Watershed Warriors Worksheets, Activities and Resources

WMEE:
Watershed

Introduction:

Teacher Source: What is a MWEE

- **Using the Senses Meditation:**

  Have students quietly close their eyes and observe the sounds they hear. Have them focus on the furthest sound they could hear. Next, ask students to observe what they smell and how they would describe it. Then, ring a bell, singing bowl or anything else that makes a resounding sound. Have students open their eyes once they hear the sound stop.

- **Discussion**

  Discuss what the students observed. Tell students that animals must use their senses to survive, humans use ours to not only survive as well but to solve problems. Discuss ways that using your senses could help humans survive such as hearing warnings or smelling gasoline. Next, discuss how using their senses can help them identify problems by explaining that we must first notice our environment before we can know a problem exists. Finally, discuss how it's not safe for students to always use all 5 senses for instance: touching a wild animal or tasting an unknown plant.

- **Field Experience**

  Bring students on a field study to a location of your choice to examine the watershed. Review safety precautions with students and give parameters for them to stay in. Review the definition of phenomena with students. Allow students at least 10 minutes to explore, make observations and record phenomena in journals/notebooks.

Phenomena - observable events that occur in the universe and that we can use our science knowledge to explain or predict.

- **Issue Definition**

As a class or in small groups, have students discuss the phenomenon they observed. Create a class list on the board of the observations that they noticed. Next, introduce the term "environmental problem". Have students pair up to identify environmental problems from the list. Then, discuss as a class to narrow it down to one environmental problem that may lead to an environmental issue. Define "environmental issue".

Environmental Problem - an interaction between humans and the environment that threatens or puts something of value to humans at risk; it often includes cause-and-effects relationships

- **Land-use Planning Activity (Looking through different perspectives)**:

Explain that people come up with different solutions to problems (or even whether or not they think something is a problem) based on their own perspective and beliefs. Have students split into 4 groups and give each a map of their watershed. Assign each group a different identity, such as “business owner”, “mother”, “investor” and “environmentalist”. Then have them decide what to use the newly reclaimed land for based on the interest of their identity. Have groups debate what the land should be used for and take a vote.

Environmental Issue - An environmental problem about which individuals may take varying perspectives. The disagreement may be over how the problem is to be solved or it may be over whether or not the problem is, in fact, a problem. People disagree because of differing beliefs or values.

Examine the Watershed Issue cards to choose a category that their Problem might fall into.

- **Driving Question**

Help guide students to create a Driving Question about the Environmental Issue. Review what a Driving Question is. Focus on making sure it can lead to action.

- **Research**

Have students research and brainstorm ways to investigate the driving questions. Gather any materials they need such as water quality measurement tools (Contact your local Intermediate Unit to borrow a streamside kit).

- **Field Experience**

Return with students to the field to gather data to support the driving question. Have students record their findings in their journals and take pictures if applicable.

- **Synthesis & Conclusion**

Help each group examine the data they collected. Guide them towards making decisions about the level of human management necessary and what that might look like.

- **Action Project**

Have students use the data and the driving question to create an action project. Action projects can fall into 4 different categories. 1. Restoration or Protection, such as planning a community cleanup 2. Community Engagement, such as making a social media campaign 3. Civic engagement, such as writing elected officials/decisions makers or 4. Everyday Choices such as composting

Watershed Notes

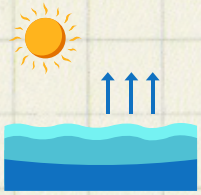
Watershed Notes

Watershed – an area of _____ where surface water drains down to a single point.

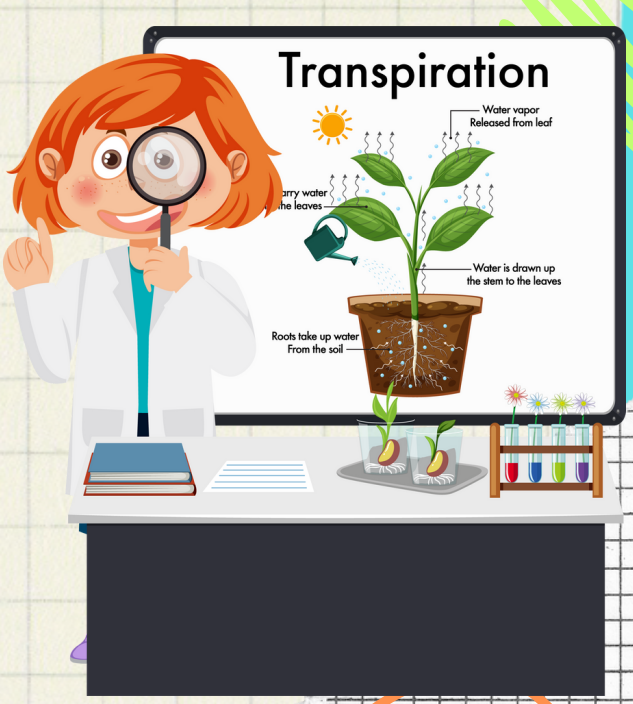
- Stream
- Lake
- Ocean



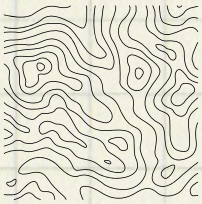
Evaporation – the process that changes liquid water to a gaseous state
(water into water vapor)



Transpiration – the process of water absorbing through the roots of plants, traveling up through the plant and releasing through stomata



Topography – the _____ of the land



Drainage Divide – highest ride that _____ the water into its own basin rather than another

Hydrological Unit Codes – watershed address (known as HCU's)

Word Bank:
drains, land, shape

Main Idea:
What is a Watershed?

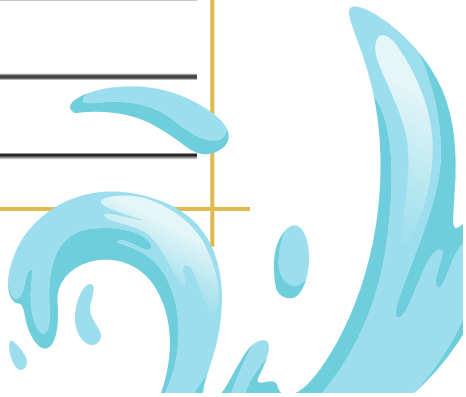
Name: Date:

Summarising the Main Idea

Text title: "What is a Watershed"

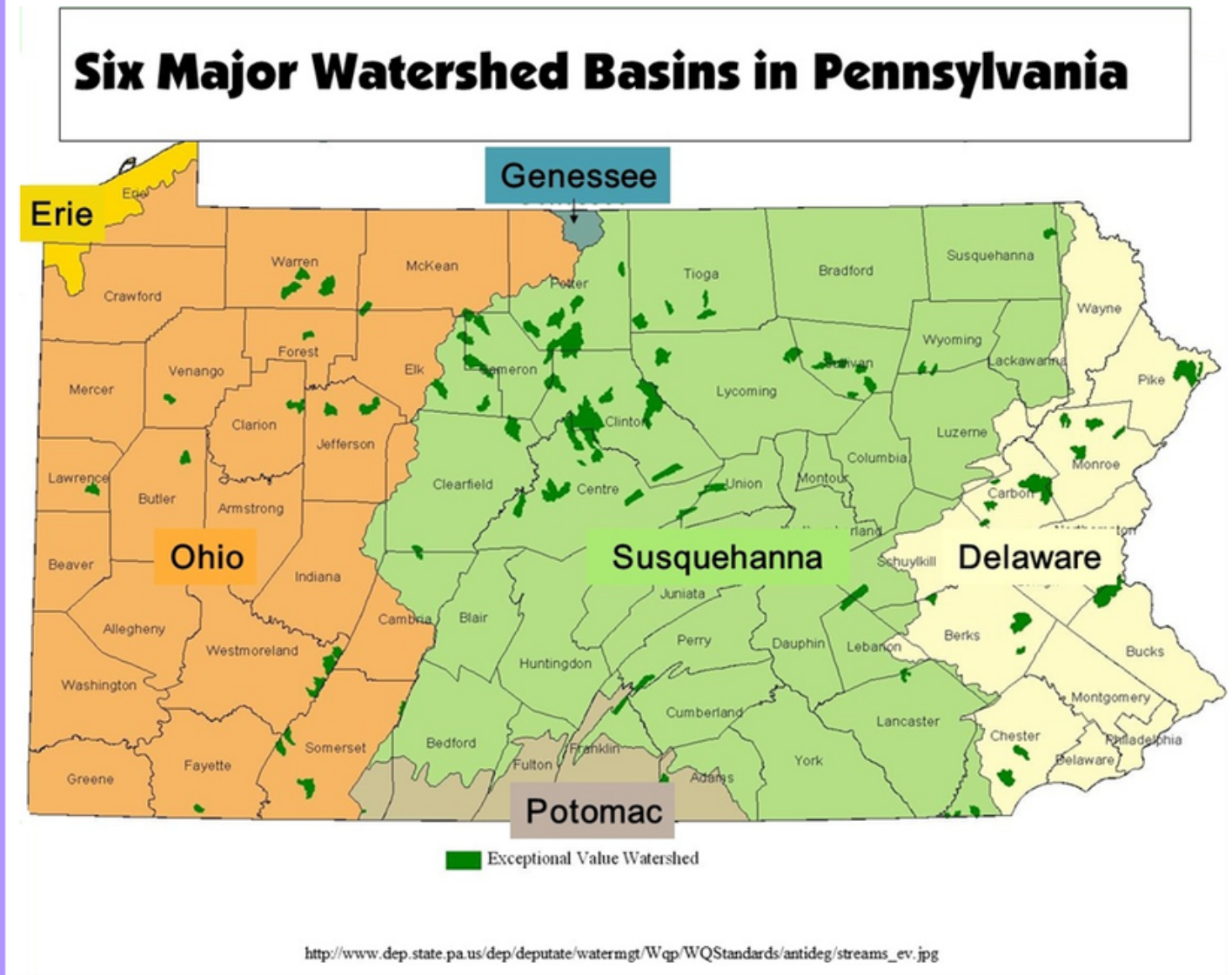
Write down six key words from the text to get the main idea

Use the keywords above to help you summarise the text.



Waterbasin Map

Which water basin do you live in?



Watershed Issue Cards

Safe Drinking Water

Drinking water in Pennsylvania comes from both surface water and groundwater. While many people have public water supplies there are also over 1 million private wells in Pennsylvania. Private water supplies are not covered by statewide regulations in PA and many are contaminated.

Find Out More

Harmful Algal Blooms

Certain types of algae produce a toxin that can be deadly to livestock, pets, and even humans. These algae have occurred in large blooms in some of Pennsylvania's lakes.

Find Out More

Urban Stormwater Runoff

Our towns, cities, and neighborhoods contain a lot of pavement and rooftops where rain water turns into stormwater runoff. This causes flooding, erosion, and pollution in our communities.

Find Out More

Wastewater

After we use water, it is returned to the environment. Most water goes through wastewater treatment first. In PA, some wastewater treatment facilities, including private septic systems, are outdated and failing to clean water properly before it re-enters the environment.

Find Out More

Stream Impairment

Many of Pennsylvania's rivers and streams are not clean and pure enough to support fish and other aquatic life; recreation; water supply for drinking, agriculture, and industry; and other protected uses.

Find Out More

Emerging Contaminants

Emerging Contaminants are a diverse collection of thousands of chemical substances that range from prescription, veterinary, and over-the-counter therapeutic drugs to cosmetics, sunscreens, and fragrances. They are a threat to PA's water quality and impact drinking water and aquatic life.

Find Out More

Riparian Buffers

Riparian buffers are the trees, shrubs, and grasses planted along streams that play an important role in maintaining the health of our waterways. They act as filters for sediments and pollutants to help keep them from reaching the water.

Find Out More

Agriculture

Agriculture is PA's #1 Industry. Agricultural runoff can carry potential pollutants into streams, lakes and groundwater supplies. Pennsylvania has identified sediment and nutrients as the most extensive agricultural contaminants affecting surface water quality, while nutrients and agrichemicals are the major concerns for groundwater.

Find Out More

Energy Industry

We use a lot of energy to support our daily lives. To make that energy, a lot of potential impacts can take place in our watersheds. From acid mine drainage to shale gas fracking wastewater disposal and even installation of natural gas transmission lines, implementing best practices are key to protecting our water resources.

Find Out More

Invasive Species

Invasive species are living things that have been moved from their native homes to a new location and then spread in a manner that is harmful to that new ecosystem. Invasive species threaten native plants and wildlife, on land and in water, by overwhelming or outcompeting them, often killing them off. Once these species are introduced into an ecosystem, it is typically very difficult to get rid of them.

Find Out More

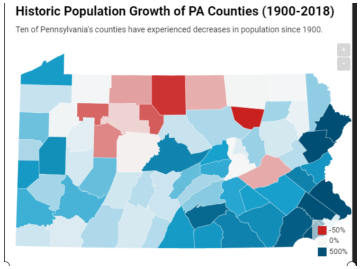
Climate Change



Climate change refers to significant, long-term changes in weather patterns that result in warming temperatures and sea-level rise, unpredictable weather patterns and increased storm intensity." The effects of climate change threaten the environment, human health and well-being, and the economy.

Find Out More

Population Growth & Development



While the overall population of Pennsylvania has declined, land use and development across the state has increased. The suburban sprawl and development of farm and forest lands threaten PA water quality, degrades natural ecosystems, and increases greenhouse gas emissions.

Find Out More

Wildlife

Loss of habitat due to development, forest fragmentation, and water pollution, continues to impact species in decline. In addition, climate change will likely usher in broad-scale habitat changes that will affect our species in ways we cannot fully predict. Three of Pennsylvania's wildlife symbols are impacted by these issues including the ruffed grouse, the brook trout and the hellbender.

Find Out More

Forestry

Pennsylvania is the largest producer of hardwoods in the country. Forests are of value not only because of their use in manufacturing, but also in keeping the environment healthy. Trees offer shade to cool the land and water, habitat for wildlife, and more. Pennsylvania's changing forests may be impacting our local watersheds..

Find Out More

Environmental Justice

Environmental Justice has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

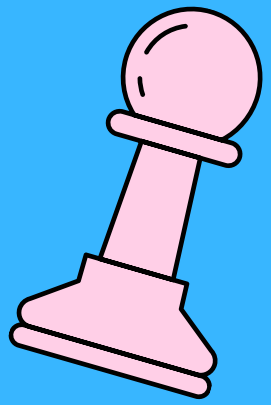
Find Out More

Water Conservation Game:

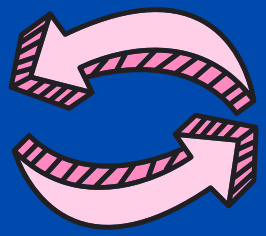
1 - Directions
2 - Game Board

Reach into the Reservoir

Setup:
Place bowl in the center of reservoir. Empty blue gems into the bowl. For easier game play, add all the beads, for more difficult add less. Start each player at the start.



Take turns rolling the die to move each player around the board. Follow the directions written on each space to take the correct number of gems from the bowl. Keep them off to the side.



Try to make it all the way around the board without draining the entire reservoir (emptying the entire bowl.)?

As a team, if you make it all the way around the board, you WON. Alternatively, the player with the least gems wins.


HOW MUCH DO YOU REACH
INTO THE RESERVOIR?
Reservoir
Place bowl of gems here.
START
FINISH
Leak in pipes. Take 10 gems.
Do your laundry. Take 3 gems.
Wash dishes in dishwasher. Take 2 gems.
Wash dishes by hand. Take 3 gems.
Mop floor. Take 1 gem.
Fill bathtub. Take 4 gems.
Flush tissue down toilet instead of throwing out. Take 2 gems.
Leave water running while brushing teeth. Take 2 gems.
Wash car. Take 7 gems.
Shower for 30 minutes. Take 3 gems.
Wash hands. Take 1 gem.
Cook pasta. Take 1 gem.
Fill pool. Take 12 gems.
Eat a burger. Take 12 gems.
Don't water lawn. Take 0 gems.
Water lawn. Take 8 gems.

Watershed Glossary

Glossary:

Abandoned Mine Drainage – water that is polluted from contact with mining activity, and normally associated with coal mining.

Agricultural Runoff – water from farm fields due to irrigation, rain, or melted snow that flows over the earth that can absorb into the ground, enter bodies of waters or evaporate. It can include sediment, nutrients such as nitrogen, pathogens (bacteria and viruses), pesticides and herbicides, metals and salts.

Catchment – the local drainage area for a specific stream segment found in the National Hydrography Dataset Plus. NHDPlus catchments are 1-2 square miles in area on average. Note that approximately half of all catchments are watersheds; specifically, those that contain a headwater stream segment.

Condensation – the conversion of a vapor or gas to a liquid.

Continental Divide – a naturally occurring boundary or ridge separating a continent's river systems.

Contour line - on a topographic map represents a ground elevation or vertical distance above a reference point such as sea level. A contour line is level with respect to the earth's surface just like the top of a building foundation.

Evaporation – the process that changes liquid water to a gaseous state (water into water vapor)

Fertilizer - any material of natural or synthetic origin that is applied to soil or to plant tissues to supply plant nutrients. It usually contains nitrogen, phosphorous and potassium.

Headwaters - a tributary or stream of a river close to or forming part of its source.

Hydrologic Unit – a hydrologically-derived area defined with the Watershed Boundary Dataset. Hydrologic Units are organized into six levels that are similar in size within each level.

HCU – 8-12 digit numbers

National Hydrography Dataset (NHD) – a national geospatial set of surfacewater features which provides a stream addressing system and drainage network relationships that enable upstream and downstream queries of related water information. These features include streams, canals, pipelines, waterbodies and coastlines.

National Hydrography Dataset Plus (NHDPlus) – a suite of geospatial products resulting from the integration of the National Hydrography Dataset

(1:100,000-scale), the Watershed Boundary Dataset (for the 10 states where it existed in 2005), and the National Elevation Dataset (30M) that includes catchments, stream order, stream flow volume and velocity.

Non-point pollution- pollution caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters.

Point source pollution – pollution coming from a single point, such as a factory or sewage treatment plant.

Pollution - the presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects

Precipitation - rain, snow, sleet or hail that falls to the ground

Runoff - the draining away of water (or substances carried in it) from the surface of an area of land, a building or structure, etc.

Topographic Map - Map showing natural and/or physical features of a landscape, including altitude contours. Also known as “contour map”.

Total Dissolved Solids - a measure of the dissolved combined content of all inorganic and organic substances present in a liquid

Transpiration – the process of water absorbing through the roots of plants, traveling up through the plant and releasing through stomata

Tributary - a river or stream flowing into a larger river or lake

Watershed – the area that drains to a specific location on the landscape, extending upstream to include the headwaters.

Watershed Boundary – defines the areal extent of surface water drainage to a point, accounting for all land and surface areas.

Watershed Boundary Dataset (WBD) – a national geospatial set of hydrologic units organized into six levels of hydrologically-defined areas that are similar in size within each level. Note that approximately half of all hydrologic units are watersheds; specifically, those that extend upstream to include headwaters.