California Watersheds:

Our Vital Link

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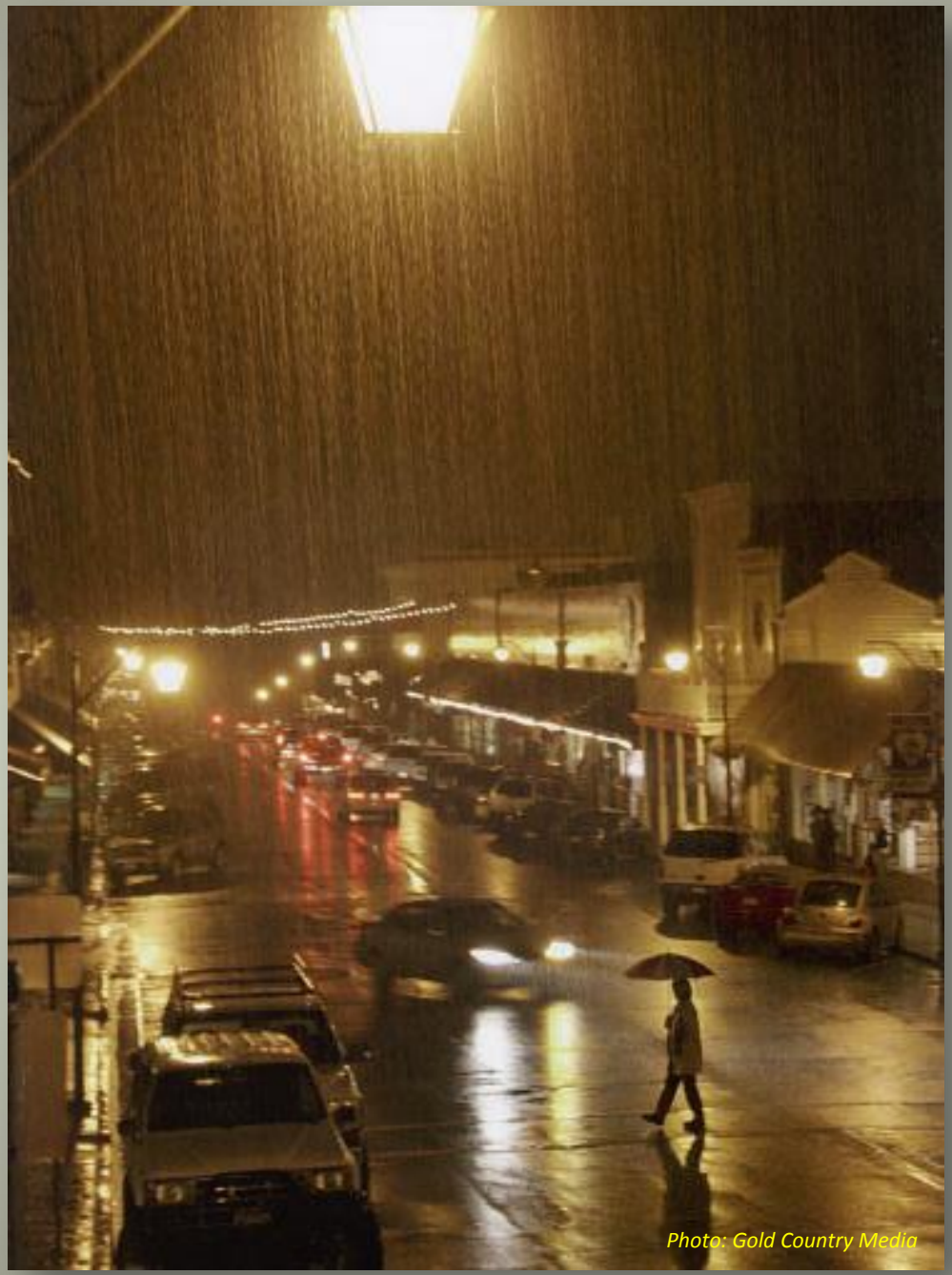
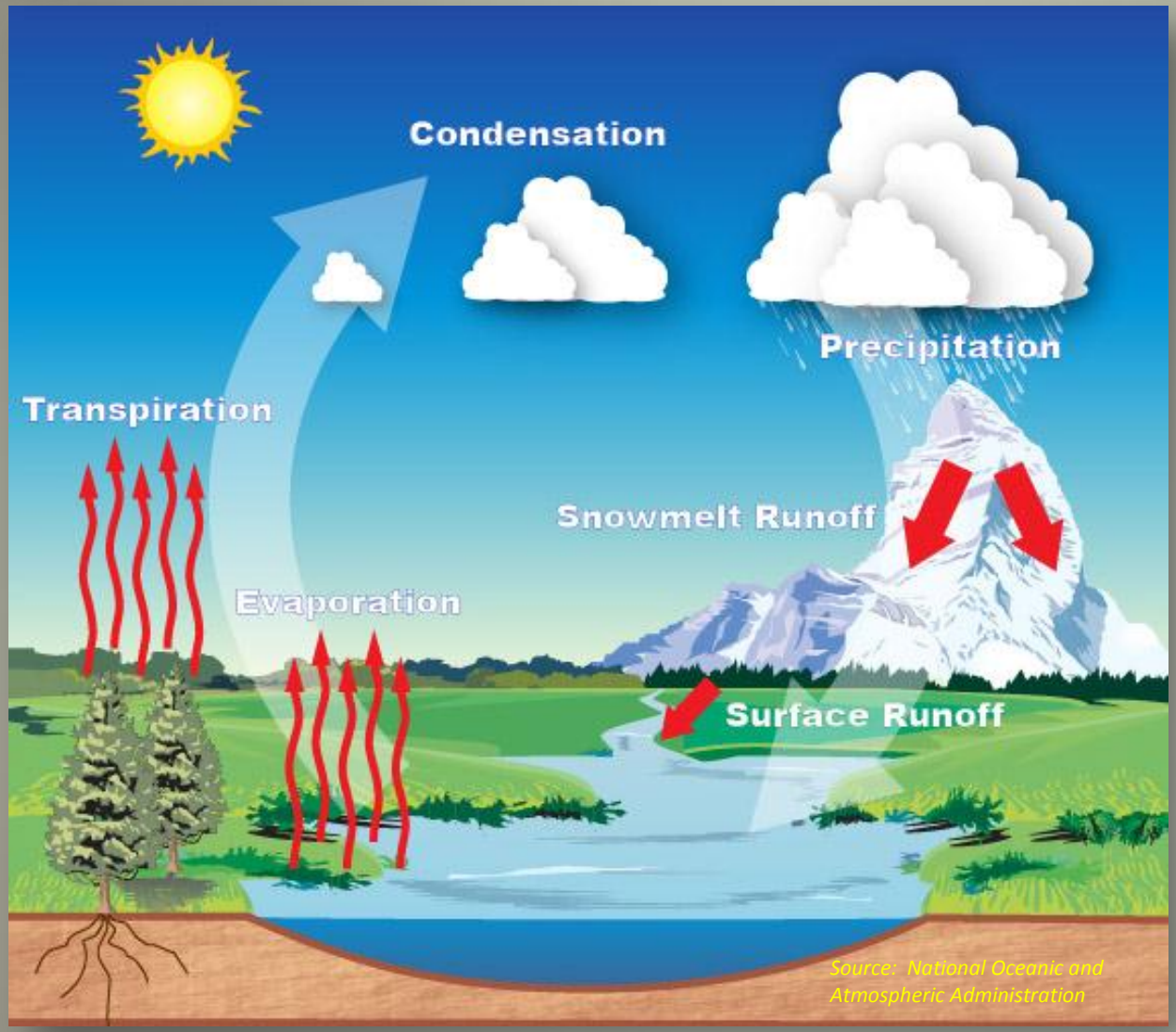
CALIFORNIA CONSERVATION

WATER EDUCATION FOUNDATION

Ever wonder where the rain goes?



What happens to water as it travels downhill?



Much of rainfall gets absorbed by the ground and by plants, or it evaporates back into the sky.

This is known as the hydrologic cycle or water cycle.

Where does the rest end up?

It drains into lakes and rivers via smaller creeks and tributaries.

All of these bodies of water plus the land that surrounds them are a watershed.

Watersheds are all around us. You're sitting or standing on one right now.

What is a Watershed?

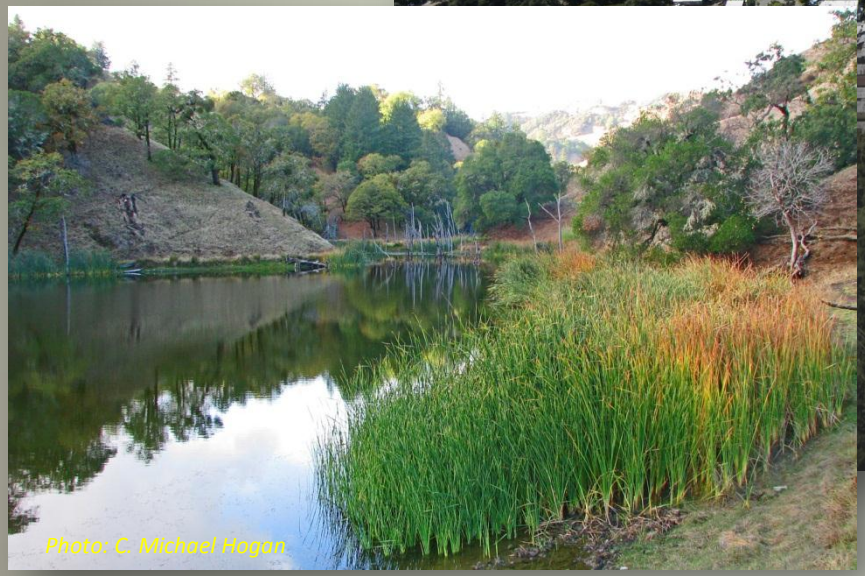
A watershed is the area of land that water – rain or melted snow – flows through. That includes water that runs off downhill into a stream, river, lake or ocean.

Other words to describe a watershed are a catchment or river basin.

There are many types of watersheds in every type of environment possible:

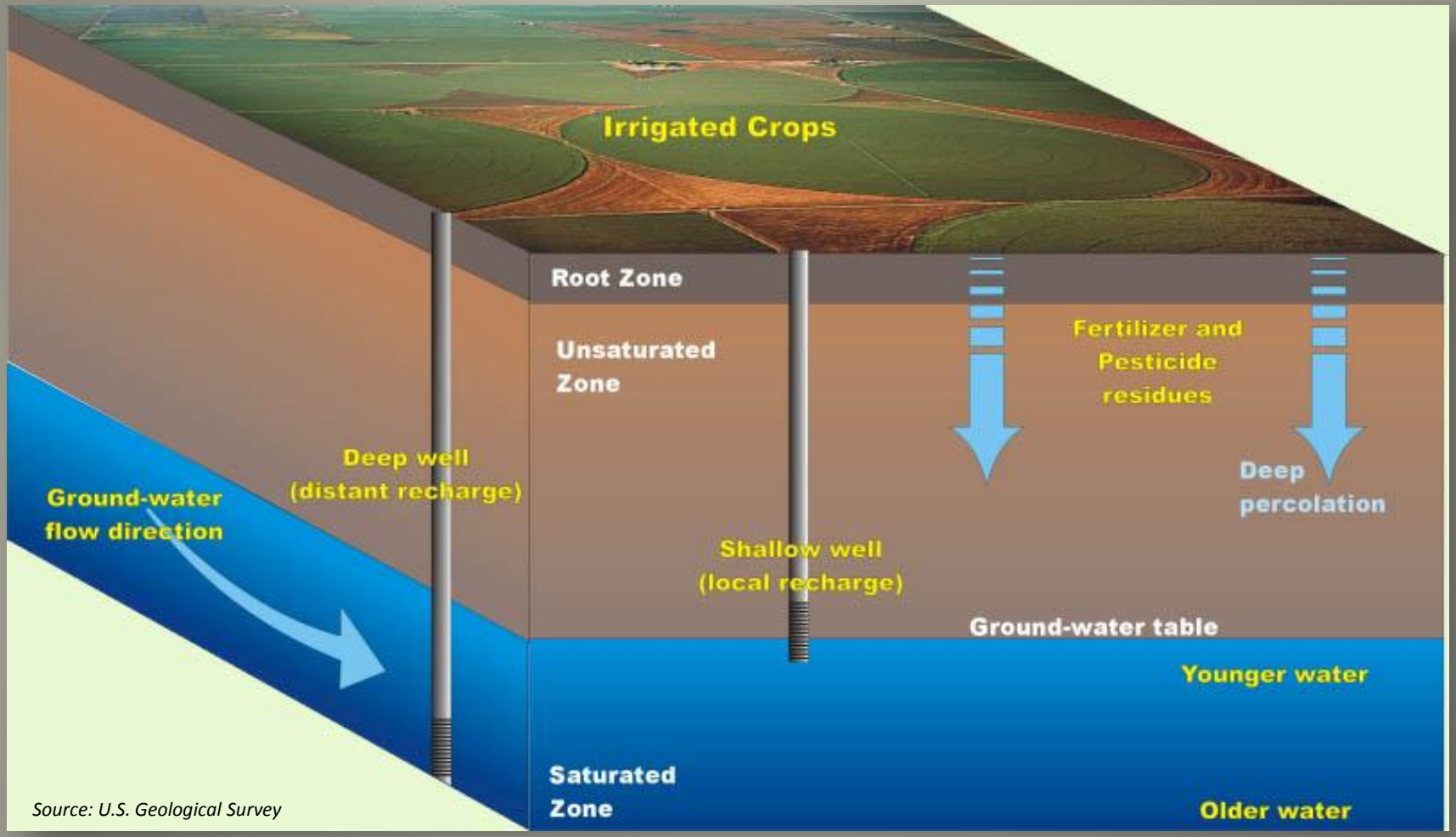
- Forests
- Grasslands
- Coast
- Deserts
- Cities
- Neighborhoods
- Farms and Ranches

Photo: Natural Resources Conservation Service



Watersheds come in all shapes and sizes. A watershed can be very large; it can drain thousands of square miles, such as the Sacramento Valley.

Or it can be very small, such as the pond at your neighborhood park.



Besides surface water that flows through a watershed via streams and rivers, groundwater exists beneath it ... in the soils, gaps and cracks in rock underground.

A small watershed that is inside a larger watershed is referred to as a subwatershed**.**

Watersheds fit together like puzzle pieces to form our land masses. There are millions of watersheds in the world – and thousands in California alone.

Watersheds are Connected

Every stream, tributary, or river has an associated watershed …

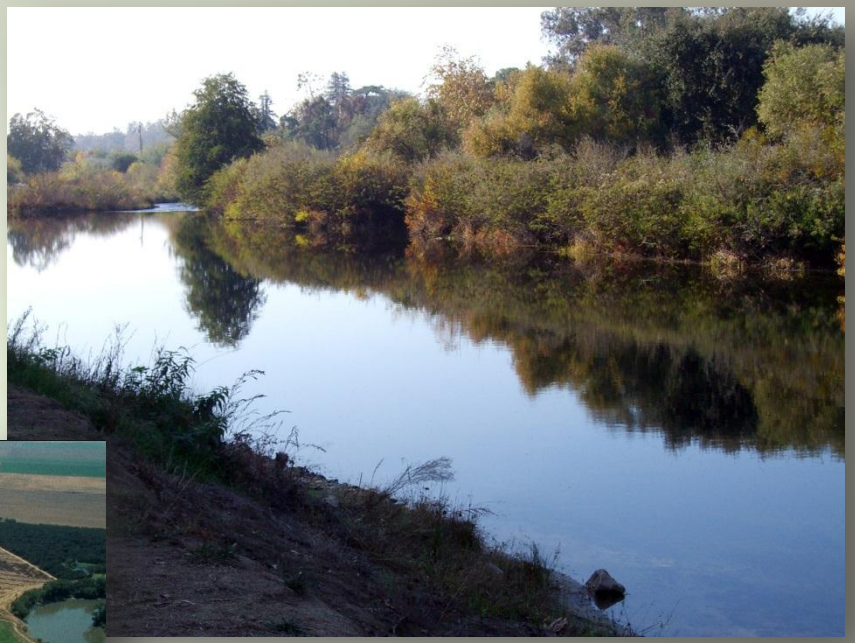


Photo: California Department of Water Resources

… and small watersheds connect together to become larger watersheds.

Watersheds Include Both Surface Water and Groundwater

Connectivity is the term that refers to the physical connection between streams, creeks and rivers and the land around them.

It also refers to the connection between water flowing above ground and groundwater below.

How to Find Your Watershed on a Map

On a map of your area, look for the stream located closest to you.

If you trace the stream to its beginning, you will reach the headwaters.

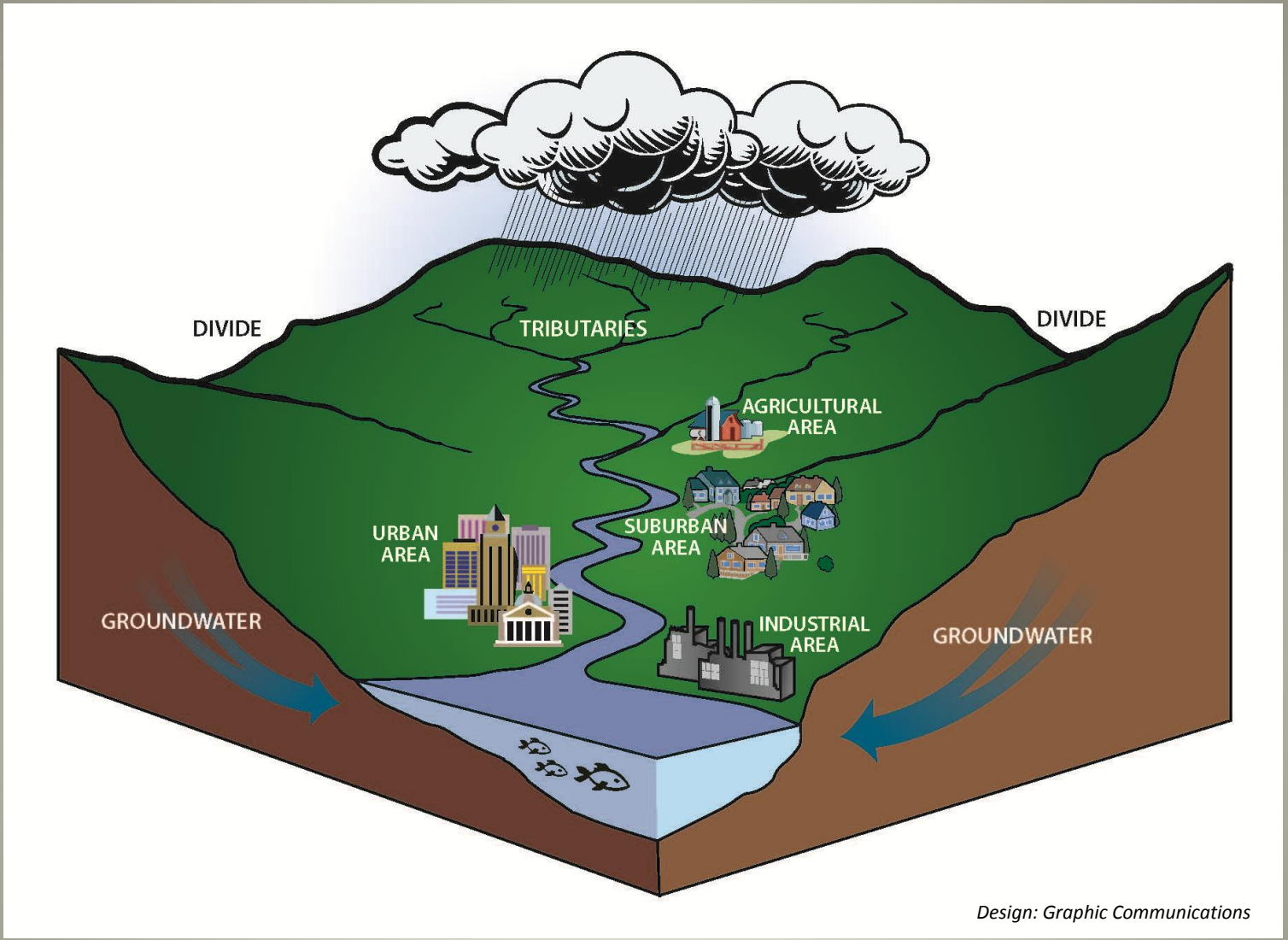
If you trace it downward you will eventually reach a larger stream or river, a lake, or the Pacific Ocean.

The area around the stream is part of your watershed.

Why Should You Care?

A watershed is more than just a piece of land that water flows through. It is a place where people and animals live, and plants and trees grow.

All life is dependent on a healthy watershed.



As water flows downhill, it moves over land and provides water for our urban, farming and environmental needs.

Watersheds provide our drinking water.

Photo: U.S Department of Agriculture

Photo: Chris Austin

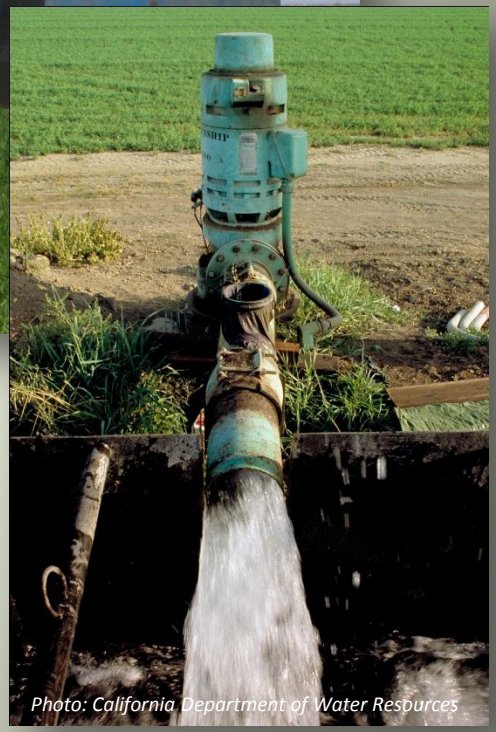


Photo: California Department of Water Resources

Surface water and groundwater from watersheds are used to grow our food.

Watersheds include the streams, rivers and lakes we use for fishing, boating and swimming.

Healthy watersheds provide habitat for wildlife.

Watersheds are the Basic Building Blocks of the Natural Environment

A watershed has important hydrologic functions:

- It collects water from rainfall
- It stores water of various amounts and for different times
- It releases water as runoff
- It cleans by filtering pollutants

Healthy watersheds also provide habitat for flora and fauna.
This is an ecological function.

Plants and animals depend on certain physical conditions – temperature of water and soil – and ecological processes – water flow, nutrient recycling and food-chain balance – for their survival.

We can harm a watershed by our activities.

For example, buildings and parking lots prevent water from seeping into the ground. Instead, it runs off quickly away from the area.

This results in less recharge of groundwater and greater chance of erosion. Also, it increases the chance of pollutants getting swept into the mix.

The Effects of Erosion

Fast-flowing water can cause erosion where land – dirt, top soil and sediment – is flushed from the watershed.

Erosion can destroy vegetation and make an area uninhabitable for wildlife.

Downstream, the sediment from erosion can lead to flooding and property damage. The loss of nutrient-rich topsoil can make land barren. It's like stripping frosting from a cake.

The Big Picture – USA

California is one of 21 large watershed regions in the country as determined by the United States Geological Survey (USGS).

USGS Region 18 includes parts of California, Nevada and Oregon.

Water ultimately ends up in the Pacific Ocean or the Great Basin Region (stretching from Oregon to Nevada) and other closed basins in California.

Hydrologic Regions

North Coast

Heavy rainfall makes the North Coast region the most water-abundant areas in California. This rugged region features redwood forests of the California Coast Range, the Klamath Mountains and about 425 miles of Pacific Ocean coastline. Overall, is about 98 percent forest and rangeland.

North Coast rivers provide about 41 percent of the state's total natural runoff, and more than half of the flows run freely to the ocean as natural runoff. Major rivers are the Klamath, the Eel, the Smith, the Russian, Mad and Mattole.

Hydrologic Regions

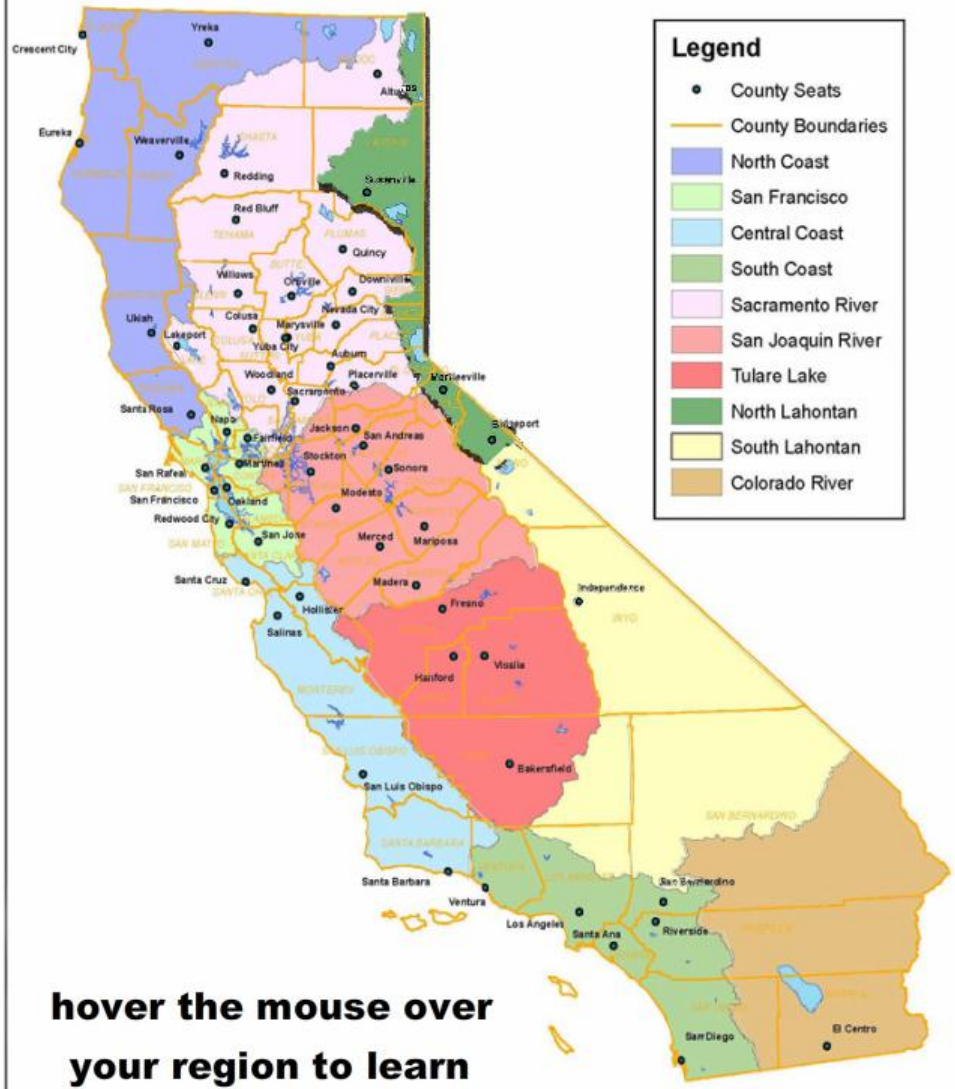
Sacramento River

The Sacramento River region includes the state's largest river - the Sacramento River – that provides about 80% of the inflow to the Delta and provides essential habitat all runs of Chinook salmon and steelhead.

Regional wetlands provide important wintering areas along the Pacific Flyway for many varieties of waterfowl. The region also supports about 2.2 million acres of irrigated agriculture (22% of the state total).

Major tributaries include Putah Creek, American River, Cache Creek, Feather River and its major tributaries Bear River and Yuba River.

Hydrologic Regions



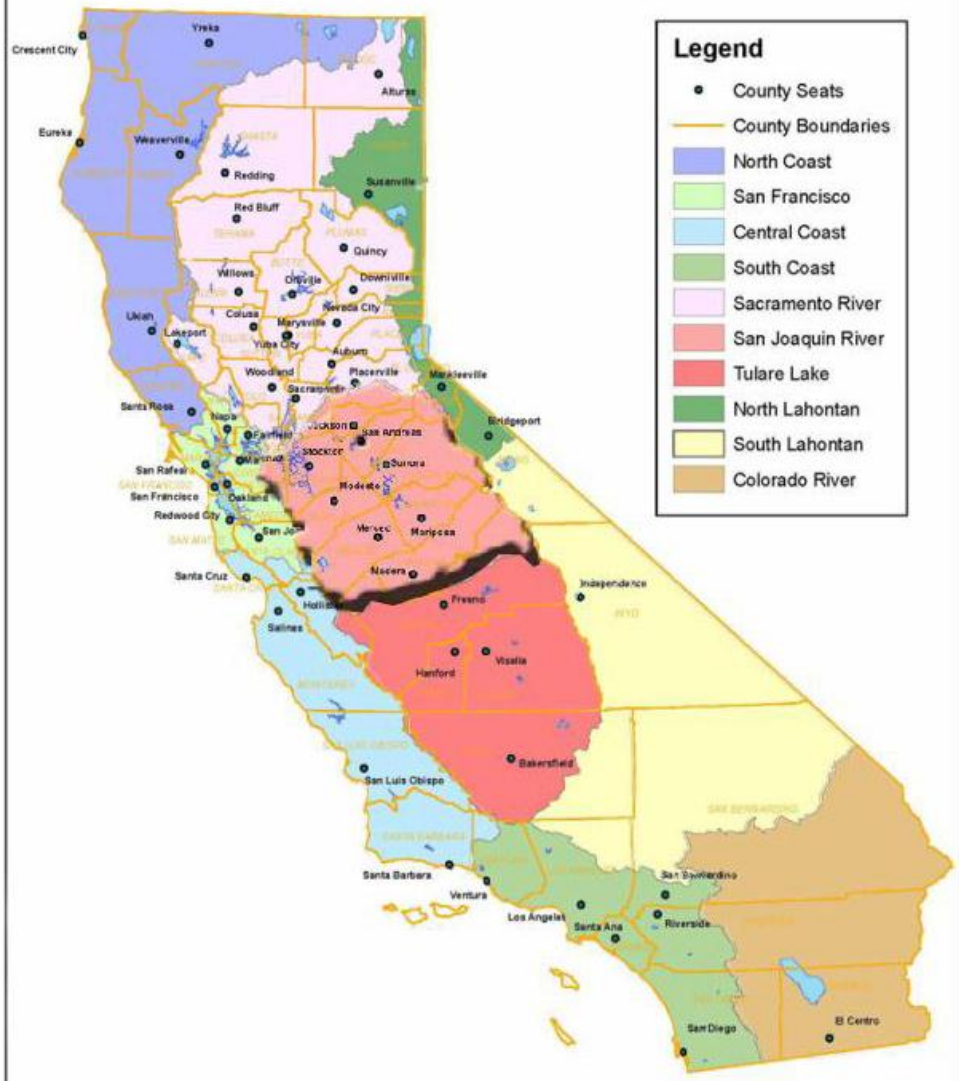
hover the mouse over your region to learn more

North Lahontan

Much of the region is national forest in the eastern Sierra Nevada and southern Cascade ranges. The most notable feature of the region is Lake Tahoe, and all surface water and snowmelt from the mountains drain eastward toward Nevada.

The northern part of this region is primarily arid high desert at up to 5,000 feet. At the southern end of the region, the ecosystem is sage desert with irrigated pasture and alfalfa fields bordered by forested mountains to the west. Recreation and tourism, as well as cattle-ranching, pasture and alfalfa crops are primary industries.

Hydrologic Regions



San Joaquin River

This region is in California's Great Central Valley. About half of the Delta is included in the region. The San Joaquin River is roughly 300 miles long, one of the state's longest rivers. The Merced, Tuolumne, Stanislaus, Calaveras, Mokelumne, and Cosumnes rivers are tributaries of the San Joaquin River and drain the Sierra Nevada, about 32,000 square miles of watershed. The San Joaquin Valley is recognized as one of the most important and productive agricultural areas in the United States with about two million acres of irrigated cropland.

Hydrologic Regions

San Francisco

The San Francisco region covers approximately 4,500 miles of numerous watersheds that drain directly into the San Francisco Bay and Pacific Ocean. The region features the Sacramento-San Joaquin River Delta and the San Francisco Bay, the state's most important estuary.

Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America, providing more than 10% of California's remaining natural wetlands.

In the north in Napa, Marin, Sonoma and Solano counties, grapes, fruit and nut trees are primary crops with dairy and livestock operations.

Hydrologic Regions

Central Coast

The dramatic Central Coast coastline features sea cliffs, foggy bays and coves, redwood forests that transform into inland stream-cut canyons with oak tree stands and chaparral-covered hills and grasslands inland.

Most of the Central Coast region is within the southern Coast Range. All of the rivers within the entire region drain into the Pacific Ocean. Coastal watersheds include the Little Sur and Big Sur rivers and numerous coastal streams. The Salinas River watershed, which is the largest in the region, drains more than 40 percent of the region. The region is primarily pastoral and agricultural.

Hydrologic Regions

Tulare Lake

The Tulare Lake Region is one of the nation's leading agricultural production areas, growing a wide variety of crops on about 3 million irrigated acres. Major rivers draining into the Tulare Lake region include the Kings, Kaweah, Tule, and Kern rivers. All of the Tulare Lake Region's streams are diverted for irrigation or other purposes, except in the wettest years. Tulare County also is the largest dairy county in the state. The California Aqueduct extends the entire length of the west side, and the Friant-Kern Canal runs along the eastside.

Hydrologic Regions

South Lahontan

Much this region has an active volcanic and seismic history, including prominent mountain ranges and dormant lava flows in the north. The region boasts of the highest and lowest elevation points in the continental United States: Mount Whitney at 14,495 feet and Death Valley at 282 feet below sea level. The South Lahontan region is largely desert and mountain with a history of ranching and some irrigated agriculture. Major lakes and reservoirs include Mono, June, Convict, Crowley lakes in the north and Lake Arrowhead, in the south.

Hydrologic Regions

South Coast

This region is California's most urbanized. About 54% of state's population lives here in all of Orange County and portions of Ventura, Los Angeles, San Bernardino, Riverside and Santa Diego counties.

Most of the region's 19 major rivers drain into the Pacific Ocean, and many terminate in lagoons or wetland areas that serve as important coastal habitat. The 2,800-sq mile Santa Ana River Watershed is the largest coastal stream system in Southern California. Its headwaters are in the San Bernardino Mountains, yet most of the river channel in Orange County is concrete-lined for flood control.

Hydrologic Regions

Colorado River

Numerous faults in this arid region, including the San Andreas, are responsible for the mountainous terrain in the north and the large valleys and plains in the south.

The region has two of the state's largest public parks: The 600,000-acre Anza-Borrego Desert State Park west of the Salton Sea and the Joshua Tree National Park in the Little San Bernardino Mountains. Despite the arid conditions, important wetland areas do exist, including the Salton Sea, the Southern Mojave Watershed, Havasu-Mojave Lakes Watershed, Piute Wash, Imperial Reservoir, and Lower Colorado River.

California Watersheds

Looking at California on the Watershed Level

Breaking the California regions down to a watershed level, the Department of Conservation has identified 190 watersheds. And that doesn't include sub-watersheds!

To find out more about all of these watersheds from the Department of Conservation, click here.

Laws to Protect Watersheds

Photo: Orange County Archives

- In 1954, a new federal law – the Watershed Protection and Flood Prevention Act – required state and federal agencies to work together in flood prevention efforts.

- In 1972, the federal Act was amended to add conservation efforts.

- In 1996, terms were changed regarding loans for groups carrying out watershed preservation and cleanup projects.

For more information from the U.S. Fish & Wildlife Service, click here.

The Federal Clean Water Act

The heavily polluted Cuyahoga River in Cleveland caught fire many times in the 1950s.

In 1969, a likely spark from a passing rail car caused oil-soaked debris in the river to flare.

1952. Photo: Cleveland Press Collection. Cleveland State University Library

Many say the fire was the catalyst for Congress to address water pollution and pass the Clean Water Act in 1972 and for the creation of agencies like the Environmental Protection Agency (EPA) which regulates pollutants allowed to be discharged into water.

Watershed Issues

Watersheds face many challenges. Among them are:

- Land-based Pollutants
- Recreation
- Development

- Water Quality
- High Intensity Fire
- Unhealthy Forests

Strategies to manage watersheds aim to address issues and solve problems.

The most success is when partnerships form among state and federal agencies, local governments, nonprofits and community groups.

Routine testing is an important way to measure water quality.

Watershed Issue: Water Quality

Pollution of a watershed can degrade an entire aquatic ecosystem, including harming animals, plants and people.

And anything you dump down drains can end up in a creek, stream or river.

What Agencies Look Out for Water Quality in California?

In addition to the federal Clean Water Act, water quality in California is governed by the **Porter-Cologne Water Quality Control Act**.

The State Water Resource Control Board (State Water Board) and its nine statewide Regional Water Quality Control Boards (Regional Water Boards) have overall responsibility for water quality protection by enforcing water quality standards the agency develops.

In addition, the California Environmental Protection Agency develops and enforces state laws to ensure clean water.

Regional Boards:

1. North Coast
2. San Francisco Bay
3. Central Coast
4. Los Angeles
5. Central Valley
6. Lahontan
7. Colorado River Basin
8. Santa Ana
9. San Diego

Types of Pollution: “Point Source”

When pollution flows from a specific source or site, it is called **“**point source.”

Examples are: Improperly treated sewage and certain industrial plants, livestock facilities, logging operations, mining operations, landfills and others.

Source: NOAA

Source: EPA Region 9

Iron Mountain Mine Cleanup

From the 1860s through 1963, the 4,400-acre Iron Mountain Mine, near Redding, was mined for iron, silver, gold, copper, zinc and pyrite.

By 1940, the mine’s toxic runoff was dumping a ton of dissolved metals a day into local creeks and the Sacramento River, polluting a drinking water supply for thousands of people and occasionally killing salmon in the river.

In 1983, EPA designated the Iron Mountain Mine as a Superfund site. Through the years, cleanup has focused on reducing the toxic runoff and treating water flows to remove contaminants. A treatment plant now captures 98 percent of the toxics coming out of the mine.

Types of Pollution: “Nonpoint Source”

“Nonpoint source” is the most common type of water pollution today, primarily because point sources have been or are being cleaned up.

Nonpoint refers to widespread sources that are difficult to pinpoint. Individually, each may not be a serious threat, but together they may be a significant threat to water quality.

Examples are: Septic systems, road drainage, agricultural runoff, residential runoff – like lawn fertilizers – and underground fuel storage tanks. Most are not required to have a permit.

The best way to maintain water quality is to limit the amount of pollution going into the water. The first step is to measure where the pollutants are and how badly the water is contaminated.

The Clean Water Act requires states to list waterways that are impaired, meaning they are so polluted they could pose health hazards and impact uses, such as recreation and fishing.

For more information about the Surface Water Ambient Monitoring Program (SWAMP) from the State Water Resources Control Board, click here.

Case Study: Keeping Trash off the Beaches in Southern California

Urban trash flushed from the Los Angeles River system to the beach and out to sea has been a serious problem, especially around Long Beach.

The garbage travels from miles upstream after it's tossed aside along streets.

Photo: Los Angeles River, California Regional Water Quality Control Board, Los Angeles Region

Case Study: Keeping Trash off the Beaches in Southern California

Not only unsightly, the pollution ruins coastal habitat, injures wildlife and poses health threats.

Case Study: Keeping Trash off the Beaches in Southern California

To stop the trash before it gets into the river, a coalition of cities and water agencies has installed thousands of trash screens beneath nearly every storm drain that flows into the lower Los Angeles River.

Those screens are expected to capture 840,000 pounds of trash each year!

Case Study: Increasing Clarity in Lake Tahoe

Lake Tahoe is one of the largest, deepest, and clearest lakes in the world.

However, since 1968, deep-water clarity has been reduced by approximately 30%, from 100 to 66 feet.

Photo: Chris Austin

Increasing Clarity in Lake Tahoe

Mainly, four sources are causing the problems: pollutants found in urban stormwater runoff, forest runoff, stream erosion and “acid rain.”

Today federal, state and local agencies and the public have teamed up to clean up the lake and keep pollutants out of the water.

The focus on urban stormwater runoff is Job No. 1 as it is both the greatest source and the best opportunity to control the pollutants.

The Secchi disk has been used to measure clarity at Lake Tahoe since 1968 with measurements taken every 10-14 days.

Increasing Clarity in Lake Tahoe – the Tahoe Regional Planning Agency

Encouraging economic growth while protecting Lake Tahoe has been a push-and-shove effort for more than 100 years. How could the health of the lake be protected while allowing development to prosper?

In 1969, Congress approved an agreement between the governors of California and Nevada and created the Tahoe Regional Planning Agency (TRPA), the first bi-state regional environmental planning agency in the country.

In the early 1980s, the agreement was revised, giving TRPA authority to adopt environmental quality standards and to enforce ordinances. Today's strategy includes building community partnerships and continuing to streamline processes.

To learn more about TRPA from its website, click here.

Photo: Chris Austin

Case Study: Reducing Nutrients in Newport Bay Watersheds

The Newport Bay watershed covers an area of 154 square miles in Orange County, and is home to 640,000 people.

One problem has been excess nutrients that come from fertilizers used in gardens, lawns, large nurseries and agriculture. Those nutrients cause algae blooms.

Each alga is short-lived, but it creates dead organic matter that starts to decay.

The decay process consumes dissolved oxygen in the water, and animals and plants may die off in large numbers.

Case Study: Reducing Nutrients in Newport Bay Watersheds

Government agencies, water districts, community groups and businesses are all involved in solving this problem.

The Irvine Ranch Water District now operates a natural treatment system, which helps remove many nutrients from San Diego Creek before it empties into Newport Bay.

Small man-made wetlands have been created throughout the watershed to capture urban runoff and smaller storm flows. Contaminants are naturally removed and prevented from reaching the Upper Newport Bay. In addition to improving water quality, the wetlands also provide riparian habitat to the urban environment.

For more information from the Irvine Ranch Water District, click here.

Case Study:
Reducing Nutrients in Newport Bay Watersheds

Plant nurseries also have changed the way they do business. Nurseries represent the largest form of agriculture in the watershed and formerly contributed large inputs of nutrients into the watershed from their runoff. Today, many of these nurseries capture and reuse most or all of their irrigation water, which has substantially reduced nutrient inputs. This has decreased nutrient loads from about 65,000 lbs. to less than 1000 lbs. of summer discharge.

Photo of a sampling site in Upper Newport Bay in summer 1996, showing excessive growth of nuisance green algae.

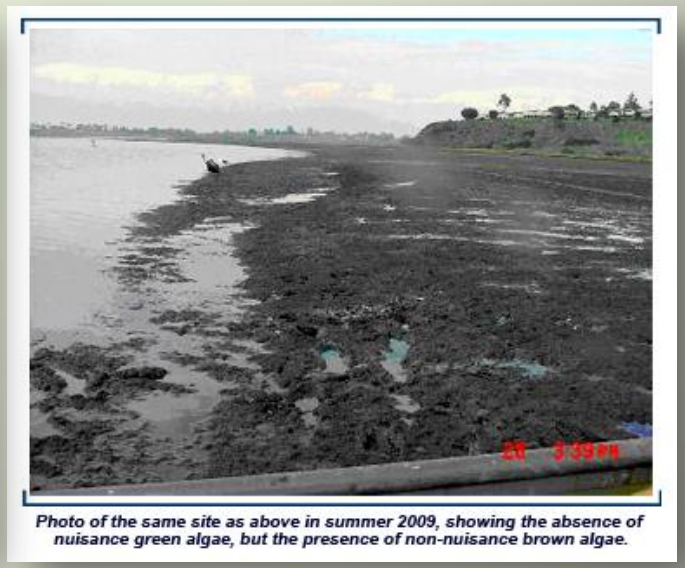


Photo of the same site as above in summer 2009, showing the absence of nuisance green algae, but the presence of non-nuisance brown algae.

The result of these efforts are watershed health has improved – there are fewer algae blooms and increased eel grass populations.

Photos: Orange County Public Works

Watershed Issues: Unhealthy Forests

Forests are water factories. Well-managed forests protect streamside areas known as riparian zones and have many benefits.

Who Cares for the Forest Watersheds?

Forests are managed, regulated and owned by many different entities:

- Federal, state and local agencies
- Tribes
- Private companies and individuals
- Nongovernmental organizations and community groups

Photo: U.S. Forest Service

Each of these entities has a different forest management strategy with different goals and challenges.

Tree cover and shade near streams help reduce water temperature and prevents sudden temperature changes. That benefits the fish and wildlife dependent on the stream and forest habitat.

A Healthy Forest and Erosion

Healthy forests also reduce flood risks because the ground can absorb water and slowly release it over time.

A healthy forest cuts down on erosion as the canopy – tree branches, needles and leaves – intercepts rainfall so it doesn't pound the ground below. And a forest floor with a covering of dropped needles and leaves further reduces the potential for erosion.

Healthy Forests: The Role of Low-Intensity Fire

Fire is a natural process and can be very good for forest health. Often, before the state was settled, lightning strikes sparked low-intensity fires that cleared forests of debris, underbrush and smaller trees.

Low-intensity fires typically burn through lower branches and clear dead wood from the forest floor. This provides ideal growing conditions and improves habitat for many species that prefer relatively open spaces.

Healthy Forests: American Indians' Use of Fire

California Indians burned parts of the watersheds in which they lived to promote a diversity of habitats.

Today, we use control burns, also known as prescribed burning, to manage and renew our forests.

Healthy Forests: The Role of Low-Intensity Fire

Yosemite Valley 1899

Yosemite Valley 1994

In the 20th century, policies dictated that low-intensity fires were to be put out to avoid damage to property and human life. But by quenching low-intensity fires that would clear the extra growth, forests became more susceptible to catastrophic fire.

As a result, forests that at one time featured open space and large trees now are overgrown with many more, smaller trees and underbrush.

Case Study: The Kings River Experimental Watershed Forest Health and Research Project

The KREW team monitors stream discharges and tests soils in order to learn more about the Kings River watershed.

In the southern Sierra on the headwaters of the Kings River, a 15-year study is ongoing to study the forest watershed. The goal is to determine the best practices to manage a forest.

The Kings River Experimental Watershed Forest Health and Research Project (KREW Project), which includes 15,000 acres, began in 2000 on eight subwatersheds.

Photos: Dr. Carolyn T. Hunsaker

Case Study: The Kings River Experimental Watershed Forest Health and Research Project

Scientists are hoping to answer questions that will guide future forest management actions:

- What is the effect of fire and tree thinning?
- How does prescribed fire affect the rate of soil erosion and soil health?
- Do stream buffers – the areas on both sides of a stream with restricted uses - protect aquatic ecosystems?

Watershed Issue: High Intensity Fire

High intensity, catastrophic wildfires are occurring more frequently because of many factors:

- Overgrowth in forests
- Variation in climate
- More industry operations in forestland
- Rural homes built in forested areas
- Land-use practices

High-intensity fires race from the ground to the treetops with towering flames and scorching heat. Not only do intense wildfires destroy forest habitat, they also impact water quality through erosion. After a fire, rain runoff captures soil and flows into streams, lakes and reservoirs.

Photo: Cameron Strandberg

Case Study: Getting the Upper Hand on Poway Lake Erosion

In October 2007, the Witch Creek Fire burned more than 7,000 acres in Poway in northeast San Diego County. The fire destroyed the natural habitat around Lake Poway, the water supply reservoir for the city's population of 50,500.

Work crews filled thousands of burlap bags with gravel to hold back erosion in the burned areas around Poway Reservoir.

Case Study: Getting the Upper Hand on Poway Lake Erosion

A turbidity curtain – plastic sheeting held up by a flotation device at the top and weighted at the bottom – stretched roughly a mile long in the lake formed a wall in the water that held back sediment.

The efforts were successful, and the watershed recovered after the fire.

Watershed Issue: Development in Rural Areas

The appeal of scenic landscapes, recreation and a rural lifestyle has spurred development in wildland areas – and near the headwaters of watersheds.

This has created added challenges, such as damaged habitats, invasion of non-native plants and animals, altered stream flows and increased fire risk.

Urban Development Alters Natural Watersheds

More recently, there's been a focus within city planning to restore segments of urban rivers to a more natural state.

Find out more information at the UCLA Institute for the Environment and Sustainability website

Urban development often involves removing plants, artificially changing the land surface and altering naturally formed waterways.

All of this impacts a watershed.

Urban Environments and Natural Watersheds

Today, some builders and communities are looking for ways to reduce the amount of pavement and restore natural functions of urban watersheds.


Photo: San Francisco Public Utilities Commission

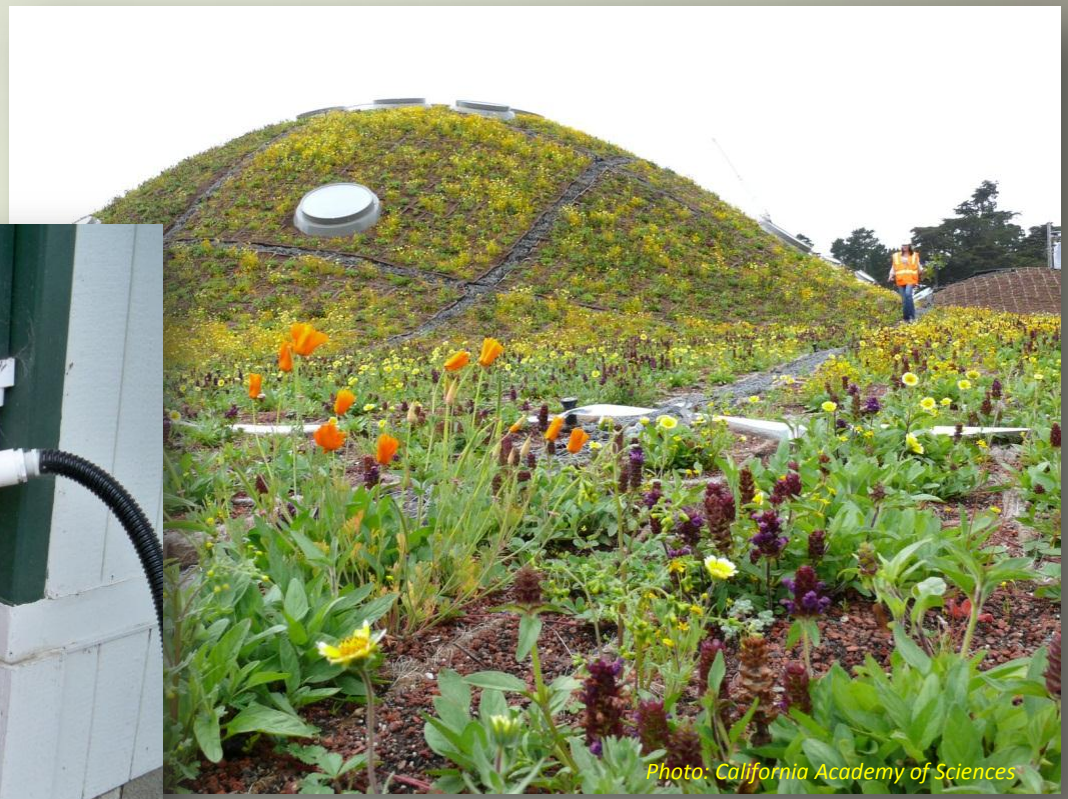


Photo: California Academy of Sciences

In San Francisco, barrels line up for rain harvesting (left), and the California Academy of Sciences building sports a green roof.

Case Study: Restoring Watersheds in San Francisco's Presidio

San Francisco's 1,480-acre Presidio served as a military post from 1776 to 1989 and has several watersheds. Since 1994, intensive work has gone into restoration.

The Presidio Trust - a US Government Corporation established by an act of Congress - is now removing some of these landfills and restoring the sites as native plant areas or forest groves.

For more information about The Presidio Trust, click here.

Case Study: Reclaiming San Francisco's Tennessee Hollow

At 270 acres, Tennessee Hollow is the Presidio's largest watershed. Once, spring-fed tributaries provided water for people. Today, the creek continues to provide wildlife habitat, although much of it is hidden beneath roadways and storm drains in neighborhoods and playing fields.

The restoration of Tennessee Hollow strives to revitalize the watershed and create a fantastic opportunity to experience an entire watershed, from springs to the San Francisco Bay.

Photos: El Polin (Presidio Trust)

Watershed Issue: Agriculture is an Important Factor in Watersheds

How to keep crops and livestock thriving and natural habitat healthy is a challenge.

California is the nation's top agricultural state, growing more than half the nation's fruits, vegetables and nuts. Throughout the state, 81,500 farms grow more than 350 crops on 25.3 million acres.

The state also leads the nation in milk production with more than 1.8 million dairy cows. The top crops are: Grapes, nursery products, almonds, lettuce, strawberries, tomatoes and rice. Specialty crops grown only in California include: artichokes, dates and olives.

Case Study: A Productive Relationship Between Rice Farmers and Wildlife in the Sacramento Valley

The Sacramento Valley has about 2,500 rice growers with about 525,000 acres in production and about 75,000 acres of managed wetlands.

Virtually all of the rice used in U.S.-consumed sushi is California grown.

Photo: California Rice Commission

About 7 million waterfowl travel through the Pacific Flyway, including about 60% of those in the Sacramento Valley.

Case Study: A Productive Relationship Between Rice Farmers and Wildlife in the Sacramento Valley

Rice farmers near Colusa are proving that rice production and wildlife can co-exist. Rice fields provide important habitat and attracts as many as 230 wildlife species.

A pilot program began in 2009 at the Davis Ranch, which has 3,500 acres of rice fields, includes changes in rice field management to enhance wildlife:

- Flatten the tops of berms between the rice fields
- Flood individual fields immediately after the fall harvest rather than at the end of the entire harvest to create open water
- Vary the water depth in individual rice fields during the winter months to create diverse habitat.

For more information from the Western Farm Press, click here

Photos: California Rice Commission

Watershed Issue: Grazing and Watersheds

Ranching in California is an important industry with a rich history in California. Today grazing land – more than 31 million acres statewide – provides forage for cattle and calves, sheep and lambs and goats.

Grazing can impact the water quality, nutrient cycles and health of a watershed if done incorrectly. For example, uncontrolled treading in one area by large cattle may increase soil compaction and decrease water infiltration.

Watersheds Issue: Grazing and Watersheds

Increased runoff yields sediment and other pollutants from animal wastes, decayed vegetation and agricultural chemicals.

On the upside, the hooves of roaming livestock increase mineral cycling and they break plant mulch down and incorporate it into the soil, where it can more quickly be broken down by soil organisms. In some areas, this even helps regeneration of plants.

Watershed Issue: Recreation

California offers some of the most beautiful landscapes in the world.

And the diverse topography and climates mean there's always something to do outside.

Photos:
California Department of Water Resources
Visit California

Popular activities include camping, hiking, backpacking, skiing, fishing, hunting, boating, off-road uses, wildlife viewing and much more.

Californians are active outdoor enthusiasts with 65.5% to 92% reporting participation in the most popular outdoor recreation activities, according to a California Department of Parks and Recreation survey.

That’s great news, yet it presents challenges. So many people enjoying the outdoors means wear-and-tear on watersheds and constant threat of pollution to waterways.

Most of the damage done to waterways and water quality are done through activities where people have body contact with the water. That most frequently includes swimming, rafting, motor boating and horseback riding.

Join a Group and Get Involved

Photo: Hillary Behr, Eastern Sierra Land Trust. Volunteers on Owens River.

The Sierra Nevada Conservancy sponsors the Great Sierra Cleanup. The 2011 event included 3,644 volunteers who removed 64,780 pounds of trash and 438,642 pounds of recyclables from a total of 287 river miles.

Community groups and nonprofit organizations play a crucial role in improving the conditions of watersheds throughout the state.
These groups have local interests at heart and frequently are able to generate volunteer help efficiently and quickly.

There's nothing like helping out a local cause to improve watersheds and quality of life.

Case Study: South Yuba River Cleanup

Each year, more than half a million visitors enjoy the river and trails of the South Yuba River And this results in enormous amounts of litter.

Photos: South Yuba River Citizens League

Case Study: South Yuba River Cleanup

The South Yuba River Citizens League has sponsored the Greater Yuba River Clean-Up and Restoration Day for the past 12 years. This one-day event has drawn a total of 4,800 volunteers to clean up more than 80 miles of shoreline sites, ranging from Donner Summit to the banks of the Lower Yuba.

In all, volunteers have removed 120,000 pounds of trash, rebuilt trails and removed invasive species to improve watershed health.

Photos: South Yuba River Citizens League

Case Study: Building Community Partnerships and Trails in El Cajon

The Department of Fish and Game manages the reserve.

In 2010, the San Diego Mountain Biking Association teamed up with the Earth Discovery Institute to get local students and the community involved in trail improvements.

In addition to learning about watershed issues related to trails, the students and volunteers get hands-on experience in building trails and improving existing ones.

From 2010 to the present, about 500 students and 75 community volunteers have assisted with building sustainable reroutes of nearly two miles of trails as well as with general trail maintenance.

Case Study: Building Community Partnerships and Trails in El Cajon

For more information from the Earth Discovery Institute, click here.

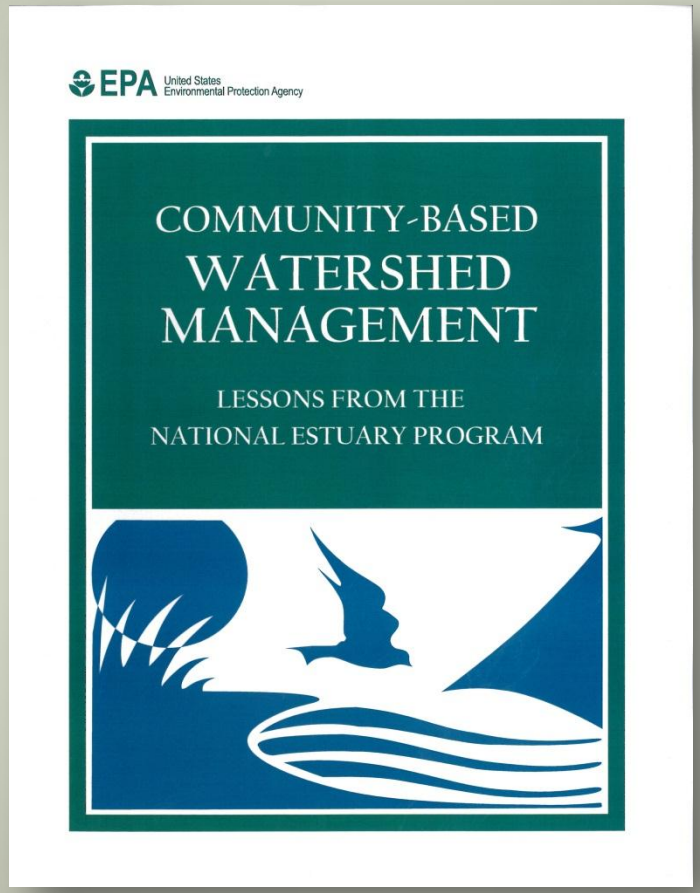
For more information from the San Diego Mountain Bike Association, click here.

The Crestridge Ecological Reserve is a popular destination that features trails that meander through the 2,900-acre landscape. Hikers, mountain bikers and horseback riders, as well as occasional non-authorized motorcyclists, all use the trails, many of which were created by users and pre-conservation owners without consideration of erosion and sustainability issues.

Photos: Earth Discovery Institute: www.earthdiscovery.org
San Diego Mountain Biking Association: www.sdmba.com

What is the Watershed Management Approach?

In 1996 the Environmental Protection Agency developed a program to help watersheds. The watershed approach focuses on combining public and private efforts to address the worst contamination issues.



These watershed teams monitor watersheds and participate in cleanup and restoration projects. (source: http://water.epa.gov/type/oceb/nep/handbook.cfm)

Focus of Watershed Management

The key to watershed management is bringing people from diverse groups together to work toward the same goal.

Making decisions about a watershed is an important responsibility. Decisions must be based on a solid understanding of the characteristics of the watershed and how physical processes shape watershed conditions.

Watershed Management

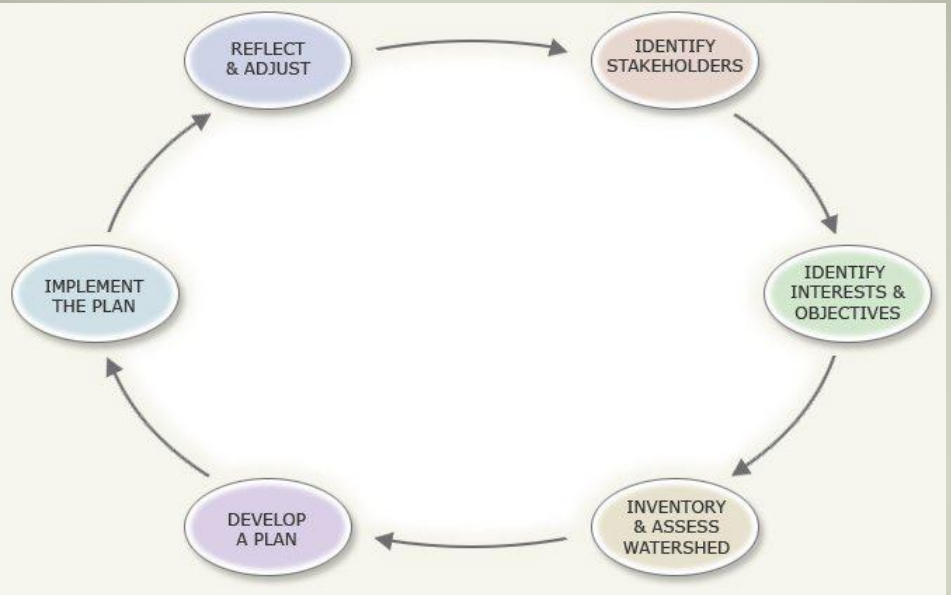
Not all watershed management decisions come by volunteer efforts. Many times it take lawsuits and enforcement of regulations.

Watershed management involves three main activities:

- Rehabilitation of abandoned and misused lands that have runoff with sediment or chemicals
- Protection of natural and sensitive areas to avoid having to rehabilitate them
- Enhancement of water resource characteristics

At Iron Mountain, surface water has been contaminated by the release of sulfuric acid, copper, zinc, and cadmium from the mine. The mine was listed as an EPA Superfund Site, and cleanup continues.

Why the Watershed Management Approach Works



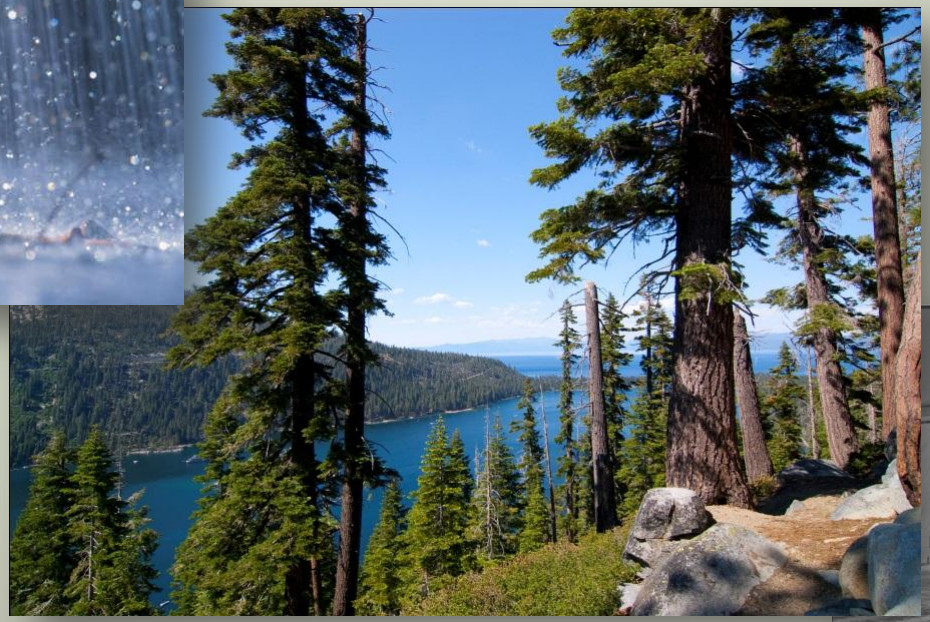
Statewide watershed management has been successful because it presents a common reference point for actions.

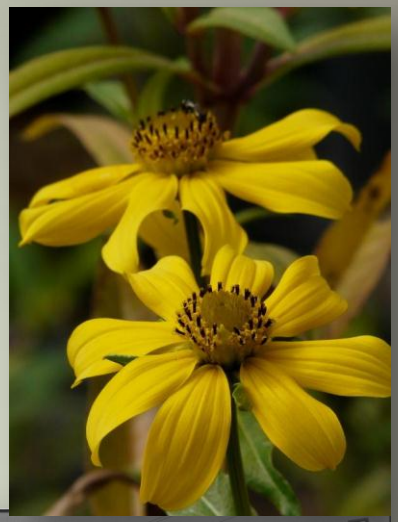
This approach means:

- Large regions can be divided based on natural topography.
- Analysis can be done on the natural systems in concert with social conditions.
- Communities within the watersheds can better track and understand the impacts of their management activities on the larger system.

Watershed Management

Effective management recognizes the interaction of various basic elements of a watershed system. Those are:





- **Hydrology** (precipitation and flow)
- **Biology** (flora, fauna, ecosystems),
- **Geology** (landforms, soils, sedimentation, topography)
- **Sociology or Human Interaction** (culture, economics and history)

Photos:
Chris Austin
Bureau of Reclamation
Laspilitas.com

Watershed Restoration Examples

Throughout California, restoration projects are ongoing by local governments and agencies, nongovernmental agencies (NGOs) and businesses.

Project sizes vary from stream cleanups by community volunteers to multi-million dollar efforts funded by several sources and involving years of planning and work.

The next slides highlight case studies from around the state that are making a difference to watershed health:

Example: Upper Feather River Watershed

For more than 25 years, a group in Northern California has made an important difference to the Upper Feather River Watershed.

Twenty-four public and private sector groups formed the Feather River Coordinated Resource Management Group in 1985 with the goal of improving watershed health.

Signs of healthy watersheds are stable, well-vegetated streams and meadows.

Photos: Gia Martynn, The Feather River Coordinated Resource Management Group

Example: Upper Feather River Watershed

Today, the Feather River Coordinated Resource Management Group has completed 66 projects that have improved approximately 44 miles of stream, and the group has restored about 3,900 acres of meadow and floodplains within the watershed.

Example: Slowing the Detrimental Effects of Tides at Elkhorn Slough

At the midpoint of the Monterey Bay shoreline, Elkhorn Slough is home to 80 species of fish, hundreds of marine invertebrates and more than 250 kinds of birds.

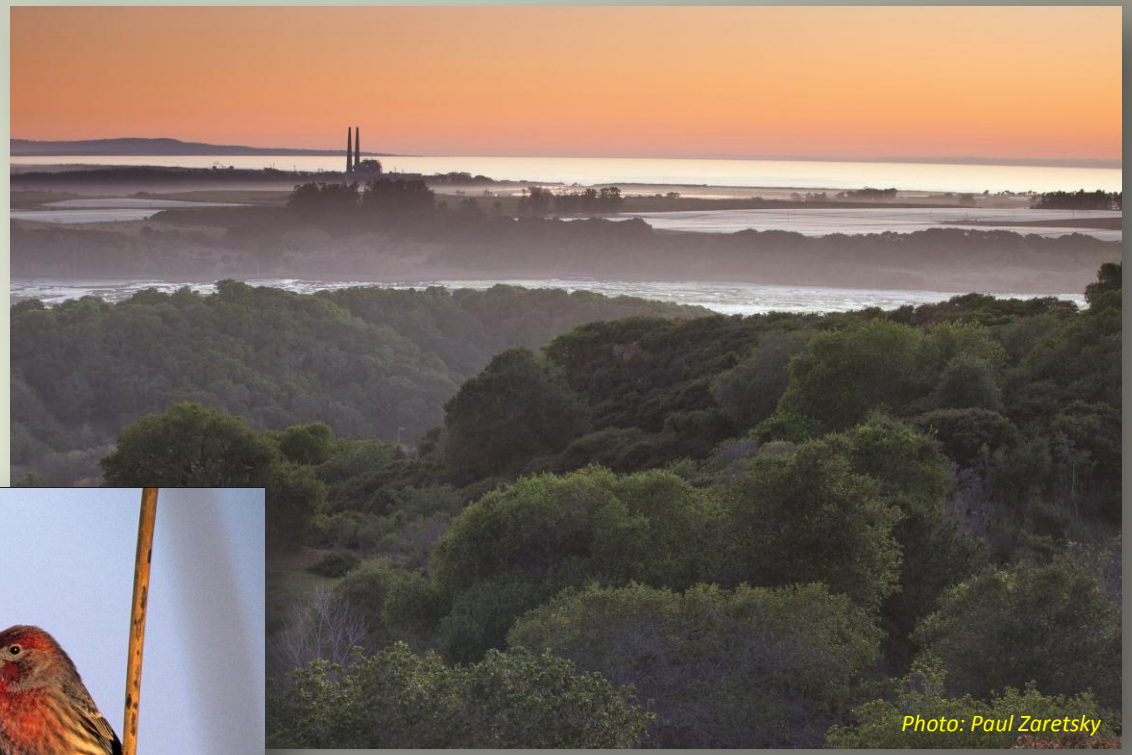


Photo: Paul Zaretsky

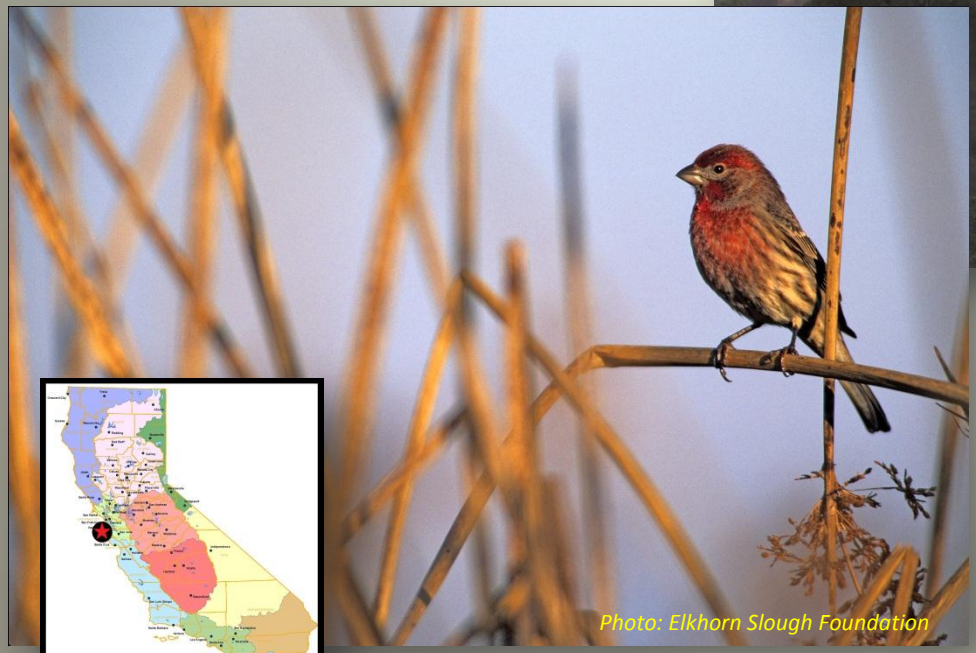


Photo: Elkhorn Slough Foundation

But the slough has lost 50% - 1,000 acres - of its salt marshes. And problems with marsh loss and habitat erosion continue.

Example: Slowing the Detrimental Effects of Tides at Elkhorn Slough

To stop the loss of habitat, the Elkhorn Slough Tidal Wetland Project began in 2004, with work and input from more than 100 scientists, specialists and lawmakers.

This included installing a large underwater sill – 200 feet wide, up to 15 feet tall and submerged five feet – at Parsons Slough.

Example: Slowing the Detrimental Effects of Tides at Elkhorn Slough

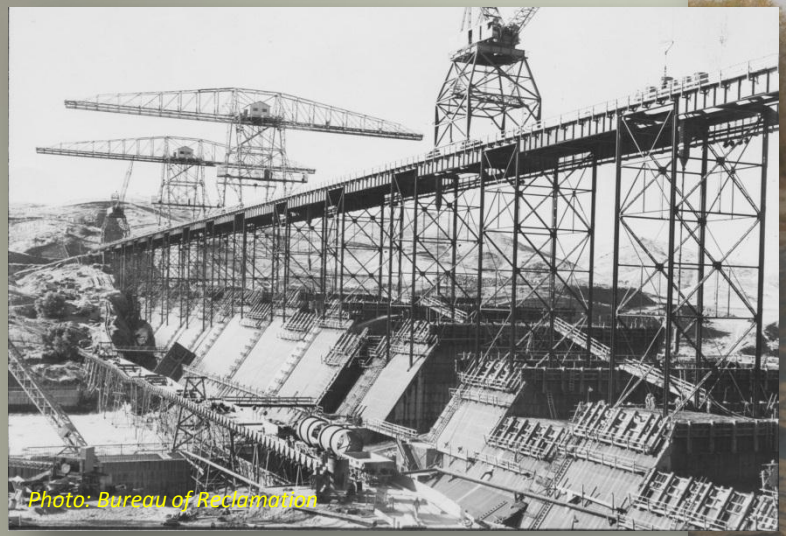
The sill acts as an underwater barrier to slow the flow of erosive tides in the slough and prevent thousands of cubic yards of sediment from washing into the bay each year.

Early monitoring indicates the sill is working, and plant, bird and other animal life, including otters and harbor seals, have adapted well.

Example: Restoring the San Joaquin River

A massive project to refill dried-up miles of San Joaquin River and revitalize the watershed is preparing to reintroduce salmon in the future.

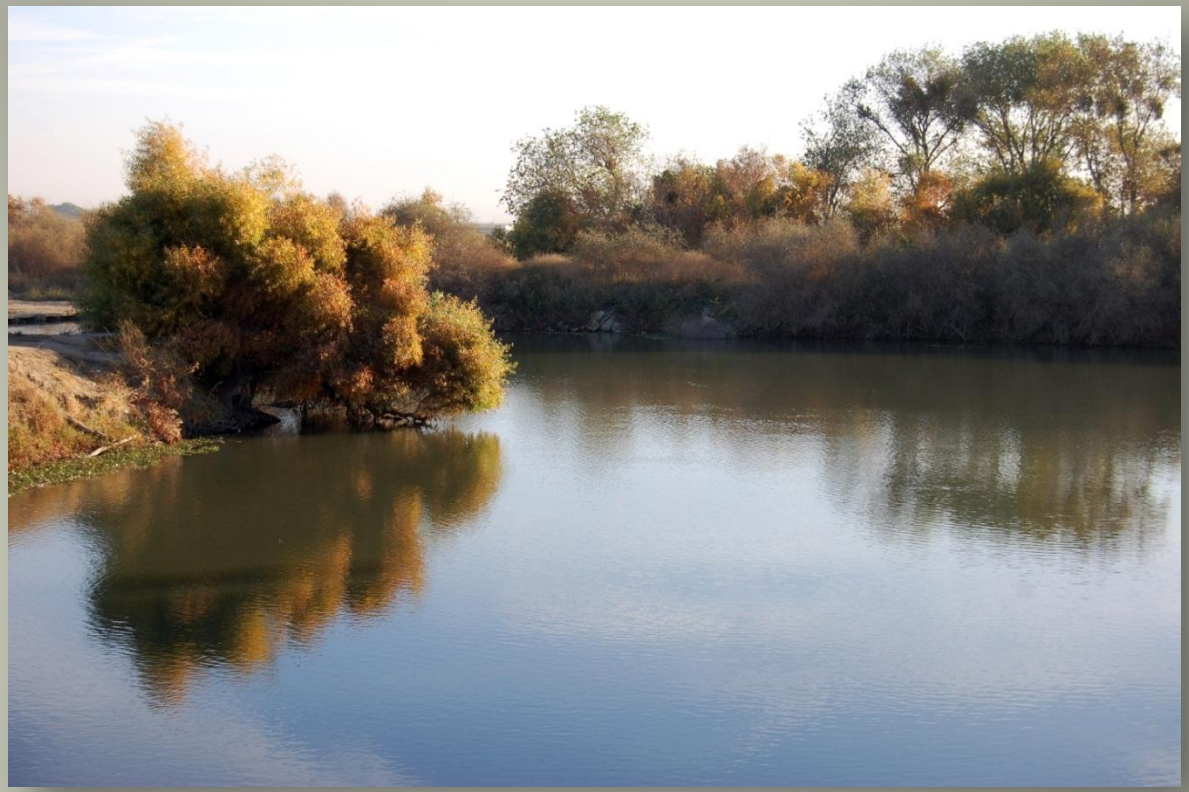
Example: Restoring the San Joaquin River



After Friant Dam was built in the 1940s, water diversions dried up miles of the state's second longest river. An 18-year lawsuit ended in 2006 with a settlement among farmers, environmentalists and the federal government.

This cleared the way to begin the restoration work, reintroducing two salmon runs and return some water to farmers. The state also is including levee improvements to protect residents.

Example: Restoring the San Joaquin River



Major restoration efforts and full flows are anticipated, with salmon re-introduction by 2014. Riparian and aquatic restoration is targeted to be completed by 2016.

The debate continues over the future of the restoration program, and pending legislation in Congress would end funding for the program.

Example: Saving Mono Lake

Mono Lake was formed about 700,000 years ago, making it one of the oldest lakes on the continent. Naturally salty and alkaline because it has no outlet to the sea, the lake has a unique, important ecosystem.

Before the turn of the last century, all water in the Mono Basin flowed into Mono Lake. Millions of migratory waterbirds relied on the lake and its ecosystem.

Example: Saving Mono Lake

The watershed dramatically and catastrophically changed in 1941 when the Los Angeles Aqueduct was extended to the Mono Basin and four creeks were diverted into the aqueduct. This dried up streams below the diversion dams and ruined downstream ecosystems. By 1982, Mono Lake dropped 45 feet, lost half its volume and doubled in salinity.

Islands where California Gulls nested became peninsulas accessible to predators, and toxic alkali dust storms whipped up from exposed salt flats. The populations of ducks and geese fell by 99%.

Example: Saving Mono Lake

After a prolonged lawsuit, the courts ruled in favor of restoring the Mono Basin, and the State Water Resources Control Board ordered the L.A. Department of Water and Power to implement the restoration plan.

Today, the level of the lake is rising – although it can never be fully restored - and efforts are being reasonably successful to lower salinity levels, reduce dust storms and reconnect the lake and improve the watershed.

Example: Private Landowners Restore Murphy Creek

Murphy Creek is located in western Amador County and eastern San Joaquin County. The creek flows into the Mokelumne River from the north, downstream from Camanche Dam.

In 2001, local landowners and the East Bay Municipal Utility District began work to restore portions of the watershed and enhance spawning habitat for Chinook salmon and steelhead.

Example: Private Landowners Restore Murphy Creek

This included removal of Sparrowk Dam, a small earthen dam constructed on private property in the 1970s. Workers removed sediment from the pond and the small reservoir behind the dam was recontoured to resemble the original creek channel.

And certain sections of the creek received gravel treatments to improve spawning opportunities for the Chinook salmon and steelhead.

The project, completed in 2003, opened up 1.5 miles of spawning and rearing habitat for the fish. Plus, the channel-straightening improved stream flow and reduced erosion and sedimentation.

Photos: California Department of Water Resources

Example: Jump-starting the Economy in the Rural Sierra Nevada

After its 1905 earthen dam was determined seismically unsafe in 1997, Finnon Lake was drained to a fraction of its capacity, leaving a marshy wetland perimeter ring. The lake is located in the rural community of Mosquito in the Sierra Nevada.

The lake was entirely drained, and the fish were put in holding pens. Then crews bulldozed the old earthen dam, spread the dirt to dry, then replaced it to meet modern seismic standards.

Example: Jump-starting the Economy in the Rural Sierra Nevada

Finnon Lake – November 2011. Photo: P.J. Beacham

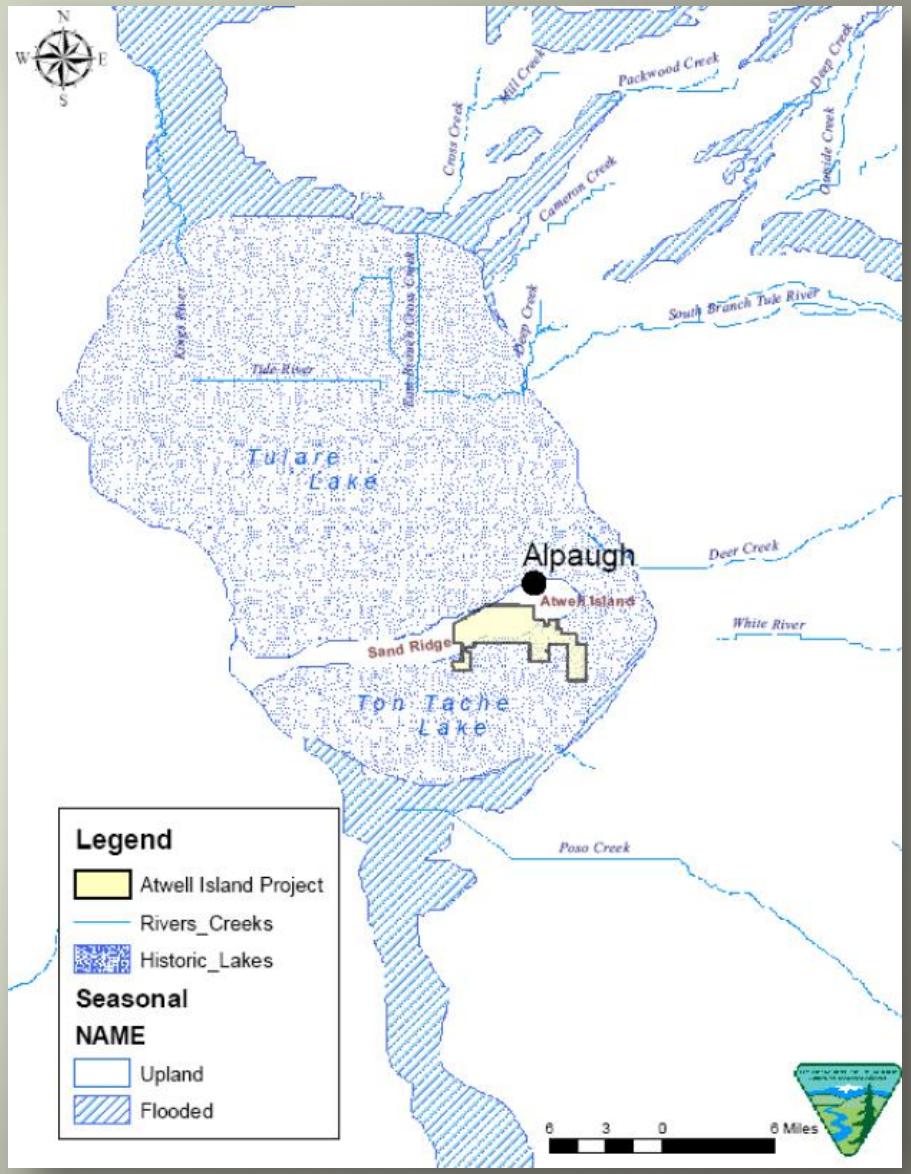
By summer 2012, the lake should be restored to its 350 acre-feet capacity and restoration to different types of habitats in the watershed - aquatic, wetland and 5.9 acres of forest.

In addition, the project will provide fishing, boating, swimming and other recreational opportunities, plus serving as a sustainable water supply to fight wildfires.

Example: Using Retired Farmland to Store Water and Create Habitat in Atwell Island

Tulare Lake once occupied about 500 square miles in the southern San Joaquin Valley, consisting of permanent wetlands, sloughs, ponds, marshes and seasonal wetlands.

Millions of migratory ducks, geese and swans used this area as their major wintering grounds.



Example: Using Retired Farmland to Store Water and Create Habitat in Atwell Island

As a result of an increasing population and expanded agriculture, Tulare Lake's water has been diverted and the basin has experienced the largest percentage of wetland loss of any portion of California.

View of Mitchell Pond, a reverse cycle wetland

Example: Using Retired Farmland to Store Water and Create Habitat in Atwell Island

The Atwell Island Project is an 8,000 acre wetland and upland restoration project made possible when farmland was taken out of service.

American Avocets touch down on the wetlands for a respite from flight

Since 2000, the project has achieved the following successes:

- Restored 3,100 acres of upland habitat with native plant species
- Restored 400 acres of historic wetlands for migratory and breeding birds
- 126 species of birds have been identified at the wetlands with one or two new species arriving each month. Some 12,000 water birds have been counted on Atwell Island at the peak.

For more information on the project, watch a video on YouTube by clicking here. Read more about the Tulare Basin Wildlife Partners by clicking here.

How You Can Get Involved in Protecting Watersheds

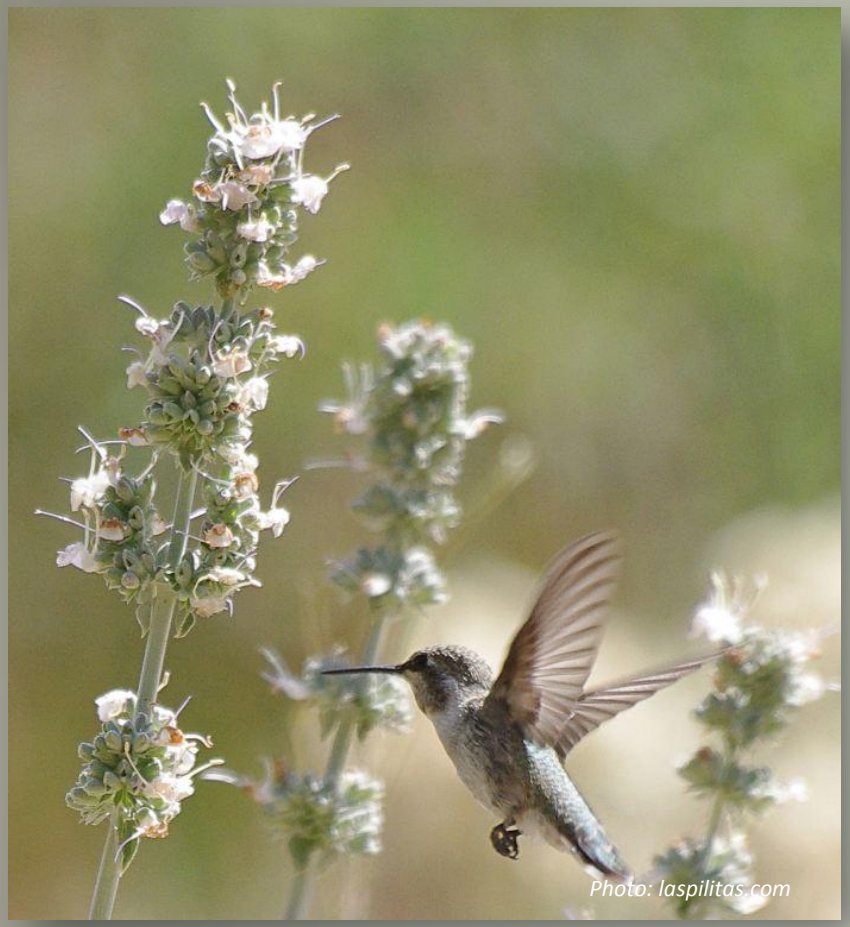
You can help protect the watersheds right now. The fewer pollutants that seep into the soil, the cleaner your watershed and water supply will be.

Here are some of the ways you can help protect the watersheds at home and around town:

Fix leaky faucets to cut down on wasted water and pollution.

Add plants and trees to prevent erosion.

Native plants use less water and prevent erosion.



- If you must use fertilizers and pesticides, follow instructions and never over-use. They can seep into the ground and get into the water supply.

- Recycle your used antifreeze and motor oil instead of dumping.

- Trash and pet waste can end up in storm drains, so when you walk your dog, bring along a bag for waste.

What Agencies are Involved in Watershed Management?

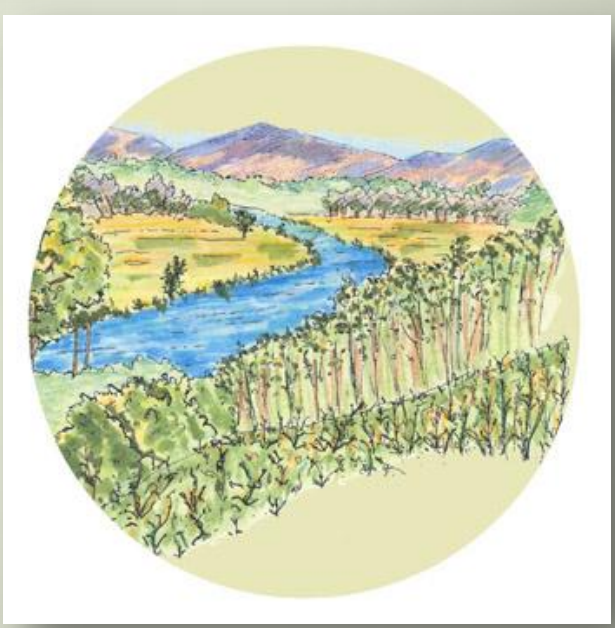
California Department of Conservation

California Department of Conservation manages the Statewide Watershed Program, which provides services and information about the state's natural resources.

To learn more about the Department of Conservation's Watershed Program, click here.

California Department of Conservation Watershed Portal

The Department of Conservation portal is a library of information on watersheds. Step through the portal and take a look.



To learn more about the Department of Conservation's Watershed Program, click here.

State Water Resources Control Board

The State Water Resources Control Board and its nine Regional Water Boards are responsible for protecting California's water resources and water quality.

The Watershed Management Initiative (WMI) works with local stakeholders to develop effective solutions to improve water quality.

Check out the "Community Based Watershed Programs" web page for further information about community-based watershed programs, volunteer monitoring programs, watershed groups in California, an inventory of watershed projects and more!

To learn more about the State Water Resources Control Board, click here.

California Department of Fish and Game

The Coastal Watershed Planning and Assessment Program (CWPAP) is a Department of Fish and Game program conducting fishery-based watershed assessments along the length of the California coast.

Watershed basins are chosen as study areas based upon the nature of the socio-economic and natural resource problems within them. The CDFG Coho Recovery Plan and Steelhead Recovery Plan are useful in selecting basins as well.

CWPAP has developed assessment methods, protocols and report outlines.

Mission: The Department of Fish and Game maintains native fish, wildlife, plant species and natural communities for their intrinsic and ecological value and their benefits to people.

Click here for more information from CWPAP

California Department of Water Resources

The DWR Watershed Program works with locally led efforts to integrate the needs of communities to sustain their watersheds.

The watershed mapping program was created after several local watershed groups requested technical assistance from DWR to provide accurate watershed boundary maps.

The maps will be used for display, planning, grant application, education and other local purposes.

Click here for more information from DWR.

Adopt Your Watershed Program
(US Environmental Protection Agency)

Get involved! EPA's Adopt Your Watershed program challenges you to serve your community by taking part in activities to protect and restore your local watershed.

To check out EPA's interactive database, click here.

Visit the EPA Adopt Your Watershed database to learn about opportunities to get involved in activities such as volunteer water monitoring, stream cleanups, and storm drain marking.

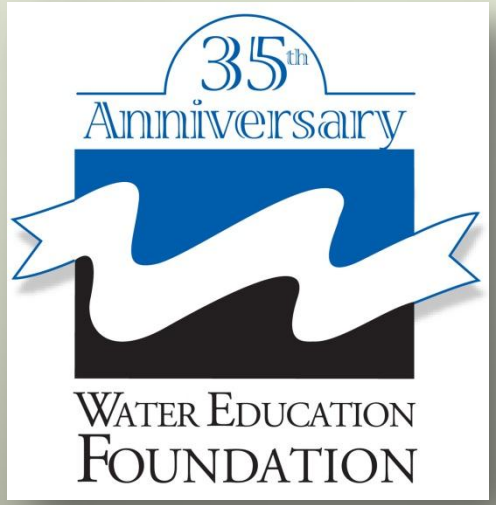
Once you locate your watershed, simply click on "citizen-based groups at work in this watershed" to find a list of organizations.

Water Education Foundation

The Water Education Foundation has 35 years experience of providing impartial public education on western water issues.

Its mission is to create a better understanding of water resources and foster public understanding and resolution of water resource issues through facilitation, education and outreach.

The Foundation's products include publications, public television documentaries, water tours, public workshops, teacher education programs, water leaders class and a daily news blog Aquafornia.



For more information about the **Water Education Foundation** click here.

To visit **Aquafornia**, click here.