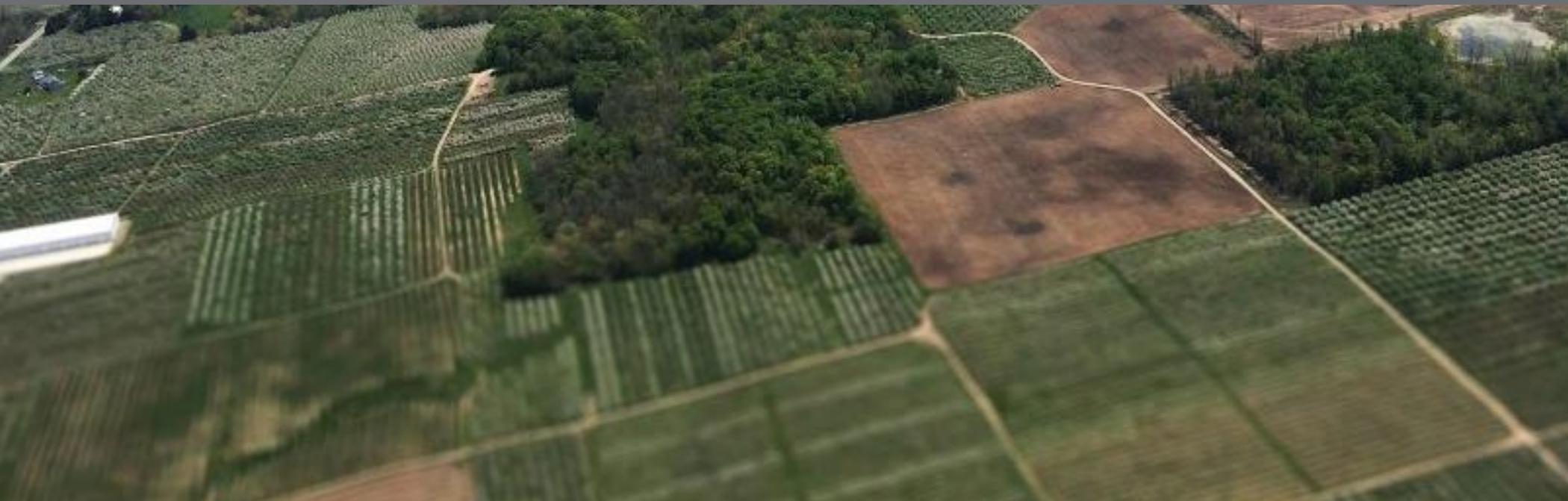




H I G H S C H O O L

S T E A M , A Q U A T I C S C I E N C E , U . S . H I S T O R Y





SHEDDING THE TRADITIONAL

Driving Question:

How does changing the composition of flat surfaces, such as parking lots, affect the absorption and filtration of rainwater before it reaches the watershed?

Materials Needed:

Science notebook, building and filtration materials such as rubber chips, filter paper, asphalt samples or other substances, a watershed model similar to [EnviroScapes](#), water in a spray bottle, dyes to represent contaminants such as red drink mix for fertilizer or cocoa powder for animal waste, bucket or tub to collect “runoff”

In this lesson, students will:

- explore the effects of urban development on watersheds, and explore alternative materials that can help control erosion and prevent pollution.

TEKS:

Aquatic Science: 2(E)(F); 7(A)(B)(C); 12(A)(B)
 U.S. History: 14(A)(B)(C); 30(A)(C); 32(A)(B)
 Art 3: 1(B)(C)(D); 2(A)(D)(F); 3(A); 4(B)



SPINNING THE COCOON

Begin by showing students a watershed model. Select students to spread the various “contaminants” around the cityscape. As the students are spreading contaminants, ask how many of them clean up the waste from their pet on a regular basis or how many know someone who fertilizes their lawn without following the application instructions.

Ask them to quickly research and identify their local watershed and drinking water source. Ask students what they think will happen when it begins to rain. Select one student to simulate rain while the other students note their observations. Discuss how everything that we put into the environment, including items such as chemicals, motor oil or animal waste, ends up in our watershed where it can be detrimental to flora and fauna, and even to us.

Draw two columns on the board and ask students what they think happens when it rains over a grassy area versus what happens over surfaces such as parking lots, sidewalks and driveways. Student responses should include the soil acting as a filter for water as well as grassy areas slowing down the flow of water into the watershed, thus preventing erosion. Tell students that contaminants such as motor oil from cars driving on roadways and other pollutants are easily washed into drains and straight into the watershed without filters such as soil to help control them.

Ask students for their ideas on how paving formerly green areas to create “improved” surfaces can affect wildlife, soil and even the aquifer, and write them on the board. Talk about

how big differences can be made in these detrimental effects depending on design. Some design aspects might include having a natural progression into green space rather than a curb, using textured surfaces to slow water flow, or even using materials other than concrete to create improved surfaces. If time allows, watch the following [video](#) on the use of a new surface material being used in Yellowstone National Park.

KERNEL OF KNOWLEDGE

Each year, Americans generate approximately 300 million tire scraps. Luckily, today more than 90% of tires are recycled and reused annually.



METAMORPHOSIS

Prior to beginning this project, students should examine the surrounding area focusing on parking lots and sidewalks. Have them make note of any erosion control or filtration systems the city or surrounding businesses use. Also have students note the amount of space transformed surfaces take up in their community versus the amount of green space. Assign students to groups, and using materials of their choice, have each group develop a design plan and prototype of an improved surface that will absorb water and possibly even filter it rather than allow it to flow freely.

As the students work on their improved surface material, they may periodically test prototypes by using drink mix and other materials to represent contaminants and the spray bottle to simulate rain over a water-capture device. Successful prototypes will allow water to pass through while still being strong enough for use, and even possibly acting as a filter for contaminants.



THROUGH THE LENS

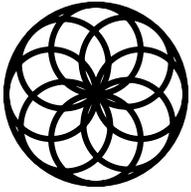
Have students create a Flipgrid video about how human activity has modified the landscape of the United States. The video should explain how we can reverse or change these negative effects. Ideas might include making parking lots flatter so to prevent oil and gas runoff into waterways.

Students should answer the following questions in their video:

- Why was the environment not given consideration initially when humans modified the landscape?
- Why are advocates building movements to reverse the effects on our environment?
- How can we avoid causing more damage?

UPCYCLE

Students will need to obtain permission from district administrators to enlarge one of the prototypes into a viable product to use on school grounds. For example, students might decide to use shredded rubber to repave the student parking lot, sidewalk or other improved area.



KALEIDOSCOPE

Introduce the concept of how Americans have been modifying their environment since the settlement of this continent. Ask students to provide examples of ways in which we have changed our environment. They may come up with ideas such as the construction parking lots and buildings, the creation of landfills, deforestation and the building of dams. Explain to students that these are some of the ways people make living in their surroundings more convenient. Help students recognize, however, that such actions typically have a negative effect on the environment.



eARTh

Many materials that are not biodegradable have been used by artists in their works, as is the case with artist Chakaia Booker. Booker is a New York-based sculptor whose medium is discarded rubber from tires. Watch the following [video](#) with your students to learn more about her process and why she chooses to work with this unique material.

Now, brainstorm with your students about other materials that are abundant but not biodegradable. Some examples might include cable wires, computer hardware, plastic, metal cans, etc. Write the list for students to refer back to on the board. Now, introduce your students to the term assemblage. This is a technique for creating 3D art that involves incorporating everyday objects in a composition, much like Booker's work. Once the students have a strong understanding of this technique, they can begin on their own assemblage project.

The work should consist of a non-biodegradable material of their choice. They can choose to include one or several different kinds of materials. The shape that they make is up to them, and can be representational or non-representational. But, it should include strong design elements such as balance, proportion, movement, etc. Once students have finished, they should present their work to the class and discuss the creative choices they made in their design. Exhibit the sculptures within the school. Each display should include a description of the work, as well as steps that people can take to alleviate the impact of these materials on the Earth.



Community Garden

- Adopt a local park, green space or street
- near your school, and coordinate with
- the parks management to plant and
- maintain a section of the designated
- area. Visit your space regularly as a class
- to pick up trash, and donate any non-
- biodegradable materials collected to the
- art class for sculptures.



CAREER CONNECTION

Environmental Compliance Manager - An environmental compliance manager tracks laws and regulations that might affect an organization's policies or practices. They assist operations management in maintaining compliance with air quality, wastewater and storm-water permits, and help address issues. This position requires a bachelor's degree and experience in the field.

Environmental Technician - An environmental technician, typically working under the direction of an environmental scientist, monitors the environment and investigates sources of pollution by performing laboratory and field tests. This job usually requires an associate's degree, but some positions may require a bachelor's degree.



CAREER HIGHLIGHT

Chris Jordan is an artist and filmmaker whose work highlights the severe damage plastics are doing to wildlife, even in areas hundreds of miles from human contact. His film, *Albatross*, depicts heart-wrenching truths about the detrimental effects human activity has on our oceans.



