School Stormwater Walk

Pollution in the Arroyo Unit, Lesson 3

Lesson Summary: Students will do a walk around campus looking for where stormwater flows and how it might carry pollutants into the waterways around Santa Fe.

Suggested Timing: 1 hour

New Mexico State Standards

Performance Expectation(s): MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Apply scientific principles to design an object, tool, process or system.	ESS3.C: Human Impacts on Earth Systems: Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	Cause and Effect: Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

Evidence Statements:

- MS-ESS3-3 Evidence Statements

ELA CCSS Connections:

- WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)
- WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)

Content Objectives and Daily Learning Targets	**Objectives**: • I can explain where stormwater comes from at my school. • I understand how impermeable surfaces make the problems caused by stormwater worse. • I can identify where stormwater flows and where it collects.
Focus Question	Where do I see evidence of stormwater and how does stormwater move pollution into our waterways?

Language Objectives	• Students share observations in writing and orally. • Students use scientific vocabulary in writing.
Vocabulary	• **Impermeable** - not allowing water to pass through. • **Infiltration** - the downward entry of water into the soil. • **Permeable** - allowing water to pass through. • **Pollution** - the introduction of harmful materials into the natural environment that will have negative effects. • **Runoff** - the flow of water occurring on the ground surface when excess rainwater, stormwater, meltwater, or other sources, can no longer sufficiently rapidly infiltrate in the soil. • **Sediment** - solid material that is moved and deposited in a new location. • **Sheet Flow** - runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel. • **Stormwater** - runoff is generated from rain and snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground.
Materials	• Maps of the campus • Optional: Projector to share map • Clipboards • Markers/pens
Preparation before class	• Print maps for students
Assessments (Formative/ Summative), Rubrics, Success criteria	• Student participation • Lab notebook • Reflection questions • Success Criteria: ○ Students are able to use what they have learned to design clear solutions to mitigate stormwater runoff and pollution in their own school area.
EL Supports	• Provide key vocabulary in English and the student's native language. • Use pair-share to allow students to practice what they want to see before sharing in front of the whole class.
Culturally Relevant Strategies	• Students investigate the environment around their school. • Students work with classmates to identify challenges caused by local environmental factors. • Students practice social and academic skills they will need.
Special Education Modifications	• Follow student IEP. • Ensure that the walk around the school is physically accessible for all students. • Carefully assign lab partners to build on student strengths and offer needed support.

Lesson Plan Details

ENGAGE (~10 min):	• Project a Google map of your school, or hand out maps if a projector is not available. • Review the terms permeable and impermeable. • Ask students to do a pair-share activity, answering the question: "What are the permeable and impermeable surfaces that you can identify on the map? Where do you think the water goes in a large rainstorm?" • Either have students draw the maps in their science journals or give them printed maps to bring outside.
EXPLORE (~15 min):	• Walk around the school campus. • Have students use their maps to record where water flows and collects. Have students describe what happens to the water next. Does it soak in? Evaporate? Ask them to also identify sources of pollution and record this on the maps.

EXPLAIN (~5 min):	• Introduce or review key vocabulary (ie. stormwater, impermeable, permeable, sheetflow, runoff, infiltration, pollution, sediment.) Ask students to add anywhere they see these to their maps.
	• Briefly discuss the pluses and minuses of different stormwater management techniques:
	  ○ Allowing water to flow off the campus and into the street.
	  ○ Sending water into the arroyo.
	  ○ Collecting water in temporary ponds.

ELABORATE (~15 min):	• Share some solutions used around Santa Fe, using prepared slideshow (3.3 Stormwater Solutions). • Ask students to brainstorm potential solutions to the stormwater and pollution caused by the runoff at their school. Have them make notes in their science journals.
EVALUATE (~15 min):	• Have students redraw the map of the school in their science notebooks, including these potential solutions. Have them label their plans, using vocabulary and concepts from the class.

Additional Sources:

- 5 Es of Science Instruction
- 5E Model of Instruction
- ISEC model of lesson sequence