Sacramento Water Action Team (SWAT)

By: Allie Bailey, Dan Griffin, Beth Seabright, Rachel Straub

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Mission Statement

To improve water quality in and along the Sacramento River Basin by reducing agricultural pollution, slowing erosion, and spreading awareness of the dangers of consuming aquatic life that contains mercury by 2028.

History/Background

The Sacramento River Valley was first settled by small hunter-gathering bands of Native Americans around 12,000 years ago. European contact with the area first occurred in 1808 after Spanish explorer Gabriel Moraga discovered the river while on an expedition looking for sites to establish missions. Later, the valley was also explored by Hudson's Bay Company fur trappers in the 1820's. The region became well-known for its agricultural value, after John Sutter established Sutter's Mill at the confluence of the Sacramento and American Rivers in 1841. This would become a significant development after Sutter and a business partner discovered gold on the site in 1848, kicking off the California Gold Rush and the subsequent migration of over 300,000 people to the region. As a result of significant economic development, the State of California was established in 1850.

The Sacramento River is the largest river and watershed in California. The basin is 27,000 square miles and stretches from the Sierra Nevada and Cascade Range in the east, to the Coast Range and Klamath Mountains in the west. The basin starts in northern California as three rivers, the Upper Sacramento, McCloud, and Pit, and flows through the waters of Lake Shasta, the foothills between Redding and Red Bluff, the Sacramento Valley. Many small and moderate-sized tributaries join the river from both east and west. The river is then joined by the Feather river and continues to flow through the city of Sacramento and is then joined by the American River. The river then flows to San Francisco where the river ends by flowing into San Francisco Bay and then finally joins the Pacific Ocean. The Sacramento River Basin provides drinking water for residents of northern and southern California, supplies farmers with water for their agricultural, and is a vital resource for hundreds of wildlife species. Since the watershed is

so large there are different water quality concerns that affect the different sections. The priority issues for the basin overall are agricultural pollution, rising mercury and methylmercury levels in aquatic life, and accelerated erosion of stream banks and channels.

Policies and Mandates in Place

The Sacramento River Flood Project was established by the federal government in 1917 to control excess floodwaters, which resulted in construction of a strengthened levee system in the river. The Central Valley Project was established by the U.S. Bureau of Reclamation in 1933 to irrigate 3 million acres of land in the Sacramento River Valley/San Joaquin River Valley. Projects that were completed as part of this initiative included the Shasta Dam, built in 1945, which is the principal water storage facility in the watershed. In 1960, California began the State Water Project, which was a plan to facilitate the transportation of water to Southern California. This was carried out through the construction of dams and channels which mostly took water out of the Sacramento River watershed in order to bring it south. In 1963, California began the Sacramento River Deep Water Ship Channel, which allowed for easier access to the Port of Sacramento from the Pacific Ocean.

Governance of the Sacramento River is controlled at the federal level by the EPA Region 9 office, which manages the Pacific Southwest region. At the state level, management is controlled by California Environmental Protection Agency, or CalEPA, the state department in charge of environmental affairs. Within CalEPA, the California State Water Resources Control Board is responsible for protecting surface, ground, and coastal waters of watersheds in the region. The Central Valley Water Resources Control Board manages the Sacramento and San Joaquin Rivers and their tributaries.

Non-profit organizations that work on behalf of the Sacramento River watershed include the Sacramento River Watershed Program (SWRP) and the Sacramento River Forum. The SWRP is an advocacy group that “brings together dozens of groups and thousands of people, concerned about the health of the Sacramento River and its watershed”. It sponsors collaborative partnerships, coordination of research and monitoring, and education among the stakeholder groups within the watershed. The Sacramento River Forum is a similar group that “works with communities, agricultural interests, landowners, organizations and agencies along the Sacramento River “ to “facilitate resource management and restoration efforts to be effective, balanced and sensitive to the needs of local communities”.

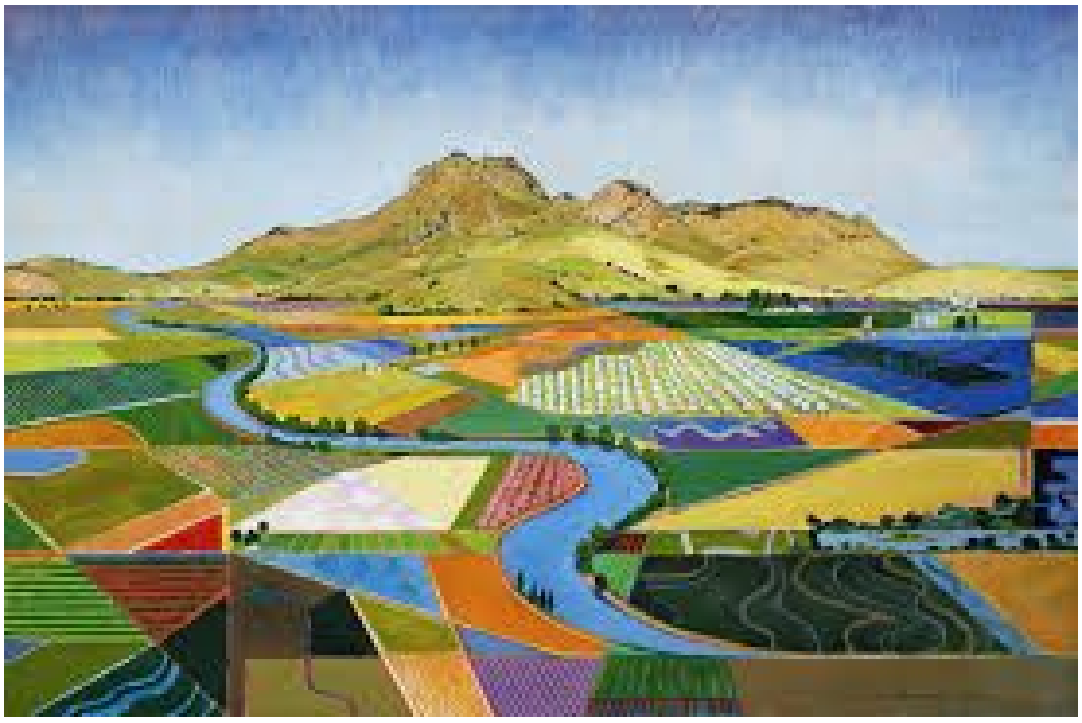
Problem 1: Agricultural Pollution

Agriculture dominates land use in the Sacramento Valley region of the Sacramento River Basin. Over 2 million acres of the Sacramento Valley is intensely cultivated, growing rice, deciduous fruits and nuts, and grain and hay crops. There are unique problems associated with

irrigated agriculture, agricultural support activities, and animal confinement operations because of the volume of water used and the nature of the discharge.

Irrigated agriculture is the artificial application of water to land for the purpose of agricultural production. This water application causes drainage and runoff of salts, nutrients, pesticides, trace elements, sediments, and other by-products into the surface and groundwater of the Sacramento River and its tributaries. Agricultural support activities are the activities associated with the application of pesticides, disposal of pesticide rinse waters, and formulation of pesticides and fertilizers. These activities cause major water quality problems due to the discharge of waters used to clean equipment or work areas. Animal confinement facilities, like stockyards, dairies, and poultry ranches, can have runoff containing significant amounts of coliform, ammonia, nitrate, and TDS contamination.

Agricultural pollution is the main source of pollution in water and lakes. Chemicals from fertilizers, pesticides, etc. can end up in the drinking water and cause health related problems. Another issue with agricultural pollution in the Sacramento River Basin is the effect on aquatic life. Fertilizers, manure, waste and ammonia turns into nitrate that reduces the amount of oxygen present in water which results in the death of many aquatic animals.



Goals

In the past, techniques such as cover crops, riparian buffers, filter strips, hedge rows, and vegetated swales and waterways have been researched and implemented to manage runoff and reduce pesticide loadings to waterways in various locations in the Sacramento River Basin.

SWAT proposes we increase all these efforts and techniques but also explore other techniques and efforts. Efforts such as collaborating with a wide range of people and organizations across an entire watershed; applying fertilizers in the proper amount, at the right time of year and with the right method; and keeping animals and their waste out of streams and rivers.

Problem 2: Rising Mercury and Methylmercury Levels in Aquatic Life

In 1848 gold was first discovered in the Sacramento River. Prospectors flocked to the area and spent hours panning every inch of the river. Once the supply of gold that could be panned was exhausted, they switched to mining. In order to remove gold from the surrounding rock and impurities the most effective method used was to dissolve it with mercury. In the beginning when panning was the method employed, prospectors would carry a small bag of mercury to drop the collected nuggets of rock and gold in. Once hydraulic mining began mercury was being pumped into the ground. This led to massive amounts of pollution in the river not only due to mercury, but also due to acid mine drainage and other mining activities.

An additional source of mercury pollution became the production of the mercury itself. Because such large quantities were required for the explosive growth of gold rush mining production plants opened up nearby. However, due to their poor air pollution standards and fast pace of production much of the mercury and its byproducts ended up vaporized in the atmosphere. It then entered the water cycle through rain and further contaminated the river.

Mercury is an especially dangerous pollutant in water because it is fat soluble. This means that it bioaccumulates in fish and other aquatic organisms and can be transferred throughout the food chain via ingestion. The more mercury contaminated organisms a fish eats, the more mercury it accumulates in its fatty tissue. This becomes a significant danger when humans enter the food chain and consume fish or other crustaceans that are contaminated. Mercury poisoning is extremely dangerous and can cause damage to the central nervous systems and eventually death.

Goals

The main goals of this initiative are to spread awareness of the dangers of mercury poisoning and to educate people on how to avoid it. Through flyers, pamphlets, and social media education will be spread encouraging catch and release fishing and avoiding consuming fish that come from the river. Educational materials will also be distributed on the warning signs of mercury poisoning and how to get help if poisoning is suspected.

Problem 3: Accelerated Erosion of Stream Banks and Channels

Both the bed and the banks of a river erode. While bed erosion leads to degradation of the stream profile, bank erosion has more complex factors and influences.Bank erosion occurs generally on the outside of meander bends where high velocity water flows directly into the banks. At one point in time, the erosion and deposition processes that occurred in the rivers of

the Sacramento River Basin were balanced, with alternating building of terraces from deposition and wearing away of erosion. However, humans activities such as gravel mining, pollution, riparian vegetation removal, flood control, and flow regulation have changed the bank composition, bank erosion, river length, depth, and width, as well as floodplain deposition.

The Pit River in the northeast region of the Sacramento Basin is another example of some of the erosion issues which have plagued the watershed with fine sediment deposition and negative effects of the aquatic life. An erosion control project implemented in the Modoc County from 1999 to 2002 aimed to reduce the accelerating bank erosion and property loss, establish stable riverbanks, and test the feasibility of these erosion control methods. Such methods included establishing a rock toe at the water's edge with brush layering on the bank above, full vegetated riprap from the bottom to top of the bank, and placement of root wads and rock between willow plants. The construction materials were harvested locally, and have yielded positive results in subsequent years, and may be used as an example for future efforts.

Some efforts to curb bank erosion have then caused further ecological issues. For example, studies have shown that bank protection has prevented re-entrainment through bank erosion of gravel deposits, reducing a source of gravel that is used for salmon spawning. Over time, the areas available for salmon spawning will decrease further, as bank protection tends to cause deepening and narrowing of rivers. Many of the rich high terrace soils and riparian forest has been converted to agricultural use, leaving only 45 percent of the original vegetation in the streambank of the Sacramento river remaining. The Sacramento River does has generally stable banks in certain regions, but does see significant erosion along other stretches.

Goals

Efforts must be made to prevent the deterioration of the stream banks from erosion and deposition in a manner which will still allow some of the beneficial natural processes to occur which coincide with erosion, namely, limit stream bank protection in certain areas to the conveyance of gravel that will allow for the spawning of salmon. By completing more erosion projects on various streams and rivers in the basin with new technology, studies can be done to determine the most beneficial combination of technologies.

SWAT Summary of Goals

To end these problems by SWAT's target year of 2028, multi-discipline efforts must be made across a broad spectrum of stakeholders. Policy-makers in California and surrounding states must be willing to commit to solutions that will solve the Sacramento River's agricultural pollution, mercury, and erosion issues. Based on our study, we have identified a set of plans that will help fix the problems and improve water quality in the Sacramento River and its tributaries now and in the future. For agricultural pollution, we recommend the implementation of cover crops, riparian buffers, vegetated swales, and hedge rows, as well as closer regulation of fertilizer application on agricultural lands. To help with the accelerated erosion of stream banks and channels, we recommend planning to make better use of stream bank protection and newer technologies that allow for natural processes to occur. Methods like the use of gravel can be implemented, but they must not interfere with natural erosion of streams.

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