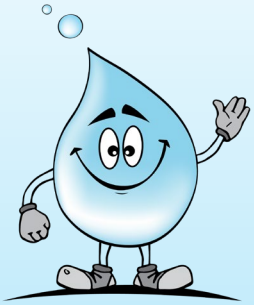


SALT LAKE COUNTY
STORMWATER COALITION

CURRICULUM GUIDE

2020

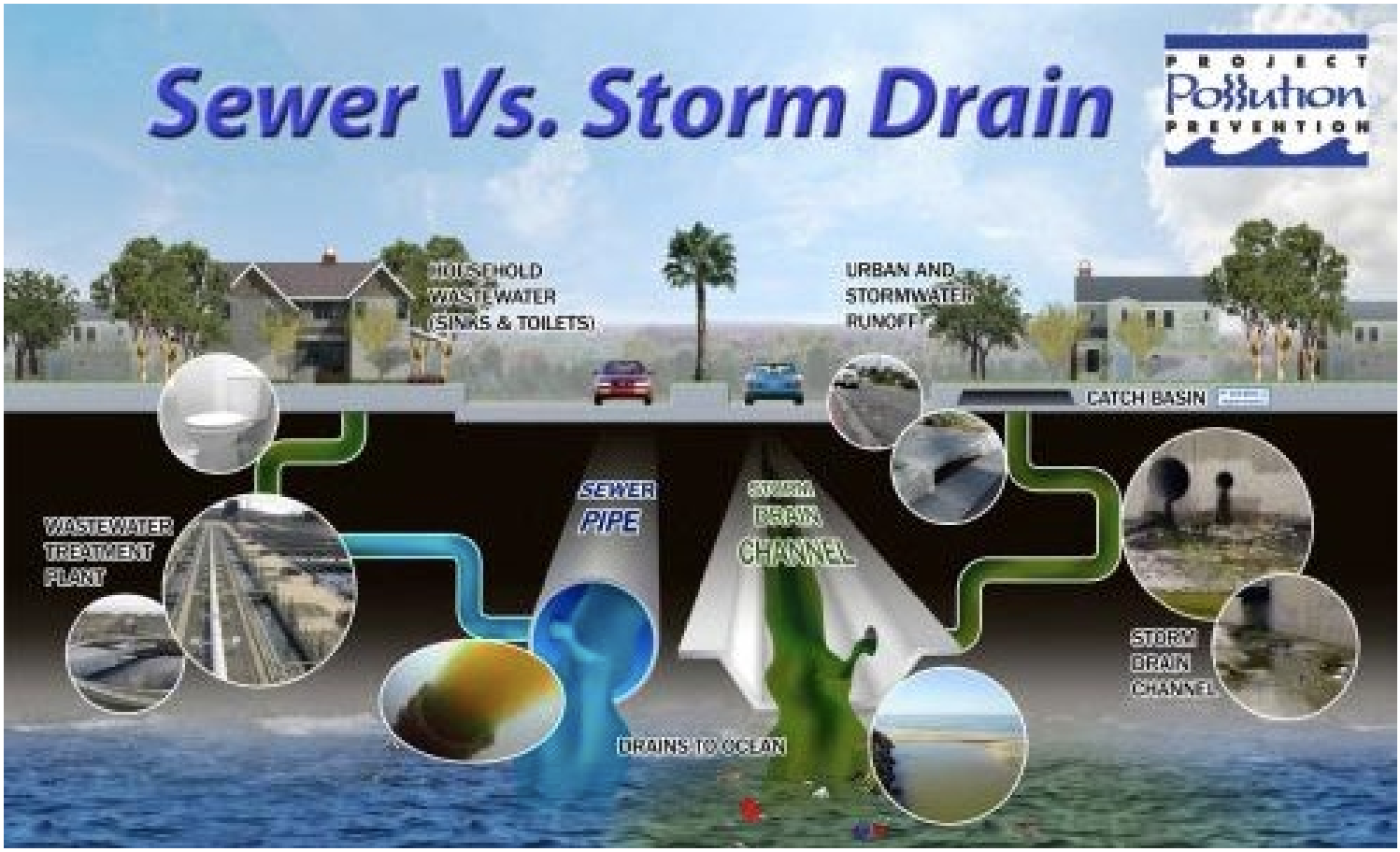
Introduction

What is Stormwater?

Stormwater is water from rain, hail, sleet and snowmelt. Once water hits the ground from a storm, it becomes stormwater. This water sinks into the ground, including lawns, gardens and other ground surfaces that can absorb water. Other stormwater lands on streets, sidewalks, rooftops, and other hard surfaces and runs off, picking up whatever is in its path - leaves, cut grasses, fertilizers, garbage, oil, and other pollutants. This water eventually flows to gutters and storm drains where it makes its way to streams, rivers, and lakes. Stormwater is untreated, meaning that it doesn't go through a water treatment facility. Everything that is in storm water eventually ends up in streams, rivers, and lakes.

There are many things that people can do to help keep our stormwater, and by extension, our streams, rivers and lakes clean. Picking up litter, disposing of pet waste in the garbage can, composting yard waste, recycling properly, and disposing of hazardous waste properly are a few places to start.

Salt Lake County is also part of the Jordan River Sub-Basin Watershed. A watershed is an area of land that drains water into a particular stream or lake. Our watershed includes streams and creeks like Bell Canyon, Big Willow, Bingham, Dry Creek, Mill Creek, Midas Creek, Little Cottonwood. These drain to the Jordan River which flows into the Great Salt Lake. Our stormwater may end up in these waterways. Our actions can ensure that these places stay clean for wildlife, plants and human recreation and enjoyment.



Who is the Salt Lake County Stormwater Coalition?

To prevent water pollution and support compliance of the Clean Water Act, the Salt Lake County Stormwater Coalition gathers local, county, state and city experts in stormwater management and water quality to provide education and actionable practices to students and educators, residents, homeowners, businesses, municipal leaders, contractors, developers, and businesses. Their efforts address stormwater pollution prevention, the importance of water quality and prevention efforts. The Salt Lake County Stormwater Coalition consists of representatives from each participating municipality, scientists, directors, and engineers that lead coordinated permit regulations and compliance. These initiatives are always in conjunction with the United States Environmental Protection Agency.

The Stormwater Coalition is comprised of 21 stakeholder municipalities and entities located within the Jordan River Watershed. Salt Lake County Public Works Engineering and Flood Control acts as the backbone entity for the group, which consists of representatives from: Bluffdale, Cottonwood Heights, Draper, Herriman, Holladay, Midvale, Millcreek, Murray, Riverton, Salt Lake City, Sandy, South Jordan, South Salt Lake, Taylorsville, West Jordan, West Valley City, Utah Department of Transportation (UDOT) , Greater Salt Lake Municipal Services District, Veterans Administration/Veterans Hospital (Salt Lake) Salt Lake City Regional Department of Affairs and Health Care System. As a result of its work, water quality efforts have been improving over 20 years.

SALT LAKE COUNTY
STORMWATER
COALITION

For more information, visit: https://stormwatercoalition.org/our-vision

How to use this guide

This educator guide for Stormwater Education includes lesson plans and resources to help 6th graders connect to their watershed and learn about the impacts of stormwater. Here's what you'll find inside:

Lesson Plans & Ideas

Included in the guide are lessons for 6th Graders. The activities can be used in the classroom or informal learning settings. To make them easy to use in the classroom, each activity highlights alignment to the Utah State Board of Education Science with Engineering Education (SEEd) standards. Lessons include background information, time involved, and materials. Additionally, each activity includes evaluation and extension ideas. Lessons can be used to scaffold a virtual visit from the stormwater manager in your city*, but many can be used as stand-alone lessons to help learners understand stormwater, water quality, watersheds, and the water cycle. *https://stormwatercoalition.org/stormwater-coalition-contact

Extensions

If your students enjoy these activities and their outreach/virtual visit from the stormwater manager there are many ways to extend the fun! Learn about how to participate in community science initiatives, visit your local rivers and streams, and find out how you can connect with local organizations and experts. For more information about lesson extensions, see the Resources section at the end of this document.

A Note on Environmental Education

These lesson plans and ideas incorporate environmental education into your school day, or educational program. Per the Environmental Protection Agency, "Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions."

Environmental education supports SEEd and the Three-Dimensions of Learning. Developing observation skills, exploring real-world phenomena, and providing hands-on experiences for discovery, are central to both environmental education and SEEd. The activities in this guide are designed to be inquiry-based, offering plenty of time for questioning and exploration.

For more information on EE and SEEd, contact the Utah Society for Environmental Education. Visit www.usee.org or email info@usee.org.

Correlations to Utah Education Standards

The activities in this guide may be used in both formal (classroom) settings as well as informal (museums, zoos, scout groups) settings. For ease of use in a formal setting, all activities have been correlated to the Utah State Board of Education SEEd Standards. Exploring topics related to stormwater, watersheds and water quality provide opportunities for students to engage with science, technology, engineering and math (STEM) concepts and have many connections to English language arts, reading, local history and geography.

This guide highlights the following 6th Grade SEEd standards:

Standard	Content
Standard 6.4.1	Analyze data to provide evidence for the effects of resource availability on organisms and populations in an ecosystem. Ask questions to predict how changes in resource availability affects organisms in those ecosystems. Examples include water, food, or living space in Utah environments.
Standard 6.4.3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Emphasize food webs and the role of producers, consumers, and decomposers in various ecosystems. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, or deserts.
Standard 6.4.4	Construct an argument supported by evidence that the stability of populations is affected by changes to an ecosystem. Emphasize how changes to living and nonliving components in an ecosystem affect populations in that ecosystem. Examples could include Utah's ecosystems such as mountains, Great Salt Lake, wetlands or deserts.
Standard 6.4.5	Evaluate competing design solutions for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize obtaining, evaluating and communicating information of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species, or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion.

Introduction to Stormwater Lesson Plans

The Stormwater Lesson Plans are designed to provide background information on stormwater, watersheds and water quality. Components that you will find in each lesson include:

- Lesson plan and details
- SEEd alignment (however, lessons can be used in informal settings),
- Approximate time needed to complete,
- Materials needed,
- Pertinent background information.

All printed resources needed for lesson delivery can be found at:
https://stormwatercoalition.org/stormwater-education

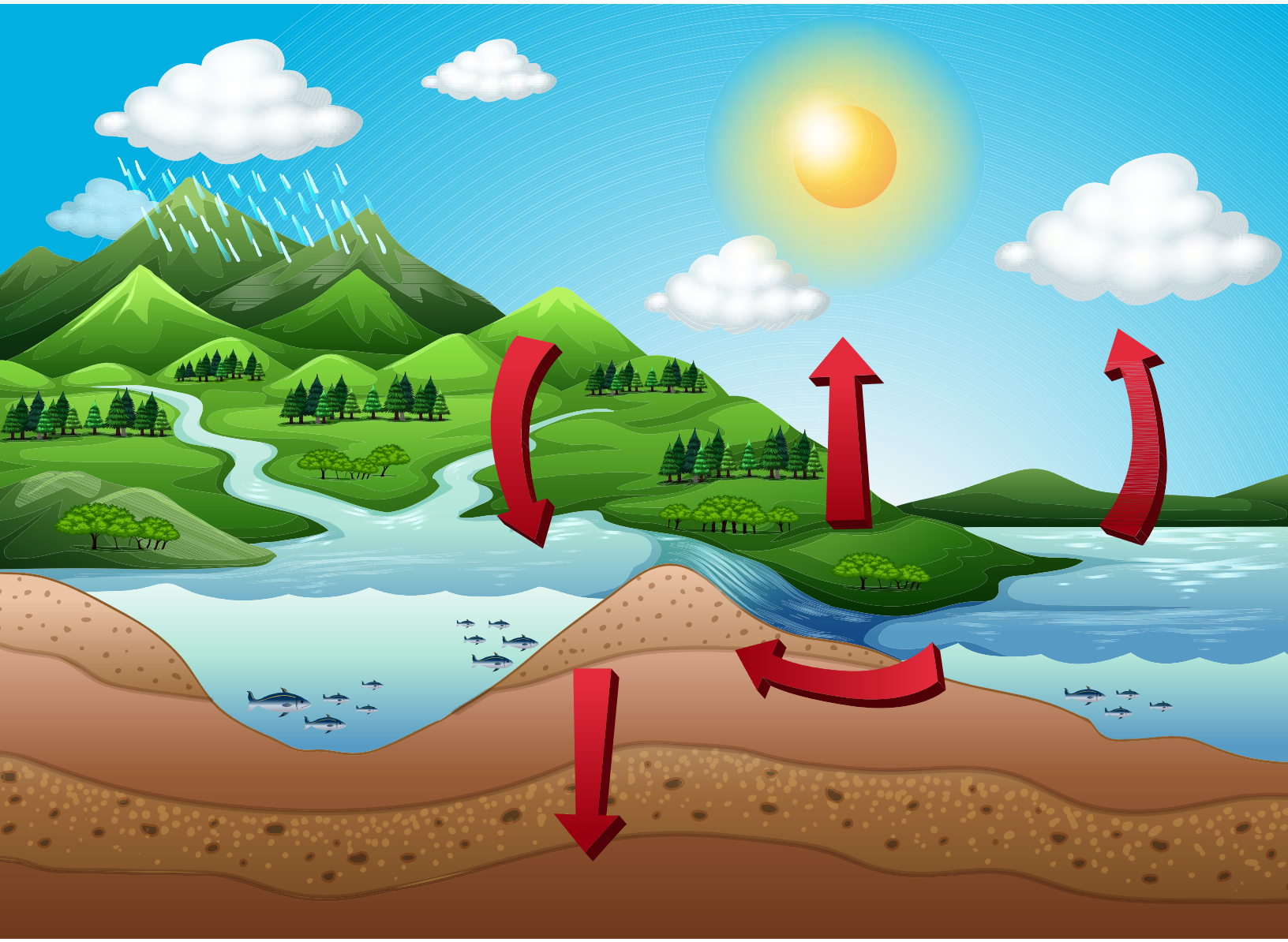
Note: Lessons contained in this curriculum utilize the 5 E model (engage, explore, elaborate, extend, evaluate) and include ideas for lesson extensions, and student pages. You can find more information on the 5 E model here: http://cbm.msoe.edu/teacherWorkshops/mspResources/documents/day1/5eSummary.pdf

General Pre-Evaluation

Prior to utilizing these lesson plans, take a few moments to find out what students know about stormwater by asking the following questions. You can record responses to reflect on the knowledge you gained after the lesson.

Have you heard of 'stormwater'? What do you think it is?
What do you know about water quality?
Can you describe a watershed?
Does stormwater have the same effects in cities as it does in forests?
What are some of the pollutants that could be transported by stormwater in cities?
What effect(s) will stormwater pollutants have on living organisms in aquatic ecosystems?
Will pollution from stormwater have lasting impacts on water quality in aquatic ecosystems?
Will stormwater have an effect on aquatic habitat?
How are humans impacted by stormwater and water quality?
Based on this conversation, are there any solutions you can think of to improve water quality and the impacts of stormwater in an urban/suburban environment?
What other questions do you have?

Lesson 1: Understanding Stormwater



In this lesson, students will refresh their knowledge of the water cycle and develop a model that includes stormwater as part of this cycle in natural and urban environments.

Alignment to SEEd: 6.4.5 Evaluate competing design solutions for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize obtaining, evaluating and communicating information of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species, or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion.
Students Will…

- Develop a model of a 'stormwater' water cycle for their community
- Explain how humans have affected the water cycle in their community
- Develop and test a hypothesis about how the intensity and duration of precipitation impacts runoff and stormwater

Practice(s) Describe how students are engaged in one or two practices	**Crosscutting Concept(s)** Explain how crosscutting concept(s) provide a lens for the students	**Disciplinary Core Idea(s)** State the big ideas students will use to explain the phenomena
Developing and using models Students develop physical, conceptual, and other models to represent relationships, explain mechanisms, and predict outcomes.	**Stability and Change** Small changes in one part of a system might cause large changes in another part. **Systems and system models:** Students use models to explain the parameters and relationships that describe complex systems.	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. 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.

Lesson Time Frame This lesson will take multiple class periods. Below is our suggested schedule.	**Lesson Materials**
Day 1: Lesson overview and water cycle models review and discussion Day 2: Where Does Water in the SL Valley come from? Videos + discussion Day 3: Activity 1.1 + share or write responses Day 4: Activity 1.2 and student sharing of findings Day 5: Why should we care? Write argument to support clean stormwater to city council.	2 buckets (any size) Each of the Items below are needed for as many groups of 4-6 students participate in the lesson: Water models Sponges, Aluminum tray Scissors Duct tape Cardboard (about the size of the sponge) Spray bottle with water pencils or dowels

Understanding Stormwater Storyline

Driving Question/Anchoring Phenomena
Where does our water come from and where does precipitation go in our communities after it lands on our yards, streets, sidewalks, and other surfaces?

Phenomena-driven question	**How students will make sense of phenomenon through practices**	**Conceptual understanding(s)**
Engage: Does the water cycle model accurately depict how water moves through our communities?	Analyze visual and quantitative data to observe and understand the water cycle.	The water cycle model may not accurately depict the water cycle in our communities, stormwater has an impact on our environment.

Explore: Where does our water come from in the Salt Lake Valley?	Analyze visual and quantitative data to observe that we rely on rain and snow are our source of water in the Salt Lake Valley	The amount of rain and snow we receive fluctuates from year to year.
Explain: How will different amounts of precipitation impact our communities and stormwater?	Make predictions, **obtain information**, then **develop and use a model** to determine how different amounts of precipitation impact our communities and stormwater.	With increased precipitation there will likely be more stormwater. Our communities impact the water quality of stormwater.
Elaborate: How can we ensure that stormwater remains clean?	**Obtain and communicate information** about how different groups are working to keep our stormwater clean to preserve our streams, rivers, and lakes	To protect ecosystems like the Jordan River and the Great Salt Lake, runoff and stormwater can be monitored for water quality so that clean water reaches these ecosystems.
Evaluate: We have an impact on the water cycle and stormwater, why should we care?	**Write an argument** for why stormwater regulations exist, citing reasons related to ecosystem services.	To protect streams, rivers and lakes, we need to ensure that the water that is there remains clean. This will ensure a healthy and productive habitat for organisms, and a safe place for humans to recreate.

Engage: Provide small groups of students with a variety of water cycle models. Sources and resources for models can be found at: https://stormwatercoalition.org/stormwater-education

Does the water cycle model accurately depict how water, and specifically stormwater, moves through our communities? Students are introduced to the phenomenon in this lesson, the water cycle, by exploring different water cycle models.

Explain to students that as they review the models, they can think about the crosscutting concept of change, and systems & system models. Students should focus on whether or not these models are representative of the real world, or how water flows through their communities. Give groups 10-15 minutes to view, analyze and discuss the water cycle models.

After groups have discussed the models, encourage them to develop a basic oral argument for which models best represent the water cycle and why. Is there anything that they would add to the model to make it more accurate? Have groups share their arguments. Ask students why they came to the conclusions they did and what information did they use to support their argument?

After the class has established that the water cycle models should also take into account the fact that water moves through our communities, ask them what questions they have about this phenomenon. Explain that during this lesson they will explore where our water comes from in the Salt Lake Valley, how it moves through our communities and what people are doing to ensure that stormwater doesn't negatively impact our streams, rivers and lakes.

Explore: Where does our water come from in the Salt Lake Valley?

Share the question, where does our water come from in the Salt Lake Valley, with students. Ask students what they think then show them data from the National Weather Service (https://www.weather.gov/slc/CliPlot). Focus on the Water Year Charts - while you can review any year from the past 20 years, we recommend 2006, 2007, 2010, 2011, 2014, 2016 as they illustrate both high and low precipitation years.

Ask students what they notice about temperature and precipitation. Are the two related? What do they think happens to snowmelt and rain? What do they think a water year is? How might it be related to our water cycle? Explain that from year to year the amount of precipitation we get in the form of rain and snow fluctuates. Snow, which falls in the winter months, melts in the form of runoff during our warmer summer months. Runoff, rain and stormwater all end up in our streams, rivers and lakes.

What do students think may happen during a year with a lot of snowfall? Have them record their predictions and then read "Reservoirs Dump Water to Accommodate Runoff" https://www.abc4.com/news/reservoirs-dump-water-to-accomodate-runoff/ and/or "Worst snowmelt in Utah history turns streets in Salt Lake into rivers" https://www.upi.com/Archives/1983/05/28/Worst-snowmelt-in-Utah-history-turns-streets-in-Salt-Lake-into-rivers/7111422942400/.

After reading these articles, ask students the following questions in one large group or small groups and record the answers:

- Where does most of our water come from?
- Does the amount fluctuate from year to year? Why or why not?
- Recall the article about the flood of 1983 - what are some of the human-made elements this water may have encountered before it reached the Jordan River or the Great Salt Lake? How do you think this would have affected the water quality of these bodies of water?

Explain: How will different amounts of precipitation impact our communities and stormwater? Let students know that now that they have a deeper understanding of where our water comes from and how it moves through the community they are going to investigate. This is at the level of their school and neighborhood.

ACTIVITY 1.1: Impervious vs. Pervious

- Take students outside for a quick demonstration, using two buckets or containers of water. Have students imagine that this water is from precipitation or runoff. Pour one bucket onto grass or soil. Ask students where this water goes (groundwater, absorbed into plants and eventually transpired, etc.). Pour the other bucket onto a paved surface. Where do students think this water will go? Some examples include down the sidewalk, over parking lots, down storm drains and eventually to our streams, rivers, and lakes.

- In one large or in smaller groups, ask students to search for a Google map image of their school, compare and contrast with nearby urban, suburban and natural areas. (Alternatively, you may want to provide various topical maps of the area). Ask students if they can find any nearby streams or rivers. Have students discuss the similarities and differences between these maps. Do they think human-built environments will have an impact on stormwater? Why or why not? What do they think will happen in these environments during a year with normal or above average precipitation?

- Have students share their answers and/or collect written responses. Note that as storm water moves through built environments it may pick up any litter or pollutants in the environment and eventually carry those to rivers, lakes or streams. Discuss how stormwater can either soak in, run off, or flow into environments. For example, it may soak into parks, gardens and forests (places that can absorb water), run off on surfaces like parking lots, sidewalks or buildings, and flow into streams, rivers, and lakes. In Utah, it may also flow into wetlands, but these environments make up a small portion of our state, around 1%.

ACTIVITY 1.2:

Students will now participate in an activity that illustrates this phenomenon. Divide the class into small groups. Each group will need sponges, an aluminum tray, scissors, duct tape, cardboard, a spray bottle with water, and pencils or dowels.

First, have students demonstrate how the ground soaks up water. The sponge represents the ground. Have students place it in the tray and spray it with water. What do they notice? The sponge will soak up water like the ground and soil. What happens when they do this with a dry sponge versus a damp one? Or a little rain (a few squirts from the spray bottle) versus a lot of rain (multiple squirts)? Have them repeat this experiment multiple times and record their findings.

Have students reflect back on the maps of their community - was it all open space or were there buildings? What about rivers and streams? To make this experiment more realistic, they will turn a sponge into a model of their community. Provide students with sponges with a notch cut out of the middle or allow them to do this themselves with the scissors. This cutout represents a river or stream. Have the students cut out a piece of cardboard that fits in this notch to represent the riverbed. Tell students that the duct tape represents buildings, roads, sidewalks and other surfaces. Allow students to add duct tape to their sponges to represent the built environment. If there are enough sets of materials, students may create multiple models.

Ask students the following questions: if we let it rain on our environments, what do you think will happen? Ask them to think about a few scenarios: a dry sponge, a damp sponge, a lot of precipitation or a little.
Have students decide which scenario they would like to observe. Elevate the sponge in the tray using the pencils or dowels and spray the sponge with water. Have students record their observations. Note how and where the water flows. Where does it soak in, run off or flow into? Do their duct tape environments impact this at all? Have students share the different scenarios they created. What happened with a lot of precipitation versus a little? What can this tell us about precipitation and stormwater in our communities? Have students record their responses or have them share aloud.

Elaborate: How can we ensure that stormwater remains clean?

Begin by having students read the article "UDOT agrees to overhaul its stormwater practices to settle suit filed by feds" https://www.sltrib.com/news/environment/2019/10/25/udot-agrees-overhaul-its/.

Ask students to think about what might happen if there were no regulations on stormwater. Discuss what might happen in this scenario. Discuss why pollution may be harmful to the health of ecosystems and to humans.

Tell students that there are many groups and organizations that are concerned about our stormwater and water quality in our state. Students will obtain and communicate information about these groups and their work. They will evaluate their projects and think about this question: if they were in charge of the city or state, which group would they deem the most important for funding?

- Salt Lake County Health Department: https://slco.org/health/water-quality
- Salt Lake County Watershed Planning and Restoration https://www.slco.org/watershed/
- Salt Lake County Flood Control: https://slco.org/flood-control/
- Greater Salt Lake Municipal Services: https://msd.utah.gov/
- Utah Department of Transportation: https://www.udot.utah.gov/connect/?type=all&s=stormwater
- The city/municipality you live in: https://stormwatercoalition.org/the-salt-lake-county-stormwater-coalition

Evaluate: We have an impact on the water cycle and stormwater, why should we care?

To evaluate this lesson, students will write an argument for why we should work to ensure our stormwater stays as clean as possible. Students should apply their knowledge of the water cycle and the importance of clean water to environments and living things, including humans.

Have students work independently or in groups to synthesize what they have learned in this lesson. Students should recognize that precipitation and runoff interact with human-made environments. They should also understand that the water cycle is complex and interacts with natural and human-made environments. Our communities are part of the water cycle, too. Fluctuations in precipitation will have an impact on runoff, streams, rivers, lakes and people.

The impacts of polluted stormwater may include poor water quality, decreased habitat for organisms, and fewer recreation opportunities for humans. Tell students that they are going to use this information to write an argument for the following prompt:

Your local city council is hosting their monthly meeting. They are planning on relaxing regulations around stormwater quality. Prepare an argument for why you believe this is a good or a bad idea. Convince your city council to adopt your recommendations.

Be sure your argument has a claim, and that you provide evidence and reasoning based on what you have learned about the water cycle and stormwater to support your claim.

Note: If you want to utilize this topic for a field day or a special event, you can check out the USU Extension stream trailer. The stream trailer is located in Salt Lake City and managed by the Department of Environmental Quality. If you are interested in using the stream trailer, you can learn more at:
https://extension.usu.edu/waterquality/educator-resources/lessonplans/Stream-Trailer/index

Lesson 2: We All Live in the Watershed

All Salt Lake County residents live in a watershed. Students will gain an understanding of what a watershed is and will understand how they interact with it on a daily basis.

Students will…

- Expand upon their understanding of stormwater and the urban water cycle
- Explain what a watershed is and how they are a part of the Jordan River Watershed
- Explain why we monitor water quality and why there are regulations around water in our watershed

Alignment to SEEd: 6.4.5 Evaluate competing design solutions for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize obtaining, evaluating and communicating information of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species, or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion.

Practice(s) Describe how students are engaged in one or two practices	**Crosscutting Concept(s)** Explain how crosscutting concept(s) provide a lens for the students	**Disciplinary Core Idea(s)** State the big ideas students will use to explain the phenomena
Developing and using models Students develop physical, conceptual, and other models to represent relationships, explain mechanisms, and predict outcomes.	**Stability and Change** Small changes in one part of a system might cause large changes in another part. **Systems and system models:** Students use models to explain the parameters and relationships that describe complex systems.	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. 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.

Lesson Time Frame *This lesson will take multiple class periods. Below is our suggested schedule.*	***Lesson Materials***
Day 1: Lesson overview and watershed review, wax paper activity + discussion Day 2: What Watershed do I live in? + How am I a part of the Watershed? Videos + discussion Day 3: How can we ensure our watershed is healthy? Article re: Future of Jordan River, visit websites + discussion Day 4: Why should we care? Write argument about watershed regulations to DEQ.	*Roll of wax paper* *eye dropper* *glass of colored water (any color, just ensure it is visible)* *an object they can use to elevate their wax paper* **photos or maps of Wasatch Mountain Range*

Understanding We All Live in the Watershed Storyline

Driving Question/Anchoring Phenomena
How are we part of the watershed and where can we find evidence of the watershed in our communities?

Phenomena-driven question	***How students will make sense of phenomenon through practices***	***Conceptual understanding(s)***
Engage: What is a watershed and what are some of the characteristics of a watershed?	*Analyze visual data to observe and understand watersheds.*	*Watershed are areas of land drained by rivers and tributaries to a common outlet.*
Explore: What watershed do I live in?	*Analyze I data to observe and identify watersheds.*	*In Salt Lake County, our neighborhoods and communities are part of the Jordan River Watershed. Water moves from the Wasatch Mountains, down rivers and tributaries, to the Jordan River and, eventually, to the Great Salt Lake.*
Explain: How am I a part of the watershed?	*Make predictions, and **obtain information** to learn more about the water quality of the Jordan River Watershed*	*As part of the watershed, we may have impacts on the environment and water quality. This impacts the environments in our communities and downstream.*
Elaborate: How can we ensure that our watersheds are healthy?	***Obtain and communicate information** about how different groups are working to keep our stormwater clean to preserve our streams, rivers, and lakes*	*To protect our watershed, runoff and stormwater can be monitored for water quality so that clean water reaches these ecosystems.*
Evaluate: We have an impact on our watershed. Why should we care?	***Write an argument** for why watershed protections exist, citing reasons related to ecosystem services and human health.*	*To protect streams, rivers and lakes, we need to ensure that the water that is there remains clean. This will ensure a healthy and productive habitat for organisms, and a safe place for humans to recreate.*

Engage: What is a watershed and what are some of the key characteristics of a watershed?

Students are introduced to the phenomenon in this lesson, watersheds, by exploring a general model of a watershed. Explain that as they go through this activity they should think about systems and systems models. Students should focus on whether or not this model is representative of the real world. If it is, where can they find it?

ACTIVITY 2.1:
Separate students into small groups and give each group a piece of wax paper, eye dropper, glass of colored water (any color, just ensure it is visible) and an object they can use to elevate their wax paper.

Begin by having students place a few drops of water on the wax paper - what do they notice? Does the water move anywhere? Record observations.

Then, have students elevate one end of the wax paper. Place a few drops of water on the wax paper and record observations.

Once students have their observations recorded, have them observe the Wasatch Mountain range, either by going outside or reviewing photos or Google Map images. When snow or rain falls on the mountains, what happens? Can they use their supplies to create a model of this phenomena? Allow students to try to do this on their own and record observations.

Bring the groups back together and ask students about the models they developed. What did they notice? Demonstrate this activity using a piece of wax paper folded in half and loosely crumpled. Where does the water go? Does it pool anywhere? If any students did this with their paper ask them why and what did they notice?

This model demonstrates what happens to water in a watershed, also known as a basin or a drainage. This is an area of land drained by a river and its tributaries into a common outlet. Salt Lake County is part of the Jordan River Watershed. Its boundaries include all of the land, air, surface and groundwater, plants and animals, mountains and deserts, cities and farms and people, including their stories and traditions. If you did the “Understanding Stormwater” lesson first, ask students what impact they think stormwater may have on the watershed.

Explore: What watershed do I live in?

Ask the question, what watershed do we live in?

ACTIVITY 2.2:
Give students maps of the Jordan River Watershed/Basin or review them together. You may also want students to view maps of their neighborhood on Google Earth. These may be provided in a hard copy or viewed on a computer. The map found here is a great place to start: https://slco.org/watershed/know-your-local-waters/jordan-river-watershed/

Ask students what they notice about these maps. Can they identify where they live? Where is water found in their communities (rivers, streams, etc.?) If you completed the “Understanding Stormwater” activity first, ask how this relates to the urban water cycle.

Have students read the following content from the Jordan River Commission website https://jordanrivercommission.com/the-river/ and the Salt Lake County Watershed Planning and Restoration website https://slco.org/watershed/know-your-local-waters/jordan-river-watershed/

After reading these articles, ask students the following questions in one large group or small groups and record the answers:

- Where does water travel from before it arrives in the Jordan River?
- Can you find the Jordan River and its tributaries in your community?
- Reflect on stormwater. Where do you think it has an increased impact on the watershed? Can you think of any regulations in place to protect our watershed?
- What are the seven tributaries of the Jordan River? Where do they originate?
- Where does all this water eventually end up?
- Was the model you created earlier representative of our watershed? Why or why not?

Explain: How am I a part of the watershed?

Let students know that now that they have a deeper understanding of our watershed they are going to investigate this at the level of their school and neighborhood.

ACTIVITY 2.3:
In one large or in smaller groups, have students find a Google map image of their school. Can they identify a nearby drainage to the Jordan River? Compare and contrast with nearby urban, suburban and natural areas. If possible, visit this area with students. Do they think human-built environments will have an impact on the watershed? What about stormwater? Why or why not?

Have students share their answers and/or collect written responses. Note that as water moves through our community and the watershed, it may pick up any litter or pollutants in the environment and eventually carry those to rivers, lakes or streams. If necessary, review stormwater and how it can either soak in, run off, or flow into environments. For example, it may soak into parks, gardens and forests (places that can absorb water), run off on surfaces like parking lots, sidewalks or buildings, and flow into streams, rivers, and lakes.

Students will now participate in an activity that highlights this phenomenon. Students can work individually or in small groups. Utilizing Google Maps or Google Earth, have students identify the location of their school. Ask students to imagine that a rainstorm has just moved through the area. Using the map, have them track the route of this water from their school to the nearest tributary of our watershed. Have students indicate places where this water may encounter stormwater. Ask students what impact this may have on the watershed. Do they think water quality improves, gets worse or stays the same as it moves through the watershed and why?

Have students explore trends in water quality by visiting the Utah Water Watch page https://www.citsci.org/CWIS438/Browse/Project/Project_Info.php?ProjectID=2043&WebSiteID=7 Any of the locations beginning with JOR are on the Jordan River. Have students investigate a few of the different items that are measured. Students may also visit https://enviro.deq.utah.gov/ to learn more about where monitoring locations are located in their communities. Ask students to compile their observations.

Elaborate: How can we ensure that our watershed is healthy?

Begin by having students read the article "Utahns asked to weigh in on the future of the Jordan River" https://www.sltrib.com/news/2020/08/24/utahns-asked-weigh-future/

Ask students to think about the potential to use resources like the Jordan River for recreation. Why would monitoring the health of our watershed be important when thinking about using these places for human use?

Tell students that there are many groups and organizations that are concerned about water quality in our state. There are also regulations in place to keep our watersheds clean and to mitigate the impact of stormwater. Have students research some of these organizations and the regulations in place to protect our watershed:

- Salt Lake County Health Department: https://slco.org/health/water-quality
- Salt Lake County Watershed Planning and Restoration https://www.slco.org/watershed/
- Salt Lake County Watersheds: https://slco.org/health/water-quality/watersheds/
- Utah Department of Environmental Quality: https://deq.utah.gov/water-quality/watershed-monitoring-program/watershed-management-program
- The city/municipality you live in: https://stormwatercoalition.org/the-salt-lake-county-stormwater-coalition

Evaluate: We have an impact on the water cycle and stormwater, why should we care?

To evaluate this lesson, students will write an argument for why we should or shouldn't have more regulations regarding our watersheds. This may include more stormwater regulations or allowing dogs up Big and Little Cottonwood Canyons. Students should apply their knowledge of watersheds, the importance of clean water to environments and living things, including humans and their knowledge of stormwater from the previous lesson.

Have students work independently or in groups to synthesize what they have learned in this lesson. Students should recognize that the rivers and tributaries of the Jordan River Watershed interact with human-made environments. They should also understand that the watersheds are complex and interact with natural and human-made environments. Our communities are part of the watershed, too. Water quality may fluctuate in different areas of the watershed based on human impacts and stormwater.

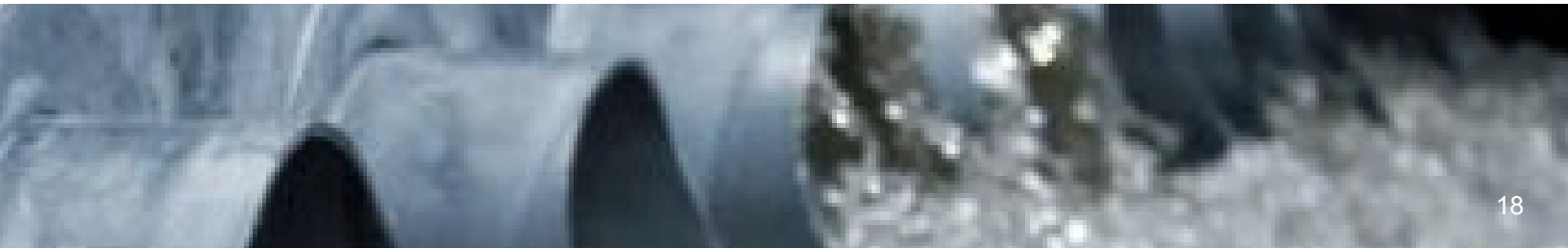
Tell students that they are going to use this information to write an argument for the following prompt:

The Department of Environmental Quality has an open public comment period on watershed regulations. They are able to modify regulations that impact our watersheds. You are submitting a public comment on your view of this issue.

Be sure your argument has a claim, and that you provide evidence and reasoning based on what you have learned about watersheds and stormwater to support your claim.

Note: If you want to utilize this topic for a field day or a special event, you can access presentations from the annual Salt Lake County Watershed Symposium. You can use the presentations to organize small groups to virtually experience and process brief presentations. More information can be found at: https://slco.org/watershed/watershed-symposium/

Also, Salt Lake County Stormwater Coalition is in the process of creating a video, A Ride Down the Watershed, available December, 2020 at: https://stormwatercoalition.org/videos



Lesson 3: What's in the Water? Learning about Water Quality

One indicator of the health of a river or stream is the presence of macroinvertebrates and other vertebrate species. Stormwater may have impacts on these living things. This lesson, adapted from http://streamsidescience.usu.edu/stream-side-lessons can take place inside the classroom. If you are able to go outside, we recommend this activity as a supplement.

Students will...

- Expand upon their understanding of the relationship between river/stream health and aquatic life
- Explain what a macroinvertebrate is, where they can be found, and how it can indicate the health of waterways
- Explain the connection between stormwater, water quality in our rivers, streams and lakes, and macroinvertebrates.

Alignment to SEEd: 6.4.1 Analyze data to provide evidence for the effects of resource availability on organisms and population in an ecosystem. Ask questions to predict how changes in resource availability affect organisms in those ecosystems. Examples could include water, food, and living space in Utah environments.

Practice(s) Describe how students are engaged in one or two practices	**Crosscutting Concept(s)** Explain how crosscutting concept(s) provide a lens for the students	**Disciplinary Core Idea(s)** State the big ideas students will use to explain the phenomena
Analyzing and interpreting data: Students analyze various types of data in order to create valid interpretations or to assess claims/conclusions. Obtaining, evaluating, and communicating information: Students obtain, evaluate, and derive meaning from scientific information or presented evidence using appropriate scientific language. They communicate their findings clearly and persuasively in a variety of ways including written text, graphs, diagrams, charts, tables, or orally.	Patterns: Students observe patterns to organize and classify factors that influence relationships Stability and change: Students evaluate how and why a natural or constructed system can change or remain stable over time	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.

Lesson Time Frame This lesson will take multiple class periods. Below is our suggested schedule.	**Lesson Materials**
Day 1: Lesson overview: What are macroinvertebrates and where are they found discussion, macroinvertebrate cards activity, river and stream photo observations discussion Day 2: What Watershed do I live in? + How am I a part of the Watershed? Videos + discussion Day 3: How can we ensure our watershed is healthy? Article re: Future of Jordan River, visit websites + discussion Day 4: Why should we care? Write argument about watershed regulations to DEQ.	Macroinvertebrate cards Photos of rivers and streams in Utah Water samples containing macroinvertebrates (or use cards) Water testing pH strips Large cardstock or posterboard (Maybe 11" x 17") Markers, tape, glue, scissors, magazines

Understanding What's in the Watershed? Storyline

Driving Question/Anchoring Phenomena
What living things are found in our waterways and how are they impacted by water quality and stormwater?

Phenomena-driven question	**How students will make sense of phenomenon through practices**	**Conceptual understanding(s)**
Engage: What are macroinvertebrates?	**Analyze visual and quantitative data** to observe and understand macroinvertebrates found in our rivers and streams.	Macroinvertebrates are organisms without a backbone large enough to be seen without a microscope. They can indicate the health of our waterways.
Explore: Where are macroinvertebrates found and what are these environments like?	**Analyze visual and quantitative data** to observe the environments that are habitats to macroinvertebrates.	Our rivers and streams also include a variety of biotic and abiotic elements. Depending on the location of the river or stream there may also be human impacts. Macroinvertebrates may be impacted by these factors.
Explain: How can we measure the macroinvertebrates in an environment?	Make predictions, and **obtain information** to learn more about macroinvertebrates in our rivers and streams.	
Elaborate: How can we ensure that we have a healthy population of macroinvertebrates and other living things in our rivers and streams?	**Obtain and communicate information** about how different groups are working to keep our stormwater clean to preserve our streams, rivers, and lakes	To protect the organisms in our rivers, lakes and streams we can mitigate the impacts of stormwater.
Evaluate: Why should we care about the impacts of stormwater on our rivers and streams?	**Write an argument** for why we should work to create a healthy environment for macroinvertebrates,, citing reasons related to ecosystem services and human health.	

Engage: What are macroinvertebrates?

Students are introduced to the phenomenon in this lesson, that organisms can provide information about the health of a river or stream and that they may be impacted by water quality and stormwater . Explain that as they go through this activity they should think about systems and systems models. Students should focus on the adaptations of these organisms.

ACTIVITY 3.1:
Working individually or in small groups, give students a set of macroinvertebrate cards. Allow students to view and read the cards. Have students organize their cards, looking at things like adaptations, habitat or another characteristic. Allow students to share why they arranged, or classified, their cards the way they did.

Once students have shared, let students know that they have been classifying macroinvertebrates. These are living things that don't have a backbone and are large enough to see without a microscope. Macroinvertebrates, like the ones students just observed, can be found in our watershed. Their adaptations may include things like claws for holding on to rocks, specialized tails to swim in the water, antennae to sense changes in their environment and gills to help them breathe. Ask students if they think macroinvertebrates may be impacted by stormwater and water quality and why? Explain that macroinvertebrates can tell us about the health of a waterway and that they will continue to explore this phenomena.

Explore: Where are macroinvertebrates found and what are their environments like?

Ask the question, what environments are these macroinvertebrates found in? Do you think they have common characteristics? Give students pictures of a few different examples of rivers and streams in Utah. These include streams in our local canyons and the Jordan River. Working individually or in small groups, have students write down what they notice in or near the water, this can include living and nonliving things. Give students a few minutes to record their answers.

Allow students to read the following article: https://deq.utah.gov/communication/news/water-quality-macroinvertebrates.

As a group, discuss observations from these photos and the readings. Ask the following questions to guide discussion:

- What were the similarities or differences?
- How would you classify what you noticed by the rivers and streams? (guide responses to living (biotic) and nonliving (abiotic) things.)
- Which environments may be more impacted by human activity or stormwater?
- How do you think macroinvertebrates may respond to changes in water quality produced by stormwater?
- Reflect on the macroinvertebrates you classified in the previous activity. Which macroinvertebrates do you think you would easily be able to find in rivers and streams near you? Why?

Explain: How can we measure the macroinvertebrates in the environment?

Let students know that now that they have a deeper understanding of macroinvertebrates, they are going to investigate samples collected locally.

ACTIVITY 3.2:
Provide students with two to four water samples collected from local rivers and streams prior to this lesson, or use the macroinvertebrate cards to create samples. Allow students to test the pH of the water, or provide information about the "water sample" if using the macroinvertebrate cards. Samples should be labeled with a number with location information withheld.

Before looking at the macroinvertebrates, have students collect observations about their water samples, if present. This should include information about the color of the water and smell. Have students measure the pH of the water samples. If using predetermined information, have students read about the "water sample".

For each sample, have students classify the macroinvertebrates by using a dichotomous key. They should also note how many of each type of macroinvertebrate is present in the sample. Students should also record the similarities and differences between the samples and make predictions about where each sample was collected.

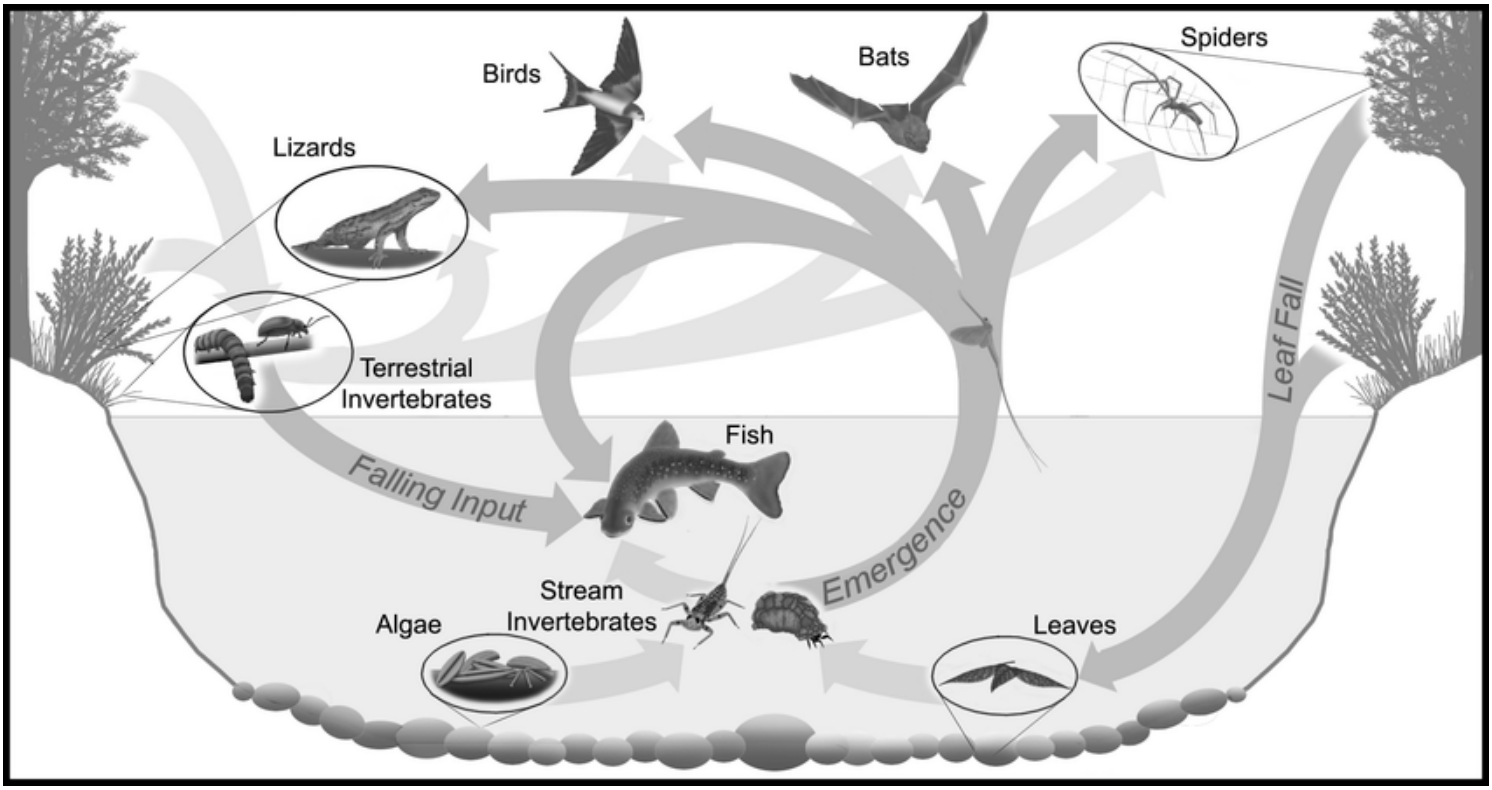
Have students share their observations and their predictions about the location of each sample. Reveal where each sample was collected. Ask students if their predictions were correct. What information did they gather that led them to these conclusions? Is there any additional information that would have been helpful as they were making their predictions?

Reinforce that samples collected in places like the Jordan River may have additional human impacts than samples collected further up the canyon. Factors like stormwater, as well as additional factors, can impact the health of an ecosystem.

Elaborate:How can we ensure that we have a healthy population of macroinvertebrates and other living things in our rivers and streams?

Begin by having students read this abstract, or the modified version provided in this guide:
https://www.researchgate.net/publication/332259377_Jordan_River_Report_2018_Macroinvertebrate_Chapter_V15

Remind students that stormwater may be impacted by pet waste, grass clippings or leaves, dirt and debris, vehicle maintenance, and household chemicals. All of these abiotic factors can impact the water quality and environment for organisms like macroinvertebrates. Even though these organisms are small, they can tell us a lot about the environment and they are an important part of the food chain/web. Many larger organisms rely on macroinvertebrates as a food source.



Remind students that there are many groups and organizations that are concerned about storm water and water quality in our state. Many individuals also want to ensure that their waterways remain clean and healthy. Mitigating the impacts of stormwater starts at home and can help ensure that places like the Jordan River have a diverse population of macroinvertebrates.

Evaluate: Why should we care about the impacts of stormwater on our rivers and streams?

To evaluate this lesson, students will design a poster that communicates how stormwater can impact our rivers and streams, and the macroinvertebrates that live there.

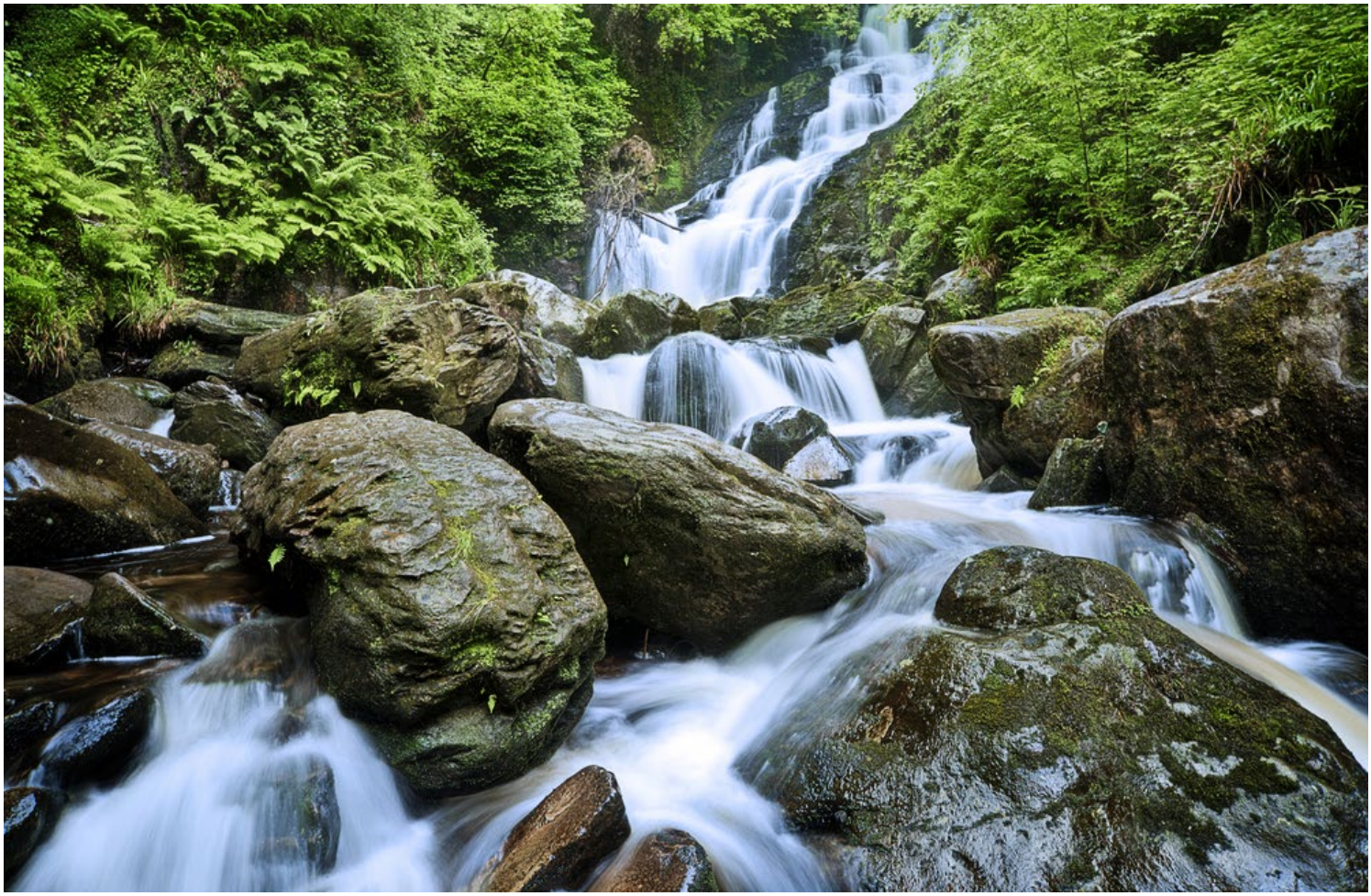
Have students work independently or in groups to synthesize what they have learned in this lesson. Students should understand that macroinvertebrates can indicate the health of a river or stream. The variety and number of macroinvertebrates present in a waterway provide information about water quality and environmental conditions. Factors like stormwater can impact the presence of macroinvertebrates and other living things.

Tell students that they are going to use this information to create a poster and 1-2 paragraphs explaining their design for the following prompt:

A local magazine is holding a poster contest on the topic of stormwater and its impact on the environment. Your poster design should include information about how stormwater impacts water quality and organisms like macroinvertebrates.

Design a poster communicating this message. Write 1-2 paragraphs on your poster design providing evidence and reasoning based on what you have learned about macroinvertebrates and stormwater to support your claim.

Lesson 4: Designing Stormwater Solutions



How can we create spaces and communities that function as part of an ecosystem? In this lesson, students will use their knowledge to redesign their school to answer this question.

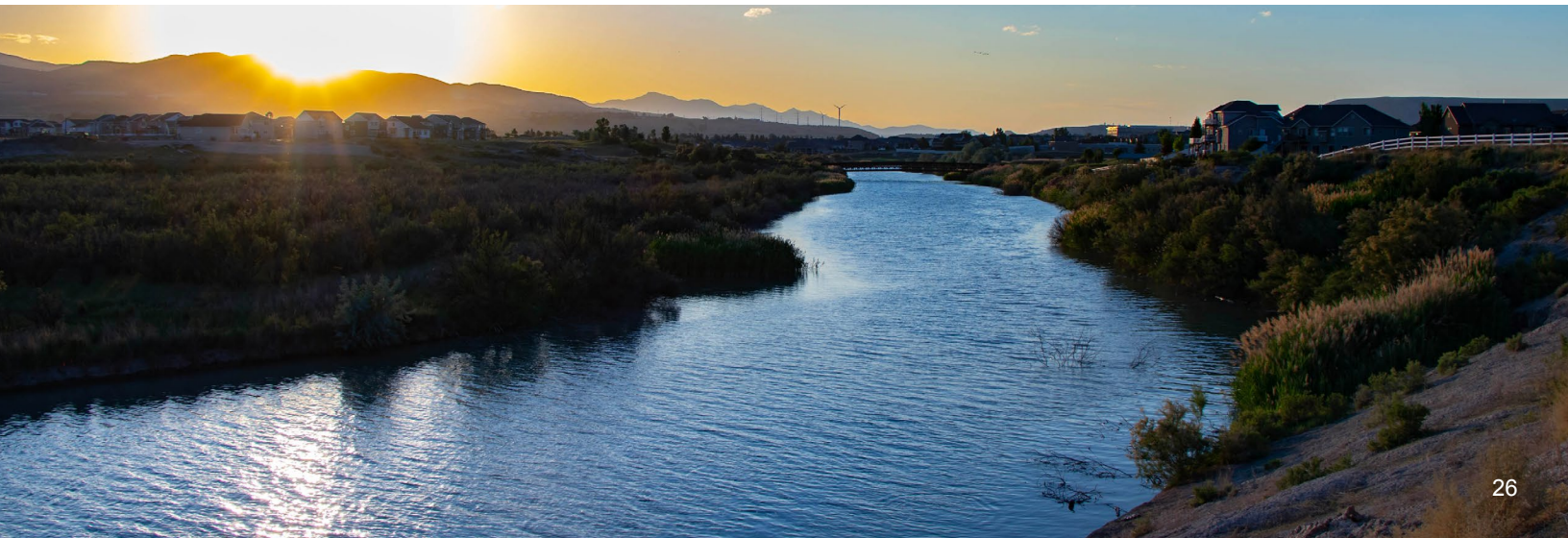
Students will...

- Expand upon their understanding that stormwater can impact our water quality
- Explain how stormwater can be managed to mitigate its negative impacts
- Explain the connection between stormwater, water quality in our rivers, streams and lakes, and macroinvertebrates

Alignment to SEEd: Standard 6.4.5 Evaluate competing design solutions for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize obtaining, evaluating, and communicating information of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species, or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion.

Practice(s) Describe how students are engaged in one or two practices	**Crosscutting Concept(s)** Explain how crosscutting concept(s) provide a lens for the students	**Disciplinary Core Idea(s)** State the big ideas students will use to explain the phenomena
Constructing explanations and designing solutions: Students construct explanations about the world and design solutions to problems using observations that are consistent with current evidence and scientific principles. Obtaining, evaluating, and communicating information: Students obtain, evaluate, and derive meaning from scientific information or presented evidence using appropriate scientific language. They communicate their findings clearly and persuasively in a variety of ways including written text, graphs, diagrams, charts, tables, or orally.	Cause and effect: Students investigate and explain causal relationships in order to make tests and predictions.	Engineering Design: (ETS1.A) Defining and Delimiting an Engineering Problem (ETS1.B) Developing Possible Solutions

Lesson Time Frame This lesson will take multiple class periods. Below is our suggested schedule.	**Lesson Materials**
Day 1: Lesson overview: Designing Stormwater Solutions, video + site inventory discussion Day 2: Site Inventory Activity (90 minutes—maybe 2 sessions) Day 3: Analyze results from site inventories, students update their inventories or draw maps based on what they have learned after hearing from all groups Day 4: Why should we care? Video or letter to school administrators	Site Inventory Map Satellite Map of your school Site Inventory Sheet, Questions, Vocabulary and symbols from https://stormwatercoalition.org/stormwater-education Colored pencils or markers



Understanding What's in the Watershed? Storyline

Driving Question/Anchoring Phenomena
What living things are found in our waterways and how are they impacted by water quality and stormwater?

Phenomena-driven question	How students will make sense of phenomenon through practices	Conceptual understanding(s)
Engage: What is a site inventory?	Ask questions about what a site inventory is and how it can be conducted. Review information about stormwater.	Stormwater can be managed and mitigated in may ways. In order to do this, it is helpful to have an understanding of the environment. This can include both natural and human-made environments.
Explore: How can we do a site inventory at our school?	Ask questions and define how a site inventory can be conducted on school grounds.	A site visit is one tool that can be used to understand more about built environments and their impact on stormwater. Planning a site visit can include multiple disciplines and perspectives, in addition to identifying what type of information should be collected.
Explain: What can we learn about our school site and stormwater?	**Make predictions, and obtain information about school grounds and where stormwater may be found.**	Visiting a location and collecting information is one way that we can gather data. Conducting a site visit of the school grounds can help us collect information and understand more about how a building like a school may interact with and be connected to the larger environment.
Elaborate: How could we redesign our school to mitigate the impacts of stormwater?	Construct explanations and design solutions about the school grounds and design ways to mitigate the impacts of stormwater.	Data can help inform decisions. Once we understand more about how a building, like our school, is connected to the environment and how it may (or may not!) impact stormwater, we can design and implement solutions.
Evaluate: Why should our school care about stormwater?	Write an argument to your school administrators encouraging them to adopt your plans to mitigate the impacts of stormwater at your school.	There are many ways to mitigate the impacts of stormwater. Some solutions may be simple and low cost (like picking up litter before it reaches the gutters), and some solutions may need an investment, like changing a structure or surface. There are many things we can do in our communities to mitigate the impacts of stormwater to ensure that our streams, rivers and lakes stay healthy.

Engage: What is a site inventory?

Students are introduced to the phenomenon in this lesson, that stormwater in our communities eventually makes its way to rivers and streams.

Watch this video with students to review the concept of stormwater https://www.youtube.com/watch?v=grWVQjNtLus and review how you can manage stormwater at home: https://stormwatercoalition.org/homeowners-and-businesses/

Ask students if they can think of other ways they can assess and mitigate the impacts of stormwater. One way to do this is to understand a site and it's landscape architecture. Landscape architecture is a multidisciplinary field that combines aspects of biology, civil engineering, horticulture, hydrology, architecture, art, ecology, and much more. It is the design of outdoor spaces such as parks, gardens, streetscapes, residences, etc. There are many different methods and goals. One of the first things a landscape architect has to do in design is complete a site inventory.

Ask if students know what a site inventory is and record responses. Site inventory is one of the first stages of the design process that involves identifying, observing and recording different features on the site such as stormwater flow, vegetation, sun and shade patterns, wildlife habitat, and elevation changes. Tell students that they will work together to complete a site inventory of their school to determine how they can manage stormwater.

Explore: How can we do a site inventory at our school?

Ask the question, how can we do a site inventory at our school? Give students example site inventory maps adapted from https://cbtrust.org/wp-content/uploads/EPA-SW-Lesson-Plan-Book.pdf.

As a group, discuss how students may want to conduct a site inventory at their school. You may want to include staff from facilities as part of this discussion to learn if there are any measures to mitigate stormwater impacts already in place. Students should discuss:

- What information should be recorded?
- Are there any additional people from the school we should involve?
- What do we want to know about our school's site?
- Do we want to propose solutions to stormwater at our school?
- What do we think we will find?

Explain: What can we learn about our school site and stormwater?

ACTIVITY 4.1:
Working individually or in small groups, provide students with a map of the school. (googlemaps.com, enter school name, select satellite view) and the Site Inventory Sheet, Questions, Vocabulary and Symbols (https://stormwatercoalition.org/stormwater-education).

Walk around school grounds to record observations. If your school is on a large site, have students spilt up to record separate areas. Students should focus on stormwater elements, including impervious surfaces, places where water can collect, high and low areas and where stormwater may flow once it leaves the school property.

When students return to the classroom, show students a map of the school in relation to nearby streams and the Jordan River on Google Maps or Google Earth. Remind students that stormwater eventually makes its way to our rivers and streams. Have students update their maps, either individually or in groups so they can be easily observed and interpreted by others and allow students to share their maps. Discuss the following questions:

- What were some of the observations you made while reviewing our school's site?
- Is our school close to any rivers or streams?
- Did you notice any puddles or erosion?
- Are there any areas at our school that could be improved or used in different ways to mitigate the impacts of stormwater?
- What are some of the things that you would change?
- If you were a landscape architect how would you redesign our school?

Elaborate: How could we redesign our school to mitigate the impacts of stormwater?

ACTIVITY 4.2:
Review your site inventory and what you found. Now that we have an inventory of our site, we can do a site analysis to propose solutions to any issues we found. One example of this is:

- Site inventory: when it rains, a lot of water drains from the roof.
- Site analysis: this runoff may cause erosion and carry sediment to nearby rivers and streams. A rain barrel could potentially capture this water.

Go back to your inventory maps and/or go back outdoors to where you collected your observations. Notice where data was collected. At each of these locations determine if a modification could be made to mitigate the impacts of stormwater and why or why not this is a good solution. Modifications include:

- Canopy trees: trees with a wide spread to provide shade and catch rain water
- Green roof: A roof with vegetation and a system that has a growing medium and a waterproofing layer. Green roofs have many benefits such as storing rain water and reducing the urban heat island effect.
- Permeable pavement: A hardscape surface that allows water to infiltrate through it into the ground or an underdrain. These include porous asphalt, permeable pavers, pervious concrete, and aggregate.
- Rain barrel: A system that collects and stores rainwater from your roof in barrels. It is to ensure the polluted water does not become runoff and flow into storm drains or streams.
- Rain garden: A planted depression that infiltrates and cleans stormwater runoff.

After conducting this inventory, students should update their maps to indicate where modifications could be made.

Evaluate: Why should our school care about stormwater?

To evaluate this lesson, students will create updated school maps or totally redesign the school to reflect modifications to mitigate stormwater.

Have students work independently or in groups to synthesize what they have learned in this lesson. Students should understand that design, or landscape architecture, is a tool that can be used to mitigate the impacts of stormwater, in addition to the individual actions that we can take at home.

Tell students that they are going to use this information to create a short video or letter to school administrators on the following prompt:

Your school has just received a grant to improve it's school grounds. Some of this funding must be spent on stormwater mitigation. You want to share your ideas for how to spend this funding with school leadership.

Create a short video or write a letter to your school administrators with your ideas. Provide evidence and reasoning based on what you have learned about stormwater and site analysis.

General Post-Evaluation

After participating in these lessons, take a few moments to find out what students discovered. You can record responses and reflect on the responses collected during the Pre-Evaluation.

- Have you heard of 'stormwater'? What do you think it is?
- What do you know about water quality?
- Can you describe a watershed?
- Does stormwater have the same effects in cities as it does in forests?
- What are some of the pollutants that could be transported by stormwater in cities?
- What effect(s) will stormwater pollutants have on living organisms in aquatic ecosystems?
- Will pollution from stormwater have lasting impacts on water quality in aquatic ecosystems?
- Will stormwater have an effect on aquatic habitat?
- How are humans impacted by stormwater and water quality?
- Based on this conversation, are there any solutions you can think of to improve water quality and the impacts of stormwater in an urban/suburban environment?
- What other questions do you have?

Extension Activities

There are multiple ways to extend learning beyond attending the Water Quality Fair. Consider the following activities:
Plant a water-wise garden
-Example: Sandy City Sego Lily Garden https://sandy.utah.gov/1334/Sego-Lily-Gardens

- -Plant a Rain Garden or Bioswale https://extension.usu.edu/waterquality/urbanstormwater/green-infrastructure/rain-gardens-and-bioswales

- Participating in a citizen or community science project

A citizen or community science project allows students to contribute data to real scientific research. The Utah Water Watch website has information on their project and many others: https://extension.usu.edu/utahwaterwatch/citizenscience/

- Field trips
  -SLCo Stormwater Coalition Annual Water Quality Fair at Hogle Zoo (May)
  -SLCo Stormwater Coalition Annual Water Science Fair at Wheeler Farm (October)

Appendices

Local Resources & Organizations

- Fish for Garbage
- Friends of Great Salt Lake
- Great Salt Lake Institute
- Jordan River Commission
- Seven Canyons Trust
- SLC Public Utilities
- SLCo Stormwater Coalition
- SLCo Stormwater Division
- SLCo Watershed Planning and Restoration
- The Nature Conservancy Utah
- Utah Division of Water Resources
- Utah Society for Environmental Education
- Utah State University Streamside Science
- Wasatch Mountain Institute

National Resources & Organizations

- Cal Water H20 Challenge
- Nature Conservancy Nature Works Everywhere
- North American Association for Environmental Education
- Project Learning Tree Green Schools
- Project WET
- United States Environmental Protection Agency

Vocabulary

- **adaptation:** a physical trait or behavior that helps an organism survive in their environment
- **biodiversity:** the variety of living things found in habitats, ecosystems and the Earth as a whole. Includes plants, animals, bacteria and fungi.
- **ecosystem:** living and nonliving organisms and their many interactions. Can vary in size and are found on land and in water. Examples can include school gardens and entire forests.
- **ecosystem services:** the benefits that humans receive from the environment. Examples may include food production, raw materials, recreation and other resources.
- **environment:** the living and nonliving organisms and other physical and chemical factors present in a particular place
- **habitat:** the place where an organism or community of organisms is found. Includes the other living and nonliving things that are found there.
- **macroinvertebrate:** any animal lacking a backbone and large enough to see without the aid of a microscope. Macroinvertebrates are exothermic (or cold-blooded) and may be aquatic or terrestrial, the aquatic organisms often being larval or nymphal forms of otherwise terrestrial species.
- **natural resource:** materials and other items found in nature, like organisms or substances that are beneficial to humans. This includes solar and wind energy, oil and mineral deposits, to name a few.
- **precipitation:** is any liquid or frozen water that forms in the atmosphere and falls back to the Earth. It comes in many forms, like rain, sleet, and snow
- **stormwater:** Stormwater is water from rain, hail, sleet and snowmelt. Once water hits the ground from a storm, it becomes stormwater.
- **water quality:** Water quality escribes the condition of the water, including chemical, physical, and biological characteristics, usually with respect to its suitability for a particular purpose such as drinking or swimming
- **watershed:** an area of land where all of the water that is under it, or drains off of it collects into the same place (e.g. the river)

Getting Students Outdoors

There are many ways to support learning in the outdoors. Whether you are going to a small patch of grass at your school or site or going on a field trip, there are many benefits to taking students outside. Here are a few tips and tricks to ensure that students have a great experience in the outdoors:

- If you're able, visit the site ahead of time. Assess any risks and any accessibility issues. For example, can all students get to the site? Will it be comfortable for the length of the lesson you are planning? Are there any insects or animals at the site to be aware of?
- Ensure students have what they need to be comfortable outdoors. Depending on the time of year you may want students to have a jacket, rain jacket, water bottle or sunscreen.
- If you plan on being outdoors for an extended period of time and want students to sit down, ensure that the surface you are sitting on is dry and can support multiple students. A simple way to ensure comfortability on a variety of surfaces is by using carpet squares for students to sit on.
- Before going outdoors, ensure that students are aware of the expectations for learning. Discuss how you should treat plants and animals you encounter and protocols for collecting at your site.

Resources

Adaptation
https://www.nationalgeographic.org/encyclopedia/adaptation/

Adaptations: Specialist and Generalist
https://vetmed.illinois.edu/wildlifeencounters/grade9_12/lesson2/adapt_info/specialist.html

Biodiversity
https://www.nationalgeographic.org/encyclopedia/biodiversity/

Habitat
https://www.nationalgeographic.org/encyclopedia/habitat/

Living Things
https://kids.britannica.com/students/article/living-things/275509

Natural Resource
https://kids.britannica.com/students/article/natural-resource/599843

Summary of the 5E Instructional Model
http://cbm.msoe.edu/teacherWorkshops/mspResources/documents/day1/5eSummary.pdf