

Teacher Background – Construct a Watershed Model

The concept of the watershed forms the foundation of much environmental science. Formally, a “watershed” is the area of land that water flows over and through on its way to a larger body of water like a creek, river, lake, or bay. Practically, this means that a watershed is all the land that drains into a specific body of water. Every house, school, and neighborhood is part of a watershed. Studying ones own watershed allows students to apply scientific knowledge to their neighborhood and community and are easy ways for students to make connections between their actions (pollution, water conservation, habitat restoration, etc.) and the quality of the environment they live in.

Watersheds may be as large as several states (the Mississippi River watershed for example) or as small as a few city blocks. For instance, the San Francisco Bay watershed covers the entire western slope of the Sierra Nevada Mountains, the Central Valley of California, the Sacramento River Delta, and the many smaller creek systems that surround the San Francisco Bay itself. This area of land is approximately 40% of the entire state of California!

Both are equally valid watersheds to discuss since students can see their personal connection both to the Bay and to the neighborhood they live and go to school in.

A watershed begins in the tallest mountain areas where water falls as rain or snow. This water then trickles into rivulets, rivulets merge into creeks, and creeks merge into rivers on the water’s way downhill. Eventually, these streams of water reach the larger body of water under study – a bay, a river, a lake, a creek. Much of this water will also seep into the ground as groundwater and may travel much more slowly through the soil and rock and perhaps underground aquifers to reach a body of water. Any land a water drop has traveled over or through to get to the body of water being studied belongs to that watershed. All this movement of water is part of the larger water cycle (see the Water Cycle Stories Lesson).

I found that my students had a difficult time understanding that a watershed meant *land* and did not just include the creeks, rivers, lakes and bays. Pointing out that a watershed is usually bordered by ridges helps. Using a 3-D map to illustrate separate valleys that have separate watersheds also helps.

At the edges of a watershed, particularly those with little human development, one will find wetlands. Broadly defined, “wetlands” are transitional areas between land and water habitats. More specifically, the wetlands are characterized by:

- 1) lots of water - the water table is at the surface or close to it most of the time
- 2) soil that is wet much of the time (although some wetlands are actually dry for more of the year than they are wet)
- 3) specialized plants that are adapted to live in wet soils with lots of groundwater

The many types of wetlands include marshes, swamps, bogs, meadows, mud flats, and other habitats where land and water meet.

In the not so distant past, up until even the 1970's, wetlands were often considered to be wasted space. The marshy land at the edges of bays seemed wasted on the weedy plants that grew there and seemed like perfect, flat strips of land that could be filled in with soil and concrete to build desirable waterfront housing, office, and industrial space. In a span of 150 years, the San Francisco Bay watershed lost 90% of its wetlands. And only now are we realizing their worth and importance to a healthy ecosystem.

Wetlands serve many essential roles in the environment. They are critical habitat for many specialized plants and animals that survive nowhere else. The plants that live in a wetland act as a filter to soak up pollution that runs off upstream. In fact, several communities such as Arcata, CA and Phoenix, AZ use wetlands as part of their urban water treatment facilities instead of the harsh chemical treatments that must otherwise occur. Wetlands also serve as a reservoir to even out fluctuating water levels, soaking up excess water during a wet times and releasing stored water during dry times. Finally, as the nation learned in the Hurricane Katrina disaster, wetlands can serve as a buffer against natural disasters such as hurricanes.