Walk through the Watershed

What is a watershed?

A watershed is a land area that captures rainfall and other precipitation which drains to a common body of water - e.g. the ocean

In Santa Barbara, everything drains into the Pacific Ocean

Why should we care?

Our actions effect the health of our watershed

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Background Information

Using watershed as the backbone of this activity provides a place-based thematic framework for exploring ocean and conservation-related concepts. By using the geographic area that is one’s watershed, the learner is able to contextualize the activity in a space that relates to their daily life. It also provides a useful structure to show the interconnected nature of human activity, urban/suburban environments, and wild lands – especially the unnoticed impacts our daily habits have on the health of our fresh water and oceans. By shedding light on these harmful actions and showing easy steps on how individuals can act in a more eco-friendly way, watershed education can promote desired behavior change and foster stewardship.

Santa Barbara is uniquely suited for facilitating this kind of conversation. It has some of the shortest watersheds in the world, which allows learners to see from the mountaintops to the ocean. This visually direct line shows where the water comes from, where it runs through, and where it enters the ocean. The view from mountain to ocean can be enhanced by a model representation of the Mission Creek Watershed. As you can see in Image 1, the Mission Creek watershed goes from the upper watershed, through the Santa Barbara Botanic Garden, the Santa Barbara Museum of Natural History, the Santa Barbara Mission, State St. (downtown Santa Barbara), residential areas, and enters the ocean at the base of Sterns Warf (home to the Santa Barbara Sea Center). This prime watershed is full of iconic Santa Barbara landmarks that not only bring locals closer to the concept, but also tourists.

Image 1: Santa Barbara Watersheds, City of Santa Barbara (2013)

The Santa Barbara Creeks Department offers the following breakdown of this 7,400 acre watershed originating in the Los Padres National Forest:

**Land Use**
- Residential 30%
- Commercial/Office 2%
- Open Space 68%
Imperviousness in Urban Areas (above 15% can lead to water quality and bank stabilization problems)

- Upper Watershed 0.5%
- Middle Watershed 21%
- Lower Watershed
  - Old Mission 29%
  - Lower Mission 49%

City of Santa Barbara (2013)

This particular watershed also has the greatest potential for steelhead trout restoration projects. If fish barriers, pollution, and erosion risks can be removed and restoration of its riparian regions takes place, steelhead population increases will further rebalance the freshwater ecosystems of the area.

If the desire to preserve our natural spaces, foster a healthy ecosystem, and restore habitats was not enough to inspire concern for the health of our water, consider the ways in which ocean health is essential to our way of life.

- Climate and weather patterns are strongly impacted by ocean dynamics – moving heat from equator to poles and moderating carbon dioxide levels in the atmosphere (Townsend, 2012).
- According to National Geographic Education (2015), phytoplankton, kelp, and algal plankton produce about 70% of the earth’s oxygen. Rainforests are estimated to be responsible for 28%.
- The ocean is home to many of our food sources (e.g. fish and seaweed). If our food is in an unhealthy environment, we are consuming products filled with toxins.
- Our economy also relies on healthy oceans through industries like fishing, distribution, tourism, recreation, and transportation. According to SeaWeb (2015), “seafood has become one of the most exported items in the global market today.”
- 90% of global trade occurs through ocean shipping (SeaWeb, 2015).
- We don’t only eat the plants and animals in the ocean; we also use them for biomedical products that produce important health benefits and medications.
- Finally, recreation and beauty drives us to spend time and money to enjoy the wonder that is our oceans.

These human necessities – and luxuries – are threatened by numerous preventable direct and indirect consequences of our own actions.

- Land-based pollutants (i.e. plastics and electronics), which account for an estimated 80% of marine debris (SeaWeb, 2015). Some of this solid trash sinks to the sea floor, but much of it stays afloat with new modern materials. Flotsam – “accidental junk floating about (e.g., from a shipwreck)” – and jetsam – “intentionally jettisoned material” – is capable of traveling long distances on ocean currents (Townsend, 2012, p. 494). Some of this litter remains afloat (e.g. ‘Great Pacific Garbage Patch’), while the rest washes ashore (Townsend, 2015).
- Toxic chemicals and nutrient enrichment from nonpoint-source pollution such as factory, sewage, garden, or agricultural runoff (SeaWeb, 2015; Townsend, 2015). The dumping of nitrogen and phosphorus rich substances (e.g. fertilizer or sewage) in a concentrated area stimulates phytoplankton and, in shallow areas, benthic algae production (Townsend, 2015). The overstimulation of algae production (eutrophication) causes a number of problems including lack of sunlight penetration, nontoxic foam (more of a nuisance than a danger as far as we know), and dead zones. Because of the overproduction of phytoplankton biomass and the resulting death and sinking of said biomass in Gulf of Mexico, for example, causes extremely low levels of dissolved oxygen especially in bottom waters. This causes suffocation of fish and invertebrates in the hypoxic (low in $O_2$) or anoxic ($O_2$-depleted) waters (Townsend, 2015).
- Energy consumption involving burning of coal or other incineration practices release mercury, which ends up in our oceans and, ultimately, in the fish that we consume (SeaWeb, 2015). In one study on mercury hazards to wildlife, Ronald Eisler (1987) found that mercury pollution has a long lasting consequences defined as “a sharp increase in the number of epidemics of fatal mercury poisonings in humans, wildlife, and aquatic organisms” (Eisler, 1987). A study on mercury pollution in the South China Sea found that the levels of mercury in fish depends on their eating habits and location (Liu, Xu, Yu, Cheng, Hong, & Feng, 2014). Generally, larger carnivorous fish tend to have higher toxicity levels. Although it is inconclusive if these levels of Hg accumulation alone will cause fatal levels of mercury, it is a concern (Liu, et al., 2014).
- Pharmaceuticals (flushing of unused medications)
- Oil spills can have catastrophic and immediate implications to ocean ecology. Not only do they coat the beaches and animals in black goo, they can also cause oceans to burn like the Deepwater Horizon spill in 2010. Oil does seep naturally into the ocean, which accounts for about 46% of all oil to reach the marine environment annually, but these are not concentrated or as dangerous as oil spills like the Exxon Valdez or Deepwater Horizon (Townsend, 2012).
- Carbon emissions causing ocean acidification from absorption of about 50% of carbon dioxide from carbon emissions (SeaWeb, 2015). This acidification – lowering of the ocean’s pH – causes problems from calcium carbonate-forming organisms (e.g. planktonic, nektonic, and benthic marine organisms) (Townsend, 2012). These emissions along with other greenhouse gases also cause global warming, rising sea levels, and melting ice caps. All with alarmingly catastrophic and imminent consequences (Townsend, 2012).
- Invasive species can offset and even smother local ecosystems. On land, invasive flora and fauna can cause unexpected damage to the ecology of the area. For example, Anacapa Island, one of the Channel Islands off the coast of Santa Barbara, has become overrun with various species of iceplant. These plants were originally introduced by the Coast Guard to combat erosion, but have now become a serious problem for the native and endemic species. Iceplant forms monocultures, which threaten biodiversity and natural food sources for native animals (National park Service, 2015). The same issue can happen in the water through commercial
shipping ballast dumping – also known for transporting diseases like cholera (Townsend, 2012).

There is hope for humans, however. Most, if not all, of these negative effects can be reduced and corrected with changes in our own actions. Inspiring behavior change starts at the individual level – shifting daily actions bit by bit to affect local change. Once individual and cultural views on conservation begin to shift towards pro-nature behaviors, political and policy-related movements can gain momentum towards inspiring regional and national progress towards an eco-friendly way of life. Yes, ultimately we need a global change in our behaviors and radically change how we treat nature, but that must start at the personal and individual level.

Activity: What do you do in your watershed?

Topic: Watershed
Theme: The health of our watershed and oceans is tightly tied to our daily actions and behaviors.

Sub themes: streets, parks, and homes/gardens

Learning Goals
- Create deeper understanding of what it means to have a healthy watershed through discussion and inquiry
- Use brainstorming and self-reflection to come to conclusions that relate to watersheds and our daily lives
- Reflect on was we can change our behavior to help keep our watersheds and ultimately our oceans clean
- Use interactive elements of the activity to create a active learning experience

Materials
- Map of Santa Barbara Watersheds
- 3D model of Santa Barbara’s Mission Creek Watershed
- watering can
- pieces of trash
- canola oil
- chocolate
- green and red food coloring
- Dish soap
- plastic tub
- water

Activity Steps
1. Discuss what learners know about watersheds and establish an understanding of WHAT a watershed is – use inquiry-based questioning techniques

2. Assign ‘community member roles’ and have participants brainstorm and discuss how these roles might impact the watershed
   a. Car owner – procrastinates on getting a leak in their car fixed causing their car to drip oil into their driveway.
   b. Gardener – uses pesticides and herbicides to remove unwanted pests from his/her garden
   c. Picnicker – leaves pieces of trash behind after a beautiful lunch in the park
   d. Dog owner – leaves dog’s waste along the side of the road (in or out of a poop bag)
   e. Dish washer – uses non-biodegradable dish soap

3. Ask participants to place their ‘pollutant’ in their watershed

4. Use the watering can to represent a heavy rain that washes all of the pollutants through the watershed

5. Observe and discuss as a group what happened

6. Discuss how this effects the health of our oceans and WHY it is important to us

7. Reflect on what they do in their own lives that have a similar effect on the watershed

8. Discuss simple steps that participants can do to improve watershed/ocean health

References


