per Million

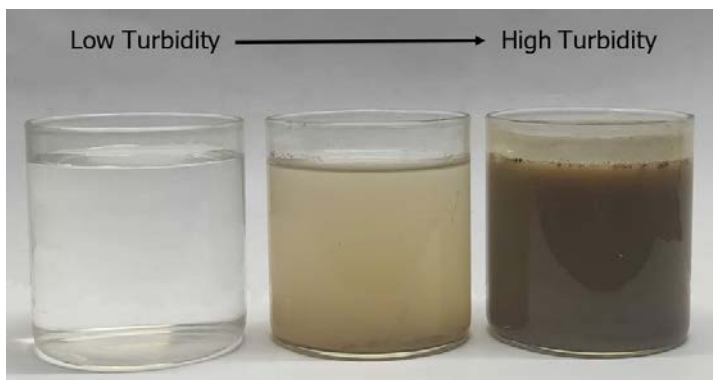


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TURBIDITY

(fill in the blanks according to instructions from your teacher)

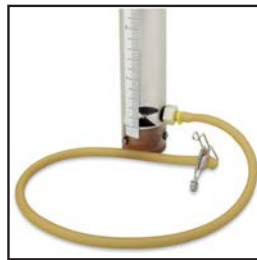
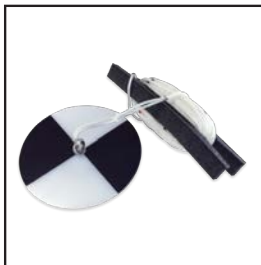
Turbidity is a measurement of the _____ of a sample of water.



Turbidity is measured in _____ and measures how far light can travel in the sample. Two devices used to measure turbidity include:

1. _____

2. _____



High turbidity levels can be caused by algae blooms and excessive amounts of _____ from runoff.





WATER CHEMISTRY DATA SHEET

Sample

Date: _____ Time: _____

GPS Coordinates: _____

Weather: _____

Air Temp. (°F): _____ Air Temp (°C): _____

Water Temp. (°F): _____ Water Temp (°C): _____

Salinity: _____ pH: _____

Dissolved O₂: _____ Nitrogen: _____

Turbidity: _____

Additional Notes:

COMMON MACROINVERTEBRATES

Sensitive Species



Gilled Snails



Mayfly Nymph



Water Pennies

Semi-Sensitive Species



Clams



Dragonfly Nymph



Damselfly Nymph



Crayfish

Tolerant Species



Leeches



Orb Snails



Black Fly Larva

Definition - Define macroinvertebrate

MACROINVERTEBRATE SURVEY DATA SHEET - SIMULATION

Sensitive

___ Caddisflies (*except net spinners*)
 ___ Mayflies
 ___ Stoneflies
 ___ Watersnipe flies
 ___ Riffle beetles
 ___ Water pennies
 ___ Gilled snails

Semi-Sensitive

___ Dobsonflies
 ___ Fishflies
 ___ Craneflies
 ___ Damselflies
 ___ Dragonflies
 ___ Crayfish
 ___ Clams
 ___ Mussels
 ___ Scud
 ___ Sowbug
 ___ Alderfly
 ___ Net-Spinning Caddisfly

Tolerant

___ Aquatic worms
 ___ Black flies
 ___ Midge flies
 ___ Leeches
 ___ Lunged snails
 ___ Orb snails

Total: (_____) x 3 = _____ **A**

Total: (_____) x 2 = _____ **B**

Total: (_____) x 1 = _____ **C**

Total A (_____) + **Total B** (_____) + **Total C** (_____) = **Grand Total** _____

MACROINVERTEBRATE SURVEY SCORING

Simulation

During your visits to Radcliffe Creek you will collect information about macroinvertebrates that live in and around the Creek. You will record this data (see page 17), and then use a form like this to “score” your results.

Date: _____ Time: _____

Use the tally sheet on the opposite page to record the number of each type of macroinvertebrate you find. Based on your findings, analyze the health of Radcliffe Creek’s headwaters and record your data below.

Stream score based on macroinvertebrate data

_____ Excellent (> 22)

_____ Good (17-22)

_____ Fair (11-16)

_____ Poor (< 11)

Prediction: Make a prediction about which macroinvertebrates you will find in Radcliffe Creek. Be sure to support your prediction.

Question: Based on the water quality data collected today, what grade would you give the health of Radcliffe Creek?

Module 2 Reflection



Location: Gateway Park, Chestertown

Circle whether the organism is invasive or native to the area, and record the number of specimens caught in the tally boxes below each image.

Invasive

--



Invasive

--



Invasive

--



Invasive

--



Madtom - *Ictaluridae Noturus*

Native

Invasive



Northern Snakehead - *Channa argus*

Native

Invasive



American Eel - *Anguilla Rostrata*

Native

Invasive



Mummichog - *Fundulus heteroclitus*

Native

Invasive

Reptiles & Amphibians



Tadpole - *Anura (ranidae)*

Native

Invasive



Stinkpot - *Sternotherus odoratus*

Native

Invasive

Macroinvertebrates



Giant Water Beetle - *Hydrophilus triangularis*

Native

Invasive



Virile Crayfish - *Faxonius virilis*

Native

Invasive



Asian Clams - *Corbicula fluminea*

Native

Invasive



Freshwater Mussel - *Elliptio complanata*

Native

Invasive



Dragonfly Nymph - *Odonata (anisoptera)*

Native

Invasive



Damselfly Nymph - *Odonata (zygoptera)*

Native

Invasive

Additional Notes/Sketches

MACROINVERTEBRATE SURVEY DATA SHEET - RADCLIFFE CREEK HEADWATERS

Sensitive

_____ Caddisflies (*except net spinners*)
 _____ Mayflies
 _____ Stoneflies
 _____ Watersnipe flies
 _____ Riffle beetles
 _____ Water pennies
 _____ Gilled snails

Semi-Sensitive

_____ Dobsonflies
 _____ Fishflies
 _____ Craneflies
 _____ Damselflies
 _____ Dragonflies
 _____ Crayfish
 _____ Clams
 _____ Mussels
 _____ Scud
 _____ Sowbug
 _____ Alderfly
 _____ Net-Spinning Caddisfly

Tolerant

_____ Aquatic worms
 _____ Black flies
 _____ Midge flies
 _____ Leeches
 _____ Lunged snails
 _____ Orb snails

Total: (_____) x 3 = **A**

Total: (_____) x 2 = **B**

Total: (_____) x 1 = **C**

Total A (_____) + **Total B** (_____) + **Total C** (_____) = **Grand Total** _____

MACROINVERTEBRATE SURVEY SCORING

Location: Radcliffe Creek Headwaters

Date: _____ Time: _____

Use the tally sheet on the opposite page to record the number of each type of macroinvertebrate you find. Based on your findings, analyze the health of Radcliffe Creek's headwaters and record your data below.

Stream score based on macroinvertebrate data

_____ Excellent (> 22)

_____ Good (17-22)

_____ Fair (11-16)

_____ Poor (< 11)

Additional Notes (or drawings):

WATER CHEMISTRY DATA SHEET

Location: Radcliffe Creek Headwaters

Date: _____ Time: _____

GPS Coordinates: _____

Weather: _____

Air Temp. (°F): _____ Air Temp (°C): _____

Water Temp. (°F): _____ Water Temp (°C): _____

Salinity: _____ pH: _____

Dissolved O₂: _____ Nitrogen: _____

Turbidity: _____

Additional Notes:

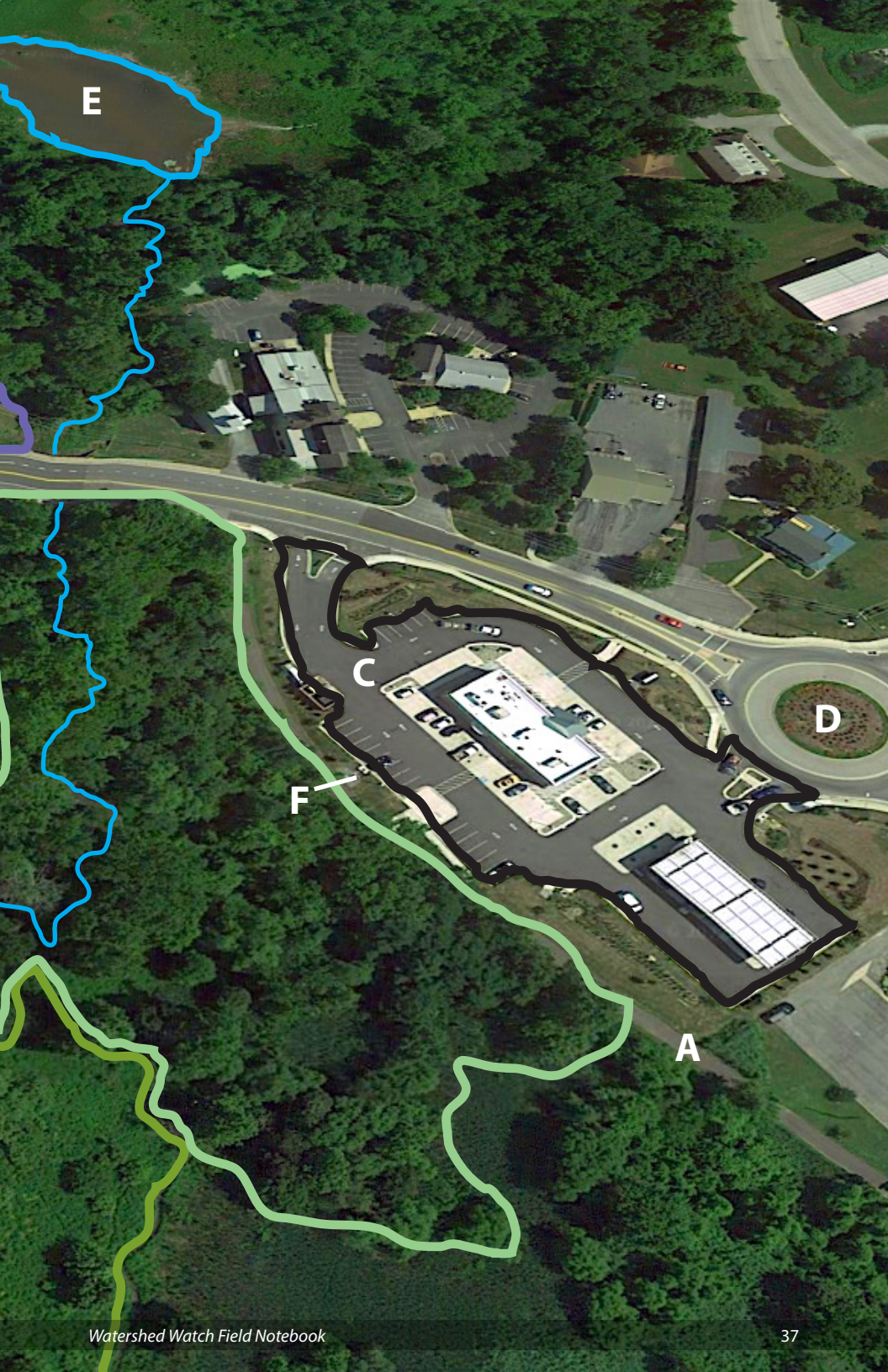
LAND USE & STORM DRAIN SURVEY

Location: Radcliffe Creek Headwaters

Walk around and survey the area along Radcliffe Creek by Gateway Park, the crossing of Route 20, behind Royal Farms, and along the end of the Chestertown Rail Trail. Use the map on the following page to observe types of land uses around Radcliffe Creek by using colors indicated in the key as reference. Hypothesize the percentage of each use in the mapped area, and fill in below. Then, on the following page fill in the points of interest key on the map.

Examples of Land Use Color Key

	 Water & Aquatic % _____
	 Grass & Lawn % _____
	 Agriculture % _____
	 Impervious Surfaces % _____
	 Wetland % _____
	 Forest & Trees % _____



Question: Based upon the data we collected today, what grade would you give the health of Radcliffe Creek at its headwaters?

Question: What are some things we could do to improve the health of the Creek at this location?

Module 3 Reflection



MODULE 4: LAND USE & WATER QUALITY

Location: Holt Education Center

A. Land Use

Question: How has the land around Radcliffe Creek and the Chester River been used in the past?

Question: How has the land changed? Use evidence from the maps in your answer.

B. Crayfish Dissection

Question: What is a macroinvertebrate?

Question: Why are macroinvertebrates good bioindicators?

Question: What does the presence of crayfish in Radcliffe Creek indicate about the health of the ecosystem?

Question: How does an exoskeleton help a crayfish survive?

Question: Name two structures of a crayfish and explain their function.

Question: What are the internal features that make some macroinvertebrates sensitive to pollution?

Question: How does water quality affect the health of aquatic organisms?

Question: Based upon the data we collected today, what grade would you give the health of Radcliffe Creek?

Question: What are some things we could do to improve the health of the Creek for macroinvertebrates and other aquatic organisms?

C. Module 4 Reflection



Module 5: Ecosystem Experts

Location: At Your School

Becoming an Ecosystem Expert will prepare you to be an expert presenter on one of the many organisms we will see while paddling Radcliffe Creek.

A. Organism Selection

Start by choosing one organism from the following list:

Invertebrates

Grass shrimp
Atlantic blue crab
Brackish water clams

Birds

Great blue heron
Bald eagle
Barn swallow
Osprey
Red-winged blackbird
Wood ducks
Mallards

Fish

Mummichog
Banded killifish
White perch
Striped killifish
Northern Snakehead
American Eel

Mammals

Muskrat
White-tailed deer
Beaver
River otter

Reptiles

Red-bellied turtle
Brown water snake
Eastern painted turtle
Stinkpot musk turtle
Black rat snake

Plants

Phragmites
Cattails
Wild rice
Smooth cordgrass
Arrow arum (Tuckahoe)
Pickerelweed
Big cordgrass
Duckweed

B. Organism Report

Organism's Common Name: _____

Organism's Scientific Name: _____

Question: Is your organism native or invasive, and what role does it play in the ecosystem?

Question: What positive and/or negative impacts does your organism have on the ecosystem?

Question: In what kind of habitat(s) does your organism live?

Question: What role does your organism play in the food web?
What is its food source, and what eats it?

Question: What other plants and animals does your organism interact with commonly?

C. Module 5 Reflection



MODULE 6: LOWER RADCLIFFE CREEK

Location: Wilmer Park

Use the checklist below to record the types of animals and plants you observed.

Species Check List:

Animals

- _____ Bald eagle
- _____ Banded killifish
- _____ Barn swallow
- _____ Black rat snake
- _____ Brown water snake
- _____ Eastern painted turtle
- _____ Grass shrimp
- _____ Great blue heron
- _____ Mallard duck
- _____ Mummichog
- _____ Muskrat
- _____ Osprey
- _____ Red-bellied turtle
- _____ Red-winged blackbird
- _____ Snapping turtle
- _____ Stinkpot musk turtle
- _____ Striped killifish
- _____ White perch
- _____ White-tailed deer
- _____ Wood duck

Wetland Plants

- _____ Arrow arum (Tuckahoe)
- _____ Big cordgrass
- _____ Cattails
- _____ Phragmites
- _____ Pickerelweed
- _____ Smooth cordgrass
- _____ Wild rice

Others Not Listed

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Question: Did you see any submerged aquatic vegetation (SAV) during your paddle? If so, what kind(s)?

Question: What are the positive impacts of submerged aquatic vegetation (SAV)?

Question: How would you describe the level of biodiversity at this part of Radcliffe Creek?

WATER CHEMISTRY DATA SHEET

Location: Lower Radcliffe Creek

Date: _____ Time: _____

GPS Coordinates: _____

Weather: _____

Air Temp. (°F): _____ Air Temp (°C): _____

Water Temp. (°F): _____ Water Temp (°C): _____

Salinity: _____ pH: _____

Dissolved O₂: _____ Nitrogen: _____

Turbidity: _____

Additional Notes:

Question: Based on the water quality data, biodiversity levels, shoreline health, and signs of human impact, what grade would you give the health of lower Radcliffe Creek?

Question: What are some things we could do to improve the health of this part of Radcliffe Creek and improve habitat for the organisms that live here?

Module 6 Reflection

MODULE 7: WHAT DOES IT ALL MEAN?

Location: At Your School

A. The Purpose of the Data

Question: Why do scientists collect water quality data?

Question: Why do scientists put data in the form of a graph?

Question: What is a trend in data? What can data trends inform us about water quality?

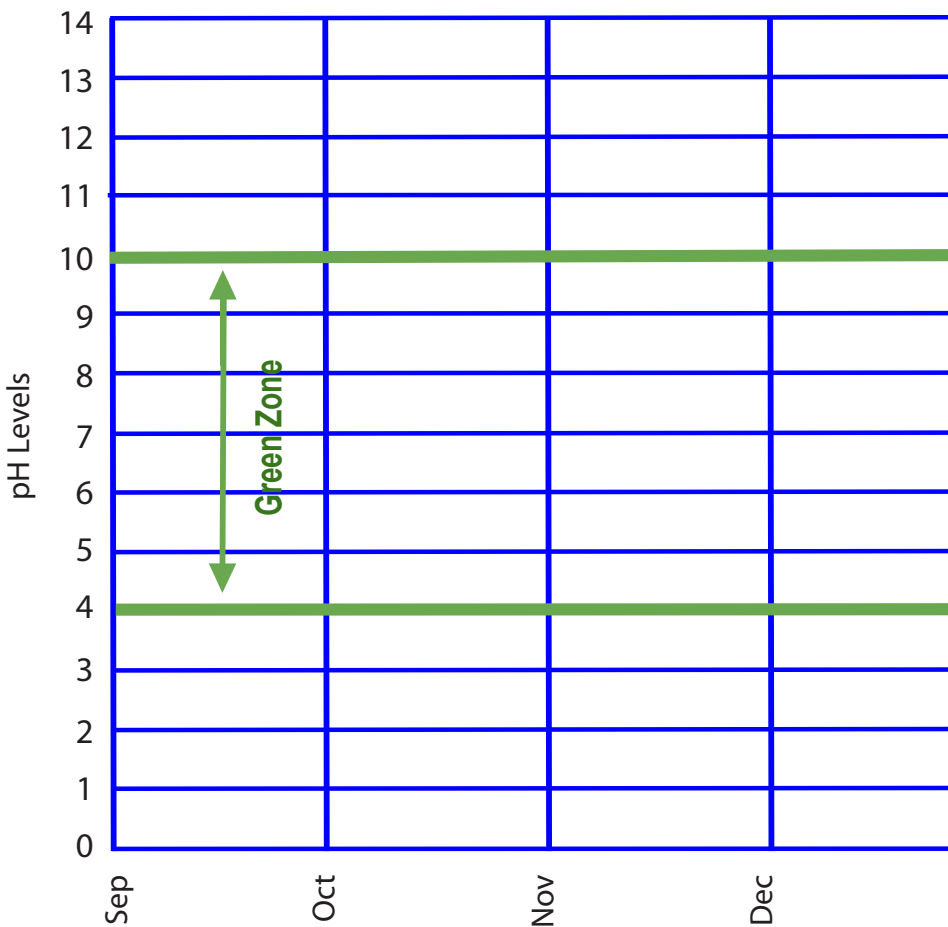
B . Radcliffe Creek Data Over Time

Graph water quality data collected on Radcliffe Creek using the table below. You will need to complete this graphing exercise before moving on to the next Section.

	pH	D.O. <i>ppm</i>	N <i>ppm</i>	turbidity <i>cm</i>
September				
October				
November				
December				
January				
February				
March				
April				
May				

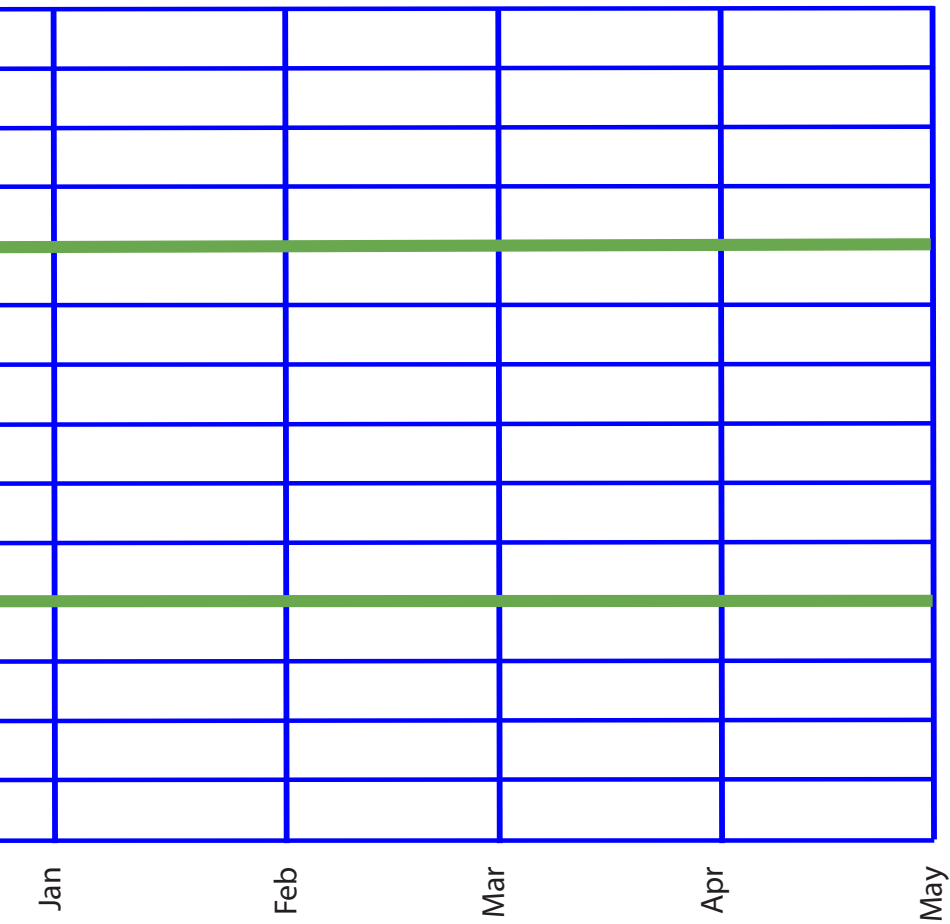
C. Plotting Your Data

pH LEVELS



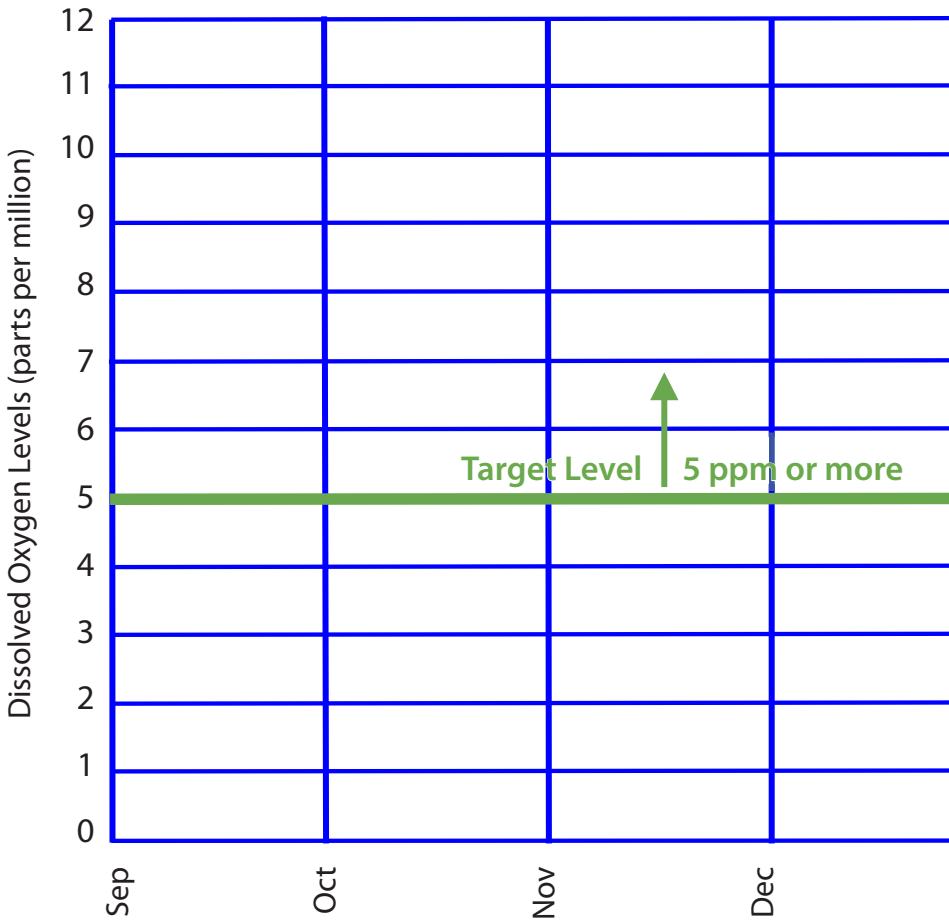
Question: Are these healthy pH levels for Radcliffe Creek? How do these levels impact the ecosystem and organisms in the Creek?

IN RADCLIFFE CREEK



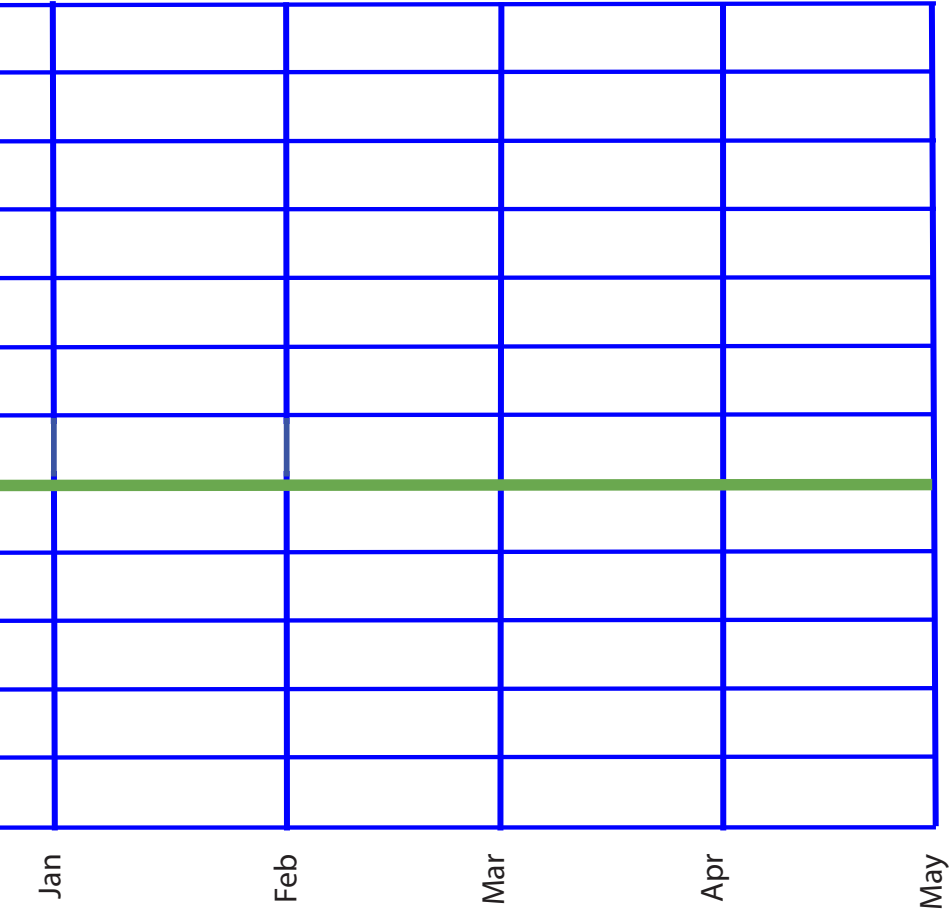
Question: Did the pH levels change during the year, and what might account for these changes?

DISSOLVED OXYGEN LEVELS



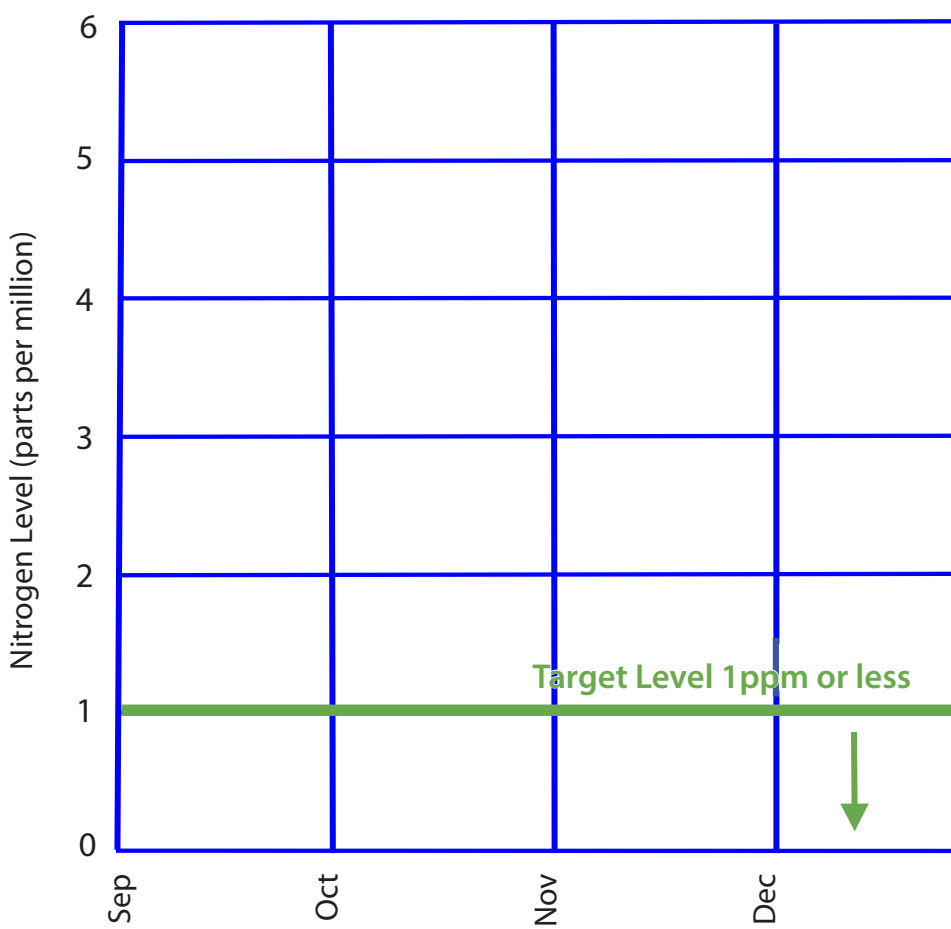
Question: Are these healthy D.O. levels for Radcliffe Creek? How do these levels impact the ecosystem and organisms in the Creek?

IN RADCLIFFE CREEK



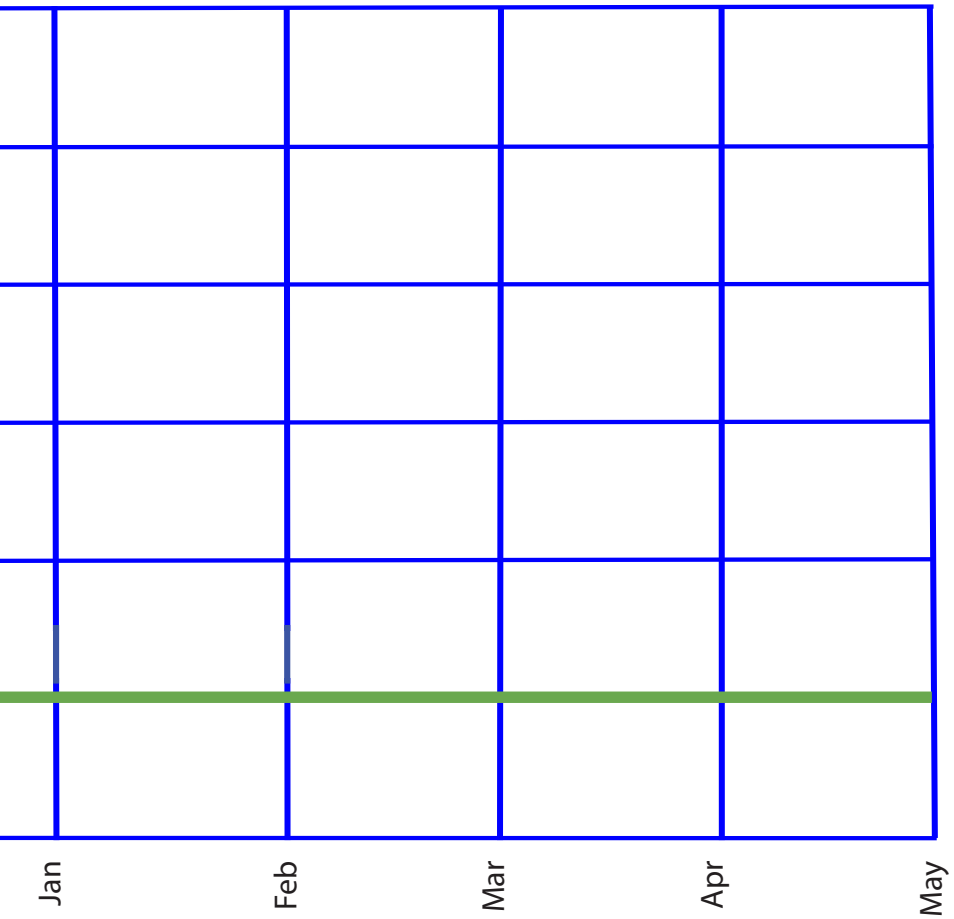
Question: Did the D.O. levels change during the year, and what might account for these changes?

NITROGEN LEVELS



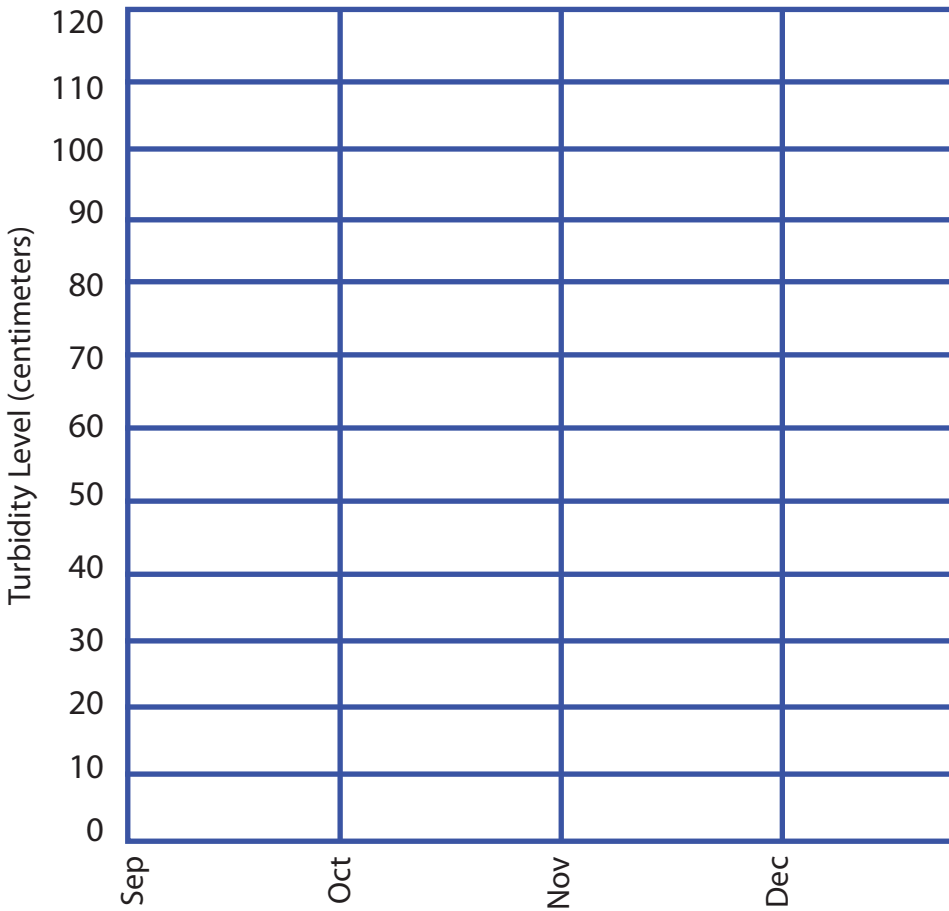
Question: Are these healthy nitrogen levels for Radcliffe Creek? How do these levels impact the ecosystem and organisms in the Creek?

IN RADCLIFFE CREEK



Question: Did the nitrogen levels change during the year, and what might account for these changes?

TURBIDITY LEVELS



Question: Are these healthy turbidity levels for Radcliffe Creek? How do these levels impact the ecosystem and organisms in the Creek?

Jan Feb Mar Apr May

D. Analyzing the Data

Question: Based on this water quality data, what grade would you give Radcliffe Creek for the year and why?

Question: How does your grade for Radcliffe Creek compare to the grade that was given by the local riverkeepers?

Question: How does the health of Radcliffe Creek and the Chester River affect the overall health of the Chesapeake Bay?

Question: What are some things we can do to improve the water quality in Radcliffe Creek?

D. Module 7 Reflection

MODULE 8: TAKE ACTION!

Location: At Your School

A . Envisioning an Action Project

Your teacher will ask you to create an action project to benefit the water quality of Radcliffe Creek. This could involve hands-on solutions to improve habitat in the watershed or community outreach to increase public awareness. The rest of this module will help you define the specifics of your project.

B . Purpose of Your Action Project

What are some problems affecting Radcliffe Creek?

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Briefly describe your action project idea.

[illegible]

Explain how your project will positively impact the Radcliffe Creek Watershed.

List the steps needed to complete your project.

What supplies are needed to complete your project?

[illegible]

MODULE 9: PRESENTING YOUR WORK

Location: Holt Education Center

A . Envisioning a Presentation

Your teacher will ask you to create a presentation that communicates the findings of your research on Radcliffe Creek.

B . Describing Your Presentation

How can you communicate your investigation, results, and action projects to the local community?

Outline your presentation or display here:

C. Module 9 Reflection *(to be completed following your presentation)*



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.





RADCLIFFE CREEK FIELD GUIDE

Plants & Animals Found in the
Radcliffe Creek Watershed

REPTILES & AMPHIBIANS



Stinkpot Turtle



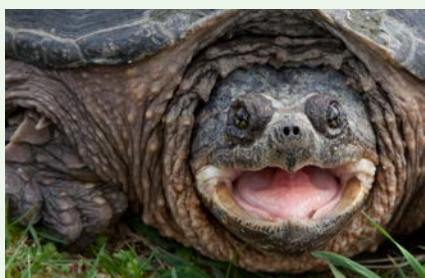
Eastern Painted Turtle



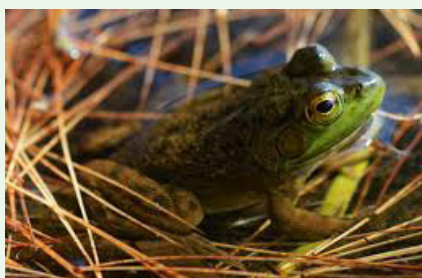
Black Rat Snake



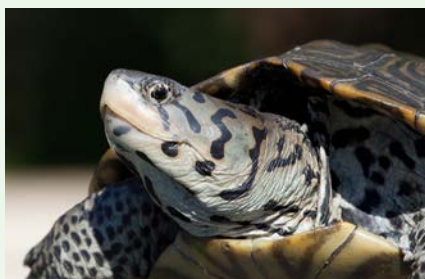
Skink



Common Snapping Turtle



American Bullfrog



Diamondback Terrapin



Common Water Snake

FISH - UPPER CREEK



Mosquitofish



American Eel



Northern Snakehead



Tessellated Darter



Tadpole Madtom



Redbreast Sunfish



Pumpkinseed Sunfish



Bluegill Sunfish

FISH - LOWER CREEK



Yellow Perch



Bullhead Catfish



White Perch



Mummichog



Striped Killifish



Banded Killifish

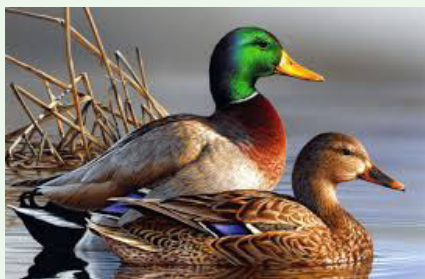


Channel Catfish



Atlantic Silverside

BIRDS & WATERFOWL



Mallard Duck



Wood Duck



Red-winged Blackbird



Blue Heron



Bald Eagle



Osprey



Barn Swallow



Green Heron

MAMMALS



White-tailed Deer



Red Fox



Muskrat



River Otter



Raccoon



Beaver



Possum



Gray Squirrel

CRUSTACEANS & MOLLUSKS



Atlantic Blue Crab



Barnacle



Freshwater Mussel



Grass Shrimp



Mud Crab



Scud



Crayfish



Freshwater Clam

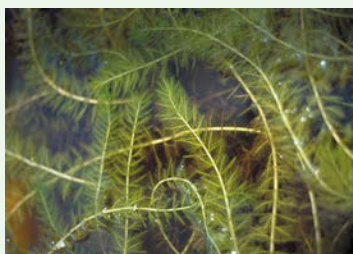
SUBMERGED AQUATIC VEGETATION



HYDRILLA (*HYDRILLA VERTICILLATA*): *Hydrilla* is an invasive grass that arrived in the United States in the 1950s through the aquarium trade. It grows in dense mats and its leaves grow in whorls which usually contain five leaves. In Radcliffe Creek, hydrilla is thickest along the edges and in the upper section of the stream.



WILD CELERY (*VALLISNERIA AMERICANA*): *Wild celery* is a native grass that grows in fresh to low salinity brackish water. The leaves are long and ribbon-like with a lime green stripe down the center. Celery is an important food source for waterfowl during their winter migration to the Chesapeake region.



EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM*): *Eurasian watermilfoil* is an invasive grass that thrives in low salinity creeks where water quality is degraded. The leaves are feather-like and grow in whorls of four or five. While not a great food source for waterfowl, milfoil does provide excellent cover for fish and crabs.



COONTAIL (*CERATOPHYLLUM DEMERSUM*): *Coontail* is a native plant that can either be rooted to the bottom or free floating. Its leaves are stiff and hold their shape when removed from the water. Coontail is an important food source for ducks and geese and provides shade and spawning habitat for smaller fish.



NAIADS (*NAJAS* spp.): There are four different species of naiads in the Chesapeake region. All varieties have slender branching stems that have short leaves less than 4 cm long. They are native to the area and serve as an important food source for many species of ducks.

WETLAND PLANTS



COMMON REED/PHRAGMITES

(*PHRAGMITES AUSTRALIS*): *Phragmites* is an invasive reed that can grow to 12 feet tall. It is typically found along the shoreline in dense colonies. Because it grows in such thick stands, it crowds out native plants that have much more food value to local animals. Red-winged blackbirds value *phragmites* habitat for nesting



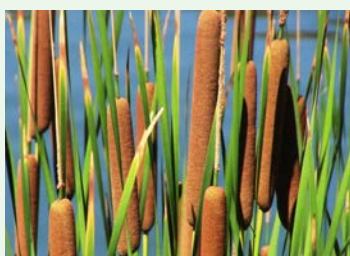
ARROW ARUM (*PELTANDRA VIRGINICA*):

Arrow arum, also known as tuckahoe, is an annual emergent plant that thrives along the shorelines of Radcliffe Creek. The plant's root system contains a large, potato-like tuber that was a valuable food source to local Indian tribes. Its leaves take the shape of an arrowhead, and it often grows alongside pickerelweed.



PICKERELWEED (*PONTEDERIA CORDATA*):

Pickerelweed is a native plant whose leaves look similar to those of arrow arum, with the main difference being that the leaf bottoms have rounded (rather than pointy) lobes. In the summer, the plant can be identified by its long purple flowers, which provide food and habitat for butterflies.



CATTAILS (*TYPHA LATIFOLIA*):

Cattails grow in thick stands on the upper reaches of Radcliffe Creek. The plant once served as a valuable food source for both Indians and early colonists. The roots are edible and rich in starches, the young shoots can be eaten raw and taste like cucumbers, and the long leaves could be woven into mats.



WILD RICE (*ZIZANIA AQUATICA*): Wild rice is an annual grass that thrives in the middle and upper reaches of Radcliffe Creek. The seed heads reach peak ripeness in July - August and provide a rich source of food for dozens of species of birds. This native grass used to be harvested by Native Americans who added the grains to salads.

WETLAND PLANTS CONTINUED



BIG CORDGRASS (*SPARTINA CYNOSUROIDES*): *Big cordgrass is a native grass that thrives along the shorelines of brackish water marshes such as those found in Radcliffe Creek. It can grow to a height of eight feet and the seed heads provide valuable food to many species of birds.*



SMOOTH CORDGRASS (*SPARTINA ALTERNIFLORA*): *Smooth cordgrass is a native wetland grass that is found on the lower stretches of Radcliffe Creek. The peak growth occurs from July through September with rich seed heads providing food for birds.*



MARSH HIBISCUS (*HIBISCUS MOSCHEUTOS*): *The marsh hibiscus is a native flower that can be white or pink. The flowers contain five petals and measure up to five inches across. Peak blooms occur from July through August. The root systems of this plant were once used to provide the flavoring for marshmallows.*



SEASHORE MALLOW (*KOSTELETZKYA VIRGINICA*): *Seashore mallow is a native, pink flower that blooms along the brackish water shorelines of Radcliffe Creek from July through September. The flowers often appear in large stands, attracting many species of insects and butterflies.*



JEWELWEED (*IMPATIENS CAPENSIS*): *Jewelweed is common on the upper, fresh water stretches of Radcliffe Creek. The flowers are bright orange, and the leaves can be used to treat a variety of skin rashes such as poison ivy.*



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About the Sultana Education Foundation

Founded in 1997, the Sultana Education Foundation is a private nonprofit dedicated to providing unique, hands-on educational opportunities that promote stewardship of the Chesapeake Bay's historic, cultural, and environmental legacies. The Foundation is a two-time recipient of the National Maritime Historical Foundation's Walter Cronkite Award for Excellence in Maritime Education.