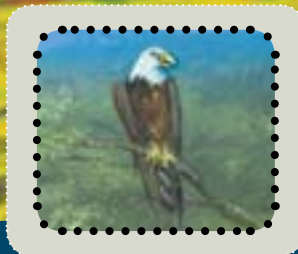


Living Rivers

of the Sacramento Valley

Clean Water for the 21st Century

Painting courtesy of Vicki Asp



ECO GUIDE

Exploring Aquatic Ecosystems



RECLAMATION
Managing Water in the West

Where Does a River Start?

Answer:

The flowing bodies of fresh water that we call rivers often begin in hills or mountains from rain falling, snow melting, or natural spring water bubbling up from the ground.

These small amounts of water collect to form rivulets and streams. As these streams merge, a river is formed, which is then joined by more creeks and rivers as the water cascades downhill. All these feeder streams are called tributaries of the river.

The source, or beginning, of a river usually flows quickly as the natural force of gravity pulls the water from higher areas down toward lower elevations. As a river follows its course out of the mountains towards valleys, it becomes wider and the flow slows. As the land continues to flatten, a river meanders, cutting curved paths across the landscape. At the end of its path – called its mouth – a river empties through a delta into a larger river, lake, or the ocean.

Rivers change the structure and shape of the land through which they travel. The moving force of water wears down rocks, moves soil and plants, and cuts through the ground, forming features like gorges, valleys, canyons, and waterfalls.

Material is carried away by rivers, only to be deposited again. In this way the Great Central Valley of California has filled with sand, silt, and gravels from both the Coast



“I have never seen a river that I could not love. Moving water...has a fascinating vitality. It has power and grace and associations. It has a thousand colors and a thousand shapes...”

- Roderick Haig-Brown, author

.....

Range and, especially, the Sierra Nevada. These sediments are as much as half a mile thick in the Sacramento area.

So when you walk on the flat plain of the Sacramento Valley, you are also walking on some of the Sierra Nevada, that was brought down by rivers!

Rivers in the News

Find an article in the newspaper, or online, related to a local river. Then research that river on the Internet and discover exactly how the river is used in your area. Create an advertisement for your local river to attract customers, merchants, tourists, environmentalists, outdoor adventurers, photographers, artists, or whoever might enjoy what your river has to offer.

The Important Role of Rivers

Rivers provide habitat for many species of plants, reptiles, amphibians, birds, insects, and mammals. Through their periodic floods, rivers are a critical source of fertility for rich valley soils. People depend on rivers as a source of food, drinking water, transportation, hydroelectric power, and irrigation of agricultural fields. In addition, people use rivers for fun and recreational activities such as fishing and whitewater rafting. Through the millennia, rivers have also provided inspiration.

To use rivers for drinking water and farm irrigation, people often change them. Dams, canals, and aqueducts are built to change or divert the flow of rivers and to reclaim dry lands by bringing water to them. In addition, some dams are built to control flooding downstream. Others are built to generate hydroelectric power, a cleaner form of energy. Like our local Folsom Dam, some of the 1400 dams in California are multipurpose, covering all of these functions water supply, flood control, and power generation – as well as providing lake recreation. Dams provide important benefits for people, but slowing and/or stopping a river's flow generally causes dramatic changes in the river's entire ecosystem, both upstream and downstream.

In addition to these dams, California has three major canal/aqueduct systems which move water to California farms and cities: One aqueduct diverts most of the lower Colorado River; another carries water 200 miles from the Owens Valley on the East side of the Sierra; the third main aqueduct sends half the water from the Sacramento River south. These diversions are necessary because 70% of California's water falls in the north part of the state, but 70% of our people live in the central and southern parts. California has been transformed by all this water management into one of the most important agricultural regions on earth.

Did you know?

Because of our aqueducts, canals, and water use:

- California is one of the richest agricultural areas in the world
- Cities in our arid south have been able to boom

But:

- Colorado River water no longer reaches the ocean
- 60 miles of the San Joaquin River is often dry
- San Joaquin's Tulare Lake, once the largest lake in the Western United States, is completely dry
- Owens Lake, covering 150 square miles in 1913, is now mostly dry



Rivers in the Classroom

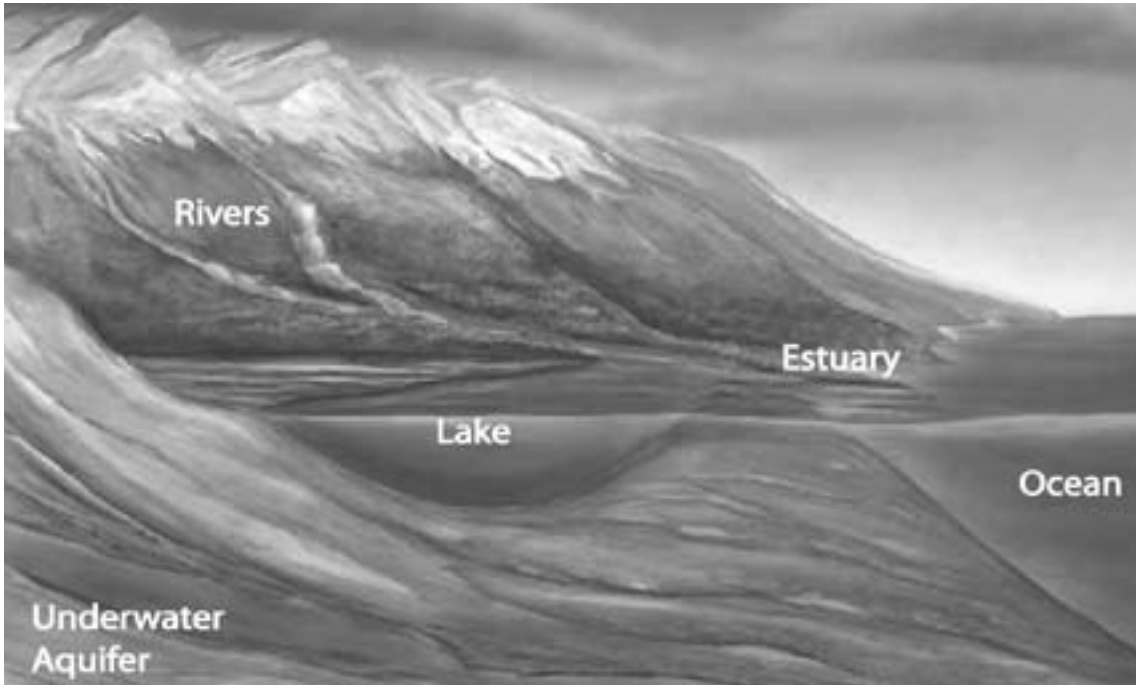
Find out how electricity in your home generated by collecting several power mix inserts mailed to your parents with their electricity bills (PG&E or SMUD). Research the advantages and disadvantages of each source of energy. Which of these energy sources are the least damaging to the environment? Discuss and then write an essay (or design a poster) with the following theme: How is it that when I conserve water, I also affect power generation, which in turn affects the footprint I make on the natural world I live in?

Rivers in the News

Imagine that a large dam has been proposed for construction on a river in the Sacramento Valley. The dam will be multipurpose, providing flood protection, hydroelectric power, water supply and lake recreation. Wildlife advocates, however are concerned that we cannot afford to lose any more riparian or salmon spawning habitat. They are also concerned about cottonwood regeneration and a small fish that only lives in that river and needs cold flowing water to reproduce. Conduct a classroom debate using the background information from this ecoguide.

Key Parts of Watersheds

Rivers are like the freeways of the watershed, bringing water from one area to the next. In addition to bringing water, the river carries other things it picks up along its travels such as sediment, dirt, plant life, and even trash and pollutants.



What is a Watershed?

Rainwater and snowmelt flow from high areas and travel into low areas through what is called a watershed – all the land that “sheds” runoff into a particular body of water. If you live on planet Earth, you live in a watershed.

The water in watersheds eventually either evaporates, drains into rivers, lakes, and/or the ocean, is used by plants and animals, or seeps into the earth as groundwater. Groundwater moves more slowly than water on the surface but is still part of the watershed. It seeps into rivers and lakes further downhill.

What Watershed Do You Live In?

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Look at the map on the back page and see if you can tell which river that rain hitting your roof could end up in. What route would a raindrop from your house take if it made it all the way to the ocean without first evaporating or being used by an animal or plant?

What’s Your Water Address?

Name: Taylor

School: Bella Vista High

Rain on my roof: might flow to my driveway, into a gutter, to a storm drain on my street in Orangevale, to Arcade Creek, to the Sacramento River, through the Delta to San Francisco Bay.



Rivers in the Classroom

Throughout history, rivers all over the world have played a significant part in the settling of communities. Large cities such as Sacramento are located along the banks of rivers. Ask yourself, “Why would people choose to settle near a river?” In the newspaper, find a photo of a community located on a river or find a photo of such a community online. Study the photo carefully. Brainstorm and list reasons why this particular community settled on the river. Do some research on the Internet and discover if your ideas were correct. In both the Sacramento area and surrounding foothill cities, farmers, and wildlife advocates deliberate over the limited supply of water as they struggle to get their needs met. Prepare a classroom bulletin board display using some of the water issues you find in the newspaper and/or on the internet.

Water Connects Us

If water runs through a mountain forest, it will pick up leaves, pine needles, dirt or other debris. If it runs through a pasture where cows graze, it will pick up bacteria or pollution from the wastes cows produce.

If water runs through a city or a neighborhood with a lot of people, it will pick up things people discard such as food wrappers, plastic water bottles or lawn fertilizers and pesticides. If it runs through factory or farm areas, it will pick up chemicals, pesticides, oil, fertilizers or other pollutants.

The pollution, trash, and other materials collected by rain runoff make their way through a

watershed. All this contamination can end up in rivers, lakes, wetlands, estuaries, and the ocean. The resulting pollution can harm fish, other wildlife, plants, and ultimately, us.

Think about it! Watersheds, rivers, and oceans aren't bound by town, state, or even country lines. By looking at a map you can see that the United States shares watersheds with Canada and Mexico. Once the water reaches the ocean, currents drive it to other parts of the world, so water truly does connect us all.

Rivers in the Classroom

Imagine that a large dam has been proposed for construction on a river in the Sacramento Valley. The dam will be multipurpose, providing flood protection, hydroelectric power, water supply and lake recreation. Wildlife advocates, however are concerned that we cannot afford to lose any more riparian or salmon spawning habitat. They are also concerned about cottonwood regeneration and a small fish that only lives in that river and needs cold flowing water to reproduce. Conduct a classroom debate using the background information from this Eco Guide.

Rivers in the News

Select the Sacramento/San Joaquin Delta, or a local river. Divide the class into different interest groups, such as farmers, ranchers, business owners, city/town dwellers, firefighters, fishermen, rafters, wildlife advocates, nature lovers. Have each group develop a plan for using the water, and be able to defend its plan. Discuss which water uses are the most important.

***All things within a watershed
affect the quality of the water in the watershed.***

Sections of a River

A river can be divided into three sections: upper, middle, and lower. In each segment the speed of the water, the amount of water, and the way a river moves through the land is different.

UPPER RIVER

Trickles of runoff are pulled downward here by gravity, trickles which combine with other streamlets and grow, wearing away the land as they tumble along. The upper river develops from these merging waters.

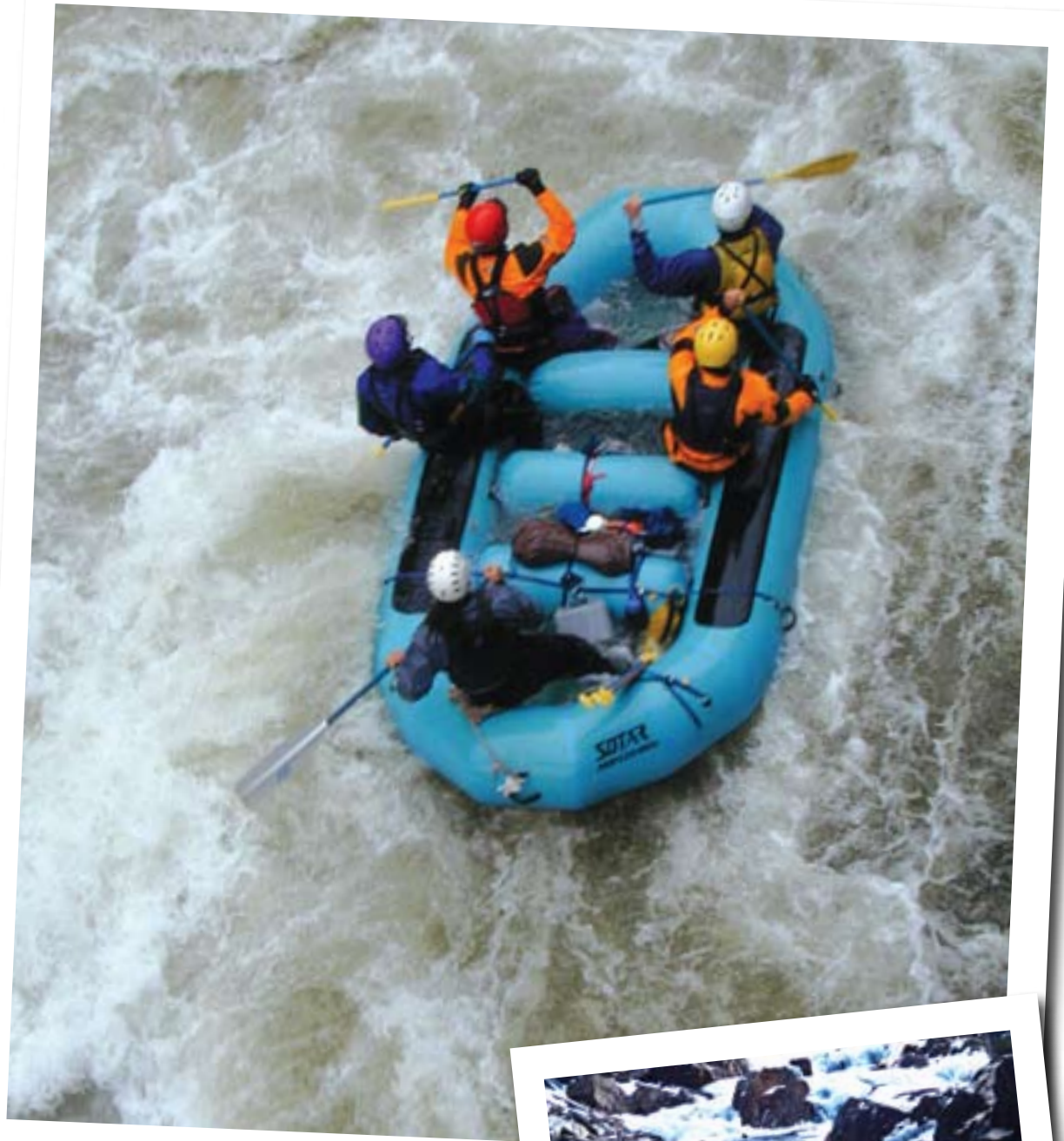
In mountainous areas, a fun and challenging activity is white-water rafting, recently introduced as an Olympic sport. The South Fork of the Upper American River is one of the most popular rafting areas in the country, with over 50 major rapids. For this sport, rapids are rated on a scale from one to six. Class one rapids are described as easy with fast-flowing water and small waves, while Class six rapids are not navigable except by knowledgeable experts. Rucka-Chucky rapid on the Middle Fork of the Upper American River is an example of a class six rapid.

MIDDLE RIVER

As a river emerges from the mountains and begins to meet flatter land, the water slows down, sediment picked up earlier begins to drop and fill the riverbed, and the river spreads out and widens. This is the river section you see flowing through Sacramento.

LOWER RIVER – DELTAS and ESTUARIES

Most rivers eventually flow to the ocean or another large body of water. This area is called the mouth of the river. When a river meets the ocean, it slows down still



further as it hits oncoming waves, becoming calm. As the river slows, it drops still more of the material it has been carrying, creating a new triangular land form. These deltas get their name from the Greek letter Δ .

Deltas are often associated with estuaries, rich habitats where freshwater of rivers and streams meet the salt water of the ocean.

CASE STUDY: Sacramento-San Joaquin Delta – a crisis for all Californians

This 700 mile maze of sloughs and waterways just west of Sacramento is formed by the meeting, or confluence, of our state’s two largest rivers – the Sacramento and the San Joaquin. These rivers combine and flow through Suisun Marsh to San Francisco Bay, forming the largest estuary in all of Western North America.

The Delta and the tangled riparian vegetation along its shores are a rich and productive habitat, providing homes for many mammals and other animals. It also acts as a nursery for young fish, amphibians, and insects, and is an important resting place for birds migrating along the Pacific Flyway.

But people have changed the Delta dramatically. Over the last 150 years, levees have been built, marsh habitat has been drained, and half the water that used to flow to the ocean has been diverted through canals to far away cities and farms. In fact, water for some 23 million Californians now comes from the delta region, which has been transformed into a vast network of productive island farms. Of the original 345,000 acres of tidal marsh, only 8,000 acres have not been turned into dry land. These and other changes have triggered a host of problems, including saltwater intrusion, crashes in the population of some fishes, and high flood risk to farms and homes (as peat soils dry out and islands sink below sea level.)

At the eye of the storm is the Delta Smelt. This small fish lives in the Sacramento-San Joaquin Delta and nowhere else on earth. It is a mere 2-3 inches long, and is too small for us to bother fishing. Yet this little fish, listed as threatened in 1993, is sending California water supply into crisis. Why?

The population of this fish, once one of the most common in the Delta, has crashed in



Rivers in the Classroom

- Select the Sacramento/San Joaquin Delta, or a local river. Divide the class into
- different interest groups, such as farmers, ranchers, business owners, city/town
- dwellers, firefighters, fishermen, rafters, wildlife advocates, nature lovers. Have
- each group develop a plan for using the water, and be able to defend its plan.
- Discuss which water uses are the most important.

the past few decades. It may well go extinct in the next few years.

Why do we care? For one thing, the delta smelt is an important part of a complex, interdependent food web. If the delta smelt disappears, so could animals that eat it, such as salmon and migrating birds, and the animals that eat them. And every time we lose a species, that unique genetic information is lost forever. In fact, the Delta smelt is seen by biologists as the “canary in the coal mine”^{*} an indicator species for the overall ecological health of the whole Delta system, and the quality of drinking water for most Californians. For reasons such as these, the Endangered

Species Act requires us to try to prevent extinctions. Researchers, environmental groups, and government officials are scrambling to save this tiny fish.

A judge ruled that water pumped south out of the Delta must decrease by 30% in order to protect the Delta smelt. Jaws dropped to think that Southern California farms and cities must cope with such a drastic cut.

**Canaries were taken underground by early coal miners to indicate, with their dying, that air was dangerously toxic, thereby warning people to escape contaminated mines.*

Human Impacts on Rivers:

Alien invaders, deadly fish, and parkways of vision

As we have read, humans can have a tremendous impact on rivers. We increase their flood potential by paving large areas of their watershed, and try and decrease the flood potential with levees and dams.



Here are three other impacts you may not be aware of: one that is a serious current issue, and two that are left over from people of past centuries.

Suffering today from last century's pollution: the mercury legacy

So much mercury has been left behind by the gold miners of the 1800s, that many fish today in the American River (Folsom Lake and Lake Natoma areas) pose a health hazard. Why? Because mercury was used in the washing of gold-rich soils upstream, and because fish tend to accumulate the mercury in their tissues. This accumulation has intensified as soils are held back by reservoirs, and as one fish eats another, concentrating the mercury again.

Health advisories exist for Folsom Lake and Lake Natoma. Children 1–17 or women 18–45 who are pregnant should not eat from largemouth bass, smallmouth bass, spotted bass, king salmon, and large trout. Others should limit consumption of those

same species to once per week, and no one of any age or gender should eat catfish from Lake Natoma. More detailed restrictions and weekly limits can be found on the State Office of Environmental Health Hazard Assessment's website, <http://www.oehha.ca.gov/fish.html>

Health advisories also exist for the Delta. Isn't it amazing that we are suffering today from pollution generated in the time of our great great great grandparents? And how about the effect of all that mercury on the fish themselves?

What legacy will you leave YOUR great great great grandchildren? Remember, there is no "away" when it comes to trash and pollution.

A good legacy from our predecessors- People have also done good things along the river. The American River Parkway, one of

Don't move a mussel!

One of the most important ecological issues of our time is that of nonnative invasive species. Both plants and animals brought from other areas of the world have created havoc with the ecology of our local watersheds. About half the fish species found in the American and Sacramento Rivers are nonnative, with some brought intentionally and some accidentally, mostly with ships. These fish have changed the whole food web and threaten native species. Many invasive plants are also here clogging our waterways and displacing natives. Small mollusks such as zebra and quagga mussels grow rampantly, overwhelm structures like fish screens and water pipes, and destroy the environmental health of creeks, lakes, and rivers.

Did You Know...

The Sacramento River drains most of Northern California with a watershed of 27,000 square miles.

the most beautiful river parks in the nation, stretches 30 miles from Sacramento to Folsom, covering both sides of the river. Perhaps you have walked its paths, biked its trails, or fished its waters, resting like others from the bustle of urban Sacramento. We enjoy this amazing natural area because of the vision of city planners almost 100 years ago, and the hard work of many people since to keep the park free of development and trash. The Parkway also provides essential riparian habitat and wildlife corridors for fish, other animals, and plants.

What can you do to stop these invasions? Never empty aquarium fish, plants, or water into rivers, streams, stormdrains, or any wild area. Be careful not to mix plants or animals from one body of water with those of another - make sure your rafts, shoes, etc. are dry for a week or more before allowing them to enter another creek or river. Empty fish bait buckets on land, never into the water. Join a community group that is removing non-native invasive plants and restoring native habitat.

Learn more about non-native species so that you can report sightings to a special toll-free line: (877) STOP-ANS. It was a teenager who spotted the nearest zebra mussel occurrence, about 100 miles south of here. Officials now are scrambling to keep the mussel from migrating further north to Sacramento.

Delta – Hot Bed of Controversy

All these human effects on Sacramento waterways come to a head in the Delta. That this Rhode Island-sized estuary is in serious trouble is not debated. But what do we do about it? Is there any way to balance all interests?

Watch your newspaper for arguments like these:

Wildlife biologist:

“We need to do something immediately. The Delta smelt fish population continues to decline sharply and will disappear altogether if we don’t act fast. The winter-run Chinook salmon is in trouble as well, and the green sturgeon, central valley spring-run Chinook salmon and Central Valley steelhead are also listed as threatened. Losing these species would affect the entire ecosystem, a once-rich vibrant estuarine system critical for migrating birds, fish, and other wildlife. We need to stop pumping so much water south because the pumps themselves are killing the fish.”

San Joaquin Valley farmer:

“We help feed not only Californians but the whole world. Our farm economy has helped California become one of the most important economies in the world. That means jobs and tax revenue for things like schools and other services. Well, we can’t farm without water. We agree with the Southern California farmer who said: “We feel

we should get the water instead of the fish.” No one even knows if it’s really the pumps that are causing the problem. Why not end ocean fishing, or look for other causes like pesticides and urban contaminants?

Northern California environmentalist:

“It’s in everyone’s best interest to save the Delta from further degradation. We are part of the environment, not separate from it. The long term health of California is more important than short term profits for a few large corporations. We should stop sending so much of our water south just to facilitate development booms in arid Southern California, and stop subsidizing the farming of such thirsty, but profitable, crops as cotton and rice. All of these practices are simply not sustainable with California’s water situation. Leave the water in the Delta, where it belongs, and grow crops like fruit and nut trees which use less water and are better suited for California.”

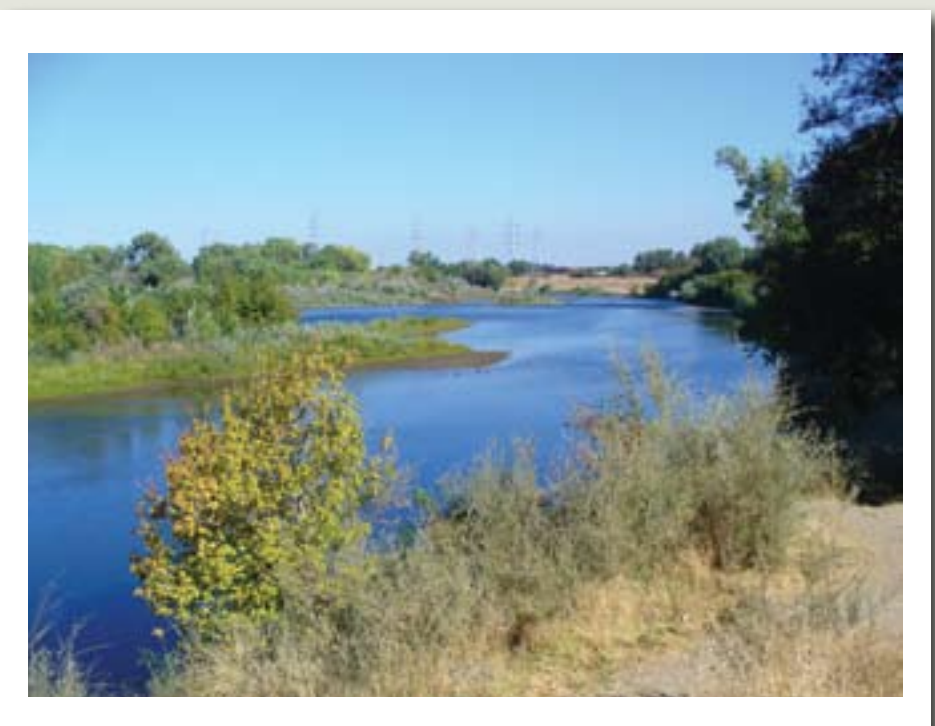
Southern California urbanite:

“What do you expect people down here to do, just stop using water? Abandon homes and businesses? The fact is, we are doing a much better job than you northerners of conserving water. We care about the environment too and are trying to do the right



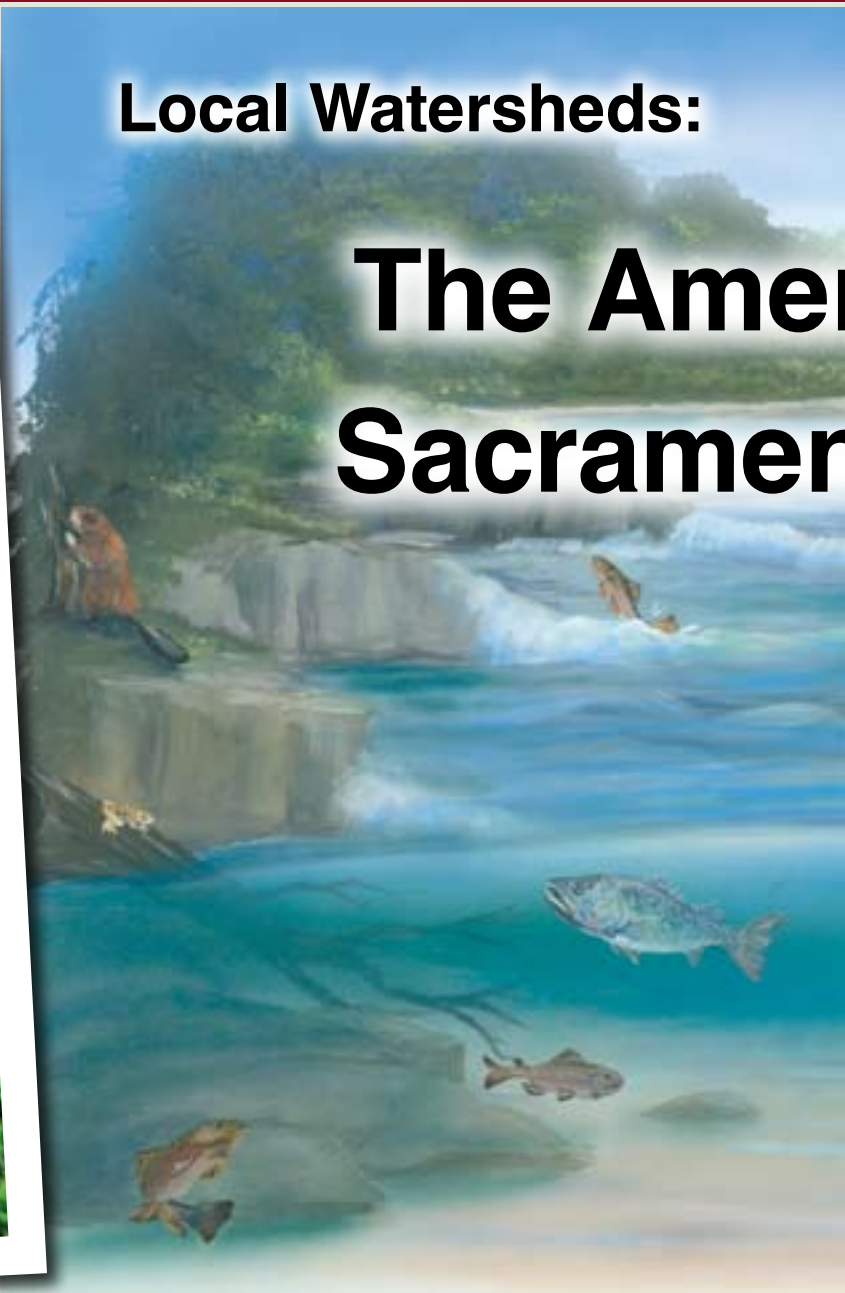
thing. Did you know that in 2007, the average Angeleno used only 138 gallons of water each day, whereas Sacramentans may have used twice as much – a whopping 278 gallons of water

per person per day? Some of us are removing lawns, planting drought-tolerant vegetation, and buying water efficient appliances to reduce our water use. What are you doing?”



Local Watersheds:

The American Sacramento



Beginning high in the snow-covered peaks of the Sierra Nevada Mountains, the water cascades from over 10,000 feet in elevation down to just 23 feet above sea level.

The land that drains into the American River is large and varied. Overall the American River watershed drains about 1,900 square miles.

The American River is just one of many rivers that empty into the Sacra-

mento River, a river system that drains most of northern California and part of southern Oregon. All of this water flows through the city of Sacramento. Are you surprised that Sacramento sometimes floods?

Just 150 years ago, there were still vast riparian* forests with plants like cottonwood and grapevines stretching several miles wide along both rivers. Meadows were thick with wildflowers, and large herds of elk and pronghorn antelope

“Each one of us can help the water

American and into Rivers



shed we live in with our actions”

*Alice Cantelow,
Environmental Educator*

Grizzlies and black bear drank from the rivers. The Sacramento River periodically turned the valley into a huge inland sea with its seasonal flooding.

Today, grizzlies, elk, and antelope are gone from the region. Black bears have retreated to the hills and mountains, and the wildflower meadows have been pushed out by annual grasses from Europe. Ninety-five percent of the wetlands and 90% of riparian woodlands have

been filled in or otherwise destroyed. But not all the news is bad. There are still over 200 species of birds that are sheltered by the watersheds, over 50 species of mammals, and many different reptiles, amphibians, fish and insects. People are working hard to protect the remaining riparian habitat and even bring back some of what we have lost.

**The word “riparian” refers to something situated along a riverbank.*

The Sacramento River: Another Taste of Controversy

Flood woes - today

Sacramento is built in a floodplain that used to frequently become an inland sea. It is now protected by three main dams upstream – Shasta and Oroville Dams in the Upper Sacramento River Watershed, and Folsom Dam on its American River tributary. People are concerned that these dams do not provide enough protection.

Why was such a large city built in such a flood prone area? And what do we do now to better protect all the people living here?

Sacramento was developed during the Gold Rush near where the American River empties into the Sacramento River. The rivers were a source of water and the new city could easily be reached by boat from the San Francisco Bay. Things happened fast and no one really paid attention to warnings about flooding. The very first year, a bad flood occurred making the residents seriously consider moving, but they chose to cope instead, eventually raising the street level to the height of a building's second story to try to avoid the frequent floods. Waters were so high in certain months that boats were used to get from building to building.

Levees were later constructed to try and keep the rivers in narrow channels. The last two miles of the American River were straightened out to try and get the sediments left by hydraulic mining to wash away. Today you can still see how some

of the older homes in downtown Sacramento were built as “high water bungalows”. The lower stories had dirt floors used mostly for storage, while the home itself began on the second story. (this practical type of construction for homes in a floodplain is being used again for some newer homes, especially up along the Sacramento River portion of the city).

The state and federal governments stepped in and built Shasta, Oroville and Folsom Dams during the 1940-1960s, the “Big Dam Era”. Flood control was an important part of these multipurpose dams. Unfortunately, huge storms which began to occur were much bigger than the historic levels used when designing the dams. Meanwhile, population boomed, as more and more people moved to the floodplain.

To make matters worse, channeling the river between levees with little riparian vegetation to absorb water meant that when floods did occur, they tended to be bigger and more damaging.

What now? Should the dams be made bigger? Who should pay? Should people not be allowed to move into the floodplain anymore? Should those already there be required to buy flood insurance? Engineers and politicians alike are struggling with these issues.



Farmers Versus The Miners – 19th Century

During the Gold Rush, water was used to blast away the sides of Sierra hills and mountains to get at gold, sending tons of sediment down tributaries to the Sacramento River. Those sediments settled out when the waters slowed, burying farmlands, filling in river beds, and causing flood waters to pour over the riverbanks more frequently. This destruction led to one of the nation's first lawsuits over environmental problems. In 1884, valley farmers sued the foothill miners to get them to stop using hydraulic mining.

Who do you think should have won? The miners built flumes and canals needed to channel water for hydraulic hoses. The former cleared their land, planted seeds, and developed their farms.

The judge sided with the farmers. Hydraulic mining essentially ended.

Rivers are Alive!

Local plants and animals you might see:

Great Blue Heron – *Ardea herodias*

Meet an expert fisherman! This top predator uses its long yellow bill as a spear, catching fish and frogs in shallow waters, and rodents like mice and gophers in nearby fields.

Great blue herons stand four feet tall, with wings that stretch 6 feet. They build platforms of sticks high in trees for their nests, often in colonies.



Where to see them: This common bird can be seen standing still with crooked neck or slowly stalking prey at the edges of local ponds, creeks, and rivers. Usually alone, herons can also be found out in dry fields.



Beaver – *Castor canadensis*

This large rodent can weigh as much as 100 pounds, though 30-40 pounds is more normal. They have small eyes and ears, very large front teeth, long brown fur, and large wide tails.

In the deep water of rivers, beavers build burrows in the banks, with an underwater entrance. In creeks and other shallow water, they often build dams of stick and mud.

Beavers are vegetarian, eating bark, twigs, roots, grasses, and other plants.

Where to see them: Beavers are found throughout the larger creeks and rivers of the Sacramento Valley and in the Sierra Nevada Mountains. The best time to look for these quiet animals is in the evening along the river edge, where you can see them pulling branches through the water. You can often hear the loud slap of their tail as they warn other beavers of your presence, just before they disappear underwater. Another sign you might see is a chewed stump. This is a successful reintroduction story they had vanished from the valley because of earlier overhunting.

Rivers in the Classroom

Plan a model community. Sketch an area that includes a mountain range, a valley, and a river. Show the best locations for houses, croplands, community businesses and recreation areas. Where will the water for the community come from, and how will floods and droughts be dealt with? How will riparian wildlife and plants that lived here originally be protected to prevent extinction? What will happen as the community grows?



Visit your school library to find information about changes in local irrigation practices prior to the Gold Rush. Report on dry wheat farming of the 1800s, the later changes in crops grown, and reclamation of dry lands by building dams and moving water around the state. Perhaps a simple skit would be fun.

Discuss the main farm crops in your county and the Central Valley. Do these crops or livestock need large or small amounts of water? Invite a county extension agent or a farm bureau representative to your class to discuss crop yields and the different kinds of crops in your area. Ask whether farmers/ranchers have all the water they need at an affordable price. Ask about water recycling and whether other things are being done by farmers/ranchers in your area to conserve water.



Cottonwood



Dragonfy



Chinook Salmon



Crayfish

Cottonwood – *Populus fremontii*

This native tree of the poplar family is very distinctive: It is up to 90 feet tall with a massive crown and bright green leaves that are rounded or even heart-shaped.



In the Spring, flowers of the cottonwood dangle in soft white cottony masses which blow away in the breeze once the seed has ripened.

Early explorers often mentioned the cottonwood, as an indication of water in arid lands, and with bark that could be used as food for horses.

Where to see them: Cottonwoods are a common tree along creeks and rivers throughout the valley, as well as in the Sierra foothills. Look for large trees with leaves that flutter with the slightest breeze, or the spring “cotton” they shed. Most cottonwoods you see will be large mature ones.

Dragonfly – *Anisoptera*

These large beautiful insects fly above ponds, creeks, and rivers feeding on smaller insects like mosquitoes.

Dragonflies have large spherical eyes and two pair of very efficient wings, making them successful predators.

The familiar dragonfly we see is the adult phase, which often lasts no more than a few months. Most of the dragonfly’s life is spent underwater as a nymph – a wingless larval phase. Equipped with jet propulsion, these nymphs are also ferocious predators, catch-

ing other underwater insects with a unique extendable lower lip.



Where to see them: Dragonflies are easy to spot, flying near most bodies of water in the Sacramento Valley. They also can be found perching on nearby plants. As nymphs they can be found in river riffles, often clinging to rocks. There are over 60 species of dragonflies in California. Damselflies are very similar, but are daintier with eyes that stick out to the sides.



Chinook Salmon –

Oncorhynchus tshawytscha

Often called “king” salmon in the Sacramento region, Chinook is the name preferred, and used throughout the United States and Canada. These are the same salmon that are caught in the ocean and rivers by fishermen in Alaska and the Pacific Northwest.

Salmon are one of several native fish that are anadromous. They are born in a freshwater creek or river, then swim down stream to live in the salty waters of the ocean. They live in the ocean for two to five years, then return to the freshwater to spawn – to mate and lay eggs.

They miraculously return to the same river or creek where they were born. After spawning

they die, and the cycle is repeated.

Adult salmon scoop out a nest in river gravels to lay their eggs. These nests, or redds, can be disturbed by people, or animals accidentally as they step on the eggs and young fish.

Where to see them: Although their numbers are greatly reduced because of pollution, diversion pumps, and loss of spawning habitat to dams, you can still see salmon returning to spawn in both the American and Sacramento Rivers.

One good place to look for them is in the American River’s riffles between Watt Avenue and Hazel, between the months of October and December. During those same months, both sides of the river are often lined



with people fishing for them just below Nimbus Dam. You can also see them at the Nimbus fish hatchery, where about a fifth of the salmon in the American River now spawn.

Crayfish (Crawdad) –

Orconectes

This reddish brown crustacean looks like a small lobster, with jointed legs, two pairs of antennae, and front claws. It makes burrows in the stream banks or under rocks, concealing itself, facing out, to watch for food.

Small fish, snails, and insects like dragonfly larva are food for the crayfish. It is able to walk or swim in any direction – forwards, backwards, or sideways.

Crayfish grow by molting – casting off the hard outside cov-

ering and growing a larger one. The back part of their body is flexible, which helps with swimming.

Where you can see them: Crayfish can be found hiding or walking along the bottom of many creeks, streams and rivers in the Sacramento area. Small bits of reddish shell in animal scat near rivers tell you crayfish live there.

5 Ways You Can Help

Everyone can make a difference when it comes to protecting rivers. Here are some things you or your class can do to help. Can you think of others?

1. Conserve Water. Contact your local water provider to find ways to conserve water indoors and outdoors.

2. Get Involved. Contact a group in your area that is working on river conservation and ask how you might help. Write to your state legislator or U.S. representative and express your concern for the health of rivers in your area.

3. Go Natural. Use natural fertilizers on your lawn and garden instead of chemicals. Grass clippings left on the lawn will fertilize it and it doesn't cost a thing! Compost is great for your garden. Contact your local cooperative extension for a free composting workshop.

4. Don't Litter. Do not throw garbage into your local waterways or into the street. Also encourage your friends to throw garbage in appropriate receptacles. In addition, pick up trash when you see it on the ground. When it rains, the trash gets washed through the storm drains right into the water.



5. Use Less Electricity. Turn off lights when you aren't in the room and encourage your parents to buy special light bulbs and appliances that use less energy. Less demand for electricity can mean fewer dams needed for electrical power.



What is your idea?

Chad Pregracke: Cleaning up rivers one piece at a time



Tires, barrels, even refrigerators. These are just a few of the many items people dump near rivers. Thousands of pounds of

trash every year are left behind. Now, thanks to Chad Pregracke, that trash is disappearing. Pregacke grew up along the banks of the Mississippi River. He swam and fished in its waters, and enjoyed the water rushing by his back yard. He never noticed the garbage accumulating around him until he became a commercial diver during high school and college. He could no longer ignore all the trash.

Chad went on to obtain sponsorships from corporations, a barge to collect the trash, and thousands of volunteers to help. It has become a full time job and his passion. At first he believed that his youth was an obstacle to reaching his goals.

He has come to realize that it is actually an asset. Now in his twenties, he has founded a non-profit organization called "Living Lands and Waters" which has a million dollar budget and has

"I didn't like what I was seeing and I just started to pick stuff up."

gone on to clean up trash at several other rivers around the country. "People want to see young people succeed," he says.

To that end he encourages kids to get involved in environmental projects, and he also urges young people not to be shy asking for the help of adults to find ways to make a difference.

In his river work, Chad has seen first hand how individuals can make things better. "The great thing is that the garbage is not coming back", he says. "People are becoming aware of the problem and they are not dumping as much."

The key to real change is making a start, however small, being an inspiration to others, and from there, running with it.

www.livinglandsandwaters.org

Local Kids: Helping Watersheds, Here and Abroad

In the upper reaches of the American River Watershed, about 40 kids from four different El Dorado County high schools gather every Fall for W.E.S. – Watershed Education Summit. Working in teams side by side with professionals, they collect aquatic macroinvertebrates (bugs in the water), measure various water quality factors, conduct “pebble counts,” record locations of large woody debris (important for critter habitat), survey the banks of the streams, record the extent of canopy (shading from plants), and in general monitor the health of the streams. The intensive three-day weekend in the mountains is a combination of hard work and fun. “I love getting to be outside working on something that really makes a difference,” Eliza Lubetkin, Union Mine High School.

All the data is actually used by people making decisions about the river at the National Forest Service.

In 2004, eleven of the W.E.S. students had the incredible opportunity to travel to Mongolia and Siberia. They brought water quality testing equipment, along with the expertise in using it, to high school students in a small town on the banks of Lake Baikal, a mile-deep, 400 mile long lake with a polluting pulp mill on its shores. During the three and a half weeks there, they met with various government officials, stayed in the homes of Siberian families, visited a yurt on the steppes of Mongolia, and experienced the Trans-Siberian Railway.



“I love getting to be outside working on something that really makes a difference.”

- Eliza Lubetkin,
Union Mine High School



Local and Russian teens working together in Siberia.

What Can YOU Do?

There are many opportunities where local teens can volunteer to help their watershed(s). Here are a few to consider:

American River Wildlife Count

Join other volunteers on the first Saturday in December to cover the American River Parkway by foot or canoe listing all the species of birds and other animals sighted that day. Researchers use these valuable data collected over many years as an indicator of changes occurring in wild life populations. Even beginners can help. Visit American River Natural History Association at www.arnha.org/annualevents.html to learn more.

Great American River Clean Up

Participation is a real contribution to the health of the Parkway and river. Removing trash and debris prevents pollutants from entering the watershed, harming the wildlife, or creating hazards for recreational users. Additionally, keeping the Parkway clean protects ocean life by preventing trash from being washed downstream during the winter rains. Volunteers collect 20 tons of trash from the parkway and river bottom every year! <http://www.arpf.org/garcu.htm>

Planting native vegetation/watershed restoration

The American River Conservancy in Coloma can always use help with their watershed restoration projects in El Dorado County. You can help

plant acorns or other native vegetation, remove invasive weeds, or pick up trash from rivers and streams. Tabling at various community events is another possibility. To volunteer visit www.arconservancy.org

Creek Week

Be part of an area-wide volunteer effort to improve and enhance our urban waterways. www.creekweek.net.

More Volunteer Opportunities

Here are just a few locations where students can help and make a difference. Check out your neighborhood for other volunteer opportunities:

- American River Water Education Center (ARWEC) - www.usbr.gov/mp/arwec
- Effie Yeaw Nature Center - www.sacnaturecenter.net
- Placer Nature Center - www.placernaturecenter.org
- Roseville Utility Exploration Center - www.roseville.ca.us/explore



Rivers in the News

One way groups spread the word about environmental issues is to create posters that illustrate a particular problem. Find an article in the newspaper that discusses a local environmental problem involving a river, drinking water or fresh water ecosystem. Use photos and text from the newspaper to create a poster aimed at heightening awareness of the problem. Hang it in your school or in a public place in your community.

Job Opportunities

Starting out as a student intern is an excellent way to try different careers and see if they fit with your interest and educational choices. Another bonus can be earning college credits while in an internship.

Rebecca contributed to the team at BBWTP in several ways – the water sampling, analysis, and reporting areas of water conservation, she was the lead person in creating a detailed presentation that provided information on the water treatment process at



Rebecca Abbott, a University of California, Davis, civil engineering student was interviewed and selected as a student intern for BBWTP lab. Rebecca's educational background was strong in math and sciences and complimented her engineering courses.

Rebecca had interest in the hydrology (water) field of engineering, so the student laboratory internship was a perfect fit for her.

BBWTP. This presentation was utilized by the BBWTP management team at a conference held in Phoenix, Arizona.

Rebecca graduated from University of California, Davis and is now living in San Diego and working for a prestigious engineering firm that has several offices throughout the United States. Her specialty is in water projects.

The field of water has limitless careers.

Wonder What Kinds Of Water-Related Careers Are Out There? Here's A Sample:

Watersheds: Love indoor and outdoor activities? Hydrologist studies water resource availability, flows, and related environmental issues.

Treatment/water quality: Is chemistry your passion? Laboratory Analyst – takes samples of water from various points of water production and service points in the water mains, performs lab testing of water quality and treatment to ensure your water meets drinking standards.

Distribution: Like designing and building things? Engineer designs water systems, bridges, dams, and treatment plants.



Local youth monitoring a mountain creek.

Conservation: Conservation Coordinator - designs and implements public outreach programs on water conservation, and conducts home and landscape water audits.

Customer Service: Always trying to help others? Field Technician - provides office and field assistance to customers.

Media: Love to write or take photos? Journalist/Photographer – writes articles about topics that impact the environment or photographs the impacts of climate change or droughts.



The Sacramento River watershed covers approximately 27,000 square miles.

Streams that begin in the Sierra Nevada, the Coast Ranges, the Cascade Range, and the Modoc Plateau all flow into the Sacramento River. The American and Feather Rivers are just two of the many streams that feed the Sacramento River.

Credits

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Pacific Ocean