ENVIROATLAS
EDUCATIONAL CURRICULUM
EXPLORING YOUR WATERSHED

MODULE DESIGNED FOR K-6 STUDENTS

Created by

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PREFACE

The following lesson plan module was created as part of a larger curriculum of activities for educational use to introduce students to *EnviroAtlas* and the concepts of watersheds, pollution, connections between the environment and human health, greenways, and using maps in decision-making. **This lesson plan specifically addresses watersheds, the water cycle, and pollution.** Additional lesson plan modules are available and forthcoming that address a variety of other topics directed at a range of grade-levels and ages.

There is also an **Educational Overview** document that outlines some of the tools in *EnviroAtlas* for educators who wish to design their own lesson plans around the available *EnviroAtlas* tools. We encourage you to look over that Educational Overview document so that you can use *EnviroAtlas* to best meet your needs.

For questions regarding this case study and supplemental materials, please contact the *EnviroAtlas* Team at EnviroAtlas@epa.gov.

While this document has been reviewed and approved by the U.S. Environmental Protection Agency, its contents do not necessarily reflect the views and policies of the Agency.

ACKNOWLEDGMENTS

These educational materials were developed though the joint efforts of multiple contributors. Thanks to our non-classroom teacher reviewers: Jessica Daniel: Environmental Protection Specialist, National Exposure Research Laboratory, Kelly Witter: Director of STEM Outreach, US EPA National Exposure Research Laboratory and Lauren Bamford: US EPA Student Services Contractor. Their feedback was extremely valuable in the completion of this product.

Additional thanks to our classroom teachers and informal educators as well as their students for carrying out and reviewing this *EnviroAtlas* Lesson Plan:

Exploring Your Watershed (2017)

- Julia Crowcroft, 2nd grade teacher, *Hope Valley Elementary School*
- Sarah Shouse, K-5 STEM Coordinator with Raleigh YMCA
- Jane Allen and Andrea Franks, Pre-K-2nd grade Environmental Educators, *First Environments Early Learning Center*
- Stacy Goodman, K-5 ESL teacher (English as a Second Language), *Efland Cheeks Elementary School*

We learned much from these pilot tests and utilized the teachers' feedback to adjust and edit the Lesson Plan.

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Lesson Plan

www.epa.gov/enviroatlas

Exploring Your Watershed with EnviroAtlas

A three-part lesson module that gets students outdoors, mapping, and simulating a watershed.
Lesson can be done in whole (all three parts) or as independent lessons, and with or without internet.

Suggested Grades: K-6

Suggested Topics: water, water cycle, watershed, pollution, human impact on the environment, mapping

Key Concept: Rain falls and moves to a nearby body of water. Depending on location, different things can happen to the rain along the way.

Time Considerations
Prep Time: 30 minutes
Wax Paper: 20 minutes
Outdoors: 15-30 minutes
EnviroAtlas: 30 minutes

Materials: computer, internet (*optional*), wax paper, markers, spray bottles, pans, *EnviroAtlas* maps

NGSS Standards *(State Standards in Resources Section in back)*: K-LS1-1, K-ESS2-2, K-ESS3-1, K-ESS3-3, K-2ETS1-1, K-2ETS1-2, 4-ESS2-2, 4-ESS3-2, 5-ESS2-1, 5-ESS3-1, 3-5-ETS1-1, 3-5-ETS1-2, 3-5ETS1-3, MS-LS2-4, MS-LS2-5. NGSS Science & Engineering Practices: 1, 2, 8.

Learning Objectives

By the end of this module, students will be able to:

- Describe what a watershed is and how it works.
- Describe characteristics of ecosystems, including local ecosystems on or near their school grounds (ecosystem type will vary based on outdoor availability near the school, such as: forested area, creek, pond, field, etc.).
- Explain how humans can change their behavior to protect their local watershed and describe solutions to problems associated with their local watershed.

Key Words/Vocabulary

adapt	environment	human health	river
divide	erosion	pollution	runoff
drainage	flooding	pond	stream
ecosystem	habitat	precipitation	watershed
ecosystem services		ridge	

Summary

This module follows the **BSCS 5E model** to promote student discovery and learning about the complex interactions between the watershed, the environment, and human behavior.

In addition to a laboratory Investigation and outdoor component of the lesson, this lesson uses a web-based mapping tool called ***EnviroAtlas,*** developed by the Environmental Protection Agency (EPA) and its partners.

EnviroAtlas is an easy-to-use mapping tool designed for citizens, students, and professionals to assess the status of local and regional environments, and the benefits that humans receive them (*ecosystem services*).

ECOSYSTEM

All living and nonliving things in an area, as well as the interactions among them.

WATERSHED

The area of land from which rainfall (and/or snow melt) drains into a stream or other water body.

Watersheds are also sometimes referred to as drainage basins or drainage areas. There are watersheds within watersheds.

Ridges of higher ground generally form the boundaries between watersheds. At these boundaries, rain falling on one side flows toward the low point of one watershed, while rain falling on the other side of the boundary flows toward the low point of a different watershed.

This lesson package is designed for 4th and 5th grade students. There are adaptions available for K-3rd grade students; the lessons can also be adapted for students in the 6th grade and early middle school.

Students are prompted first to explore the concept of a watershed and its ecosystem services with the laboratory investigation, then to examine their own local watershed in person (outdoors), and finally to consider the impacts to their local watershed using the computer-based *EnviroAtlas* mapping tool. Students are prompted to consider the interconnectedness of an ecosystem, the ecosystem services and benefits of a clean and healthy watershed, and how their actions may impact their local watershed.

More information about how to use *EnviroAtlas* in the classroom can be found in the *EnviroAtlas* Educational Curriculum Overview Document.

Left: Students complete one of the *Extension Ideas* in the lesson.

At-a-glance Summary

Teaching Strategies	Student/teacher actions
Engage	Students are prompted to consider the concept of a watershed by viewing a quick video (1:15 minutes) made by the Environmental Protection Agency and The Weather Channel. Students are then asked a few questions to help review and/or clarify the concept of a watershed. **Outdoors Lesson.** Students walk to a spot on campus outdoors that shows the relation to a watershed (field, forested area, parking lot, etc.). Students are asked questions to explore the various interactions of the ecosystem.
Explore	**Part 1: Wax Paper Watersheds.** Students are given the laboratory Investigation activity or walked through the process via the Teacher Script. Students explore the concept of a watershed by creating a physical model of a watershed and seeing how the watershed and the rain interact. **Part 2: EnviroAtlas Lesson.** Students explore their local watershed with the handout and the EnviroAtlas tool on a computer or using paper maps (either as a whole class, small groups, or individually). The teacher assists in student inquiry.
Explain	**Part 1: Wax Paper Watersheds.** Students respond to questions with their partners to explain what happens in the watershed when it rains. **Part 2a: EnviroAtlas Lesson.** During student exploration of EnviroAtlas, the teacher explains watershed and ecosystem principles. Then students explain to each other how they saw connections during their explorations.
Elaborate	Students suggest solutions to problems that could be present within their watershed. The teacher introduces the concept of ecosystem services and benefits. Students are tasked with identifying individual and societal solutions that could produce benefits. **EnviroAtlas Lesson—Follow Your Raindrop!** Students go outdoors with their printed maps of the path of a raindrop from their school to the nearest water body. Following this path, students observe the local landscape.
Evaluate	Students **complete the handout**, answering questions as they go. **Options for handouts:** 1. Q&A Sheet (Student Handout, available in English and Spanish; there is a version for ESL Modifications) 2. Coloring Page 3. Word Search 4. Comic Strip
Extend* **optional*	Students can explore the *Eco-Health Relationship Browser*; more *Extension Ideas* can be found in the Resources portion of the lesson.

Teacher Preparation

General:

Students should have a basic understanding of environmental concepts (e.g. streams provide habitat for some animals, humans create pollution, etc.) and the water cycle (hydrologic cycle).

Engage, Option 1: Videos

1. Either assign the video for homework or set up the video on the teacher computer and make sure that internet connection is good enough to stream the video(s). URLs for video: http://sciencenetlinks.com/videos/what-watershed/

Engage, Option 2: Outdoors Lesson

1. Choose a location outdoors, on the school grounds and within walking distance, which can be investigated safely with students.
2. Make sure the trip outside of the classroom is approved through all required channels.
3. Go over rules for outdoor etiquette with students (quiet in the hallways, etc.).
4. Have questions prepared to ask students. If you need a guide, use the teacher handout.

Explore, Part 1: Wax Paper Watersheds Lesson

1. Acquire supplies for each group (wax paper, washable markers, spray bottles filled with water, and a baking pan or small bucket).
2. Make sure that students have a work area that is clear of anything that can be damaged by water.
3. If splitting students into small groups, pre-determine groups and group size.
4. Print student handouts.

Explore, Part 2: EnviroAtlas Lesson

1. Acquire supplies (computers [group computers will work fine], internet connection).
2. Print student handouts.

Explain, All sessions

1. Print student handouts.
2. Be prepared to facilitate conversation about ecosystems and the concept of a watershed.

Elaborate: EnviroAtlas lesson—Follow Your Raindrop!

1. Make and print student maps from school (instructions available within this packet), or have students look at the maps on the *EnviroAtlas* Interactive Map online.
2. Look at the student maps ahead of time to assess the path of the raindrop from your school.
3. Walk the path ahead of time to make sure that you know where it goes and that the path (or the part of the path that you'll be walking on) is safe from hazards.
   *It is important to note that the Raindrop Tool in *EnviroAtlas* does not account for storm drains, culverts, or built infrastructure—it operates only on topography. Keep that in mind as you walk along the path of your raindrop.

Procedure

Engage, Option 1: Video

1. Play the following video for the students (1:15 minutes): "What is a Watershed?"
   URL for the video: http://sciencenetlinks.com/videos/what-watershed/
2. Ask students the following questions/prompts:
   - Describe a watershed.
     - *An area of land where all rainfall will drain into one body of water.*
   - Where does rain go once it hits the Earth?
     - *To streams, creeks, wetlands, lakes, rivers, and eventually the ocean.*
   - What features are included in the watershed?
     - *Streams, creeks, wetlands, rivers, ponds, lakes, as well as all of the terrestrial features—farms, forests, homes, roads, etc.*
   - An **ecosystem service** is a product or function of nature (including human-modified environments) which benefits humans. What components of the features that you just mentioned in the watershed might provide ecosystem services, and how?
     - *Forests and wetlands can filter drinking water and provide recreation; healthy ecosystems provide wildlife habitats; forests produce oxygen and remove CO_2 from the atmosphere, etc.*
   - Why might watershed knowledge be important to humans?
     - *It's important to know how water flows through the landscape to plan for filtration of pollutants, flood prevention, etc.*
   - Do you know of any local watersheds or parts of a watershed in our area?
     - *Answers will vary by location; every area is part of a watershed.*

Teacher tip: If the teacher wants to incorporate **literacy** or **student reading** into the lesson, or if some students finish early and have extra time, the EPA has an informative web page dedicated specifically to healthy watersheds: https://www.epa.gov/hwp/benefits-healthy-watersheds.

Engage, Option 2: Outdoors Lesson

This activity invites students to explore their local environment and their watershed in action by walking outdoors to a location of the teacher's choosing. The location could be anywhere on campus; the site could be a stream, creek, wooded area, sloping hill (erosion), paved parking lot with drain grates, a drainpipe, etc. The goal of this portion of the lesson is to ***connect students to their local environment*** *and encourage them to think about and interact with it. The lack of opportunity for outdoor experiences has been associated with declines in independent thinking and problem-solving abilities (Louv, 2006); this portion of the lesson serves to a) directly connect the students to the subject matter and b) strengthen their intellectual development via interaction with nature.*

1. Safely walk with students to a campus outdoor spot that illustrates its role in the watershed (sloping hill, small creek, small pond, accessible drain pipe or drain grate, etc.).
2. Ask the students sample questions that can be found later in this packet.

Louv, R. (2006). *Last child in the woods: Saving our children from nature-deficit disorder*. Chapel Hill, NC: Algonquin Books of Chapel Hill

Explore, Part 1: Wax Paper Watersheds Lesson

This activity invites students to explore the physical characteristics of a watershed by making a wax paper model of a watershed and then examining how water moves through different topographic features. A student handout has been designed specifically for this portion of the lesson; it can be used to guide students through the lesson in a self-directed manner.

1. Set up student work stations with the required supplies.
2. Give students the handout: *Exploring Your Watershed with Wax Paper*.
3. Move around the room and monitor student work.

Teacher tip #1: The markers must be washable (water-soluble) so that the ink will run down the wax paper when sprayed with the water.

Teacher tip #2: Make sure that the students *spray* the wax paper in a *light mist*; pouring water on too quickly will make it difficult for students to see the process and might not effectively portray typical rainfall.

Explore, Part 2: EnviroAtlas Lesson

This activity invites students to engage with mapping tools and technology via the EnviroAtlas online tool or printed paper maps from EnviroAtlas. The Evaluation portion of this lesson is answering questions, coloring, or completing a Word Search, but feel free to create your own Evaluation.

1. Decide if you're going to conduct this lesson as a whole class with a teacher-demo, in small groups, or as individuals. If conducting the lesson in small groups (no more than 4 students per group recommended), set up an area where all students in each group can see a screen and be involved.
2. Be sure that students are equipped with the necessary materials.
3. Lead demonstration to instruct students how to use the *EnviroAtlas* website for this activity.
4. Go through some of the first steps with the students; make sure they understand how to use the *EnviroAtlas* tool.
5. Let students explore their local watershed with the handout and the *EnviroAtlas* tool on a computer.

Explain: EnviroAtlas Lesson—Follow Your Raindrop!

1. **Outdoors Lesson.** While outdoors, the teacher asks leading questions and the students discuss and explain the local features of their watershed. Students evaluate and explain how the environment is the life-support system for humans: providing food, water, building materials, buffering us from natural and man-made hazards, and promoting healthful lifestyles (providing opportunities for physical activity, social interaction, and engagement with nature).
2. **Wax Paper Watersheds Lesson.** Students observe what happens as one partner sprays the wax paper and then students explain to one another what they observed. Students respond to questions out loud with their partners to describe what happens in the watershed when it rains. Students respond to questions on their handout about whether or not their predictions were correct and explain why or why not. Students evaluate what happened in their landscape. Students also think about how pollution might impact the water supply, discuss that in their groups, and respond on their handout.
3. **EnviroAtlas Lesson.** During student exploration of EnviroAtlas, the teacher emphasizes interconnectedness of the ecosystem and then students explain to each other how they saw such connections during their EnviroAtlas explorations.

Elaborate: EnviroAtlas Lesson—Follow Your Raindrop!

1. With your students, walk the path of the raindrop outdoors (where safe).
2. Have different students come to the front of the line to "lead" and "navigate" using their maps.

3. Discuss concepts along the way about watersheds, pollution, and ecosystems. *It is important to note that the Raindrop Tool in *EnviroAtlas* does not account for storm drains, culverts, or built infrastructure—it operates only on topography. Keep that in mind as you walk along the path of your raindrop.

Photos above: Students from the A.E. Finley YMCA STEM TrackOut Camp in Raleigh, North Carolina, follow the path of their raindrop as part of the "Exploring Your Watershed:" K-6 lesson plan package.

Evaluate

Wax Paper Watersheds Lesson. Students finish the questions on their handouts.

Outdoors Lesson. The teacher assesses student understanding via oral communication with students in the outdoor environment.

EnviroAtlas Lesson. Students individually complete the student handout, which asks questions about healthy ecosystems and ecosystem services. Students could also work on their Coloring Page, Word Search, or Comic Strip, depending on their level.

Note to the teacher: There are sections on the student handout that require immediate teacher approval during the lesson (as the teacher moves around the room) so that the teacher can get a quick glimpse of the students' understanding and correct any misunderstandings prior to the end of class period *(as opposed to whenever the teacher has time to grade the students' papers)*.

Extension (optional)

Students could extend their learning by exploring the EnviroAtlas Eco-Health Relationship Browser (https://www.epa.gov/enviroatlas/enviroatlas-eco-health-relationship-browser). The Eco-Health Relationship Browser illustrates scientific evidence for linkages between human health and ecosystem services. Students can dig more deeply into the interconnected relationships as discussed in this lesson.

There are additional Extension Ideas and Resources at the end of the lesson.

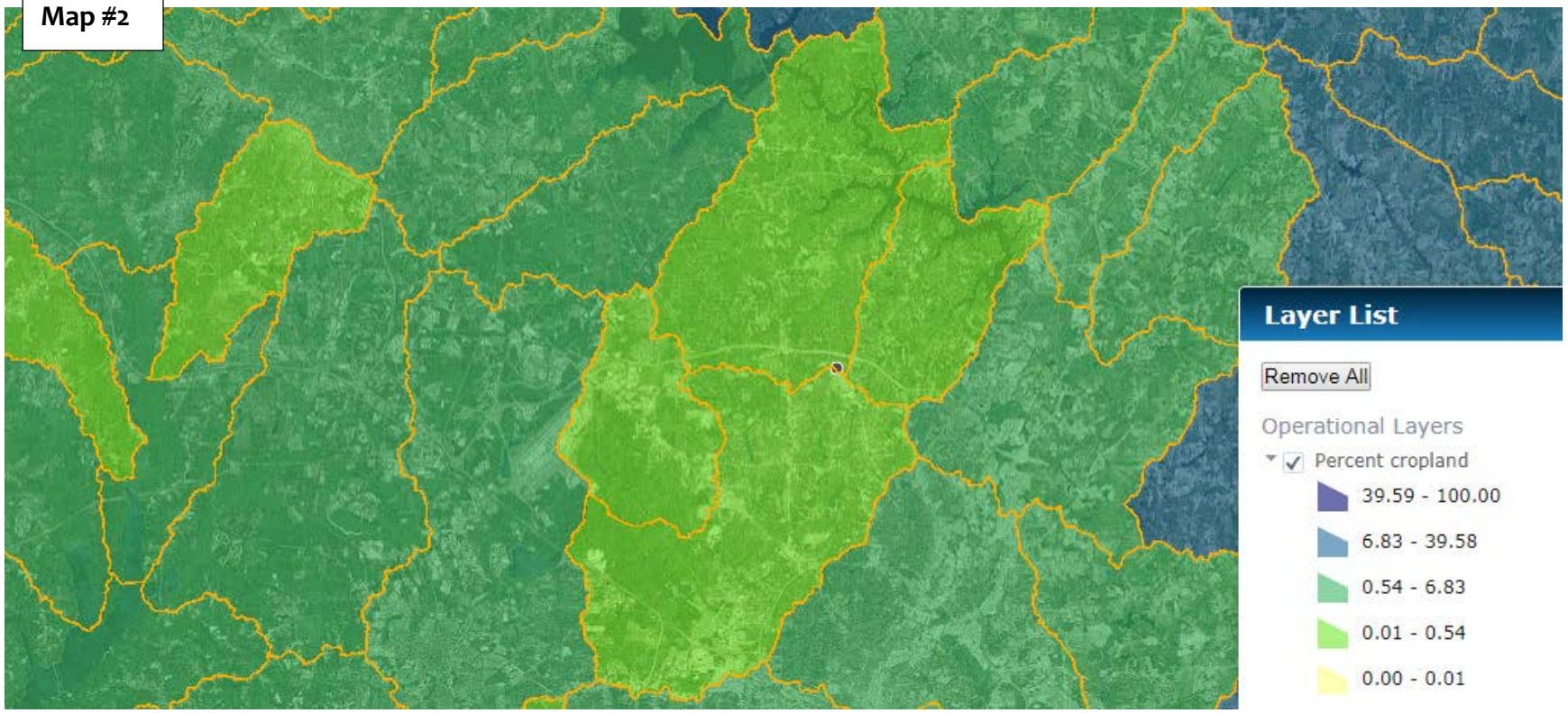
Map #1

Bottom image is just a little more zoomed in.

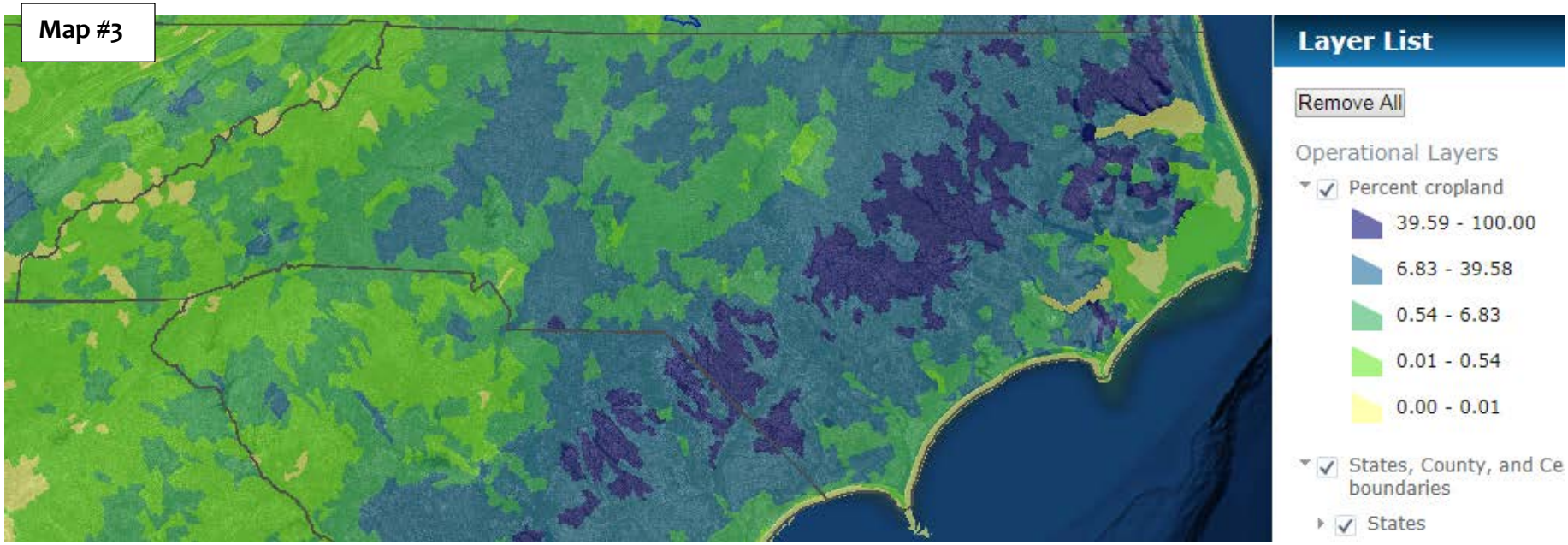
Note to the teacher: <u>These are sample maps</u>. You will either use the maps online or print paper maps like these from the online maps for your location.

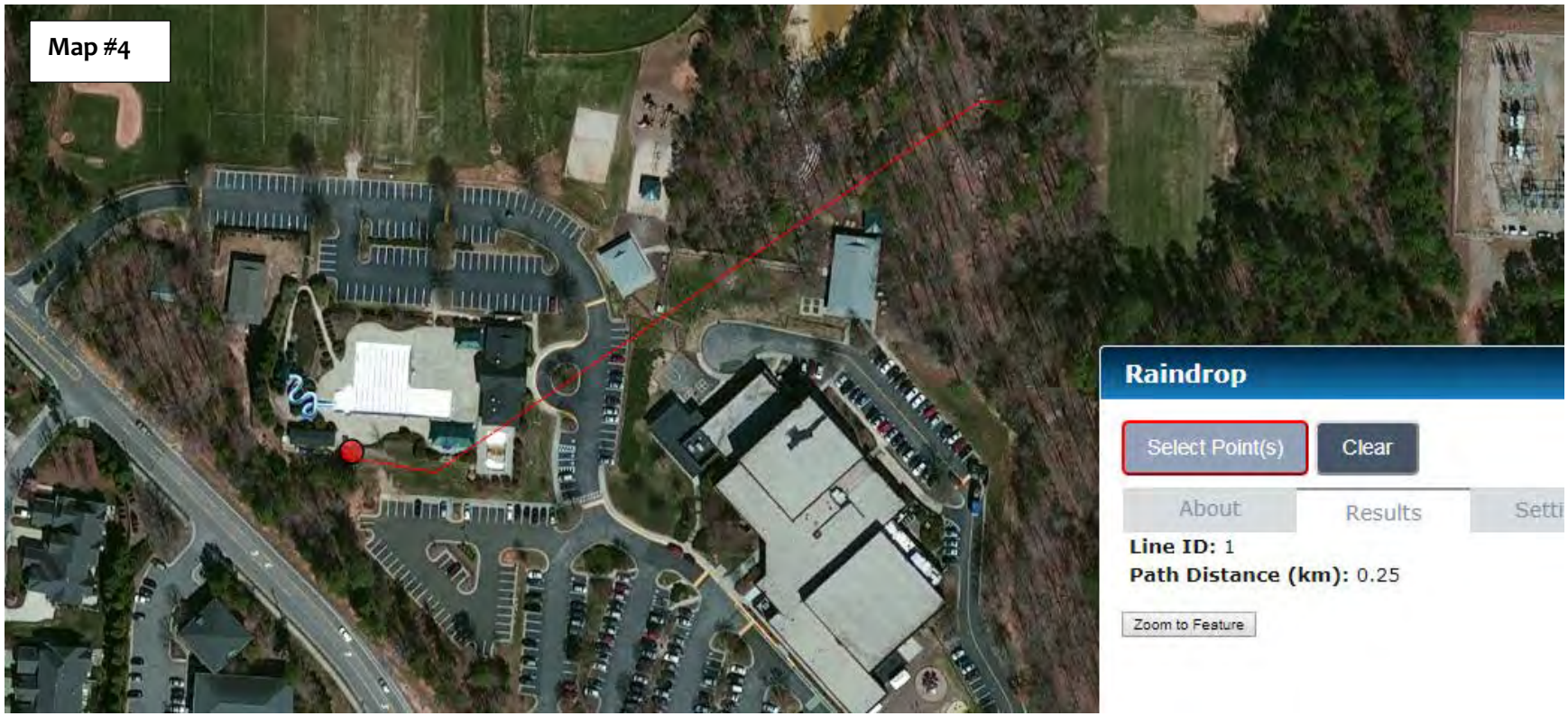
Instructions for how to make paper maps for your school location are in the following pages. Once you make the maps one time, save them for use in later years! Storing them in sheet protectors will prolong their quality.

Map #2


Layer List
Remove All
Operational Layers
Percent cropland
39.59 - 100.00
6.83 - 39.58
0.54 - 6.83
0.01 - 0.54
0.00 - 0.01

Map #3


Layer List
Remove All
Operational Layers
Percent cropland
39.59 - 100.00
6.83 - 39.58
0.54 - 6.83
0.01 - 0.54
0.00 - 0.01
States, County, and Ce
boundaries
States


Map #4
Raindrop
Select Point(s)
Clear
About
Results
Setti
Line ID: 1
Path Distance (km): 0.25
Zoom to Feature

Instructions: Teacher Preparation of Paper Maps for Classrooms without Computers/Internet

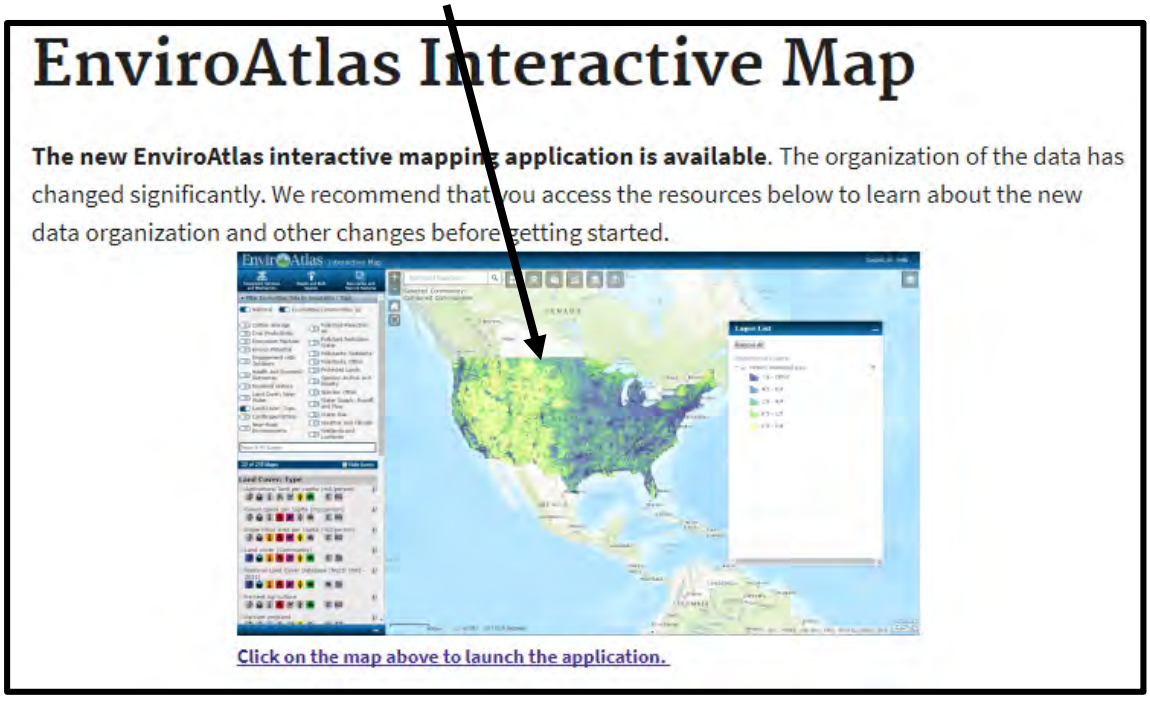
Follow the steps outlined below to make your own paper maps from your school or teaching location.

1. **Check and see if your computer has the "Snipping" tool.** Search your programs and files for "Snipping"—the icon looks like this: 

2. **If your computer does not have the "Snipping" tool, check to see if it has a "Print Screen" function, and use that and the cropping tool instead.**

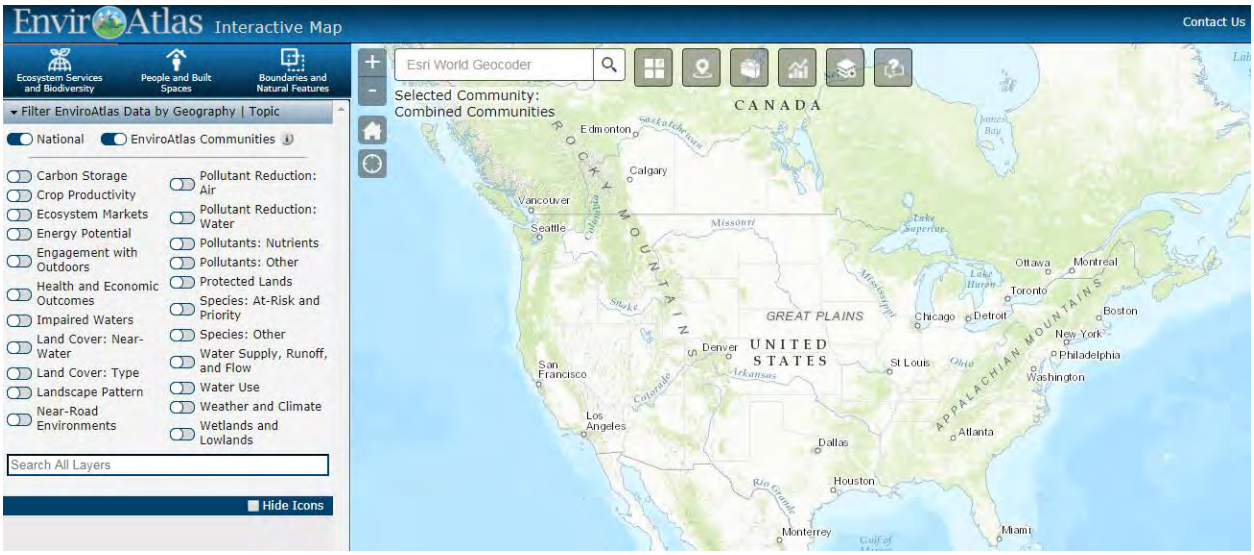
3. **Go to the following website:** https://www.epa.gov/enviroatlas/enviroatlas-interactive-map

   Once on the website, **click on the map image** that looks like the image below:



4. The next page will show the terms and conditions of using the *EnviroAtlas* tool. Click on **"I understand and agree to the terms and conditions of this disclaimer."**

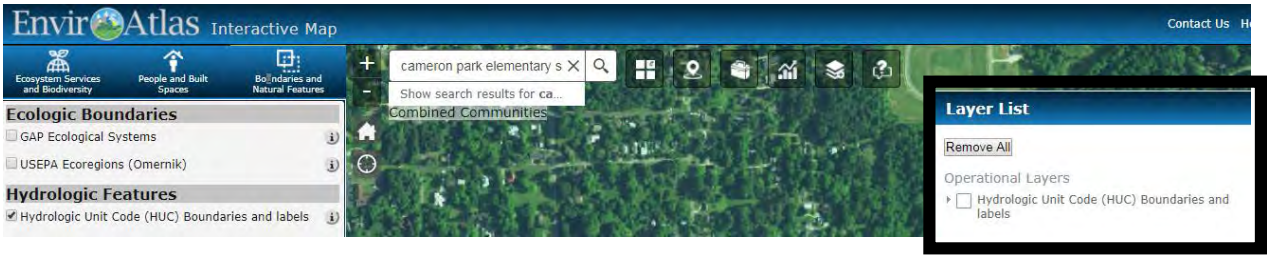
5. Next, you'll see the screen below. In the left corner of the map, there is a white box that says *Esri World Geocoder.* Type in the name of your school (example: Cameron Park Elementary School). There will be some options that populate below the search box. Choose your location from that list. Then, the map will zoom in to your school.



6. Once zoomed in, you'll need to change the base layer to see some of the features around your school. To do this, click on the icon with four boxes in it (see right).

7. **<u>Choose basemap.</u>** The options for basemaps will appear. Choose **"Imagery."** Minimize the Basemap Gallery window by clicking the line in the upper right-hand corner of the box.

8. **<u>Turn on watershed layer.</u>** Click on the upper left where it says, **"Boundaries and Natural Features."** Click in the box that says **"Hydrologic Unit Code (HUC) Boundaries and labels."** The **<u>layer list</u>** will pop up to the right on your screen. See image below.



9. Click the box next to "Hydrologic Unit Code (HUC) Boundaries and labels." Minimize the Layer List by clicking the line in the upper right-hand corner of the box.

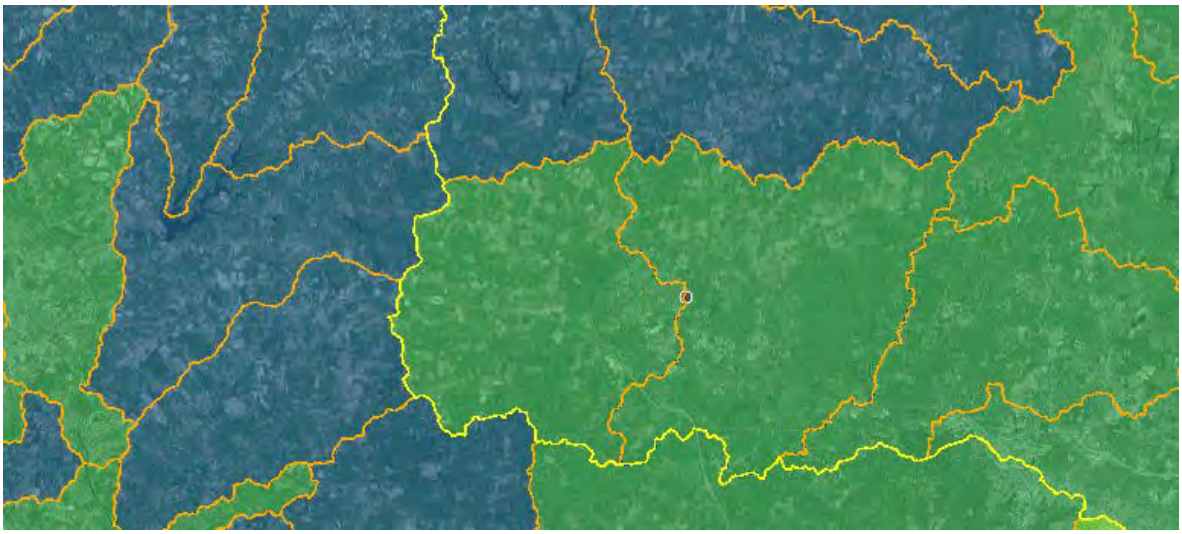
10. **Make Map #1.** At this point, zoom out slowly on the map using either the zoom bar in the upper left corner of your map or the scroll wheel on your mouse if you have one. Continue to zoom out until you can see at least one orange/yellow line surrounding the area of your school (like in the example below). **Take your first screenshot or snip of the map. This is Map #1.** *You can zoom in a little more to really see the school—this might help to engage the students more if they can see locations that they recognize.*
Use "Ctrl+v" to paste the screenshot or snip into your document.

11. With your mouse, click on the tab at the top left of the page that says, "Ecosystem Services and Biodiversity."

12. In the box that says *Search all layers,* type in **"Percent cropland."** A box will pop up below that says "Land Cover: Type." Click on the checkbox next to **"Percent cropland."** The **layer list** will pop up to the right on your screen again. This time, click the box next to **"Percent cropland."** To see the legend, click the words **"Percent cropland."**

13. **Make Map #2.** Zoom out a little bit until you have multiple HUCs in the frame (see image below). You can leave or uncheck different HUC-levels as it suits you (the default setting shows all HUC 4s, HUC 8s, and HUC 12s (different levels of watersheds and sub-watersheds). If you would like, you can to adjust the transparency of this map

so that the school and surroundings can be identified through the colored watersheds. To do so, click on "Percent cropland" in the Layer List. Then select "Transparency," and change the transparency as you see fit. **Take your second screenshot or snip of the map. This is Map #2.** ***Use "Ctrl+v" to paste the screenshot or snip into your document.***



14. In the Layer List, uncheck the "Hydrologic Unit Code (HUC) Boundaries and labels." Zoom out until you can see your State. If you cannot see the outline of your State, follow these quick steps:
    - Click "Boundaries and Natural Features."
    - Under "Political Boundaries," click the checkbox next to **"States, County, and Census Block Group boundaries."**
    - In the Layer List to the right, click the little arrow to the left of **"States, County, and Census Block Group boundaries."**
    - Click the box next to "States" to put the state lines onto your map.
    - Minimize the Layer List.

15. **Make Map #3. Take your third screenshot or snip of the map of your entire State. This is Map #3.** ***Use "Ctrl+v" to paste the screenshot or snip into your document.***

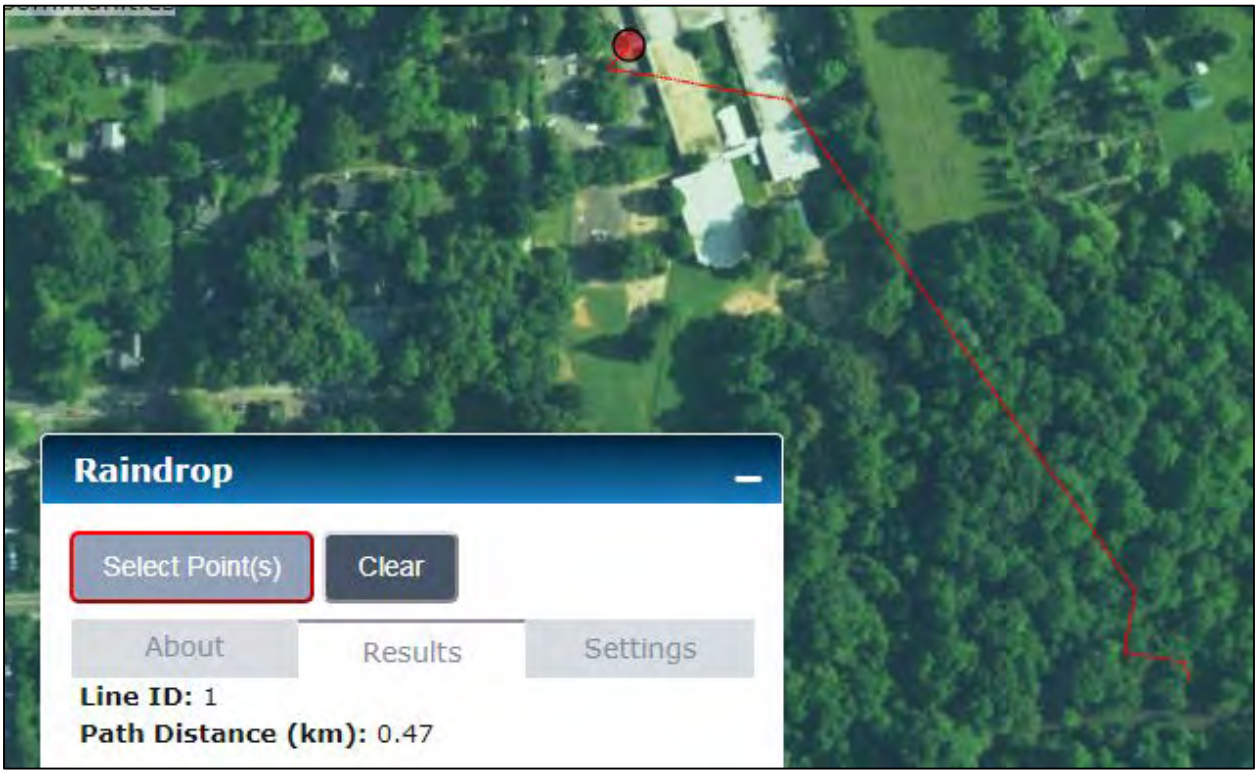
16. Go back into the Layer List by clicking the icon in the upper right. Click **"Remove All."** Minimize the layer list.

17. Click the icon (example shown below) along the top of the map where it says, **"Analytical Tools."**

18. At this point, zoom back in to your school. You can do this simply by pressing "enter" in the search box if the school name is still there. Click on the button that says **"Raindrop."** A window will appear. Click **"Activate Tool."** Move the Raindrop window out of the way by dragging it.

19. Click on an outdoor area near your school (Note: If you went outside to talk about watersheds, try to find the spot where you went and click on that!). A red dot and a red line will appear. Feel free to zoom in or out so that the whole red line is visible. You can drag and drop the Raindrop Tool legend if it is in your way.

20. **Make Map #4.** That red line on the map is from the point that you chose to your nearest creek, stream, lake, or pond! This is the path of a "raindrop" from your selected location to the nearest downhill body of water. You can also take a screenshot or snip of the Raindrop tool widget to show the students the distance that appears on the widget. See example below. **Take your fourth screenshot or snip. This is Map #4.** ***Use "Ctrl+v" to paste the screenshot or snip into your document.***



Still have questions or want help with making these paper maps?
We're here to help!
Email EnviroAtlas@epa.gov

EnviroAtlas
people health nature economy
Lesson Plan
www.epa.gov/enviroatlas

Exploring Your Watershed by Getting Outdoors

This activity invites students to explore their local environment and their watershed in action by walking outdoors to a location of the teacher's choosing. The location could be anywhere on campus; the site could be a stream, creek, wooded area, sloping hill (erosion), paved parking lot with drain grates, a drainpipe, etc.

The goal of this portion of the lesson is to **connect students to their local environment** and encourage them to think about and interact with it. The lack of opportunity for outdoor experiences has been associated with declines in independent thinking and problem-solving abilities (Louv, 2006); this portion of the lesson serves twin goals: 1) to directly connect the students to the subject matter and 2) to strengthen their intellectual development via interaction with nature.

If you live in an urban area and your outdoor resources are limited, even a storm drain or a drain pipe will work! If you're in a traversable urban area, you could also try a local urban park, baseball field, or soccer field (use the **field, meadow, or open area Additional Questions** below).

Before asking any questions of the students once you get outside, make sure that all of the students feel comfortable and safe. It might help to give the students a little bit of time (5-10 minutes) to get their bearings and adjust to being outside. For example, you can have them sit quietly and sketch, free-write, or just observe for 5-10 minutes prior to asking them questions.

Note to the teacher: Students that don't spend a lot of time outdoors might have a more difficult time with this exercise on days when the weather is poor. If you have a group that might not spend a lot of time outdoors, try to do this exercise on a nice, sunny, warm day. This will be beneficial for both you and the students.

Louv, R. (2006). *Last child in the woods: Saving our children from nature-deficit disorder.* Chapel Hill, NC: Algonquin Books of Chapel Hill.

Guiding Questions: General

- Where are we located on (or off) campus right now?
- Take a deep breath. How do you feel being in the environment quietly for 5-10 minutes?
- Are ***you*** a part of the watershed? Have students explain why or why not they think that they are part of the watershed.
- If rain fell right where you are standing, which direction would it go (runoff)?
- How do trees and plants prevent runoff?
- How might heavy pollution from humans in this area affect the watershed?

Feel free to add questions as you wish. Additional location-specific questions are below. *Encourage students to elaborate and be as specific as possible.*

Additional Guiding Questions if you walk to a creek, stream, or pond:

- Where does the water in this [creek/stream/etc.] come from?
- Where does the water in this [creek/stream/etc.] go from here?
- Which types of animals might live here or depend on this area for habitat? Can you hear or see any right now? (birds, squirrels, salamanders, etc.)
- Are there trees around the [creek/stream/etc.]? How do the trees influence the [creek/stream/etc.]?
- Is there any man-made infrastructure nearby (parking lot, neighborhood, shopping center, playground, dog park, etc.)? How might that [parking lot, neighborhood, shopping center, playground, dog park, etc.] impact the watershed or this [creek/stream/etc.]?

Additional Guiding Questions if you walk to a field, meadow, or open area:

- How is this [field, meadow, open area] part of the watershed?
- Which types of animals might live here or depend on this area for habitat? Can you hear or see any right now? (birds, squirrels, insects, etc.)
- Is there any man-made infrastructure nearby (parking lot, neighborhood, shopping center, playground, dog park, etc.)? How might that [parking lot, neighborhood, shopping center, playground, dog park, etc.] impact the watershed or this [field, meadow, or open area]?

Additional Guiding Questions if you walk to a parking lot, drain pipe, or storm drain:

- If rain falls at this [parking lot, drain pipe, or storm drain], where does it go next?
- What does a creek, stream, forest or grassy area provide that this [parking lot, drain pipe, or storm drain] does not? How is that important?

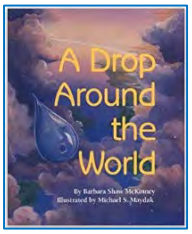
Additional Ideas/Resources


Macroinvertebrate sampling

- **Extension Ideas:**
  1) ***Outdoor Science—Macroinvertebrate Sampling:*** For a more hands-on approach, this lesson can be paired nicely with an outdoor macroinvertebrate count at your local stream or creek. A pilot group did this in conjunction with the lesson plan; it was highly successful for supplementing student understanding with ecology fieldwork.
  2) ***Art/English—Story Stones:*** Have students paint smooth stones showing the path of their local Raindrop or the Water Cycle. Then have the students tell their stories to one another using their stones or write down their stories using their stones as a guide.


Story Stones

  3) ***English/Read-Aloud—A Drop Around the World,*** by Barbara Shaw McKinney. The book leads readers around the world and teaches about the process of the water cycle.



- **Additional Resources:**

  ProjectWET lessons (from ProjectWET Curriculum and Activity Guide, Generation 2.0**,** www.projectwet.org):

  - *"Blue River," p. 135: Students participate in a whole-body exercise to simulate the movement of water through a river and its watershed.*
  - *"Rainy Day Hike," p. 169: Students are introduced to urban watershed concepts and storm water issues through an investigation of school buildings and grounds.*
  - *"River Talk," p. 175: Students analyze analogies of common things to learn about watersheds*
  - *"Seeing Watersheds," p. 187: Students use maps to characterize what a watershed is; to identify the key parts and functions of watersheds; to determine watershed boundaries; to discover how watersheds are named; and to describe how water flows in a watershed based on elevation.*
  - *"A-maze-ing Water," p. 231: Students guide a drop of water through a maze of "drainage pipes" to learn how activities in their homes and yards affect water quality.*
  - *"Color Me a Watershed," p. 239: Through investigation of maps, students observe how development can affect a watershed.*

Resources: State Science Educational Standards *(on following pages)*

Alignment of this Lesson Module to State Science Educational Standards—Kindergarten

Alignment of this Lesson Module to State Science Educational Standards—1st grade

Alignment of this Lesson Module to State Science Educational Standards—2nd grade

Alignment of this Lesson Module to State Science Educational Standards—3rd grade

Alignment of this Lesson Module to State Science Educational Standards—4th grade

Alignment of this Lesson Module to State Science Educational Standards—5th grade

Alignment of this Lesson Module to State Science Educational Standards—6th grade

STATE EDUCATIONAL STANDARDS

KINDERGARTEN, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**Kindergarten Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" Module**
AL (1/2017, 2015)	6. Identify and plan possible solutions (e.g., reducing, reusing, recycling) to lessen the human impact on the local environment.
AK (1/2017, 2012)	None.
AZ (1/2017, 2005)	None
AR (1/2017, 2005)	None
CA (1/2017, 2009)	**NGSS:** K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. K–2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K–2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **NGSS Science & Engineering Practices (APPENDIX F):** 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.

CO (1/2017, 2009)	None.
CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).
DE (1/2017, 2013)	NGSS (see CA above).
FL (1/2017, 2014)	SC.K.L.14, C: C. Humans can better understand the natural world through careful observation.
GA (1/2017, new standards up 2017-2018)	None.
HI (1/2017, 2005)	SC.K.1.2. Ask questions about the world around them. The student: Asks questions about objects, organisms, events, places, or relationships in the environment.
ID (1/2017, 2016)	None.
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	K.ESS.4 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
IA (1/2017, 2016	K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
KS (1/2017, 2013	NGSS (see CA above).
KY (1/2017, 2013)	K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. ESS3.C: Human Impacts on Earth Systems • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary to K-ESS2-2),(K-ESS3-3)
LA	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)

(1/2017, 2016)	2. Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).
MA (1/2017, 2016)	K-ESS3-3. Communicate solutions to reduce the amount of natural resources an individual uses.
MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	0.4.2.1.1. Natural systems have many components that interact to maintain the system.
MS (1/2017, 2010)	4.d. Describe ways to conserve water. (DOK 2)
MO (1/2017, 2015)	K-ESS3-3. Communicate solutions to reduce the amount of natural resources an individual uses.
MT (1/2017, 2016)	Benchmarks at end of 4th grade, 8th grade, and upon graduation from high school
NE (1/2017, 2010)	2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings. 2.1.1.a Ask questions that relate to a science topic 2.4.2.b Recognize ways in which individuals and families can conserve Earth's resources by reducing, reusing, and recycling
NV (1/2017, 2014)	NGSS (see CA above).
NH (1/2017, 2016)	Separated into GSEs (Grade Span Expectations), K-2 (so, "By the end of Grade 2, all students will…"
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	None.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	K.E.1.1 Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses.
ND (1/2017, 2014)	K.8.1. Explain why anyone can be a scientist
OH	Ohio State Science Standards are not numbered or coded in any way:

(1/2017, 2014)	None for Kindergarten.
OK (1/2017, 2014)	K-ESS2-2 Students who demonstrate understanding can: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. K-ESS3-1 Students who demonstrate understanding can: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
OR (1/2017, 2014)	NGSS (see CA above).
PA (1/2017, 2002)	3.3.K.A4. Identify sources of water for human consumption and use.
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**K.S.1A.1** Ask and answer questions about the natural world using explorations, observations, or structured investigations. **K.S.1A.2** Develop and use models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. **K.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings. **K.S.1A.6** Construct explanations of phenomena using (1) student-generated observations and measurements, (2) results of investigations, or (3) data communicated in graphs, tables, or diagrams. **K.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions about the natural world, (2) understand phenomena, (3) develop models, or (4) support explanations. Communicate observations and explanations using oral and written language.
SD (1/2017, 2015)	K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
TN (1/2017, 2009)	GLE 0007.Inq.2 Ask questions, make logical predictions, plan investigations, and represent data. GLE 0007.Inq.3 Explain the data from an investigation. GLE 0007.T/E.2 Apply engineering design and creative thinking to solve practical problems. GLE 0007.2.2 Know that people interact with their environment through their senses.
TX (1/2017, 2014)	112.11.a4A. A central theme throughout the study of scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment is active engagement in asking

	questions, communicating ideas, and exploring with scientific tools. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations and descriptive investigations. 112.11.b3A. Identify and explain a problem such as the impact of littering on the playground and propose a solution in his/her own words.
UT (1/2017, K-2: 2010, 3-6: 2002, 7-8: 2003, 9-12: 2003, Earth Science: 2012)	**Standard 2, Objective 1.** Investigate non-living things. **Standard 4, Objective 1.** Investigate living things.
VT (1/2017, 2013)	NGSS (see CA above).
VA (1/2017, 2016)	**K.1. Scientific Investigation, Reasoning, and Logic:** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which *a) basic characteristics or properties of objects are identified by direct observation;* *b) observations are made from multiple positions to achieve different perspectives;* *c) a set of objects is sequenced according to size;* *d) a set of objects is separated into two groups based on a single physical characteristic;* *e) nonstandard units are used to measure the length, mass, and volume of common objects; f) observations and predictions are made for an unseen member in a sequence of objects;* *g) a question is developed and predictions are made from one or more observations;* *h) observations are recorded;* *i) picture graphs are constructed;* *j) unusual or unexpected results in an activity are recognized; and* *k) objects are described both pictorially and verbally.* **K.6. The student will investigate and understand the differences between living organisms and nonliving objects.** Key concepts include *a) all things can be classified as living or nonliving; and* *b) living organisms have certain characteristics that distinguish them from nonliving objects including growth, movement, response to the environment, having offspring, and the need for food, air, and water.*

	K.11. The student will investigate and understand that materials can be reused, recycled, and conserved. Key concepts include: c) water and energy conservation at home and in school helps ensure resources are available for future use.
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).
WI (1/2017, 2012)	By the end of **grade four**, students will: **A.4.1** When conducting science investigations, ask and answer questions that will help decide the general areas of science being addressed **A.4.2** When faced with a science-related problem, decide what evidence, models, or explanations previously studied can be used to better understand what is happening now **A.4.3** When investigating a science-related problem, decide what data can be collected to determine the most useful explanations **A.4.4** When studying science-related problems, decide which of the science themes are important **A.4.5** When studying a science-related problem, decide what changes over time are occurring or have occurred **C.4.1** Use the vocabulary of the unifying themes to ask questions about objects, organisms, and events being studied **C.4.2** Use the science content being learned to ask questions, plan investigations, make observations, make predictions, and offer explanations **C.4.3** Select multiple sources of information to help answer questions selected for classroom investigations **C.4.4** Use simple science equipment safely and effectively, including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers, to collect data relevant to questions and investigations **C.4.5** Use data they have collected to develop explanations and answer questions generated by investigations **C.4.6** Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means, to display their answers **C.4.7** Support their conclusions with logical arguments **C.4.8** Ask additional questions that might help focus or further an investigation **F.4.1** Discover how each organism meets its basic needs for water, nutrients, protection, and energy in order to survive **F.4.4** Using the science themes, develop explanations for the connections among living and non-living things in various environments

	H.4.2 Using the science themes, identify local and state issues that are helped by science and technology and explain how science and technology can also cause a problem. **H.4.3** Show how science has contributed to meeting personal needs, including hygiene, nutrition, exercise, safety, and health care **H.4.4** Develop a list of issues that citizens must make decisions about and describe a strategy for becoming informed about the science behind these issues
WY (1/2017, 2016)	**K-ESS2-2.** Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. **K-ESS3-1.** Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. **K-ESS3-3.** Communicate solutions that will manage the impact of humans on the land, water, air, and/or other living things in the local environment. **K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

STATE EDUCATIONAL STANDARDS

1st GRADE, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**1st Grade Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" Module**
AL (1/2017, 2015)	None.
AK (1/2017, 2012)	None.
AZ (1/2017, 2005)	PO 2. Participate in guided investigations in life, physical, and Earth and space sciences.
AR (1/2017, 2005)	None.
CA (1/2017, 2009)	K–2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K–2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **NGSS Science & Engineering Practices (APPENDIX F):** 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.
CO (1/2017, 2009)	None.
CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).
DE (1/2017, 2013)	NGSS (see CA above).
FL (1/2017, 2014)	SC.1.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.
GA	None.

(1/2017, new standards up 2017-2018)	
HI (1/2017, 2005)	None.
ID (1/2017, 2016)	None.
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	1.ESS.4 Develop solutions that could be implemented to reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
IA (1/2017, 2016)	None.
KS (1/2017, 2013)	NGSS (see CA above).
KY (1/2017, 2013)	None.
LA (1/2017, 2016)	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1) 2. Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).
MA (1/2017, 2016)	K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change that can be solved by developing or improving an object or tool. 1.K-2-ETS1-2. Generate multiple solutions to a design problem and make a drawing (plan) to represent one or more of the solutions.
MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	1.1.3.1.1. Designed and natural systems exist in the world. These systems are made up of components that act within a system and interact with other systems.
MS (1/2017, 2010)	4d. Categorize types of actions that cause water, air, or land pollution. (DOK 2)
MO (1/2017, 2015)	1.K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change that can be solved by developing or improving an object or tool. 1.K-2-ETS1-2. Generate multiple solutions to a design problem and make a drawing (plan) to represent one or more of the solutions.
MT	Benchmarks at end of 4th grade, 8th grade, and upon graduation from high school

(1/2017, 2016)	
NE (1/2017, 2010)	2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings. 2.1.1.a Ask questions that relate to a science topic 2.4.2.b Recognize ways in which individuals and families can conserve Earth's resources by reducing, reusing, and recycling
NV (1/2017, 2014)	NGSS (see CA above).
NH (1/2017, 2016)	Separated into GSEs (Grade Span Expectations), K-2 (so, "By the end of Grade 2, all students will…"
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	None.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	1.L.1.1. Understand characteristics of various environments and behaviors of humans that enable plants and animals to survive. 1.L.1.2. In North Carolina, from the coast to the mountains, students should observe how different environments support the needs of different organisms (crab/seashore, raccoon/piedmont, elk/mountains). There are different kinds of organisms in different places. 1.E.2.2. Compare the properties of soil samples from different places relating to their capacity to retain water, nourish and support the growth of plants. 1.L.1.3. Summarize ways that humans protect their environment and/or improve conditions for the growth of the plants and animals that live there (e.g. reuse or recycle products to avoid littering) 1.7.2. Describe ways that humans influence their environment (e.g., littering, recycling, car pooling)
ND (1/2017, 2014)	1.8.1. Identify ways (e.g., create things, ask questions, make observations, figure things out) that everybody can do science
OH (1/2017, 2014)	Ohio State Science Standards are not numbered or coded in any way: Living things have basic needs, which are met by obtaining materials from the physical environment.
OK (1/2017, 2014)	1-LS1-1 Students who demonstrate understanding can: Use materials to design a solution to a human problem by mimicking how plants and/ or animals use their external parts to help them survive, grow, and meet their needs. 1-ESS3-1 Students who demonstrate understanding can: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

OR (1/2017, 2014)	NGSS (see CA above).
PA (1/2017, 2002)	3.3.1.A4 Identify and describe types of fresh and salt-water bodies (ocean, rivers, lakes, ponds).
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**1.S.1A.1** Ask and answer questions about the natural world using explorations, observations, or structured investigations. **1.S.1A.2** Develop and use models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. **1.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings. **1.S.1A.6** Construct explanations of phenomena using (1) student-generated observations and measurements, (2) results of scientific investigations, or (3) data communicated in graphs, tables, or diagrams. **1.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions about the natural world, (2) understand phenomena, (3) develop models, or (4) support explanations. Communicate observations and explanations clearly through oral and written language. **1.E.4A.2** Develop and use models (such as drawings or maps) to describe patterns in the distribution of land and water on Earth and classify bodies of water (including oceans, rivers and streams, lakes, and ponds). **1.E.4B.1** Obtain and communicate information to summarize how natural resources are used in different ways (such as soil and water to grow plants; rocks to make roads, walls, or buildings; or sand to make glass). **1.E.4B.2** Obtain and communicate information to explain ways natural resources can be conserved (such as reducing trash through reuse, recycling, or replanting trees).
SD (1/2017, 2015)	None.
TN (1/2017, 2009)	GLE 0107.Inq.2 Ask questions, make logical predictions, plan investigations, and represent data. GLE 0107.3.1 Recognize that plants and animals are living things that grow and change over time.
TX (1/2017, 2014)	112.12.a4A. A central theme in first grade science is active engagement in asking questions, communicating ideas, and exploring with scientific tools in order to explain scientific concepts and processes like scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations and descriptive investigations. 112.12.b2A-E.

	(A) ask questions about organisms, objects, and events observed in the natural world; (B) plan and conduct simple descriptive investigations such as ways objects move; (C) collect data and make observations using simple equipment such as hand lenses, primary balances, and non-standard measurement tools; (D) record and organize data using pictures, numbers, and words; and (E) communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.
UT (1/2017, K-2: 2010, 3-6: 2002, 7-8: 2003, 9-12: 2003, Earth Science: 2012)	**Standard 2, Objective 1.** Investigate the natural world including rock, soil and water. **Standard 4, Objective 2.** Living things change and depend upon their environment to satisfy their basic needs.
VT (1/2017, 2013)	NGSS (see CA above).
VA (1/2017, 2016)	**1.1a-j.** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which *a) the senses are used to observe differences in physical properties;* *b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy;* *c) objects or events are classified and arranged according to characteristics or properties;* *d) simple tools are used to enhance observations;* *e) length, mass, volume, and temperature are measured using nonstandard units;* *f) inferences are made and conclusions are drawn about familiar objects and events;* *g) a question is developed from one or more observations;* *h) predictions are made based on patterns of observations;* *i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and* *j) simple investigations and experiments are conducted to answer questions.* **1.8a-c. The student will investigate and understand that natural resources are limited. Key concepts include** *a) identification of natural resources;*

	b) factors that affect air and water quality; and *c) recycling, reusing, and reducing consumption of natural resources.*
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).
WI (1/2017, 2012)	By the end of **grade four**, students will: **A.4.1** When conducting science investigations, ask and answer questions that will help decide the general areas of science being addressed **A.4.2** When faced with a science-related problem, decide what evidence, models, or explanations previously studied can be used to better understand what is happening now **A.4.3** When investigating a science-related problem, decide what data can be collected to determine the most useful explanations **A.4.4** When studying science-related problems, decide which of the science themes are important **A.4.5** When studying a science-related problem, decide what changes over time are occurring or have occurred **C.4.1** Use the vocabulary of the unifying themes to ask questions about objects, organisms, and events being studied **C.4.2** Use the science content being learned to ask questions, plan investigations, make observations, make predictions, and offer explanations **C.4.3** Select multiple sources of information to help answer questions selected for classroom investigations **C.4.4** Use simple science equipment safely and effectively, including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers, to collect data relevant to questions and investigations **C.4.5** Use data they have collected to develop explanations and answer questions generated by investigations **C.4.6** Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means, to display their answers **C.4.7** Support their conclusions with logical arguments **C.4.8** Ask additional questions that might help focus or further an investigation **F.4.1** Discover how each organism meets its basic needs for water, nutrients, protection, and energy in order to survive **F.4.4** Using the science themes, develop explanations for the connections among living and non-living things in various environments

	H.4.2 Using the science themes, identify local and state issues that are helped by science and technology and explain how science and technology can also cause a problem. **H.4.3** Show how science has contributed to meeting personal needs, including hygiene, nutrition, exercise, safety, and health care **H.4.4** Develop a list of issues that citizens must make decisions about and describe a strategy for becoming informed about the science behind these issues
WY (1/2017, 2016)	**K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

STATE EDUCATIONAL STANDARDS

2nd GRADE, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**2nd Grade Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" Module**
AL (1/2017, 2015)	7. Obtain information from literature and other media to illustrate that there are many different kinds of living things and that they exist in different places on land and in water (e.g., woodland, tundra, desert, rainforest, ocean, river). 11. Examine and test solutions that address changes caused by Earth's events (e.g., dams for minimizing flooding, plants for controlling erosion).
AK (1/2017, 2012)	None.
AZ (1/2017, 2005)	Strand 1, PO 2. Participate in guided investigations in life, physical, and Earth and space sciences. Strand 2, PO 2. Identify science-related career opportunities
AR (1/2017, 2005)	None.
CA (1/2017, 2009)	2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. 2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid. K–2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K–2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **NGSS Science & Engineering Practices (APPENDIX F):** 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.
CO (1/2017, 2009)	None.

CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).
DE (1/2017, 2013)	NGSS (see CA above).
FL (1/2017, 2014)	SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.
GA (1/2017, new standards up 2017-2018)	S2E3. Obtain, evaluate, and communicate information about how weather, plants, animals, and humans cause changes to the environment. (Clarification statement: Changes should be easily observable and could be seen on school grounds or at home.) a. Ask questions to obtain information about major changes to the environment in your community. b. Construct an explanation of the causes and effects of a change to the environment in your community.
HI (1/2017, 2005)	SC.2.5.1 Identify distinct environments and the different kinds of organisms each environment supports. **SC.2.8.2** Identify the limited supply of natural resources and how they can be extended through conservation, reuse, and recycling
ID (1/2017, 2016)	None.
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	None.
IA (1/2017, 2016)	None.
KS (1/2017, 2013)	NGSS (see CA above).
KY (1/2017, 2013)	2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

LA (1/2017, 2016)	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1) 2. Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1) 48. Describe a variety of activities related to preserving the environment (SE-E-A3) 49. Describe how consumption of resources can be reduced by recycling, reusing, and conserving (SE-E-A4) 50. Describe ways in which habitat loss or change can occur as a result of natural events or human impact (SE-E-A5)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).
MA (1/2017, 2016)	2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area. 2-LS4-1. Use texts, media, or local environments to observe and compare (a) different kinds of living things in an area, and (b) differences in the kinds of living things living in different types of areas.
MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	2.1.1.2.1 Scientific inquiry is a set of interrelated processes incorporating multiple approaches that are used to pose questions about the natural world and investigate phenomena.
MS (1/2017, 2010)	4d. Distinguish how actions or events related to the Earth's environment may be harmful or helpful. (DOK 2)
MO (1/2017, 2015)	2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area. 2-LS4-1. Use texts, media, or local environments to observe and compare (a) different kinds of living things in an area, and (b) differences in the kinds of living things living in different types of areas.
MT (1/2017, 2016)	Benchmarks at end of 4th grade, 8th grade, and upon graduation from high school
NE (1/2017, 2010)	2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings. 2.1.1.a Ask questions that relate to a science topic 2.4.2.b Recognize ways in which individuals and families can conserve Earth's resources by reducing, reusing, and recycling
NV (1/2017, 2014)	NGSS (see CA above).

NH (1/2017, 2016)	S:SPS1:2:2.2 Suggest a plan and describe a sequence of events for conducting an exploration. S:SPS4:2:3.1 Make observations and tell ideas about real-life issues. S:SPS4:2:4.1 Ask questions and take part in investigations. S:SPS4:2:4.3 Look for evidence to support ideas. S:SPS4:2:5.1 Use computer software and various technologies as appropriate to display and communicate information and ideas. S:SPS4:2:6.1 Plan and carry out simple activities with a group. S:SPS4:2:8.1 Take part in sharing information with another classroom or school as a group.
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	Strand II: Content of Science Standard II (Life Science): K-4 Benchmark II. 3. Observe how the environment influences some characteristics of living things (e.g., amount of sunlight required for plant growth). Strand III: Science and Society Standard I: K-4 Benchmark I: 4. Understand that everybody can do science, invent things, and formulate ideas.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	None.
ND (1/2017, 2014)	2.2.1. Ask questions and seek answers about the world (e.g., Why do we have seasons?) 2.2.2. Communicate (e.g., verbal, written, graphic) observations to others 2.7.2. Describe some things (e.g., UV Rays, secondhand smoke, pollution) from our environment that are harmful to people 2.8.1. Identify ways scientists work together to solve problems (e.g., share results, teamwork, investigate)
OH (1/2017, 2014)	Ohio State Science Standards are not numbered or coded in any way: Living things cause changes on Earth.
OK (1/2017, 2014)	2-LS4-1 Students who demonstrate understanding can: Make observations of plants and animals to compare the diversity of life in different habitats. 2-ESS1-1 Students who demonstrate understanding can: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

	2-ESS2-2 Students who demonstrate understanding can: Develop a model to represent the shapes and kind of land and bodies of water in an area.
OR (1/2017, 2014)	NGSS (see CA above).
PA (1/2017, 2002)	None.
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**2.S.1A.1** Ask and answer questions about the natural world using explorations, observations, or structured investigations. **2.S.1A.2** Develop and use models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. **2.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings. **2.S.1A.6** Construct explanations of phenomena using (1) student-generated observations and measurements, (2) results of scientific investigations, or (3) data communicated in graphs, tables, or diagrams. **2.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions about the natural world, (2) understand phenomena, (3) develop models, or (4) support explanations. Communicate observations and explanations using oral and written language. **2.L.5B.2** Develop and use models to exemplify characteristics of animals that help them survive in distinct environments (such as salt and freshwater, deserts, forests, wetlands, or polar lands). **2.L.5B.3** Analyze and interpret data from observations to describe how animals respond to changes in their environment (such as changes in food availability, water, or air).
SD (1/2017, 2015)	None.
TN (1/2017, 2009)	GLE 0207.Inq.2 Ask questions, make logical predictions, plan investigations, and represent data.

	GLE 0207.Inq.3 Explain the data from an investigation. GLE 0207.T/E.2 Apply engineering design and creative thinking to solve practical problems.
TX (1/2017, 2014)	112.13. a. (3) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time. 112.13. b(9)(C) compare and give examples of the ways living organisms depend on each other and on their environments such as food chains within a garden, park, beach, lake, and wooded area.
UT (1/2017, K-2: 2010, 3-6: 2002, 7-8: 2003, 9-12: 2003, Earth Science: 2012)	**Standard 4, Objective 2.** Identify basic needs of living things (plants and animals) and their abilities to meet their needs.
VT (1/2017, 2013)	NGSS (see CA above).

VA (1/2017, 2016)	**2.1a-m.** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which a) observations and predictions are made and questions are formed; b) observations are differentiated from personal interpretation; c) observations are repeated to ensure accuracy; d) two or more characteristics or properties are used to classify items; e) length, volume, mass, and temperature are measured in metric units and standard English units using the proper tools; f) time is measured using the proper tools; g) conditions that influence a change are identified and inferences are made; h) data are collected and recorded, and bar graphs are constructed using numbered axes; i) data are analyzed, and unexpected or unusual quantitative data are recognized; j) conclusions are drawn; k) observations and data are communicated; l) simple physical models are designed and constructed to clarify explanations and show relationships; and m) current applications are used to reinforce science concepts. **2.5a-c.** The student will investigate and understand that living things are part of a system. Key concepts include a) living organisms are interdependent with their living and nonliving surroundings; b) an animal's habitat includes adequate food, water, shelter or cover, and space; c) habitats change over time due to many influences
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).

WI (1/2017, 2012)	By the end of **grade four**, students will: **A.4.1** When conducting science investigations, ask and answer questions that will help decide the general areas of science being addressed **A.4.2** When faced with a science-related problem, decide what evidence, models, or explanations previously studied can be used to better understand what is happening now **A.4.3** When investigating a science-related problem, decide what data can be collected to determine the most useful explanations **A.4.4** When studying science-related problems, decide which of the science themes are important **A.4.5** When studying a science-related problem, decide what changes over time are occurring or have occurred **C.4.1** Use the vocabulary of the unifying themes to ask questions about objects, organisms, and events being studied **C.4.2** Use the science content being learned to ask questions, plan investigations, make observations, make predictions, and offer explanations **C.4.3** Select multiple sources of information to help answer questions selected for classroom investigations **C.4.4** Use simple science equipment safely and effectively, including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers, to collect data relevant to questions and investigations **C.4.5** Use data they have collected to develop explanations and answer questions generated by investigations **C.4.6** Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means, to display their answers **C.4.7** Support their conclusions with logical arguments **C.4.8** Ask additional questions that might help focus or further an investigation **F.4.1** Discover how each organism meets its basic needs for water, nutrients, protection, and energy in order to survive **F.4.4** Using the science themes, develop explanations for the connections among living and non-living things in various environments **H.4.2** Using the science themes, identify local and state issues that are helped by science and technology and explain how science and technology can also cause a problem. **H.4.3** Show how science has contributed to meeting personal needs, including hygiene, nutrition, exercise, safety, and health care **H.4.4** Develop a list of issues that citizens must make decisions about and describe a strategy for becoming informed about the science behind these issues

WY (1/2017, 2016)	**2-ESS2-2**. Develop a model to represent the shapes and kinds of land and bodies of water in an area. **K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2.** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

STATE EDUCATIONAL STANDARDS

3rd GRADE, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**3rd Grade Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" Module**
AL (1/2017, 2015)	14. Collect information from a variety of sources to describe climates in different regions of the world.
AK (1/2017, 2012)	[3] SC3.2 organizing a simple food chain of familiar plants and animals (L) [3] SD2.1 identifying and comparing a variety of Earth's land features (i.e., rivers, deltas, lakes, glaciers, mountains, valleys, and islands) [3] SE1.1 identifying local problems and discussing solutions (L)
AZ (1/2017, 2005)	None.
AR (1/2017, 2005)	Strand 2, PO 2. Describe science-related career opportunities. Strand 3, PO 1. Describe the major factors that could impact a human population (e.g., famine, drought, disease, improved transportation, medical breakthroughs). Strand 3, PO 2. Describe the beneficial and harmful impacts of natural events and human activities on the environment (e.g., forest fires, flooding, pesticides).
CA (1/2017, 2009)	3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. 3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. **NGSS Science & Engineering Practices (APPENDIX F):** 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.
CO (1/2017, 2009)	None.
CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).
DE	NGSS (see CA above).

(1/2017, 2013)	
FL (1/2017, 2014)	SC.3.N.1.1: Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
GA (1/2017, new standards up 2017-2018)	S3L2. Obtain, evaluate, and communicate information about the effects of pollution (air, land, and water) and humans on the environment. a. Ask questions to collect information and create records of sources and effects of pollution on the plants and animals. b. Explore, research, and communicate solutions, such as conservation of resources and recycling of materials, to protect plants and animals.
HI (1/2017, 2005)	None.
ID (1/2017, 2016)	Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced 3.S.5.1.1 Identify local environmental issues. (581.01.a)
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	3-5.E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
IA (1/2017, 2016)	None.
KS (1/2017, 2013)	NGSS (see CA above).
KY (1/2017, 2013)	3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. LS4.D: Biodiversity and Humans • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)
LA (1/2017, 2016)	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1) 2. Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1) 58. Describe how humans have had negative and positive effects on organisms and their environments (SE-E-A3) (SE-E-A5)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).

MA (1/2017, 2016)	3-LS4-4. Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.
MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	None.
MS (1/2017, 2010)	4d. Identify the causes and effects of various types of air, land, and water pollution and infer ways to protect the environment. (DOK 3)
MO (1/2017, 2015)	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1) 2. Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1) 58. Describe how humans have had negative and positive effects on organisms and their environments (SE-E-A3) (SE-E-A5)
MT (1/2017, 2016)	Benchmarks at end of 4th grade, 8th grade, and upon graduation from high school
NE (1/2017, 2010)	5.1.1.f Develop a reasonable explanation based on collected data. 5.1.1.g Share information, procedures, and results with peers and/or adults. 5.3.3 Students will describe relationships within an ecosystem. 5.3.3.d Recognize all organisms cause changes, some beneficial and some detrimental, in the environment where they live.
NV (1/2017, 2014)	NGSS (see CA above).
NH (1/2017, 2016)	Separated into GSEs (Grade Span Expectations), 3-4 (so, "By the end of Grade 4, all students will…"
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	Strand I: Scientific Thinking and Practice Standard I: K-4 Benchmark II: Use scientific thinking and knowledge and communicate findings. 1. Use a variety of methods to display data and present findings. 2. Understand that predictions are based on observations, measurements, and cause-and-effect relationships. Strand II: Content of Science Standard II (Life Science): Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. K-4 Benchmark II: Know that living things have similarities and differences and that living things change over time.

	1. Identify how living things cause changes to the environments in which they live, and that some of these changes are detrimental to the organism and some are beneficial. Strand III: Science and Society Standard I: K-4 Benchmark I: 2. Know that science produces information for the manufacture and recycling of materials (e.g., materials that can be recycled [aluminum, paper, plastic] and others that cannot [gasoline]). 3. Know that naturally occurring materials (e.g., wood, clay, cotton, animal skins) may be processed or combined with other materials to change their properties.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	3.E.2.2. Compare Earth's land features (including volcanoes, mountains, valleys, canyons, caverns, and islands) by using models, pictures, diagrams, and maps. 3.L.2.2. Explain how environmental conditions determine how well plants survive and grow.
ND (1/2017, 2014)	3.8.1. Identify ways people of all ages, genders, and backgrounds use science in their careers and in daily life (e.g., children check temperature conditions to decide what to wear, farmer uses genetic grains, hikers use GPS, depth-finder in boat, hearing-aides for disabilities)
OH (1/2017, 2014)	Ohio State Science Standards are not numbered or coded in any way: Changes that occur in an environment can sometimes be beneficial and sometimes harmful. Earth's nonliving resources have specific properties. Earth's resources can be used for energy. Some of Earth's resources are limited.
OK (1/2017, 2014)	3-LS4-4 Students who demonstrate understanding can: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
OR (1/2017, 2014)	NGSS (see CA above).
PA (1/2017, 2002)	3.4.3.B1 Describe how using **technology** can be good or bad.
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**3.S.1A.1** Ask questions that can be (1) answered using scientific investigations or (2) used to refine models, explanations, or designs.

	3.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. **3.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings. **3.S.1A.6** Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams. **3.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language. **3.E.4A.2** Develop and use models to describe and classify the pattern distribution of land and water features on Earth. **3.E.4A.3** Obtain and communicate information to exemplify how humans obtain, use, and protect renewable and nonrenewable Earth resources. **3.E.4B.3** Obtain and communicate information to explain how natural events (such as fires, landslides, earthquakes, volcanic eruptions, or floods) and human activities (such as farming, mining, or building) impact the environment. **3.E.4B.4** Define problems caused by a natural event or human activity and design devices or solutions to reduce the impact on the environment. **3.L.5A.1** Analyze and interpret data about the characteristics of environments (including salt and fresh water, deserts, grasslands, forests, rain forests, and polar lands) to describe how the environment supports a variety of organisms.
SD (1/2017, 2015)	None.
TN (1/2017, 2009)	GLE 0307.Inq.1 Explore different scientific phenomena by asking questions, making logical predictions, planning investigations, and recording data. GLE 0307.Inq.4 Identify and interpret simple patterns of evidence to communicate the findings of multiple investigations.

	GLE 0307.T/E.5 Apply a creative design strategy to solve a particular problem generated by societal needs and wants.
TX (1/2017, 2014)	112.14.a3. The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific methods, analyzing information, making informed decisions, and using tools to collect and record information while addressing the content and vocabulary in physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time. 112.14.a4C. Students explore patterns, systems, and cycles within environments by investigating characteristics of organisms, life cycles, and interactions among all components of the natural environment. Students examine how the environment plays a key role in survival. Students know that when changes in the environment occur organisms may thrive, become ill, or perish. 112.14.b9C. describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.
UT (1/2017, K-2: 2010, 3-6: 2002, 7-8: 2003, 9-12: 2003, Earth Science: 2012)	**Standard 2, Objective 1:** Classify living and nonliving things in an environment. **Standard 2, Objective 2:** Describe the interactions between living and nonliving things in a small environment.
VT (1/2017, 2013)	NGSS (see CA above).
VA (1/2017, 2016)	**3.1a-m.** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which *a) observations are made and are repeated to ensure accuracy;* *b) predictions are formulated using a variety of sources of information;* *c) objects with similar characteristics or properties are classified into at least two sets and two subsets;* *d) natural events are sequenced chronologically;* *e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques;* *f) time is measured to the nearest minute using proper tools and techniques;* *g) questions are developed to formulate hypotheses;* *h) data are gathered, charted, graphed, and analyzed;*

	i) unexpected or unusual quantitative data are recognized; *j) inferences are made and conclusions are drawn;* *k) data are communicated;* *l) models are designed and built; and* *m) current applications are used to reinforce science concepts.* **3.6a-d.** The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include a) aquatic ecosystems; b) terrestrial ecosystems; c) populations and communities; and d) the human role in conserving limited resources. **3.10a-d.** The student will investigate and understand that natural events and human influences can affect the survival of species. Key concepts include a) the interdependency of plants and animals; b) the effects of human activity on the quality of air, water, and habitat; c) the effects of fire, flood, disease, and erosion on organisms; and d) conservation and resource renewal.
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).
WI (1/2017, 2012)	By the end of **grade four**, students will: **A.4.1** When conducting science investigations, ask and answer questions that will help decide the general areas of science being addressed **A.4.2** When faced with a science-related problem, decide what evidence, models, or explanations previously studied can be used to better understand what is happening now **A.4.3** When investigating a science-related problem, decide what data can be collected to determine the most useful explanations **A.4.4** When studying science-related problems, decide which of the science themes are important **A.4.5** When studying a science-related problem, decide what changes over time are occurring or have occurred

	C.4.1 Use the vocabulary of the unifying themes to ask questions about objects, organisms, and events being studied **C.4.2** Use the science content being learned to ask questions, plan investigations, make observations, make predictions, and offer explanations **C.4.3** Select multiple sources of information to help answer questions selected for classroom investigations **C.4.4** Use simple science equipment safely and effectively, including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers, to collect data relevant to questions and investigations **C.4.5** Use data they have collected to develop explanations and answer questions generated by investigations **C.4.6** Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means, to display their answers **C.4.7** Support their conclusions with logical arguments **C.4.8** Ask additional questions that might help focus or further an investigation **F.4.1** Discover how each organism meets its basic needs for water, nutrients, protection, and energy in order to survive **F.4.4** Using the science themes*, develop explanations* for the connections among living and non-living things in various environments **H.4.2** Using the science themes*, identify* local and state issues that are helped by science and technology and explain* how science and technology can also cause a problem. **H.4.3** Show* how science has contributed to meeting personal needs, including hygiene, nutrition, exercise, safety, and health care **H.4.4** Develop* a list of issues that citizens must make decisions about and describe* a strategy for becoming informed about the science behind these issues
WY (1/2017, 2016)	**3-5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. **3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

STATE EDUCATIONAL STANDARDS

4th GRADE, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**4th grade Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" module**
AL (1/2017, 2015)	**16.** Describe patterns of Earth's features on land and in the ocean using data from maps (e.g., topographic maps of Earth's land and ocean floor; **maps** of locations of mountains, continental boundaries, volcanoes, and earthquakes).
AK (1/2017, 2012)	None.
AZ (1/2017, 2005)	**Strand 3, Concept 1: PO 1.** Describe how natural events and human activities have positive and negative impacts on environments (e.g., fire, **floods**, pollution, dams). **PO 2.** Evaluate the consequences of environmental occurrences that happen either rapidly (e.g., fire, **flood**, tornado) or over a long period of time (e.g., drought, melting ice caps, the greenhouse effect, erosion).
AR (1/2017, 2005)	**ESS.8.4.6** Evaluate human use of Arkansas' natural resources on the environment, including but not limited to • mining • clear cutting • dredging
CA (1/2017, 2009)	**4-ESS2-2.** Analyze and interpret data from **maps** to describe patterns of Earth's features. **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. **3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **3-5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. **NGSS Science & Engineering Practices (APPENDIX F):** 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.
CO (1/2017, 2009)	Standard 2, Life Science, Concept 3: There is interaction and interdependence between and among living and nonliving components of ecosystems
CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).

DE (1/2017, 2013)	NGSS (see CA above).
FL (1/2017, 2014)	**SC.4.L.17.4**, Recognize ways plants and animals, including humans, can impact the environment. A. Plants and animals, including humans, interact with and depend upon each other and their environment to satisfy their basic needs. B. Both human activities and natural events can have major impacts on the environment.
GA (1/2017, new standards up 2017-2018)	**S4L1**. Obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an ecosystem. c. Design a scenario to demonstrate the effect of a change on an ecosystem. (Clarification statement: Include living and non-living factors in the scenario.)
HI (1/2017, 2005)	None.
ID (1/2017, 2016)	None.
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	**4.ESS.4** Develop solutions that could be implemented to reduce the impact of humans on the natural environment and the natural environment on humans. **3-5.E.2** Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
IA (1/2017, 2016)	**4-ESS2-2.** Analyze and interpret data from **maps** to describe patterns of Earth's features. **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
KS (1/2017, 2013)	NGSS (see CA above).
KY (1/2017, 2013)	**4-ESS2-2.** Analyze and interpret data from **maps** to describe patterns of Earth's features. **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
LA (1/2017, 2016)	**72.** Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g., consumer, herbivores, nonliving component) (SE-E-A2)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).
MA (1/2017, 2016)	None.

MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	**4.1.2.2.2.** Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product.
MS (1/2017, 2010)	**4d.** Describe how human activities have decreased the capacity of the environment to support some life forms. (DOK 2) • Reducing the amount of forest cover • Increasing the amount of chemicals released into the atmosphere • Farming intensively
MO (1/2017, 2015)	**72.** Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g., consumer, herbivores, nonliving component) (SE-E-A2)
MT (1, 2017, 2016)	**1.1** develop the abilities necessary to safely conduct scientific inquiry, including (a step-by-step sequence is not implied): (a) asking questions about objects, events, and organisms in the environment, (b) planning and conducting simple investigations **1.6** identify how observations of nature form an essential base of knowledge among the Montana American Indians **5.2** describe a scientific or technological innovation that impacts communities, cultures, and societies **5.3** simulate scientific collaboration by sharing and communicating ideas to identify and describe problems **5.4** use scientific knowledge to make inferences and propose solutions for simple environmental problems
NE (1/2017, 2010)	**5.3.3** Students will describe relationships within an ecosystem. **5.3.3.d** Recognize all organisms cause changes, some beneficial and some detrimental, in the environment where they live.
NV (1/2017, 2014)	NGSS (see CA above).
NH (1/2017, 2016)	**S:SPS1:4:1.7** Ask questions about objects, organisms and events in their local environment. **S:SPS1:4:1.8** Pose questions to investigate and practical problems to solve. **S:SPS2:4:2.1** Demonstrate that if something consists of many parts, the parts usually influence one another. **S:SPS2:4:4.2** Understand that some changes are so slow or so fast that they are hard to see. **S:SPS3:4:1.1** Be able to complete an assigned task when given a specific role in a group. **S:SPS3:4:1.2** Communicate ideas to others. **S:SPS3:4:1.3** Give specific feedback about work of others.

	S:SPS3:4:2.1 Demonstrate a basic conservation action such as recycling or a schoolyard habitat project. **S:SPS3:4:2.2** Develop questions based upon their observations about the natural world and design a simple investigation. **S:SPS3:4:2.3** Develop questions that help them learn about the environment; and design and conduct simple investigations. **S:SPS3:4:2.4** Locate and collect information about the environment and environmental and natural resources topics. **S:SPS3:4:2.5** Use reliable information to answer questions. **S:SPS3:4:2.6** Organize information to search for relationships and patterns concerning the environment and environmental topics. **S:SPS3:4:2.7** Identify and investigate issues in their local environments and communities. **S:SPS4:4:1.1** Access information from a variety of media sources (e.g., Internet, CD-ROM programs, print resources). **S:SPS4:4:1.3** Analyze and compare data from a variety of age-appropriate sources such as newspapers and websites. **S:SPS4:4:2.1** Use a variety of tools and formats (oral presentations, journals, and multimedia presentations) to summarize and communicate the results of observations. **S:SPS4:4:6.1** Plan and conduct a scientific investigation in group settings.
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	**Strand II: Content of Science Standard II (Life Science):** Understand the properties, structures, and processes of living things and the interdependence of living things and their environments. **Strand III: Science and Society Standard I: K-4 Benchmark I:** 1. Know that science has identified substances called pollutants that get into the environment and can be harmful to living things.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	**4.L.1.1.** Give examples of changes in an organism's environment that are beneficial to it and some that are harmful. **4.L.1.3.** Explain how humans can adapt their behavior to live in changing habitats (e.g. recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion).

ND (1/2017, 2014)	**4.6.1.** Evaluate the effects of technology on people and the environment (e.g., new construction, oil drilling, electric cars). **4.7.1.** Identify consequences of natural and human induced environmental changes (e.g., erosion, tsunami, deforestation). **4.7.2.** Identify ways in which science and technology have greatly improved human lives (e.g., food quality and quantity, transportation, health, sanitation, communication).
OH (1/2017, 2014)	**Ohio State Science Standards are not numbered or coded in any way:** Earth's surface has specific characteristics and landforms that can be identified.
OK (1/2017, 2014)	**4-ESS2-2** Analyze and interpret data from **maps** to describe patterns of Earth's features. **4-ESS3-1** Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment. **4-ESS3-2** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
OR (1/2017, 2014)	NGSS (see CA above).
PA (1/2017, 2002)	**3.3.4.A4** Recognize Earth's different water resources, including both fresh and saltwater. **3.4.4.B1** Describe how **technology** affects humans in various ways. **3.4.4.B2** Explain how the use of **technology** affects the environment in good and bad ways.
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**4.S.1A.1** Ask questions that can be (1) answered using scientific investigations or (2) used to refine models, explanations, or designs. **4.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
SD (1/2017, 2015)	**4-ESS2-2** Analyze and interpret data from maps to describe patterns of Earth's features. **4-ESS3-1** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. **4-ESS3-2** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
TN (1/2017, 2009)	**GLE 0407.Inq.1** Explore different scientific phenomena by asking questions, making logical predictions, planning investigations, and recording data.

	GLE 0407.T/E.5 Apply a creative design strategy to solve a particular problem generated by societal needs and wants. **GLE 0407.2.1** Analyze the effects of changes in the environment on the stability of an ecosystem. **GLE 0407.7.2** Evaluate how some earth materials can be used to solve human problems and enhance the quality of life.
TX (1/2017, 2014)	**112.15.a4(A).** Within the natural environment, students know that earth materials have properties that are constantly changing due to Earth's forces. The students learn that the natural world consists of resources, including renewable and nonrenewable, and their responsibility to conserve our natural resources for future generations.
UT (1/2017, 3-6: 2002)	**Standard 5, Objective 1:** Describe the physical characteristics of Utah's wetlands, forests, and deserts. **Standard 5, Objective 2:** Describe the common plants and animals found in Utah environments and how these organisms have adapted to the environment in which they live.
VT (1/2017, 2013)	NGSS (see CA above).
VA (1/2017, 2016)	**4.1.** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which *a) distinctions are made among observations, conclusions, inferences, and predictions;* *b) objects or events are classified and arranged according to characteristics or properties;* *e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;* *h)* ***hypotheses are developed*** *as cause and effect relationships;* *k) data are communicated with simple graphs, pictures,* ***written statements****, and numbers;* *l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and* *m) current applications are used to reinforce science concepts.* **4.5b,d,f.** The student will investigate and understand how plants and animals, including humans, in an ecosystem interact with one another and with the nonliving components in the ecosystem. Key concepts include *b) organization of populations, communities, and ecosystems and how they interrelate;* *d) habitats and niches; and* *f) influences of human activity on ecosystems.* **4.9a-d.** The student will investigate and understand important Virginia natural resources. Key concepts include *a) watersheds and water resources;* *b) animals and plants;*

	c) minerals, rocks, ores, and energy sources; and *d) forests, soil, and land.*
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).
WI (1/2017, 2012)	By the end of **grade four**, students will: **A.4.1** When conducting science investigations, ask and answer questions that will help decide the general areas of science being addressed **A.4.2** When faced with a science-related problem, decide what evidence, models, or explanations previously studied can be used to better understand what is happening now **A.4.3** When investigating a science-related problem, decide what data can be collected to determine the most useful explanations **A.4.4** When studying science-related problems, decide which of the science themes are important **A.4.5** When studying a science-related problem, decide what changes over time are occurring or have occurred **C.4.1** Use the vocabulary of the unifying themes to ask questions about objects, organisms, and events being studied **C.4.2** Use the science content being learned to ask questions, plan investigations, make observations, make predictions, and offer explanations **C.4.3** Select multiple sources of information to help answer questions selected for classroom investigations **C.4.4** Use simple science equipment safely and effectively, including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers, to collect data relevant to questions and investigations **C.4.5** Use data they have collected to develop explanations and answer questions generated by investigations **C.4.6** Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means, to display their answers **C.4.7** Support their conclusions with logical arguments **C.4.8** Ask additional questions that might help focus or further an investigation **F.4.1** Discover how each organism meets its basic needs for water, nutrients, protection, and energy in order to survive **F.4.4** Using the science themes, develop explanations for the connections among living and non-living things in various environments

	H.4.2 Using the science themes, identify local and state issues that are helped by science and technology and explain how science and technology can also cause a problem. **H.4.3** Show how science has contributed to meeting personal needs, including hygiene, nutrition, exercise, safety, and health care **H.4.4** Develop a list of issues that citizens must make decisions about and describe a strategy for becoming informed about the science behind these issues
WY (1/2017, 2016)	**4-ESS2-2.** Analyze and interpret data from maps to describe patterns of Earth's features. **4-ESS3-1.** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. **3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **3-5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

STATE EDUCATIONAL STANDARDS

5th GRADE, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**5th Grade Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" Module**
AL (1/2017, 2015)	**14.** Use a model to represent how any two systems, specifically the atmosphere, biosphere, geosphere, and/or hydrosphere, interact and support life (e.g., influence of the ocean on ecosystems, landform shape, and climate; influence of the atmosphere on landforms and ecosystems through weather and climate; influence of mountain ranges on winds and clouds in the atmosphere). **16.** Collect and organize scientific ideas that individuals and communities can use to protect Earth's natural resources and its environment (e.g., terracing land to prevent soil erosion, utilizing no-till farming to improve soil fertility, regulating emissions from factories and automobiles to reduce air pollution, recycling to reduce overuse of landfill areas).
AK (1/2017, 2012)	**[5] SE1.1** identifying a community problem or issue and describing the information needed to develop a scientific solution (L)
AZ (1/2017, 2005)	**Strand 3, Concept 1: PO 1.** Explain the impacts of natural hazards on habitats (e.g., global warming, floods, asteroid or large meteor impacts). **PO 2.** Propose a solution, resource, or product that addresses a specific human, animal, or habitat need. **PO 3.** Evaluate the possible strengths and weaknesses of a proposed solution to a specific problem relevant to human, animal, or habitat needs.
AR (1/2017, 2005)	**LS.4.5.4** Evaluate food webs under conditions of stress: • overgrazing • overpopulation • natural disaster • introduction of nonnative species • human impact/urban development **LS.4.5.16** Evaluate positive and negative human effects on ecosystems
CA (1/2017, 2009)	**5-ESS2-1.** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **3–5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **3–5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

	NGSS Science & Engineering Practices (APPENDIX F): 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.
CO (1/2017, 2009)	None.
CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).
DE (1/2017, 2013)	NGSS (see CA above).
FL (1/2017, 2014)	**SC.5.N.1.1.** Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
GA (1/2017, new standards up 2017-2018)	None.
HI (1/2017, 2005)	None.
ID (1/2017, 2016)	**5.S.5.1.1.** Identify issues for environmental studies. **5.S.5.2.1.** Describe how science and technology are part of a student's life. **5.S.5.2.2.** List examples of science and technology.
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	**5.ESS.3** Investigate ways individual communities within the United States protect the Earth's resources and environment. **5.ESS.4** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
IA (1/2017, 2016)	**5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
KS (1/2017, 2013)	NGSS (see CA above).

KY (1/2017, 2013)	**5-ESS2-1.** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **ESS3.C:** Human Impacts on Earth Systems • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)
LA (1/2017, 2016)	**Physical Science:** 26. Identify and describe ecosystems of local importance (LS-M-C3) **Science and the Environment:** 49. Identify and give examples of pollutants found in water, air, and soil (SE-M-A3) 50. Describe the consequences of several types of human activities on local ecosystems (e.g., polluting streams, regulating hunting, introducing nonnative species) (SE-MA4)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).
MA (1/2017, 2016)	**5-ESS3-1.** Obtain and combine information about ways communities reduce human impact on the Earth's resources and environment by changing an agricultural, industrial, or community practice or process.
MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	**5.4.2.1.1.** Natural systems have many components that interact to maintain the living system **5.4.2.1.2.** Natural systems have many parts that interact to maintain the living system **5.4.4.1.1.** Humans change environments in ways that can be either beneficial or harmful to themselves and other organisms.
MS (1/2017, 2010)	**4d.** Describe changes caused by humans on the environment and natural resources and cite evidence from research of ways to conserve natural resources in the United States, including (but not limited to) Mississippi. Examples of Mississippi efforts include the following: (DOK 2) • Associated Physics of America, a private company located in Greenwood Mississippi, develops ways to convert a variety of agricultural products into efficient, environment-friendly and cost-effective energy sources. • The Natural Resource Enterprises (NRE) Program of the Department of Wildlife and Fisheries and the Cooperative Extension Service at MSU educate landowners in the Southeast about sustainable natural resource enterprises and compatible habitat management practices.

	• The Engineer Research and Development Center of the Vicksburg District of the U.S. Army Corps of Engineers provides quality engineering and other professional products and services to develop and manage the Nation's water resources, reduce flood damage, and protect the environment.
MO (1/2017, 2015)	**5-ESS3-1.** Obtain and combine information about ways communities reduce human impact on the Earth's resources and environment by changing an agricultural, industrial, or community practice or process.
MT (1/2017, 2016)	Benchmarks at end of 4th grade, 8th grade, and upon graduation from high school
NE (1/2017, 2010)	**5.3.3** Students will describe relationships within an ecosystem. **5.3.3.d** Recognize all organisms cause changes, some beneficial and some detrimental, in the environment where they live.
NV (1/2017, 2014)	NGSS (see CA above).
NH (1/2017, 2016)	Separated into GSEs (Grade Span Expectations), 5-6 (so, "By the end of Grade 6, all students will…"
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	**Strand II: Content of Science Standard II (Life Science): 5-8 Benchmark I: 4.** Describe how human activity impacts the environment.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	**5.L.2.1.** Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands. **5.L.2.3.** Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.
ND (1/2017, 2014)	**5.1.2**. Explain how changes alter the balance within a system (e.g., the effects of limited resources on populations, global climate change, flood, drought) **5.7.2.** Explain ways humans benefit from Earth's resources (e.g., air, water, soil, food, fuel, building materials)
OH (1/2017, 2014)	**Ohio State Science Standards are not numbered or coded in any way:** Organisms perform a variety of roles in an ecosystem.
OK (1/2017, 2014)	**5-LS2-2**. Use models to explain factors that upset the stability of local ecosystems. **5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
OR	NGSS (see CA above).

(1/2017, 2014)	
PA (1/2017, 2002)	**3.4.5.B2** Describe how waste may be appropriately recycled or disposed of to prevent unnecessary harm to the environment.
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**5.S.1A.1** Ask questions used to (1) generate hypotheses for scientific investigations or (2) refine models, explanations, or designs. **5.S.1A.2** Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. **5.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support hypotheses, explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language. **5.E.3A.1 Construct explanations of how different landforms and surface features result from the location and movement of water on Earth's surface through watersheds (drainage basins) and rivers.** **5.E.3B.3** Construct scientific arguments to support claims that human activities (such as conservation efforts or pollution) affect the land and oceans of Earth. **5.L.4B.4** Construct scientific arguments to explain how limiting factors (including food, water, space, and shelter) or a newly introduced organism can affect an ecosystem.
SD (1/2017, 2015)	**5-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
TN (1/2017, 2009)	**GLE 0507.2.3** Establish the connections between human activities and natural disasters and their impact on the environment.
TX (1/2017, 2014)	**112.16.b9A.** Observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements. **112.16.b9C.** Predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.
UT (1/2017, K-2: 2010, 3-6: 2002, 7-8: 2003, 9-12: 2003, Earth Science: 2012)	None.

VT (1/2017, 2013)	NGSS (see CA above).
VA (1/2017, 2016)	**5.7g.** The student will investigate and understand how Earth's surface is constantly changing. Key concepts include: *g) human impact.*
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).
WI (1/2017, 2012)	**A.8.1** Develop their understanding of the science themes by using the themes to frame questions about science-related issues and problems. **A.8.3** Defend explanations and models by collecting and organizing evidence that supports them and critique explanations and models by collecting and organizing evidence that conflicts with them. **A.8.5** Show how models and explanations, based on systems, were changed as new evidence accumulated (the effects of constancy, evolution, change, and measurement should all be part of these explanations). **C.8.1** Identify questions they can investigate using resources and equipment they have available **C.8.2** Identify data and locate sources of information including their own records to answer the questions being investigated **C.8.3** Design and safely conduct investigations that provide reliable quantitative or qualitative data, as appropriate, to answer their questions **C.8.6** State what they have learned from investigations, relating their inferences to scientific knowledge and to data they have collected **C.8.7** Explain their data and conclusions in ways that allow an audience to understand the questions they selected for investigation and the answers they have developed **C.8.8** Use computer software and other technologies to organize, process, and present their data **C.8.10** Discuss the importance of their results and implications of their work with peers, teachers, and other adults **C.8.11** Raise further questions which still need to be answered **F.8.8 Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet** **F.8.9** Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species

	H.8.1 Evaluate the scientific evidence used in various media (for example, television, radio, Internet, popular press, and scientific journals) to address a social issue, using criteria of accuracy, logic, bias, relevance of data, and credibility of sources
WY (1/2017, 2016)	**5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to conserve Earth's resources and environment.

EnviroAtlas
people health nature economy
Lesson Plan Standards
www.epa.gov/enviroatlas

STATE EDUCATIONAL STANDARDS

6TH GRADE, ALL 50 STATES & DC

These Standards have been collected from individual State websites (1/2017). They have been connected to themes that are available in an EPA tool called *EnviroAtlas*.

State (last updated on this chart, Standards adoption year)	**6th Grade Science Educational Standards that apply to the *EnviroAtlas* "Exploring Your Watershed" Module**
AL (1/2017, 2015)	14. Analyze and interpret data (e.g., tables, graphs, maps of global and regional temperatures; atmospheric levels of gases such as carbon dioxide and methane; rates of human activities) to describe how various human activities (e.g., use of fossil fuels, creation of urban heat islands, agricultural practices) and natural processes (e.g., solar radiation, greenhouse effect, volcanic activity) may cause changes in local and global temperatures over time. 16. Implement scientific principles to design processes for monitoring and minimizing human impact on the environment (e.g., water usage, including withdrawal of water from streams and aquifers or construction of dams and levees; land usage, including urban development, agriculture, or removal of wetlands; pollution of air, water, and land).*
AK (1/2017, 2012)	The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by [6] SA3.1 gathering data to build a knowledge base that contributes to the development of questions about the local environment (e.g., moose browsing, trail usage, river erosion) (L)
AZ (1/2017, 2005)	**Concept 2:** Science and Technology in Society. Develop viable solutions to a need or problem. PO 1. Propose viable methods of responding to an identified need or problem. PO 2. Compare possible solutions to best address an identified need or problem. PO 3. Design and construct a solution to an identified need or problem using simple classroom materials. PO 4. Describe a technological discovery that influences science. **Concept 3:** Populations of Organisms in an Ecosystem. Analyze the relationships among various organisms and their environment. PO 1. Explain that sunlight is the major source of energy for most ecosystems. PO 2. Describe how the following environmental conditions affect the quality of life: • water quality • climate • population density • smog
AR (1/2017, 2005)	None.
CA (1/2017, 2009)	**MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

	MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. **MS-ETS1-4.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **NGSS Science & Engineering Practices (APPENDIX F):** 1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 8. Obtaining, evaluating, and communicating information.
CO (1/2017, 2009)	3. Earth Systems Science, 3. Earth's natural resources provide the foundation for human society's physical needs. Many natural resources are nonrenewable on human timescales, while others can be renewed or recycled
CT (1/2017, 2015)	NGSS (see CA above).
DC (1/2017, 2013)	NGSS (see CA above).
DE (1/2017, 2013)	NGSS (see CA above).
FL (1/2017, 2014)	SC.6.N.1.1 Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

GA (1/2017, new standards up 2017-2018)	None.
HI (1/2017, 2005)	None.
ID (1/2017, 2016)	Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced 6.S.5.1.1 Identify issues for environmental studies. (626.01.a) Goal 5.2: Understand the Relationship between Science and Technology 6.S.5.2.1 Describe how science and technology are part of our society. (625.01.a) 6.S.5.2.2 Describe how science and technology are interrelated. (625.01.b)
IL (1/2017, 2011)	NGSS (see CA above).
IN (1/2017, 2016)	6.LS.5 Research invasive species and discuss their impact on ecosystems.
IA (1/2017, 2016)	NGSS (see CA above).
KS (1/2017, 2013)	NGSS (see CA above).
KY (1/2017, 2013)	LS2.C: Ecosystem Dynamics, Functioning, and Resilience Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (08-LS2-4) 08-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* LS2.C: Ecosystem Dynamics, Functioning, and Resilience Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (08-LS2-5) LS4.D: Biodiversity and Humans Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to 08-LS2-5) ETS1.B: Developing Possible Solutions There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to 08-LS2-5) 08-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*
LA (1/2017, 2016)	**Science and the Environment** 45. Describe methods for sustaining renewable resources (SE-M-A6) 46. Identify ways people can reuse, recycle, and reduce the use of resources to improve and protect the quality of life (SE-M-A6) 47. Illustrate how various

	technologies influence resource use in an ecosystem (e.g., forestry management, soil conservation, fishery improvement) (SE-M-A8)
ME (1/2017, 2013)	NGSS (see CA above).
MD (1/2017, 2013)	NGSS (see CA above).
MA (1/2017, 2016)	6.MS-ETS1-6(MA). Communicate a design solution to an intended user, including design features and limitations of the solution
MI (1/2017, 2015)	NGSS (see CA above).
MN (1/2017, 2009)	6.1.2.2.1. Engineering design is the process of devising products, processes and systems that address a need, capitalize on an opportunity, or solve a specific problem.
MS (1/2017, 2010)	4d. Summarize the causes and effects of pollution on people and the environment (e.g., air pollution, ground pollution, chemical pollution) and justify how and why pollution should be minimized. (DOK 1)
MO (1/2017, 2015)	6.MS-ETS1-6(MA). Communicate a design solution to an intended user, including design features and limitations of the solution
MT (1/2017, 2016)	Benchmarks at end of 4th grade, 8th grade, and upon graduation from high school
NE (1/2017, 2010)	8.1.1.g Evaluate predictions, draw logical inferences based on observed patterns/relationships, and account for non-relevant information. 8.3.3.g Identify positive and negative effects of natural and human activity on an ecosystem
NV (1/2017, 2014)	NGSS (see CA above).
NH (1/2017, 2016)	S:SPS1:6:1.2 Plan observations based on a given purpose. S:SPS1:6:1.8 Ask questions about relationships between and among observations. S:SPS2:6:2.1 Recognize that thinking about things as systems means looking for how every part relates to others. S:SPS2:6:4.1 Understand that things change in steady, repetitive, or irregular ways, or sometimes in more than one way at the same time; often the best way to tell which kinds of change are happening is to make a table or graph of measurements. S:SPS2:6:4.2 Discover how a system may stay the same because nothing is happening or because things are happening that exactly balance each other out.

	S:SPS3:6:1.1 Work effectively within a cooperative group setting, accepting and executing assigned roles and responsibilities. S:SPS3:6:1.2 Work collectively within a group toward a common goal. S:SPS3:6:1.3 Demonstrate respect of one another's abilities and contributions to the group. S:SPS3:6:2.1 Develop, focus and explain questions about the environment and do environmental investigations. S:SPS3:6:2.2 Design environmental investigations to answer particular questions. S:SPS3:6:2.3 Explore evidence that human-caused changes have consequences for the immediate environment as well as for other places and future times. S:SPS3:6:2.4 Explore how humans shape and control the environment while creating knowledge and developing new technologies. S:SPS3:6:2.5 Investigate environmental and resource management issues at scales that range from local to national to global.
NJ (1/2017, 2013)	NGSS (see CA above).
NM (1/2017, 2009)	None.
NY (1/2017, 2015)	NGSS (see CA above).
NC (1/2017, 2011)	6.E.2.4. Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and stewardship.
ND (1/2017, 2014)	6.2.4. Use appropriate tools and techniques to gather and analyze data. 6.6.2. Design a product or solution to a problem given constraints (e.g., limits of time, costs, materials and environmental factors) 6.6.3. Explain the relationship between science and technology 6.7.2. Explain how recycling and conservation affect populations, resources, and the environment
OH (1/2017, 2014)	Ohio State Science Standards are not numbered or coded in any way: Living systems at all levels of organization demonstrate the complementary nature of structure and function.
OK (1/2017, 2014)	**MS-LS2-1** Students who demonstrate understanding can: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **MS-LS2-2** Students who demonstrate understanding can: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **MS-LS2-4** Students who demonstrate understanding can: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

	MS-LS2-5 Students who demonstrate understanding can: Evaluate competing design solutions for maintaining biodiversity and ecosystem services. **MS-ESS3-3** Students who demonstrate understanding can: Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
OR (1/2017, 2014)	NGSS (see CA above).
PA (1/2017, 2002)	3.3.6.A1 Recognize and interpret various mapping representations of Earth's common features. 3.4.6.B1 Describe how economic, political, and cultural issues are influenced by the development and use of **technology.**
RI (1/2017, 2013)	NGSS (see CA above).
SC (1/2017, 2014)	**6.S.1A.1** Ask questions to (1) generate hypotheses for scientific investigations, (2) refine models, explanations, or designs, or (3) extend the results of investigations or challenge claims. **6.S.1A.2** Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. **6.S.1A.4** Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs. **6.S.1A.6** Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams. **6.S.1A.8** Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations. **6.E.2A.3** Construct explanations of the processes involved in the cycling of water through Earth's systems (including transpiration, evaporation, condensation and crystallization, precipitation, and downhill flow of water on land).
SD (1/2017, 2015)	MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

	MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services. MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
TN (1/2017, 2009)	GLE 0607.Inq.5 Communicate scientific understanding using descriptions, explanations, and models. GLE 0607.2.3 Draw conclusions from data about interactions between the biotic and abiotic elements of a particular environment. GLE 0607.2.4 Analyze the environments and the interdependence among organisms found in the world's major biomes.
TX (1/2017, 2014)	112.18a(3) Grade 6 science is interdisciplinary in nature; however, much of the content focus is on physical science. National standards in science are organized as multi-grade blocks such as Grades 5-8 rather than individual grade levels. In order to follow the grade level format used in Texas, the various national standards are found among Grades 6, 7, and 8. Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include change and constancy, patterns, cycles, systems, models, and scale. 112.18b(12)(F) diagram the levels of organization within an ecosystem, including organism, population, community, and ecosystem.
UT (1/2017, K-2: 2010, 3-6: 2002, 7-8: 2003, 9-12: 2003, Earth Science: 2012)	None.
VT (1/2017, 2013)	NGSS (see CA above).
VA (1/2017, 2016)	**6.1a-j.** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

	a) observations are made involving fine discrimination between similar objects and organisms; b) precise and approximate measurements are recorded; *c) scale models are used to estimate distance, volume, and quantity;* *d) hypotheses are stated in ways that identify the independent and dependent variables;* *e) a method is devised to test the validity of predictions and inferences;* *f) one variable is manipulated over time, using many repeated trials;* *g) data are collected, recorded, analyzed, and reported using metric measurements and tools; h) data are analyzed and communicated through graphical representation;* *i) models and simulations are designed and used to illustrate and explain phenomena and systems; and* *j) current applications are used to reinforce science concepts.* **6.7a-g.** The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include *a) the health of ecosystems and the abiotic factors of a watershed;* *b) the location and structure of Virginia's regional watershed systems;* *c) divides, tributaries, river systems, and river and stream processes;* *d) wetlands;* *e) estuaries;* *f) major conservation, health, and safety issues associated with watersheds; and* *g) water monitoring and analysis using field equipment including hand-held technology.* **6.9** The student will investigate and understand public policy decisions relating to the environment. Key concepts include *a) management of renewable resources;* *b) management of nonrenewable resources;* *c) the mitigation of land-use and environmental hazards through preventive measures; and* *d) cost/benefit tradeoffs in conservation policies.*
WA (1/2017, 2009)	NGSS (see CA above).
WV (1/2017, 2016)	NGSS (see CA above).
WI (1/2017, 2012)	**A.8.1** Develop their understanding of the science themes by using the themes to frame questions about science-related issues and problems.

	A.8.3 Defend explanations and models by collecting and organizing evidence that supports them and critique explanations and models by collecting and organizing evidence that conflicts with them. **A.8.5** Show how models and explanations, based on systems, were changed as new evidence accumulated (the effects of constancy, evolution, change, and measurement should all be part of these explanations). **C.8.1** Identify questions they can investigate using resources and equipment they have available **C.8.2** Identify data and locate sources of information including their own records to answer the questions being investigated **C.8.3** Design and safely conduct investigations that provide reliable quantitative or qualitative data, as appropriate, to answer their questions **C.8.4** Use inferences to help decide possible results of their investigations, use observations to check their inferences **C.8.5** Use accepted scientific knowledge, models, and theories to explain their results and to raise further questions about their investigations **C.8.6** State what they have learned from investigations, relating their inferences to scientific knowledge and to data they have collected **C.8.7** Explain their data and conclusions in ways that allow an audience to understand the questions they selected for investigation* and the answers they have developed **C.8.8** Use computer software and other technologies to organize, process, and present their data **C.8.9** Evaluate, explain, and defend the validity of questions, hypotheses, and conclusions to their investigations **C.8.10** Discuss the importance of their results and implications of their work with peers, teachers, and other adults **C.8.11** Raise further questions which still need to be answered **F.8.8** Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet **F.8.9** Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species **F.8.10** Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends. **G.8.2** Explain how current scientific and technological discoveries have an influence on the work people do and how some of these discoveries also lead to new careers

	G.8.3 Illustrate the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life **G.8.4** Propose a design (or re-design) of an applied science model or a machine that will have an impact in the community or elsewhere in the world and show how the design (or re-design) might work, including potential side-effects **G.8.5** Investigate a specific local problem to which there has been a scientific or technological solution, including proposals for alternative courses of action, the choices that were made, reasons for the choices, any new problems created, and subsequent community satisfaction **G.8.6** Use current texts, encyclopedias, source books, computers, experts, the popular press, or other relevant sources to identify examples of how scientific discoveries have resulted in new technology **G.8.7** Show evidence of how science and technology are interdependent, using some examples drawn from personally conducted investigations **H.8.1** Evaluate the scientific evidence used in various media (for example, television, radio, Internet, popular press, and scientific journals) to address a social issue, using criteria of accuracy, logic, bias, relevance of data, and credibility of sources **H.8.2** Present a scientific solution to a problem involving the earth and space, life and environmental, or physical sciences and participate in a consensus-building discussion to arrive at a group decision **H.8.3** Understand the consequences of decisions affecting personal health and safety
WY (1/2017, 2016)	**MS-PS1-3.** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. **MS-LS2-1.** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **MS-LS2-2.** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. **MS-ESS2-4.** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. **MS-ESS3-3**. Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment.

	MS-ESS3-4. Construct an argument supported by evidence for how changes in human population and per-capita consumption of natural resources impact Earth's systems. **MS-ETS2-2.** Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development.