Watershed Modeling- Water- Middle School

Description of Lesson	In this class, students will learn about the Cache la Poudre Watershed. Students will make a watershed model using natural materials around them to demonstrate what makes up a watershed. They will then look at local maps to see where we are in our watershed, and where our water flows. Lastly, they will reflect on how humans can positively and negatively affect the watershed.
Standards	**Science** (MS-ESS3-3) Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **Reading, Communication and Writing** Oral Expression #1: Successful group discussions require planning and participation by all. **Social Studies** Middle School p. 82 Use maps and geographic tools to find patterns in human systems and/or physical features.
Objectives	**Students will be able to...** 1) Make observations about the Cache la Poudre Watershed 2) Make a model of a watershed 3) Define components that make up a watershed 4) Work together and communicate as a team to create a watershed 5) Present their watershed to the rest of the class 6) Reflect on ways we can protect our watershed
Materials	1) Shovels (4-6)

	2) Mini White Board 3) Watershed Maps
Invitation	**Walk and Talk Questions:** 1) If you could choose any body of water to explore, swim, boat, or fish would it be a lake, river, ocean, creek?
Exploration	**I Notice, I Wonder, It Reminds Me Of:** Have students take a moment to quietly observe the environment around them. They can think, whisper out loud, draw, or write the things they notice about the environment. After, have students share their observations with a partner. Repeat this structure for what students wonder about the environment and finally what it reminds them of. Then have students turn and share one thing with a partner.
Concept Invention	**What is a Watershed?** The instructor will ask an assortment of questions of the class and will have students Think-Pair-Share to start a discussion of what a watershed is. 1) What is a watershed? (students may have no idea what it is. One way is to have students think of different meanings to the word shed - how a dog sheds their fur) *A watershed is an area of land where all water drains down to a low point. This includes mountains, hills, forests, streams, rivers, lakes, cities, and all human made things.* Show students a diagram of a watershed 2) Show students a set of movements to go with the definition of a watershed. Hold hand out in front and move in circles when you say, "An area of land." Move hands up above your head and move them down like water is moving when you say, "drains down to a low point." 3) Are we in a watershed right now? *Yes! We are always in a watershed. Here at the PLC we are within the Cache La Poudre Watershed-* Show students a map of Cache La Poudre Watershed. There are smaller watersheds within larger ones. (Point out the mountains where are water is coming from, and then

	explain all of our water is going to travel down to the Gulf of Mexico)
	In Small Groups
	4) Think, Pair, Share: What types of things do you see here around the PLC? *River, trees, Mummy Range Mountains, building, road, cars, grasses, Farm land, cows, birds*
	5) Think, Pair, Share: What are ways people use the land? *Fish and boat on the river, build a house, farm, ranch, hunt*
	6) Think, Pair, Share: Do you think we, as humans, have an impact on the land and the watershed we use? How? *Climate* change causing *drought and fires, pollution from dumping garbage and toxic materials, littering, dog poop, mining materials, chemicals from farming instead of sustainable practices.*
Application	**Watershed Model**
	Today we are going to build a model of the Cache la Poudre Watershed using the natural materials around us.
	1) In small groups of 2-3 have students build a model of the watershed. Make sure students include any mountains, hills, streams, lakes, trees, etc. they see. Make sure to do a model with the whole group on a white board and in the dirt to demonstrate.
	2) Discuss ways humans impact the watershed. Brainstorm things to include, and how they might affect the watershed. We are going to add these different features to our watersheds.
	3) What do you find in a forest? *Trees, grasses, bushes* - How can you model this? *find lots of leaves, and sticks so you can't see the ground*
	4) What do you find on a farm? *Crop rows, exposed soil* - How can you model this? *needs to have some plants, but not totally covered like in the forest*
	5) What do you find in a city? *Buildings, parking lots, roads, sidewalks* - How can you model this? *needs impervious surfaces like rocks or plastic (have some man-made materials students can use)*

	6) Give students **15 minutes**. Give students a drawing on a white board with what to include in their watershed.
	7) Set expectations: collect things that are dead, down, and detached only (emphasis on not picking plants), work with groups, set boundaries.
	8) Do a Gallery Walk of each watershed, and dump a bucket of water on each model to demonstrate where the water flows.
	    a) To add complexity to the demonstration, model different environmental scenarios, such as
	        i) Drought - Pour little to no water
	        ii) Light rain - Sprinkle water
	        iii) Flash flood - Dump bucket on a specific location, aiming to cause erosion/damage
	        iv) Runoff/pollution - Place leaves or other detritus on the model, then pour water over that spot. Have students observe how the waste is carried down through the whole watershed. How would this impact the people and ecosystems downstream?
	9) Reflection
	    a) Bring students back together: What observations do you notice from the model?

Reflection	**Think, Pair, Share**
	1. What causes our environment to change over time? And make it harder for both humans and nature to survive? *Fires, pollution, loss of habitat, drought*
	2. Give students information of what is being done to help protect our watershed, talk about student projects for caring for our watershed:
	    a. Beaver Dams to filter out ash from forest fires
	    b. Planting of willows and riparian plants to help filter out materials from getting into the river
	    c. Creating storm catchers in parking lots to help stop pollution from getting into waterways.
	    d. Creating dog poop stations to encourage

	people to pick up after their dog, so there is less poop going into the river. 3. Think, Pair, Share in Small groups: have students discuss ways they have seen in the news, at school, or ideas they have that can help protect our watershed.