

Native American use of fire (and its effects on water)

By: Chuck Jachens
Regional Hydrologist
Bureau of Indian Affairs - Pacific Region

Native Americans have a long history of traditional fire use on Mother Earth. Fire use promoted their desired ecological state of the environment. These traditions and time of season to burn for a desired effect have been passed down generation to generation. Henry T. Lewis, who has authored more books and articles on this subject than anyone else, concluded that there were at least 70 different reasons for the Indians firing vegetation. These reasons included hunting, crop management, insect collection, pest management, improving growth and yields, fireproofing areas, clearing areas for travel, felling trees, and clearing riparian areas just to name a few.

Today, Land Management Practitioners are studying the historical use of fire by Native Americans, now known as Traditional Ecological Knowledge (TEK). TEK techniques use fire as a tool replicating the use of fire as Native Americans did during pre-settlement times to renew the landscape and mimic fire severity and intensity as an important natural disturbance mechanism. Fires, both naturally occurring and prescribed, were once part of natural landscapes in many areas of California.

Wildfires exert a tremendous positive and/or negative influence on the hydrologic conditions of watersheds in many forest ecosystems depending on a fire's severity, and intensity. The influence of wildfire on hydrologic conditions in the forest can be broken down into three major parts: surface cover, canopy, and soils. Surface cover of a watershed consists of the organic forest floor, vegetation, bare soil, and rock. Canopy is above the surface cover and includes the above ground parts of shrubs, bushes, and trees (deciduous and conifer). Soils influence hydrologic conditions by their water holding capacity, water absorption rates, and their exposure to erosion.

In the canopy, pine needles will survive fire exposure to 130°F for about 5 minutes, while needles exposed to 145°F for only a few seconds will die. Very high temperatures are produced in the flames of burning forest fuels. Fortunately, the hot gases cool rapidly above the flame zone and are back to a few degrees above normal air temperature a short distance from a low intensity fire unless the wind is calm. Adequate wind is needed to help dissipate the heat and slow its rise into the over story canopy. Wind is also important in cooling crowns heated by radiation from fire. Shortly after the fire, leaves and needles damaged by the fire are dropped by the trees which helps cover the ash and protect the soil.

Disruption of the organic surface cover, canopy, and alteration of the mineral soil by wildfire can produce changes in the hydrology of a watershed well beyond the range of historic variability. During storm events, interception is the hydrologic process by which vegetative canopies and accumulations of litter and other decomposed organic matter on the soil surface interrupt the fall of precipitation from the atmosphere to the soil surface. Interception protects the soil surface from the energy of falling raindrops. Without this dissipation of energy, the mineral soil surface can become compacted or dislodged by raindrop splash, which then impacts the infiltration characteristics of the soil surface and the pathways of water to stream systems within a watershed.

A high severity wildfire can destroy much of the forest cover on a watershed, creating many large openings in the process. High severity fire lowers the stand density which allows more of the snowpack to be lost to evaporation. However, only a few relatively small openings in the forest canopy are likely to be created by a low severity fire that consumes only the surface fuels.

Native Americans (TEK practitioners) used low severity fire to consume accumulations of litter and other decomposed organic matter on the soil surface. Low severity burning promotes herbaceous flora and new growth from the root crowns of burned bushes and shrubs, increase plant available nutrients, and thins over-crowded forests. The use of fire on the land was done purposely to establish or keep mosaics, resource diversity, environmental stability, predictability, and the maintenance of ecotones. Burning practices were dependent on the weather, vegetation type and time of year. Depending on the resources benefited, burning by Native Americans was done in selected areas yearly, every other year, or intervals as long as five years either late fall or early spring.

Traditional use of fire also had secondary benefits such as improving water quality. Fire was commonly used to clear brush from riparian areas, marshes, and mountain meadows for new grasses and sedges, plant growth (cattails), and tree sprouts (to benefit beaver, muskrats, moose, and waterfowl), including mesquite, cottonwood, and willows. Low severity fire allowed for vigorous new growth and expansion of wetland buffers into previously shaded areas. In contrast, high severity fire and the burning of heavy fuel and slash accumulations in riparian zones directly degrade water quality and cause direct fish mortality.

Native Americans used fire along the Klamath River to influence a particular aspect of water quality: Water Temperature. High water temperatures stress the salmon and steel head migration which could lead to fish die offs. Low flows in the river water would get excessively warm during the day from solar radiation. Fire were started to create smoke and shade the river thus keeping the river colder and keeping the fish healthy until spawning.

There are many recent examples in California where large, severe fires can cause changes in ecological succession rates, alter species composition, generate volatilization of nutrients and ash entrainment in smoke columns, produce rapid or decreased soil mineralization rates, and result in subsequent nutrient losses through accelerated erosion. In contrast, traditional use of fire helped renew the forest ecosystem, removed excessive fuels which could result in high severity fires, and prevent drastic alterations in stream flow discharges that are common after severe wildfires.

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