

Protecting Our Precious Resource WATER



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Nevada County, California

WHAT IS A WATERSHED?

A watershed is a drainage basin, an area of land where a stream gets its water supply. A watershed is a drainage area whose boundary is formed by the top of ridges and is a naturally delineated area. Eighty-five percent of California's water comes from the water flowing from the forests. Its important to understand that activities anywhere within the watershed can affect the condition of the stream or water body itself.

A watershed can be affected in many ways. Not only does stormwater run off into a stream, but also sediment, debris, waste, pesticides and herbicides, manures and fertilizers.

Western Nevada County is part of two major watersheds:
The South Yuba River Watershed and the Bear River Watershed.
Knowing the area of the watershed you live in will help you understand how it works and what you can do to help preserve it. The majority of land in a watershed is privately owned so it's up to you to do your part!

This booklet will discuss the following:

- ?? What is a watershed?
- ?? How does a watershed affect me?
- ?? Water Pollution-How it affects the watershed?
- ?? Effects of animals on water quality
- ?? Effects of soil erosion on water quality
- ?? Effects of humans on water quality
- ?? Contact information and references



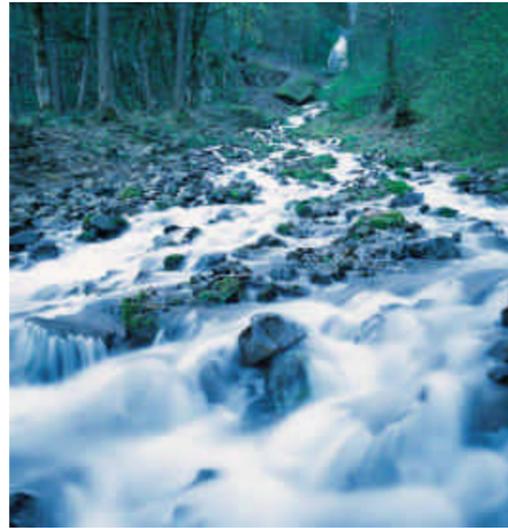
Photo courtesy of L. Osterholm

Produced and compiled by Lesa Osterholm for the North San Juan
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HOW DOES A WATERSHED AFFECT ME ?

Watersheds provide the following:

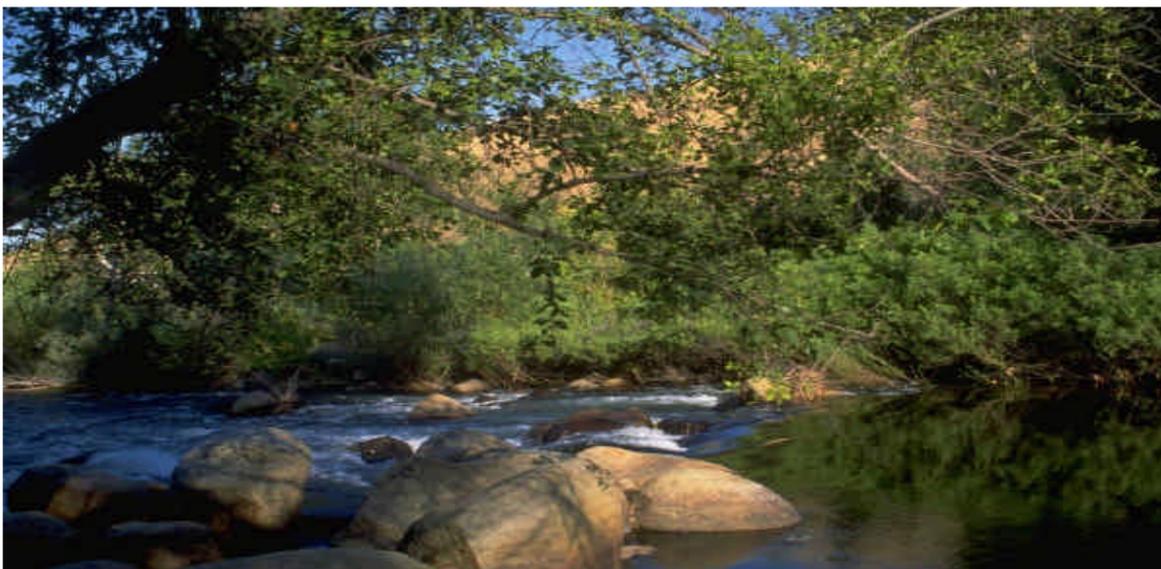
- Aesthetics
- Catchment
- Conduit for flood waters
- Drainage
- Fish and other aquatic life
- Food source
- Forest health
- Recreation
- Streams and lakes
- Water storage
- Water release
- Wildlife habitat
- Last but not least– our precious drinking
water

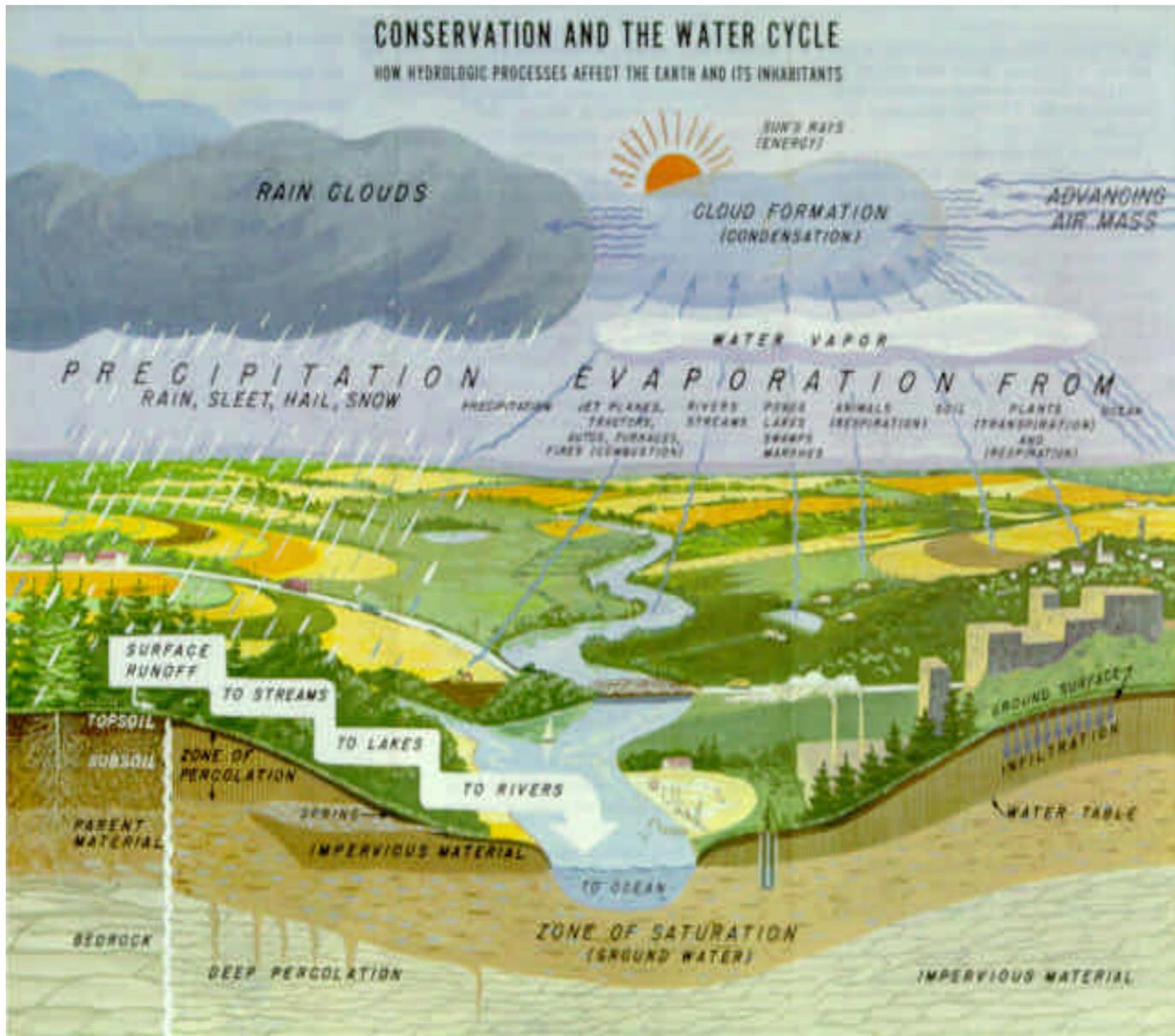


A watershed is the land on which water falls from the atmosphere, is stored within the soil, and over a period of time is released down slope to other locations. All land is part of a watershed. A watershed has three main functions:

- ?? Capturing water
- ?? Storing water
- ?? Releasing water

From a hydrologic point of view, the first step of watershed management is to evaluate past, present and proposed management practices on a watershed with respect to the watershed water balance. Water balance in a watershed refers to the balance between the inflow of water to a watershed as precipitation and the outflow of water from the watershed as evapo-transpiration, ground water recharge and stream flow . Basically, water balance is an accounting tool to keep track of the hydrologic cycle of the watershed over time.





Source: NRCS/USDA , National Water and Climate Publication

The water cycle is an endless process of water circulation going on throughout the world. To trace the movement of water through the cycle, begin at the top of the diagram. There, the sun's energy is transferring water from the sea and earth to the atmosphere in the form of water vapor. The soil and inland water bodies through *evaporation* and plants through *transpiration* add large amounts of water vapor to the atmosphere, but most of it comes from the oceans. Humans, animals, and machines add small amounts by means of *respiration* and *combustion*. Air masses (top of diagram) carry the water vapor across the earth, and the water vapor condenses into *precipitation*.

At the left, precipitation falls as rain, snow, sleet and hail. Some water or moisture evaporates while falling and returns to the atmosphere. A small amount is intercepted and held by plants or by buildings, automobiles, other structures and machines until it evaporates back into the atmosphere. Most of the precipitation soaks into the soil and doesn't run to the sea by way of streams and rivers. This type of water is called ground water. Misuse and poor management of the soil will decrease the amount of water that soaks into the soil and increase the amount that runs off over the surface. Runoff on bare land leads to erosion. Grass, trees, and other plants hold the soil in place and slow the runoff, allowing more water to soak into the soil. Some of the water that soaks into the soil is used by plants. Part of it percolates beyond the reach of plant roots to the water table, to underground reservoirs, and to springs and artesian wells. Runoff on its way to the sea can be intercepted and stored for industrial or household use, and it can be diverted for irrigation. The water cycle then repeats itself.

RAINFALL and ELEVATION

Western Nevada County receives between 36-54 inches of rainfall each year and is represented by gentle slopes to tall mountains ranging in elevation from 1000 to over 5000 feet. That's a lot of water running through our watersheds and down slope. Understanding the different parts of our watershed will help you see how it works and how you can help preserve it.



Photo courtesy of L. Osterholm

TYPES OF STREAMS

RIPARIAN HABITAT

There are different types of water flow in our area. A perennial stream flows year round. An intermittent stream flows just part of the year. An ephemeral stream only flows during a storm, or shortly thereafter. Each type of stream carries water, soil, gravel and other materials usually into larger water bodies. Streams provide habitat for fish and large numbers of aquatic insects and streamside vegetation called riparian habitat. Riparian habitat provides essential food, shelter and shade for fish and other wildlife. Wildlife nest, eat and find shelter alongside streams. Riparian habitat is used by more wildlife species than any other habitat type. Insects and microscopic organisms eat the plant material that falls into the stream and the algae present in the stream. Macro-invertebrates in a stream can indicate the health of that stream.

Riparian vegetation also provides streambank stabilization. The roots of plants find their way deeper into the soil to find water and thus help hold the soil together and limit the amount of erosion.

WATER POLLUTION- HOW IT AFFECTS THE WATERSHED

People have a tremendous affect on watersheds. You can contribute to a healthy watershed by learning how to prevent water pollution.

Water Pollution— contamination of streams, lakes, ground water, or oceans by substances harmful to the environment and humans. Pollution can be defined as an alteration of the quality of water to a degree which unreasonably affects it. Sewage, sewage sludge, garbage, solid waste, chemical waste, biological materials, radioactive materials, heat, soil and agricultural wastes can all be pollutants of water. There are two main categories of polluting materials, or pollutants.

Biodegradable pollutants are materials, such as sewage, that rapidly decompose by natural processes. These pollutants become a problem when added to the environment faster than they can decompose or when run-off occurs into a water body.

Non-degradable pollutants are materials that either do not decompose or decompose slowly in the natural environment. Once contamination occurs, it is difficult or impossible to remove these pollutants from the environment.

In the Clean Water Act, pollution is categorized by its source as either ***point or non-point***.

Point source pollution is an observable, specific and confined discharge of pollution into a water body. An examples is sewage pipelines dumping into a stream.

Non-point source pollution comes from dispersed or uncontained sources such as urban run-off of contaminated water. Other examples are erosion and sediment loss, and fecal matter from animals into streams.

The effects of pollutants may be immediate or delayed. Primary effects of pollution occur immediately after contamination occurs, such as the death of marine plants and wildlife after an oil spill at sea. Secondary effects may be delayed or may persist in the environment, going unnoticed for years, such as mercury contamination.

Types of Pollution in Our Watershed :

- Animal waste
- Arsenic contamination
- Erosion from roads, wildfires and mis-use
- Excess nutrient load in streams
- Herbicide and chemical run-off
- Human sewage
- Infectious organisms
- Mercury contamination
- Petroleum products contamination
- Urban run-off

EFFECTS OF ANIMALS ON WATER QUALITY

ANIMAL WASTE

It is a good management practice to fence animals from a stream or water body and supply an alternative drinking water source such as a water trough. Animals defecating directly into a stream can deposit enteric bacteria such as fecal coliforms and fecal streptococci. Although these bacteria are not normally considered pathogenic, or disease causing, they can be measured and indicators of contamination in the water. Most of these organisms, about 95%, are trapped and die within the sediment at the bottom. Animal waste can add nitrates and ammonium to streams which can be problematic at high concentrations and harm aquatic life. Fencing animals from water bodies and developing a drinking water source away from water is the best solution.

COMPACTED SOILS

Animals congregating in small spaces contribute to compacted soils. Why do we care about compacted soils? Compacted soils do not have much capacity for absorbing water and as a result, water runs off and carries manure and sediments with it. In addition, it is difficult to get pasture grasses to grow in an environment where the plant roots can not penetrate or move within the soil. Compacted soils are usually very dusty areas in the summertime.

OVER- GRAZED PASTURES

What do over-grazed pastures have to do with water quality? They can be a major cause of water pollution due to soil erosion, sediment loss and animal wastes. When over-grazing occurs, grasses can die and invasive weeds take over. Now, you have an even bigger problem. Since there is not much vegetative matter on top of the soil and no ability to absorb stormwater, water and manure run off. Use the 12" - 4" grazing rule of thumb; graze pastures when they are a minimum of 12" high and remove animals from the pasture when it is grazed down to 4" in height.

PASTURES ON A SLOPE

When animals graze on a hillside, animal waste can easily run off if enough vegetative matter is not retained. Vegetative filter strips or buffer zones at the bottom of pastures will trap and filter manures and sediment and aid in limiting the run-off. If you do have sloped property, consider adding a filter strip of vegetation like shrubs at the bottom of the slope, especially near the banks of streams or ponds. Not only will this create a wildlife corridor, this strip of vegetation can filter some of the run-off and keep pollution from the water body. You can also use bales of straw or straw wattles to slow down and disperse some of the run-off.

Note: The berry bushes in the picture below aid in trapping the manure run off from the hill above before it runs into the pond below.



EFFECTS OF SOIL EROSION ON WATER QUALITY

Soil erosion can affect pastures, streambanks, unpaved driveways, construction sites, roads or any area where soil has been disturbed or not protected from the erosive forces of rainfall, storm run-off or gravity. Too much sediment in streams causes it to eventually fill in and then aquatic life will be lost and riparian areas will die out. Sediment usually consists of soil, sand and gravel but can also carry pollutants. Too much sediment also reduces the stream's ability to carry water downstream, thus increasing the dangers of flooding.

Turbidity is a measure of the extent to which light passing through water is reduced due to suspended materials. Excessive turbidity may interfere with light penetration and minimize photosynthesis, thereby causing a decrease in primary productivity. Turbidity may alter water temperature and interfere directly with the essential physiological function of fish and other aquatic organisms by making it difficult for fish to locate food sources.

VEGETATION

Maintain vegetation on hillsides to prevent soil from washing down slope, and maintain filter strips next to water bodies for filtering nutrients.



Buffer vegetation around a pond above.

Photo on right showing trees and other riparian vegetation acting as a buffer for this river protecting it from farming practices.



Source: USDA/ NRCS

ROADS AND DRIVEWAYS

Poorly constructed roads and driveways create erosion problems and loss of soil and sediment into streams. A well constructed road is easier on your vehicles, requires less maintenance, looks nicer and does not cause erosion problems. If stormwater is creating gullies and running down your unpaved driveway, your road needs to be improved before it erodes away. You can slope your road so that water runs off it to either side, or by excavating crossroad drainage water bars or creating a dip to deflect the flow to the side. The side of the road should be vegetated and allow for drainage. Proper installation of culverts is essential to maintaining your road as well as allowing for storm water flow to be diverted. Gravel and larger rocks may be adequate to allow for roadside drainage and prevent soil erosion. 3/4 inch gravel is commonly used for pooling water below a downspout and in French drains along a road. Seeding and using straw mulch is necessary for bare soil near roads or on construction sites.

STREAMBANK RESTORATION

A healthy streambank needs undisturbed soil and vegetation. Streamside trees, vines, shrubs, grasses and emerging aquatic plants are all essential parts of a healthy stream environment. Riparian means stream side. Riparian plants not only provide critical wildlife habitat, but also contribute to the healthy condition of the stream itself. Stream vegetation can act as a filter to nutrients and add shade cover to a stream which lowers the water temperature favorably for aquatic life. Native riparian plants work best for restoration purposes as they are best suited for riparian areas. Examples of local natives include plants such as the big leaf maple, white alder, willow, cottonwood, several different conifers, California black walnut, elderberry, blackberry, and California wild rose.



Erosion and sediment affecting water quality and water movement of a stream.

Source: USDA/ NRCS

EFFECTS OF HUMANS ON WATER QUALITY

URBAN RUN OFF

People contribute to pollution daily by grease, oil and other petroleum products on roadways washing into storm drains which ultimately flow into water bodies. Not only does aquatic life live in these waters, but most likely someone you know swims there also. The placement of animal runs on a slope or near a stream can contribute to waste pollution and affect the nutrient load in that stream. Failing or leaky septic systems contribute to polluted surface and ground water as well as contamination downstream. Keep septic systems and leach fields well away from streams or ponds. Watch for surfacing sewage, especially during the winter months. Call



the county health department if you have a problem. They will help you determine what the problem is and what you can do about it.

Properly dispose of antifreeze, waste oil, paint, solvents, detergents, old tires, garden wastes, pesticides or any other chemicals. Call the hazardous waste disposal office for more information. Many yard and garden chemicals are extremely toxic to aquatic organisms and wildlife. **NEVER** apply herbicides or pesticides near a streamside area and consider wind drifts when spraying. Even small droplets entering a stream can affect it. Contact the local Agriculture Commissioner's office for permits and guidelines for pesticide and herbicide use.

MERCURY CONTAMINATION

Mercury contamination from historic gold mining represents a potential risk to human health and the environment. Miners used mercury (quicksilver) to recover gold in Nevada County. Most of the mercury used was for hydraulic, drift and dredging methods of mining, and it is estimated that approximately 3-8 million pounds or more of mercury was lost to the environment. Minute particles of quicksilver were found floating on surface water as far as 20 miles downstream, per A.J. Bowie in 1905. In the northwest central Sierra Nevada, the highest average levels of mercury bioaccumulation occur in the Bear River and South Yuba River watersheds, both in Nevada County. Mercury occurs in several different forms, the most important is methylmercury which is the most available to biological tissues and most toxic to humans and wildlife.



Lake in hydraulic mine pit caused by blocked drainage tunnel. Acidic water in this pit lake (pH 3.5) caused by oxidation of sulfide minerals in gold-bearing gravel deposits.



Physical hazards at hydraulic mine sites include highwalls (left photo) and open shafts (right photo). Highwalls are steep unstable slopes subject to sudden collapse. Shafts vary from tens to hundreds of feet in depth and connect with horizontal mine workings including drift mines and drainage tunnels.

Source: Charles Alpers and Michael Hunerlach,

IMPORTANT PHONE NUMBERS

Oil Recycling Program	530-265-1768
Illegal Dumping	530-265-7111
Recycling Information	530-265-1411
Recycling Program Hotline	530-265-1768
Waste Management Trash Hauling	530-274-3090
Agriculture Commissioner (for pesticide and herbicide use info)	530-273-2648
Air Quality Management District Nevada County	530-274-9360
Resource Conservation District	530-272-3417
Natural Resource Conservation Service	530-272-3417
Nevada County Planning Dept	530-265-1222
Nev Co Environmental Health Dept	530-265-1452
California Dept of Fish & Game (stream permits and information) Central Valley	916-358-2900
Water Quality Control Board	916-557-5100
US Army Corps of Engineers (permits and information)	916-557-5100



Photo courtesy of L. Osterholm

REFERENCES:

Alpers, Charlie and Michael Hunerlach, USGS FS -061-00, May 2000,
Mercury Contamination From Historic Gold Mining in California

Placer County Resource Conservation District/ Dry Creek Watershed Group
Stream Care Guide, 1999

UC Cooperative Extension/ USDA NRCS/ UCD Center for Range and Forested Ecosystems
Ranch Water Quality Planning Guide, 1998

USDA/ Natural Resource Conservation Service, photos

Properly dispose of waste products, garbage,
chemicals, pesticides and herbicides.



Protect our precious resource
WATER

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