

ENVIRONMENTAL LITERACY TEACHER GUIDE SERIES

Earth's Freshwater

A Guide for Teaching Freshwater in Grades 3 to 8



6 Water Rights and Human Communities

by Ari J. Posner

In the United States and around the globe, there are political struggles related to securing clean and abundant water resources. This may not seem like a real issue to your students because they simply turn on the tap and safe drinking water flows. Yet, even cities in the United States are continually monitoring the safety of municipal drinking water and promoting conservation efforts. In other parts of the world, access to safe drinking water is more of an issue.

The way we use and share water in our communities is a complicated issue. Students, however, may not understand how complicated the issue can become. Did you know that almost three-fourths

of Earth's major watersheds are shared by multiple nations? Imagine what happens when one country has a population larger than their own water can supply. For example, India has 17 percent of the world's population, but only 4 percent of the world's accessible freshwater (Berg & Hager 2007). Imagine if one country has higher or lower water quality standards compared to a neighboring country. Water does not follow political boundaries.

Water is a limited natural resource, so there is inevitable tension and unrest that occurs when people try to secure their supply. This chapter builds on concepts already introduced in Chapters 4 and 5, taking a closer look

at political and social issues related to freshwater such as supply and demand for water, water rights, and public-health concerns.

Water Scarcity and Stress

In the United States, almost all water scarcity issues have been addressed using technological solutions. Water scarcity can be talked about in two ways—physical scarcity and economic scarcity. Physical water scarcity happens when there is a lack of water due to droughts or depletion in surface or groundwater resources due to consumption or lack of conservation. Economic scarcity happens when people lack the

GRADE	STANDARD	EEI UNIT
Grade 3	3.1.2 3.5.3	The Geography of Where We Live California Choices—Natural Choices
Grade 4	4.1.5 4.5.3-4	Reflections of Where We Live
Grade 5	5.3.d-e	Our Water: Sources and Uses
Grade 6		
Grade 7	7.3.a 7.3.e	Shaping Natural Systems through Evolution Responding to Environmental Change
Grade 8	8.8.4 8.12.1	Struggles with Water Agriculture and Industrial Development in the United States

technological or financial capital to take advantage of existing water resources that are accessible. For example, some countries or communities do not have sufficient infrastructure to transport water to people who need the water.

As discussed in Chapter 3, technology, such as canals and aqueducts, is needed to transport water from distant sources to areas of water scarcity. But these canal systems cost money that some communities cannot afford.

The demand for water has increased and is expected to increase further, while our supplies of water are decreasing. When human communities experience higher demands for less supply, they experience **water stress**. Water stress happens when supply of water does not match demand, or when other factors (i.e., water quality or water flow) are not sufficient for healthy ecosystems. Typically dry areas such as the Middle East and large portions of the Western United States exhibit high water stress as shown in the map on the next page.

Water scarcity and water stress are issues of growing concern in the United States. Some signs to consider include the following events, which have occurred since 2007. These are from a list of events described by Glennon 2009:

- Farmers in the western states watched their crops struggle because of lack of irrigation water.

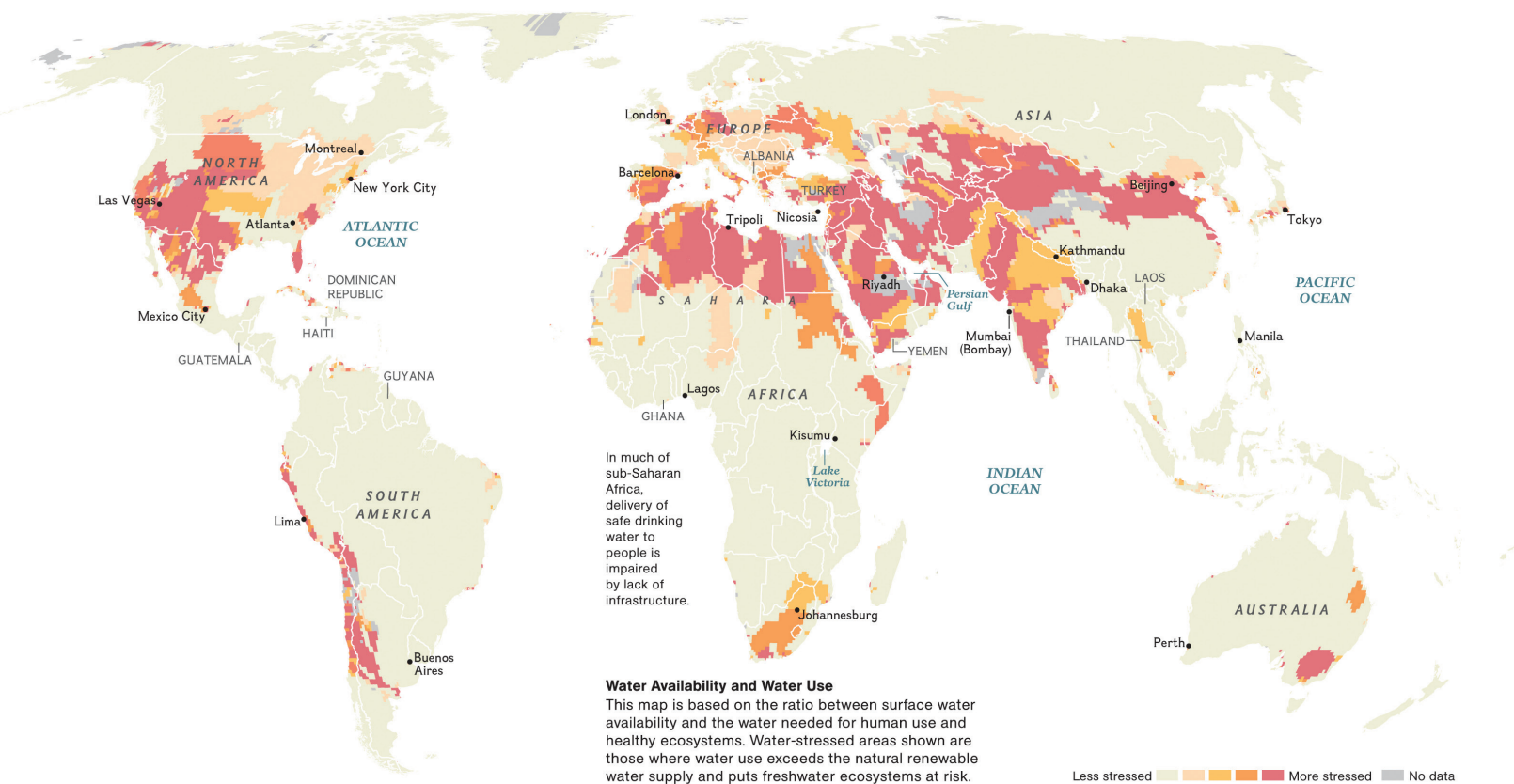
CHAPTER OVERVIEW

Water politics are becoming increasingly heated as the population around the world grows and water supplies decrease. In the United States, the illusion of limitless freshwater is common in our communities. From turning on the faucet to washing clothes, the water used in our everyday lives is accessible and clean, and we've come to depend on that.

Water quality and water politics go hand in hand, and will only grow in importance in the future, as clean water supplies decrease. How are rights to water determined, and how will they be determined as freshwater becomes harder to obtain? The answer is not simple, because there are many different laws that govern water. There are even places, such as California, where many rules apply making the issue even more complex. Historically, the United States followed Riparian Doctrine to determine one's right to water, but Prior Appropriation, is another widely used doctrine in the American West. Conflict can arise when two countries or even two people believe their right to clean water is being threatened.

This chapter explores issues related to water rights and water politics and how human activities are making water a scarce resource.

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This map is based on the ratio between surface water availability and the water needed for human use and healthy ecosystems. Water-stressed areas shown are those where water use exceeds the natural renewable water supply and puts freshwater ecosystems at risk.

- The government of the city of Atlanta, Georgia, banned the use of water for car washing, lawn watering, as well as swimming pools when the region was three months short of running out of water.
- The town of Orme, Tennessee, was forced to bring water in from Alabama in trucks as they ran out of their own reserves.
- According to the Scripps Institution of Oceanography, Lake Mead, which supplies water to every major city in the American Southwest, could become dry by 2021.
- A South Carolina paper company had to lay off hundreds of workers, because it could not discharge its wastewater into the river, due to low flows.
- At least thirty-five U.S. states are fighting with neighboring states and countries over water.

All of these issues mentioned are due to water stress brought on mostly by physical scarcity (either through droughts or overconsumption of water). In cases of extreme drought, cities also adopt political and behavioral solutions. Many of your students will be familiar with the now-common practice of limiting days and times when lawn irrigation is permitted, where the government and water companies help regulate water use. But in developing countries, there is little existing infrastructure to distribute water to communities, let alone government assistance and guidance when water needs to be rationed in drought conditions.

Water and Politics

Who really owns water? It is a natural resource found on Earth. How do we decide who owns the resource, and

how it is divided among people? It is common for students to believe that whoever discovers the water or who names the body of water is able to decide what happens to it. It is also common for people to believe that if you own land with water, the water is also yours to use. However, because water is a limited resource, there are several laws protecting how we use the water.

In the United States, there is one key set of laws that governs water resources. As populations moved from England to America, they brought their traditional water laws with them. This set of laws is known as the **Riparian Doctrine** (*riparian* refers to rivers). The Riparian Doctrine originated in medieval times when landowners owned the rivers or streams that traversed their property. This meant they had the rights to water that flowed through those rivers or streams. The landowners could even

seek compensation for loss of water that had been diverted upstream. The only way that non-landowners could obtain water was if they were granted permission from a landowner. Nowadays, the Riparian Doctrine still guides our decisions about water. It states that those who own property along the edge of a water body have the right to use that water as they wish, so long as it does not affect water for other riparian landowners. When this policy was put into place, the major uses of water were for domestic and livestock water needs. However, several political conflicts arose even within this system.

Water Politics in California. One example of **water politics** to discuss with students is how water was claimed during the California Gold Rush. This example makes a nice connection for students between science and social science concepts. California is also a great example of a place where two laws govern water rights. The Gold Rush began when gold was found at Sutters Mill in 1848, along the American River. At that time, water wheels played an important role in mining and timber industries. Some larger water wheels required upstream dams to increase the velocity of the water. In the dry West, these dams began to compromise the water use of some of the other riparian landowners downstream. Thus began the new doctrine that would be applied across the west, **Prior Appropriation**, which can be described to students as “first dibs” (also known as appropriative rights). During the California Gold Rush, miners were arriving everyday along the streams of the Sierra Nevada. There was an agreed-upon, unwritten law that new miners could not divert water so as to impact miners who were already there. For Prior Appropriation, a user must show that water is diverted for beneficial use.



A tomato seedling is stunted by salt buildup during a drought in California.

Because California is a state with dual water rights—both the Riparian Doctrine and Prior Appropriation are observed—the state has the **California Doctrine**. Some argue that the dual system is more efficient than favoring only appropriative rights, which has helped California manage its water shortages. Landowners still apply for water rights under the Riparian Doctrine, but appropriative rights are used to govern allocations and can be passed on or transferred to others.

When Many Rules Apply. One might call California’s dual system a plural system instead because there are even more doctrines governing water rights (BLM 2001). In addition to the Riparian and Appropriative rights, there are also separate doctrines for groundwater and pueblo rights. The sheer number of these doctrines may confuse your students—which doctrine applies in which situation? A response to this question is that the state owns the water (public trust), and users hold a right to a certain amount of water. Riparian and Appropriative rights are two water-law systems that can be used to allocate water to people.

Pueblos represent another unique situation. Pueblos are communities of Native Americans. Pueblo rights are derived from Spanish law in which Spanish or Mexican pueblos have claim to water. Pueblo rights take precedence over other water rights. When determining pueblo rights we must look at the entire watershed that feeds the river or stream traveling through the original pueblo. Pueblos have rights to surface and underground water from this watershed. However, pueblos can only take water from the watershed within their modern city limits. That means that a pueblo citizen cannot go to a place outside of the pueblo limits and pull water off the watershed. Also, pueblos cannot sell excess water outside the city limits.

Groundwater is another source of water that is sometimes regulated by governments. Some states, such as California, are not authorized to manage groundwater. Thus, in these states the groundwater goes largely unregulated. In some areas, the amount of water that can be extracted has been defined by a court. In other areas, groundwater may be managed by agencies that obtain their authority from the Water Code, or there may be little or no management. Students may question who owns the water underground, and the answer is that it varies from area to area, and there is no consistent regulation of this important reservoir of water.

As surface water becomes depleted, farmers have begun to rely more heavily on groundwater to sustain their crops. The fact that groundwater is largely unregulated has led to many conflicts. One of the most dramatic impacts of increasing groundwater use in California is that of **land subsidence**. The U.S. Geological Survey (USGS) describes land subsidence as a process that “occurs when large amounts of groundwater have been withdrawn from certain types of

rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rock falls in on itself.” (See Water Science for Schools: <http://ga.water.usgs.gov/edu/earthgwlandsubside.html>.) Thus, excessive groundwater extraction can result in ground compaction. In the San Joaquin Valley, land subsidence related to groundwater extraction has resulted in an almost 50-foot drop in the land surface!

Individual Rights or the Common Good. Another context to teach water politics to students is in the context of determining individual rights to water versus government control of water for the common good. One of the core issues related to natural resources is that of public trust. The Public Trust Doctrine (PTD) holds that certain resources are above private ownership and held in the trust of government to benefit the common good of the people. The government must administer these resources in the interest of the public. Each state varies in its own policies for protecting natural systems and overseeing what happens along rivers and streams. Exploring the idea of public trust through research or debates among students could

Withdrawing water from the streams around Mono Lake, California, was a notable controversy because environmentalists were at odds with the City of Los Angeles on how the water should be used.

provide an engaging classroom activity around water politics, especially when connected to local area issues.

California is currently going through some major battles related to **instream flow**, in which public trust has played a role. “Instream flow” describes the rate that water flows in a river. Changes to instream flow can greatly affect some of the fish populations that reside in the river. In order to protect those species and regulate flow, some conservationists are pressuring the government to list various fish species as endangered. With the protection of the Endangered Species Act and defining the habitat required by that species, minimum stream flows are set, as well as some of the spring high flows, to protect and create fish breeding and feeding grounds. This species protection sets up a controversial situation because farmers, who could benefit from access to the water in those rivers, are barely getting by with their current water allocations. This conflict has resulted in the now familiar debate in which one side argues that we are putting more value on a tiny fish rather than on our communities, while the other side argues that losing this species could mean an unraveling of the entire ecosystem.

This fight is reaching the boiling point for the farmers of the Westlands Water District in California’s Central Valley. The seminal court case is *National Audubon Society v. Superior Court Alpine County*. The National Audubon Society brought suit to limit the amount of water taken (or diverted) from the streams around Mono Lake. The Supreme Court ruled in favor of the National Audubon Society, forcing the other parties to amend water rights permits. This means that less water can be diverted for human communities in order to ensure the health of the natural community, placing the two at odds. This story provides a good case to discuss with your students, as it leads to many questions regarding how to make decisions about water use and how society deals with balancing environmental, economic, and personal issues. This case also shows how the government plays a role in determining water rights, especially given all the doctrines that may be used to make a decision.

Summary of Water Politics.

Water rights and politics can provide both historical or modern-day issues to discuss with students. In recent years, there has been much criticism of the water rights and appropriations systems across the West and California, so students have likely heard something about water in their own communities. It is important to point out that despite the commonly held belief that Prior Appropriation was a marked change from the Riparian Doctrine, the fact that both of these doctrines are based on “use” is a critical link. Under current patterns of water use, California faces the prospect of chronic water shortages by 2020. Discussing conservation of water on the part of users is also necessary. **Water conservation** will be discussed in more detail in Chapter 7, providing example actions of what students can do as conscientious users.



Pictures of Practice



Who Owns Water?

Centuries ago, water rights in the United States were not an issue. There was abundant, clean water for people to use. As the population of the United States expanded, this changed. Native Americans believed that water was a sacred gift and that altering a local environment could upset the balance within the larger ecosystem. European settlers started making claims on water, following traditional Riparian Doctrine. Those that had water on their land had rights to water (and could not impede water of other landowners). In the dry areas of the American West, water was an incredible asset for ranches and mining operations, although many of the people using water did not necessarily own the land on which it flowed. During the California Gold Rush, water was the key to gold mining, so miners worked out a system of “first dibs” in order to protect their rights. Nowadays, much of the American West follows the “first dibs” rules (appropriative rights), while much of the American East still follows traditional riparian rights. California follows both. Discussing water rights and talking through different scenarios can help break down the complexity of the topic for students.



Students: Grade 6

Location: San Diego, California
(a coastal community)

Goal of Video: The purpose of watching this video is to hear students' ideas about who owns water, as well as the challenge of learning about water rights.

Classroom Context

In previous lessons, students discussed water pollution and water treatment when they were posed with the question of how they could access clean water if it no longer came from their faucet. Students started thinking about who owns water and realized that they cannot simply get water from anywhere. After students had read about water rights, Ms. Fortunato posed the question again. The discussion shown in the video occurred after students had read about water rights in California.

Video Analysis

At the start of the video, students discuss that the people of California own water, but that the water is placed in the trust of the state of California. The class discusses what it means for people to own water and the difference between individual ownership and collective ownership. Taylor helps to clarify for his classmates that the California Doctrine refers to collective ownership of water. The class then discusses both riparian rights and appropriative rights. The segment shown in the video is students sharing what they had learned about riparian rights. Note that most students talk about landowners' right to use the water but do not mention their responsibility for putting back the same quantity and quality of the water, which is an important aspect of riparian rights. As shown in the postinterviews, learning about water rights was one of the most challenging things students did all week. Zach, and other students, originally thought that water was owned by the people who found or named the water. After these lessons, Zach realizes this is not the case. Thomas seems to grasp a much more complete understanding of riparian rights compared to his classmates but focused mainly on water quantity and not necessarily on returning the same quality of water.

Reflect

What should students know about water rights?

Water rights can be confusing to students because water cannot be owned like land is owned. What concepts would you teach about water rights?



Water Allocations

Water conflicts tend to arise when water becomes scarce, either due to increased population or decreased precipitation. In years of abundant precipitation, most water users get their share. In drought years, this is not always the case. In this activity, students explore what happens to water allocations during different years.

Materials

- Two buckets (one filled with water)
- 16-ounce cups or glasses
- Blue tape

Directions

- 1 In this activity you will have eight students role-play as different stakeholders that must share water along a river. Research your local area to make these stakeholders relevant. Consider having the following types of stakeholders—agriculture/farming, rancher, environmental preserve, mine operations, manufacturing, one or two cities, power plant, and another industry that is found in your local area. After determining your eight stakeholders, decide the stakeholder's allocations: either 32 ounces (2 cups), 16 ounces (1 cup) or 8 ounces (1/2 cup). Stakeholders that use a lot of water get 2 cups, while stakeholders that use less water get 1 cup or half a cup of water. Make labels for each stakeholder, with their name on one side of the label and allocation on the reverse side.
- 2 Using the tape, outline a river on the carpet or floor that is about 8 to 10 feet long.
- 3 Have the eight students draw a stakeholder label from a hat, followed by a number (numbers 1 through 8) that determines their order along the river. Have students line up along the river.
- 4 The first round of this activity will represent a normal year with ample precipitation. Start with the first stakeholder and ask what his or her allocation is. Give the student enough cups to hold the assigned allocation, and fill the cups using the bucket of water. Move on to all of the stakeholders. In this round, all students should receive their allocation.
- 5 Have students pour their water back into the bucket, then pour 1/3 of the water from the bucket into a second bucket. The water remaining in the first bucket will now represent all the water available in a drought year.
- 6 Repeat the activity as done in step 5, but because it is a drought year, at least two of the stakeholders at the end of the line should not receive their water.

Discuss

- 1 Is it fair that [X] and [X] did not receive water? What is a solution in a drought year, and who should come up with this solution?
- 2 Ask students to consider how this might be different if it was Riparian Doctrine and all eight stakeholders owned land next to the river (e.g., each stakeholder would have to return the water undiminished and unpolluted).

Student Thinking

Water Ownership

Students, especially those in urban areas, may have never thought about who owns and controls the water in their area. They may have heard of controls on days and times to water their yards, but they likely think that water from their cities is limitless. Oftentimes, the city water comes from a location far away, taking water from other communities. While controls vary depending on surface or groundwater, each state and federal government regulations ensure that one user does not impede the use of others drawing from the same water source.

	Common Student Ideas	Scientific Concepts
Water ownership	Whoever lives near water owns the water, or if you live in a city you have limitless water from the city. If you name the body of water, you have a claim to it.	Water is owned by state or federal entities, but rights are granted to individuals for a certain amount of use. Individuals cannot take so much water that it reduces another user's access. Surface water is more controlled than groundwater.
Water use	People cannot get in trouble for using too much water.	Individuals may pay more if they use more than a certain amount of water, or they may be fined for violating regulations on the amount of water they can use, especially when watering yards.
Owning land and owning water	If people own the land, then they own any water on the land or underground.	Owning land does not ensure limitless access to the surface or groundwater. A landowner cannot change the amount of water flowing to another landowner. Aquifers may have regulations that all users must follow.

Ask Your Students

- 1 Where does your water come from and who do you think owns the water? Why do you think [X] owns the water?
- 2 What might be the social, financial, or political consequences for using too much water?
- 3 How might owning land influence the rights you have to the water that flows through your property?

Pictures of Practice



Conflicts Over Water

In drought-stricken areas, students may be aware of conflicts over water because they have grown up with people and industries fighting for their fair share of water. In other areas with more abundant water, students may not be familiar with these conflicts. Conflicts over water rights and water quality happen around the globe, from international conflicts in the Middle East and on the U.S.-Mexico border to local conflicts about rivers and streams in local communities. People fight over water just like they fight over other precious resources, such as gold, diamonds, and oil. Water is more precious than many of these other resources because it is vital to life. When students are presented with such conflicts, they may bring up ideas about “sharing” and “fairness” and find it difficult to understand why people fight over water. Discussing the complexity of the issue with students will help them see different perspectives about the topic, including how different stakeholders make their claims for water.

Classroom Context

At the start of each lesson in Ms. Fortunato’s water unit, she has students respond to a “problem of the day” focused on a water topic. In today’s lesson she poses the scenario, “Imagine two towns that sit on opposite sides of a lake. Who do you think has the right to use that water?” Students write for several minutes, then share out as a whole group. This is the first activity in Ms. Fortunato’s lessons on water rights, so students have not yet learned about doctrines governing who owns water. However, students have discussed conflicts over water in different scenarios over the past few weeks of class.

Video Analysis

Ms. Fortunato says that students are finding it challenging to understand conflicts over water. Students want water to be equitably distributed, or shared, among the people who want the water, but when money or other factors come into play, the access to water may not be “fair.” In California, there are two key doctrines that govern who gets the water—riparian rights (if the water is on your land) or appropriative rights (allocations based on seniority and use). When conflicts arise, the government or a third-party official can step in to resolve the conflict, although many disagreements about water are ongoing. When presented with scenarios about water conflicts, students will engage in debates about who owns the water. In this lesson, you will hear students describe their ideas about sharing and fairness. Salma seems especially perplexed by the topic. She thinks that the person who decides what happens to water is the one that lives “next to the body of water.” Salma never seems to gain an understanding of the conflict, and in her post interview, she says it was one concept she still does not understand well.

Reflect

How would you teach about water conflict?

Think about the ideas shared by students. If these students were in your classroom, how would you respond to their questions? What concepts about water conflict would you teach to students and why are these important?



Students: Grade 6

Location: San Diego, California
(a coastal community)

Goal of Video: The purpose of watching this video is to hear students’ questions and ideas about why people fight over water.



Case Study

Water in Border Regions

Water does not recognize international boundaries, and the California-Mexico boundary has long been a source of contention between the United States and its southern neighbor. Regarding border-related water quality, there are two primary areas of concern. The first is near the Tijuana/San Diego border. For years Tijuana had a severely inadequate wastewater-treatment system. In many cases, untreated effluent was dumped into the ocean, which then floated north, contaminating California beaches. The United States invested, and continues to invest, millions of dollars to provide clean water and to treat effluent in Mexico along the border region. The EPA-administered U.S.-Mexico Border 2012 Program is providing tens of millions of dollars to border communities on both sides to protect water and air quality. In Tijuana alone, there are eight water-related infrastructure projects, nearly all of which target improving wastewater facilities and the adequate treatment of effluent.

Another primary area of concern is farther inland, along the New River, which passes through Mexicali in Baja California, Mexico, and runs north into Calexico, California. The New River's water is polluted with waste from agricultural and chemical runoff from industry irrigation in the United States (18.4 percent) and Mexico (51.2 percent), sewage from Mexicali (29 percent), and manufacturing plants in Mexico (1.4 percent). When the New River makes its way to Calexico, California, the water contains numerous contaminants, such as pesticides and heavy metals. The river also has pathogens that cause numerous illnesses, such as polio, cholera, and hepatitis. The contaminants in this river are far above acceptable levels set by the U.S. Environmental Protection Agency (EPA) and California EPA, making it one of the most polluted rivers in the United States.



To the right, a surfer heads into waters contaminated with sewage from Mexico. Water issues have long been a problem along the border between the United States and Mexico. The photograph above shows Mexicali, Mexico, (left) and Calexico, California, (right) as two different types of communities that can contaminate water in different ways.



While many are working on solving the problems along the New River, there is no comprehensive plan in place that meets the needs of both countries and all parties involved. With financial support from the United States, Mexicali has improved sewage treatment and reduced untreated discharge. The New River is an excellent example of some of the issues faced by bordering countries trying to learn to share resources across their borders.



In the Classroom

Water Wars Around the World

Much of this chapter has discussed water politics in the United States and close to home. However, students should be given opportunities to learn about water issues around the world. This activity explores water resources in the Middle East, an area where water is more precious than gold. Two of the earliest Middle Eastern civilizations, Egypt and Mesopotamia, developed along rivers where water was plentiful. Today, dwindling water sources become a common source of conflict. In this activity, students will explore the role of freshwater in the Middle East region.

Materials

- Physical map or atlas of Middle East region
- Blank Middle East outline map, <http://education.nationalgeographic.com/education/mapping/outline-map/?map=MiddleEastPolitical>
- “Water Deal Elemental to Mideast Peace, Experts Say” article, <http://news.nationalgeographic.com/news/2008/06/080603-israel-water.html>

Directions

- 1 Display or turn to the physical map of the Middle East region.
- 2 Using the map, ask students to locate ancient Egypt and Mesopotamia (modern Iraq), and then name other countries of the region.
- 3 Distribute the blank Middle East outline map and have students label countries. Prompt students to look at the physical geography and features of the region and point out water sources—both fresh and salt water. Major rivers include the Jordan, Tigris, Euphrates, and Nile. Other major surface waters include the Persian Gulf, Red Sea, Gulf of Aden, Mediterranean Sea, Caspian Sea, Dead Sea, Gulf of Aqaba, Sea of Galilee, and Gulf of Suez. In addition to surface water, students should also label the large underground water resources, such as aquifers, in the region. For example, the Yarkon-Taninim aquifer, the Eastern aquifer, and the Nablus-Gilboa aquifer. For more background information on water resources see <http://www.fao.org/nr/water/aquastat/countries/iraq/index.stm>.
- 4 Ask students to think about the importance of freshwater as they consider the following quote taken from a *National Geographic Daily News* article: “Many of the wars of this [twentieth] century were about oil, but the wars of the next century will be about water.” —*Former World Bank V.P., Ismail Serageldin*.
- 5 Distribute and read “Water Deal Elemental to Mideast Peace, Experts Say” article.
- 6 Revisit the map and identify key areas of potential and current conflicts around water. Then lead a class discussion using the “Discuss” questions below.

Discuss

- 1 Why did civilizations develop along rivers? Why was water important?
- 2 Why is freshwater a source of conflict in the Middle East region?
- 3 What short-term solution to water scarcity is Israel exploring? What are some of the benefits of this solution? What are some other possible solutions you would consider?

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Teaching Resources

- California Education and the Environment Initiative: <http://www.calepa.ca.gov/Education/EEI/default.htm>
- National Geographic Society Freshwater 101: <http://environment.nationalgeographic.com/environment/freshwater/freshwater-101/>
- USGS Water data for California: <http://waterdata.usgs.gov/ca/nwis/>
- USGS water resources for California: <http://water.usgs.gov/>
- Water Education Foundation resources: <http://www.watereducation.org/watersources/subpage.asp?rid=&page=382>

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