

**Watershed Lesson 4th grade (Adapted from Project Wet c2011)**

**Teaching Point:** Wherever you live, you are living in a watershed, an area of land drained by a river and its tributaries. Water flows downhill through the watershed shaping the terrain as it erodes and transports matter along with it. Preserving open space corridors is not only vital for plant and animal habitat but also for us to have a healthy watershed that moves water through it effectively.

**Cross Cutting Concepts:** Patterns, Cause and Effect, Systems

**NGSS: 4-ESS2-1** Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, gravity break rocks, soils, and sediments into smaller particles and move them around.

**4-ESS2-1** Living things affect the physical characteristics of their region.

**Principles of Ecology: Nested Systems, Cycles, Dynamic Balance**

**Time: 45-60 minutes**

**Materials:** Watershed maps, topo maps, Mount Diablo Regional Map, a basic drawing of a mainstream with primary and secondary tributaries. Images of landscapes with plenty of vegetation vs. those without and/or with human development and impervious scapes.

**Terms:** Headwaters, ridgelines, tributaries, mouth, floodplain, catchment, spring, water cycle terms, aquifer/groundwater, erosion

Architecture	Lesson Script
<p><b>Set</b></p> <p><i>Conduct the lesson at the amphitheater after the hike, closer to the headwaters.</i></p> <p><i>(1-2 mins)</i></p>	<p>We just hiked past Galindo Creek, up the Chupcan Canyon and are now close to the ridgeline. You probably noticed a difference between the canyon and the creek at the beginning of the hike. Where did the water come from to create the creek? (higher elevation, in this case at the ridgeline with the neighboring Genocchio property) Where will that creek water end up? (In the Suisun Bay)</p> <p>Wherever you live, you are living in a watershed, an area of land drained by a river and its tributaries. Just as we pass through to explore Mangini Preserve, water moves through this watershed bringing life and leaving its mark each year.</p>
<p><b>Teach</b></p> <p><i>(10-15 minutes)</i></p>	<p>There are many factors which influence the movement of water over the land. These include gravity, the amount of flow, the shape and composition of the terrain and the type/amount of vegetation.</p> <p><b>Show maps and a poster of a watershed review key terms (headwaters, tributaries, main stem, stream, creek, riparian, ground water, floodplain, delta, boundary, divide...)</b></p> <p><a href="http://conservation.ca.gov">CA watershed slides</a> (conservation.ca.gov)</p> <p>Ask students to cup their hands and tell them this is going to model a watershed. What parts of the model are clearly the ridge lines and headwaters? Where might snow appear in your watershed? How about rain? Running down from the thumb side of your hands/wrists, how many tributaries do you see? To where do they drain? Ultimately where might that river in the crease of your hands flow? Are there any low spots in your hand that might catch water in the form of a lake or small pond? What would happen if your hand were covered in fine dust and we sprayed the ridgeline with a fine mist of “rain” where would that dust go?</p>

<p><b>Active Engagement</b></p> <p>(30 minutes)</p>	<p>Using the space here by the amphitheater we are going to act out how water might pass through this area as it flows downhill into Galindo Creek. The center rope will represent Galindo Creek, the outer ropes represent the boundary of our watershed. As you can see the creek has a few minor rapids with small boulders here where the curves are.</p> <p><u>Simulation with vegetation (1)</u>  Half of you will be raindrops and will start up high on the hill at the headwaters and the other half of you will be vegetation like oak trees, soap plants and other grasses and shrubs. The vegetation can only pivot on one foot since it is rooted. The raindrops can walk fast (not run) between the boundary lines marked by the outer ropes and must keep going downhill due to gravity.</p> <p>Vegetation can “tag” a raindrop at which point the raindrop will be absorbed by the soil and will act this out by circling the vegetation five times to simulate the water infiltrating into the ground. Then the raindrops will crawl down slowly toward the stream to show that the water drop is moving underground. Once at the stream, the raindrop can stand up straight again and follow the stream. At the curvy rapids, the raindrop can hop and spin to show it bouncing over the rocky swift stretches.</p> <p><i>(Optional- leader adds sediment items such as leaves, pebbles, twigs, etc. to the space and raindrops are encouraged to pick up as much as they can while they move down the slope. Whenever they get tagged by vegetation, they drop all the sediment they are carrying as they percolate around and then move underground toward the stream, no longer picking up sediment)</i></p> <p>Time the group as they do this.</p> <p><u>Simulation without vegetation (2)</u>  Do the simulation a second time, this time in a watershed where the vegetation has been mostly removed and/or covered over by impervious surfaces like roads and cities. This time half of the group are raindrops and the other half are just small stumps and rocks that lie down low allowing the raindrops to easily jump over them or go around them.</p> <p><i>(Optional- leader adds sediment items such as leaves, pebbles, twigs, etc. to the space and raindrops are encouraged to pick up as much as they can while they move down the slope. Whenever they get tagged by vegetation, they drop all the sediment they are carrying as they percolate around and then move underground toward the stream, no longer picking up sediment)</i></p> <p>Time the group as they do this. Compare times from simulation 1 to simulation 2. Discuss with the group the changes in speed and in amount of sediment carried down.</p>
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<p>Link (1-3 mins)</p>	<p>Open spaces like Mangini Ranch Educational Preserve are important parts of the watershed. Left mostly untouched by humans, they have plenty of vegetation and permeable surfaces that allow the runoff water from the rains to collect more slowly and naturally. This helps reduce erosion, collect the water back into the soil, and provide safe, clean water in the streams.</p> <p>It is important that we not only keep open spaces, but that we keep all our spaces clean of garbage and pollution because gravity and water will pull those pollutants down to the rivers and ultimately to the ocean. Each watershed contains many ecosystems with plants and animals that rely on healthy, clean water.</p> <p><u>There are many ways you can help:</u></p> <ul style="list-style-type: none"><li>● Reduce your carbon footprint- CO2 is responsible for much of the severe weather we are getting which overwhelm watersheds with floods and landslides.</li><li>● Do not litter, and pick up any trash you find, particularly non-biodegradables like plastics.</li><li>● Avoid using all pesticides, herbicides, poisons because they eventually end up like the dust on your hand, in the watershed.</li><li>● Participate in stewardship planting projects to replant natives and trees.</li></ul>
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