Upper Pine River Watershed

State of the Watershed Report 2008

Pine River Watershed Group

Pine River Watershed Group

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State of the Watershed Report 2008

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Support has been provided by the

Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Pine River Watershed Group

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Cover Photo: View of the San Juan Mountains From Vallecito Reservoir.

CONVERSION FACTORS AND ABBREVIATIONS USED IN THIS REPORT

CONVERSION FACTORS:

Multiply	By	To obtain
cubic foot per second (cfs)	0.02832	cubic meter per second (m^3/sec)
foot (ft)	0.3048	meter (m)
gallon	3.78	liter (L)
inch	2.50	centimeter (cm)

Degrees Celsius (^oC) may be converted to degrees Fahrenheit (^oF) by using the following equation:

$$^oF = 9/5(^oC) + 32$$

ABBREVIATIONS:

The following terms and abbreviations may used in this report:

feet (ft)
parts per million (ppm)
parts per billion (ppb)
parts per trillion (ppt)
cubic feet per second (cfs)
milligrams per liter (mg/L, same as ppm)
micrograms per liter (µg/L, same as ppb)
nanograms per liter (ng/L, same as ppt)
nanograms per square centimeter per year (ng/cm^2/year)

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State of the Watershed Report 2008

Contributions from Volunteers of the Pine River Watershed Group

Edited by Win Wright, Certified Professional Hydrologist

EXECUTIVE SUMMARY

After decades of atmospheric deposition of pollutants from outside of the watershed, then the effects of wildfires, drought, and floods of 2002-2003, the upper Pine River watershed is slowly recovering. Air pollution prevention measures implemented in the 1980's and 1990's have improved the impacts of air pollution somewhat, but mercury and other constituents related to coal-fired power plants continue to fall onto the watershed. Ammonia, manganese, iron, and mercury are problems in Vallecito Reservoir. Manganese concentrations fluctuate from year to year, but the ammonia and iron concentrations seem to be getting worse. Water quality of the Pine River and Vallecito Creek upstream from the reservoir are very good. However, pollutants are being trapped in the reservoir sediments, and fish are absorbing pollutants from reservoir sediments.

The kokanee salmon population in the reservoir has all but disappeared, but a new program will stock the reservoir with trout instead of salmon. Call it a shift or transition in the ecosystem, it has inexorable ties to human-caused influences inside of the watershed (forest overgrowth leading to massive wildfires, housing developments, recreation) and outside of the watershed (atmospheric deposition of pollutants and dust from the urbanized southwest US).

One thing is for certain, volunteers are the back bone of the data collection effort in the upper Pine River watershed. Their selfless efforts have provided invaluable information to say that the state of the watershed is cautiously good.

1.0 INTRODUCTION

Data Collection, Volunteer Efforts, and Collaboration Have Resulted in a Better Understanding of the Health of the Upper Pine River Watershed

Beginning in 1997, water-quality investigations have documented changes in the health of the watershed. Data show the impacts of coal-fired power plants, wildfires, housing developments, and recreation. While the upper Pine River watershed appears to be an isolated setting, volunteers realize that their mountain community may not be as isolated as once thought.

The upper Pine River watershed (**Figure 1**) exemplifies a classic mountain setting of high-altitude streams, lakes, and alpine views. The watershed includes two main streams--Vallecito Creek and Los Pinos River, which converge at Vallecito Reservoir (pronounced *Vai. ya. sito*), a man-made reservoir constructed in 1942 for storage and distribution of irrigation water to farmlands in the lower Pine River watershed. Water-quality data have been collected since the 1970's by the U.S. Geological Survey (USGS) and Bureau of Reclamation (BOR). In the 1990's the BOR conducted a study of ground-water quality in the Vallecito Valley. In 1997, the USGS conducted a detailed study of the water quality of Vallecito Reservoir.

In 1999, the Pine River Watershed Group (PRWG) was formed by volunteers to collect water-quality data at Vallecito Reservoir and the surrounding watershed. The PRWG began as a monitoring effort to to make sure that their pristine waters remained pristine. The end result has been an experience in scientific observation of the effects of wildfires in the watershed (the Missionary Ridge fire of 2002, and the Bear Creek fire of 2003). During 2006, Vallecito Reservoir was posted for dangerous levels of mercury in fish tissue, which led volunteers down a path of research towards the understanding of sources and impacts of mercury in the environment.

While data collection and scientific observation began relatively recently by the PRWG, impacts to the watershed from outside sources may reach back as far as the 1960's and 70's. Historical data collected by the USGS show that high-altitude lakes and Vallecito Creek show improvements from some kind of impact. The question asked is, "Decreasing from what impact?" Back in the 1960's, the Vallecito area was an isolated and undeveloped mountain setting. There must have been impacts from outside sources.

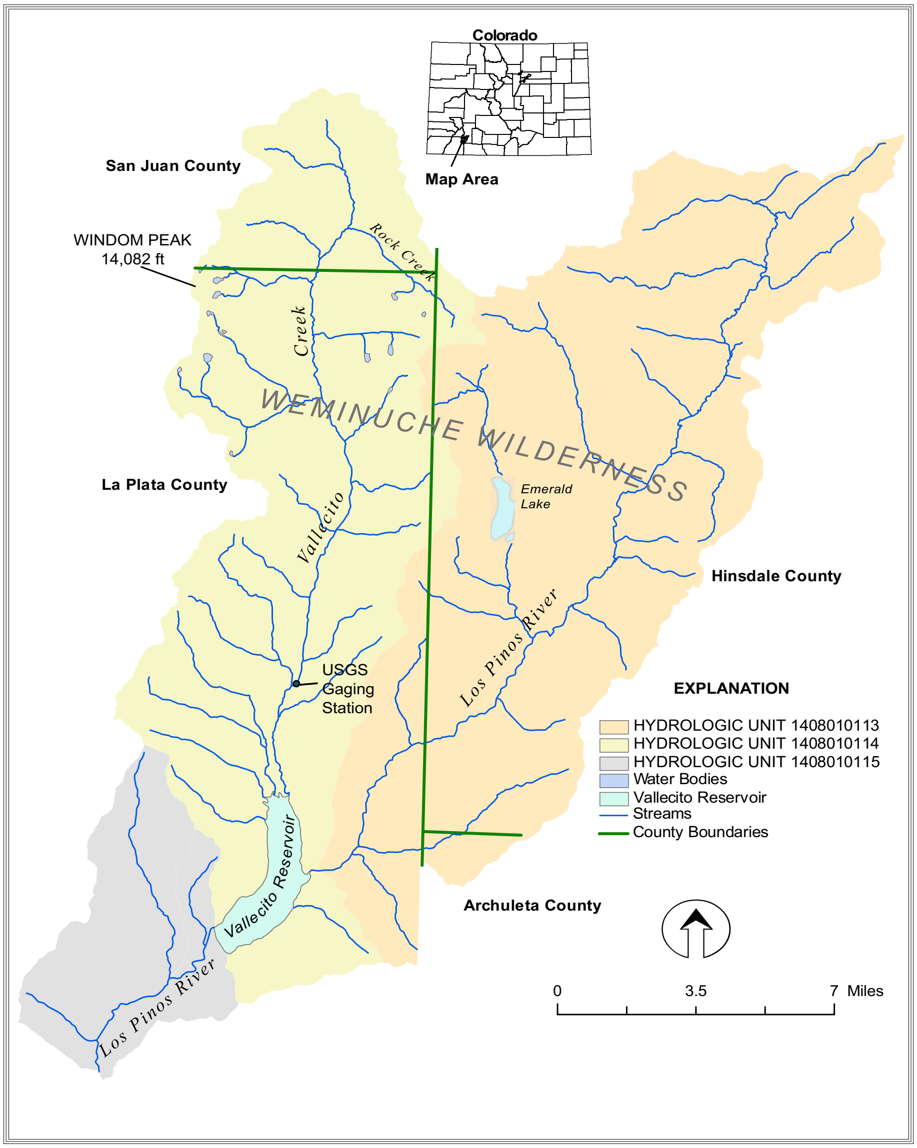
Sources from outside of the watershed could include urbanization of the desert southwest (increased dust transport) and coal-fired power plants (mainly in the Four Corners area). The fact that concentrations are decreasing invites another question, "What are the causes of decreasing concentrations?"

When Vallecito Reservoir was posted for mercury in fish tissue, the impacts felt by the watershed for years was finally manifested in the scientific data. It is, unfortunately, too late to ameliorate the contaminants deposited in the watershed in the past. But the volunteers hope to collect data in order to describe the health of the watershed, and protect it for the future.

Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 1. Streams and hydrologic units of the upper Pine River watershed.

Photos by Bob Thompson and Win Wright



2.0 HISTORY OF THE PINE RIVER WATERSHED GROUP

Volunteers are Trained in the Protocols for Water-Quality Sampling and Data Collection. Their Data have Contributed to a Better Understanding of Baseline Conditions in the Watershed.

The volunteers from the PRWG have devoted thousands of hours, using their own boats at their own expense, to know what is going on at Vallecito Reservoir and the surrounding watershed. They know that scientifically accredited water and air testing can identify sources of pollution that endanger the future of Vallecito Reservoir, which is a vital water and recreation resource.

In 1997 the Pine River Irrigation District (PRID) and the Southern Ute tribe contracted with the USGS to do a water-quality study of Vallecito Reservoir. The first preliminary report was presented to all interested parties including the La Plata County Commissioners. The report revealed that during some late summers there were low oxygen levels in the center of the lake. Otherwise, the findings revealed a pristine lake.

At the meeting it was recommended that further studies be conducted. Grants were obtained to hire a coordinator, and monthly meetings were held with representatives from surrounding county, state, federal, and local groups. This ad hoc group became the Pine River Watershed Group. The San Juan Resource, Conservation, and Development Council (San Juan RC&D) agreed to serve as the sponsoring entity of the PRWG.

With grant funds, a lake-water sampler (Kemmerer sampler) and water-quality data sonde (Hydrolab™) were purchased. Training was provided by the USGS in the proper methods for calibration of the sonde and collection of water samples for laboratory analyses.

Initially, the PRWG volunteers conducted sampling trips on the reservoir twice monthly from May through November. When a new watershed coordinator joined the effort in 2005, a data synthesis report was written describing baseline water-quality conditions in the upper Pine River watershed (http://www.swhydrologic.com/PRWG.htm). Through analysis of the data, it seemed that twice monthly sampling was too frequent, and the sampling events were reduced to once or twice a month, depending on the lake conditions.

Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 2. Instrument calibration, lake sampling, and water-sample filtration.

Meet early to calibrate the water-quality sonde, which is checked for the accuracy of pH, specific conductance, temperature, and dissolved oxygen readings.

"ANY DAY ON THE LAKE IS A GOOD DAY-- EVEN WHEN IT'S RAINING SIDEWAYS."

The sonde is lowered into the lake 5 or 10 feet at a time, and water properties are sent to the data unit, where readings are recorded by a notetaker. On this day, we had the luxury of a pontoon boat. Most sampling days are spent in a small outboard motor boat.

Photos by Bob Thompson and Doug Ramsey

Water samples are collected at the bottom and top of the lake using a point-sampler on a rope with a weighted "messenger" to trigger open the sampler. Samples are poured into one-liter cube bottles. A sample number with a suffix of "L" indicates the lower sample, and a "U" indicates the upper sample.

Water samples collected from the lake are filtered and preserved afterwards. Laboratory request forms are filled out, and samples are delivered to the laboratory by express shipping.

3.0 DROUGHT AND WILDFIRES--2002-03

Grant Funds were Scarce During the Drought. Volunteers Continued to Collect Water-Quality Data on Their Own.

Lake levels fell 50 or 60 feet; shoreline docks and marinas were left high and dry; mud flats were the only access to water. Volunteers persisted in their collection of water-quality data, but only field parameters were measured because there were no funds to analyze water samples at the laboratory.

In June and July 2002, the Missionary Ridge wildfire burned 70,485 acres in the forested and developed lands northeast of Durango, Colorado, and about 8,000 acres in the upper Pine River watershed. In August 2003, the Bear Creek wildfire burned about 1,500 acres in the upper Vallecito Creek watershed.

The drought years of 2002-03 proved to be challenging following the wildfires. Water, as well as funding, was scarce. When rains finally came, ash and wildfire debris washed into the reservoir. With no funding, volunteers continued to collect water-quality data using the Hydrolab, even though getting boats into the lake presented a formidable problem. The lake at its lowest was only 38 ft deep at the center (the lake is typically 95-105 feet deep) **(Figure 3)**.

During August 2003, thousands of fish (Primarily kokanee salmon) were killed in the reservoir. Due to the fire, the pH of water at the bottom of the lake had risen to nearly 10.0, and the dissolved oxygen concentrations were extremely low.

Forests of the upper Pine River watershed were heavily impacted by the wildfires. Surface plant cover was lost to the fires, which increased erosion and caused debris flows. Nature is very resilient, though, and the forest conditions are rapidly recovering.

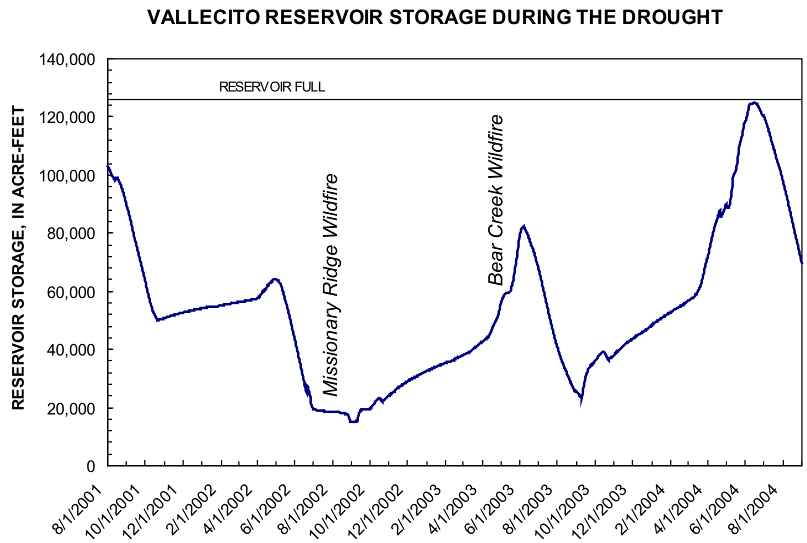
Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 3. Drought, wildfires, and low reservoir storage levels.

Photo by Denver Post

"Historical stream flow records and the forecast for 2004 make the current (1999-2004) drought in the southwestern United States the worst one in the past 80 years for portions of the Upper Colorado River Basin, and the seventh worst in the last 500 years." (Piechota, T., J. Timilsena, G. Tootle and H. Hidalgo 2004. The Western U.S. drought: How bad is it? *EOS--Bulletin of the American Geophysical Union 85/32)*

"The Colorado Division of Wildlife has announced that a major fish kill has taken place at Vallecito Reservoir. Thousands of kokanee salmon have died in the reservoir since late August, and the DOW said warm weather and run-off from the Missionary Ridge burn area are the culprits."
--*The Durango Telegraph, 2/37, Sept 2003*



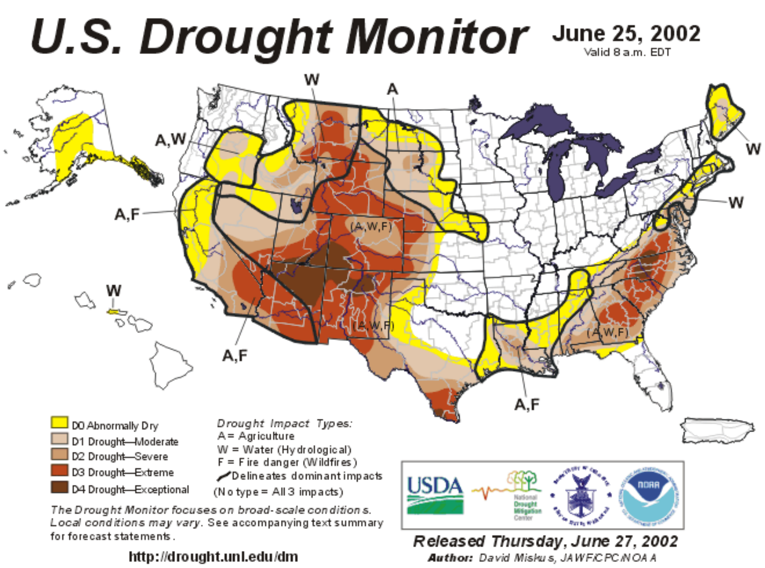


Photo by Dave Grey, USGS

Scour in Root Creek from rain on burned forest, July 22-23, 2002.

4.0 AFTER THE DROUGHT AND WILDFIRES

Volunteers Monitored Rainfall-Runoff Responses and Floods in Burned Areas, and Collected Water-Quality Samples from Vallecito Reservoir.

The volunteers carried out a diversity of hydrologic tasks, such as installation of stream gages, daily monitoring of streamflow, collection of water-quality samples, and observations of rainfall amounts, as well as continued monitoring of the reservoir. A communication network was established for houses potentially in flood danger.

Through 2004-06, snowpack and summer rains increased, and runoff into Vallecito Reservoir slowly washed some of the ash from the lake. The pH returned to near normal levels; however, dissolved oxygen remained at reduced levels in the deepest part of the lake. Volunteers, using their own boats, continued monitoring of the reservoir during the summer for pH, conductivity, temperature, and oxygen levels at the GPS-located sampling sites.

During 2006, funding was obtained to assess the potential for floods from the burned areas. PRWG volunteers monitored staff gages on a daily basis to determine the potential for floods in the recovering wildfire areas **(Figure 4)**. Water samples were collected from tributaries to Vallecito Reservoir.

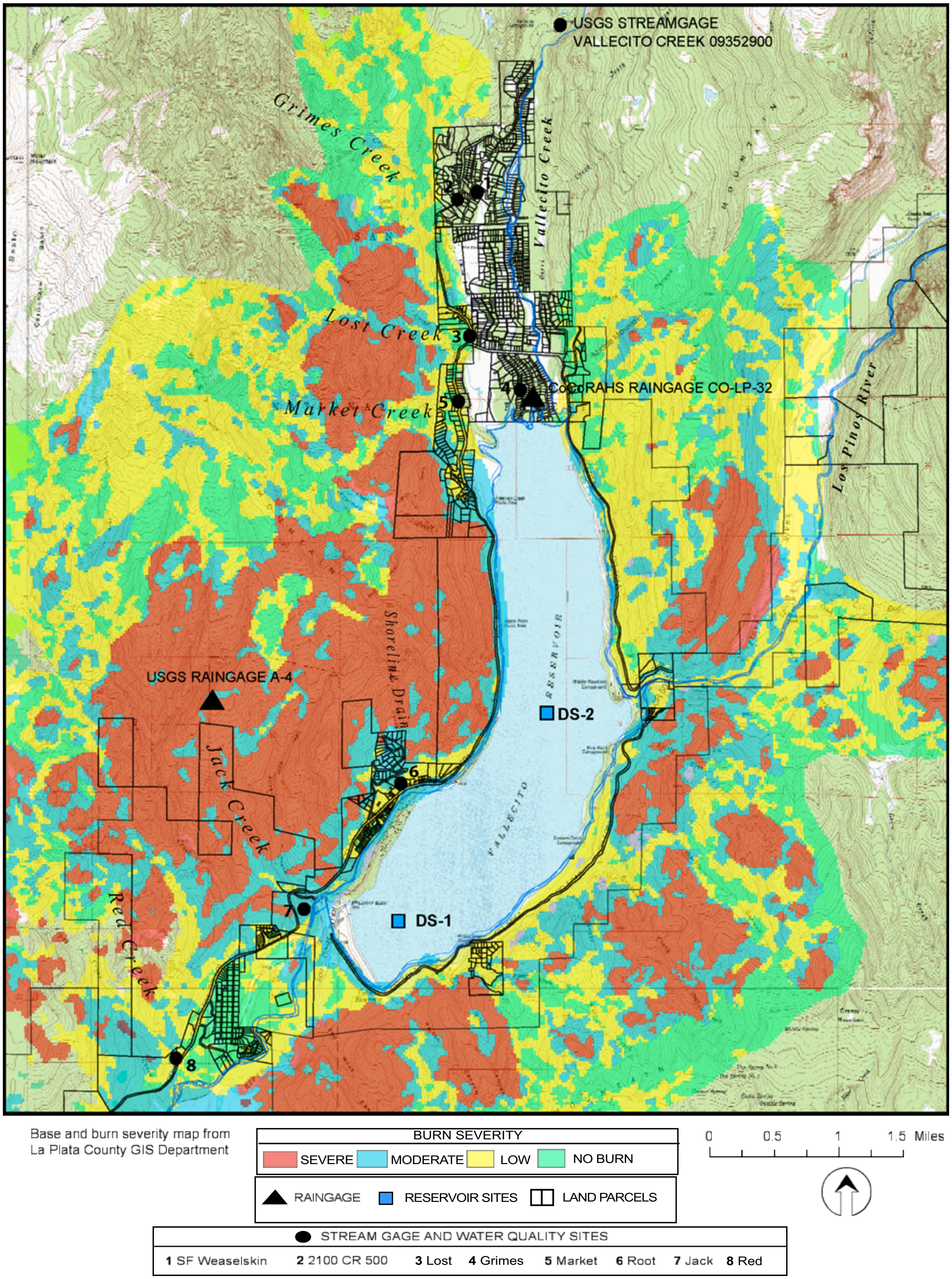
Volunteers also collected water samples at upper and lower levels of the lake. Laboratory tests showed extremely high manganese levels that were high enough to endanger fish life. The manganese was probably washing into the reservoir from the burned areas surrounding the lake, and the low oxygen levels created conditions favorable for dissolved manganese in the lake. Almost at the same time, the State of Colorado posted Vallecito Reservoir for high levels of mercury in fish tissue (northern pike and walleye). The volunteers now understood that water testing must include sampling for dissolved minerals and that additional funding would be required for costly laboratory evaluation of water samples.

From a diversity of studies during 2005 and 2006, the results showed: (1) Flood threats have been reduced in most of the burned tributaries, except Grimes Creek, and the forest seems to have recovered from the wildfire;
(2) the greatest flood threat may be present in the Vallecito Creek valley; and (3) iron, manganese, mercury, and nitrate were flowing into the reservoir from the burned areas, mainly from the Grimes Creek drainage. Reports on all of the work done by the PRWG can be found at:

http://www.swhydrologic.com/PRWG.htm

Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 4. Site locations for measurement of rainfall, streamflow, and water-quality.



5.0 WATER QUALITY OF VALLECITO RESERVOIR

Quality of Water in Vallecito Reservoir has Deteriorated Slowly Over Many Years due to Atmospheric Deposition and Wildfires.

Atmospheric deposition from coal-fired power plants and urban development of the southwest has affected the watershed. Vallecito Reservoir and its tributaries are recovering slowly from the wildfires. But manganese, iron, and ammonia concentrations appear regularly in reservoir water-quality samples, and the kokanee salmon population has all but disappeared.

Dissolved oxygen concentrations decreased in the reservoir since the wildfires occurred (**Figure 5**), resulting in a fish kill of thousands of kokanee salmon during summer 2003, one year after the Missionary Ridge wildfire. Concentrations of iron, manganese, and ammonia have increased in water from the reservoir and in the Pine River downstream.

Manganese concentrations in water from Vallecito Reservoir were as high as 1,910 parts per billion (or ppb) during 2005. The aquatic life standard for manganese is 1,200 ppb for the survival of fish. During 2006, the manganese concentrations were surprisingly low, ranging from 7 to 114 ppb. However, iron concentrations increased from 50 to 500 ppb. The iron toxicity standard for fish in Vallecito is 1,000 ppb.

Ammonia concentrations in Vallecito Reservoir were high as 0.09 ppm (or parts per million), and the chronic toxicity standard for aquatic life is 0.02 ppm. The particular form of non-ionic ammonia (NH_3^0) is the most toxic to fish and wildlife.

Laboratory results of lake water collected during August and September 2007 showed that other trace metals (such as cadmium, chromium, copper, nickel, lead, and zinc) were not present in high concentrations. However, a water sample from the bottom of the lake, with some stirred sediments, showed a mercury concentration of 3,500 ppt. The mercury toxicity standard is 10 ppt.

Every year, the reservoir becomes stratified due to a separation of warmer and colder water. When temperatures become the same throughout, the lake “turns over” where water in the bottom mixes with water at the top. When this happens at Vallecito Reservoir, white foam appears in a broad line down the middle of the lake. Laboratory analyses of this foam indicated predominant concentrations of organic carbon, iron, and ammonia.

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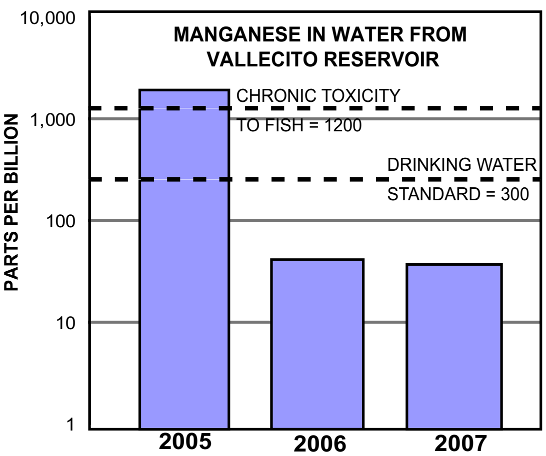
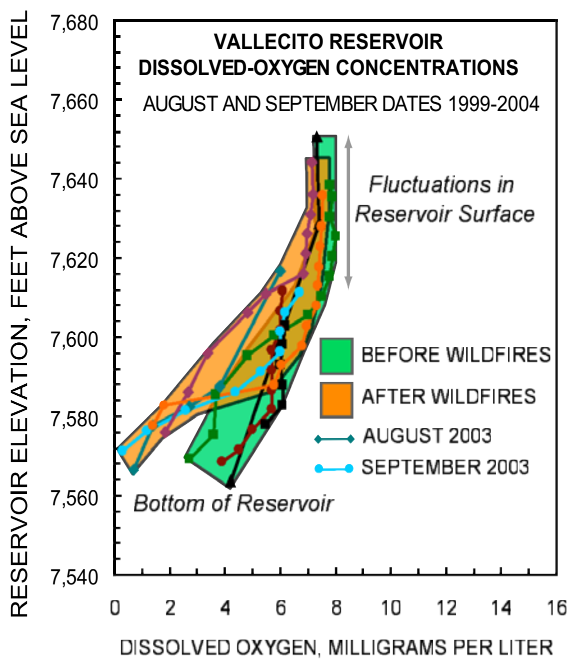
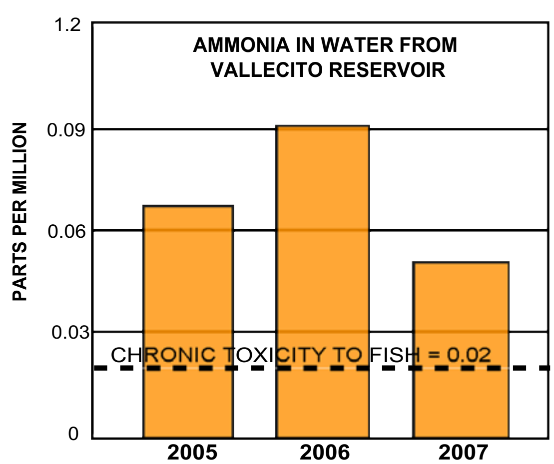
Figure 5. Manganese, dissolved-oxygen, and ammonia concentrations in Vallecito Reservoir.





Photos by Bob Thompson



6.0 MERCURY IN VALLECITO RESERVOIR

Results of Mercury Testing of Fish (Northern Pike and Walleye) Indicate that Vallecito Reservoir has a Mercury Problem. A Fish Consumption Advisory was Posted by the State During 2006.

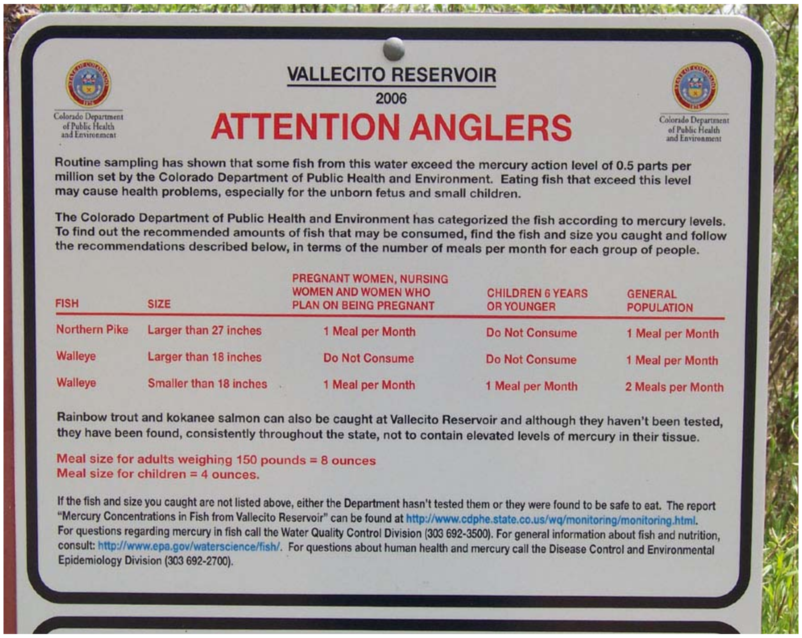
Vallecito citizens and elected officials were concerned about Vallecito Reservoir, which they thought was an isolated and pristine mountain lake. Studies were undertaken to determine the possible mercury sources.

Vallecito Reservoir was sampled by the Colorado Department of Public Health and Environment (CDPHE) in order to evaluate the potential risk to the public from consuming fish that may be potentially contaminated with mercury. Mercury bioaccumulates as it moves up the food web, and in the case of Vallecito Reservoir, northern pike and walleye are at the top of the food web. The mercury results indicate that the lake does have a mercury problem. Mercury was found at levels above the Department's action level of 0.5 ppm in several fish collected and analyzed from Vallecito Reservoir. The CDPHE, therefore, recommended that restrictions be placed on the consumption of northern pike and walleye caught in Vallecito Reservoir.

Warning signs were posted around lake, and fish consumption advisories were issued. Vallecito citizens were concerned about the impacts on recreation, visitation, and public health. They asked, "Where does the mercury come from? Are there natural sources of mercury in the watershed? If there are not natural geologic sources, could it be falling from the sky?"

Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 6. Mercury in Vallecito Reservoir and fish consumption advisory.



http://www.chemsoc.org/

Mercury was known as "quicksilver" to the ancients. Alchemists were convinced that mercury, also represented by the serpent, transcended both the solid and liquid states, both earth and heaven, both life and death.

http://www.bluesprucervpark.com/

Northern Pike from Vallecito Reservoir

7.0 WHERE IS THE MERCURY COMING FROM?

Mercury in Fish at Vallecito Reservoir Might Not Come from Geologic Sources Alone.

Baseline mercury concentrations in streambed sediments are below the crustal average of 0.09 ppm. Core samples from small lakes show increasing mercury fluxes during the 1960's through the 1980's, then show a decrease to near baseline values.

During fall 2006, streambed sediment samples were collected in the upper reaches of the Vallecito Creek and Pine River drainages. Mercury concentrations in streambed sediments ranged from < 0.01 to 0.08 ppm. The average crustal mercury concentration is 0.09 ppm; therefore, all of the samples were below the crustal average (**Figure 7**). This indicates that mercury is not present in high concentrations in geologic sources in the watershed.

Sediment cores were collected from two small lakes near Vallecito Reservoir (**Figure 7**). Ancient debris-flow deposits, sampled by David Gonzales (Fort Lewis College) for carbon-14 dating, were re-sampled for mercury concentrations. The age of lake-core samples were correlated to recent dates using lead-210 and cesium-137 isotopes.

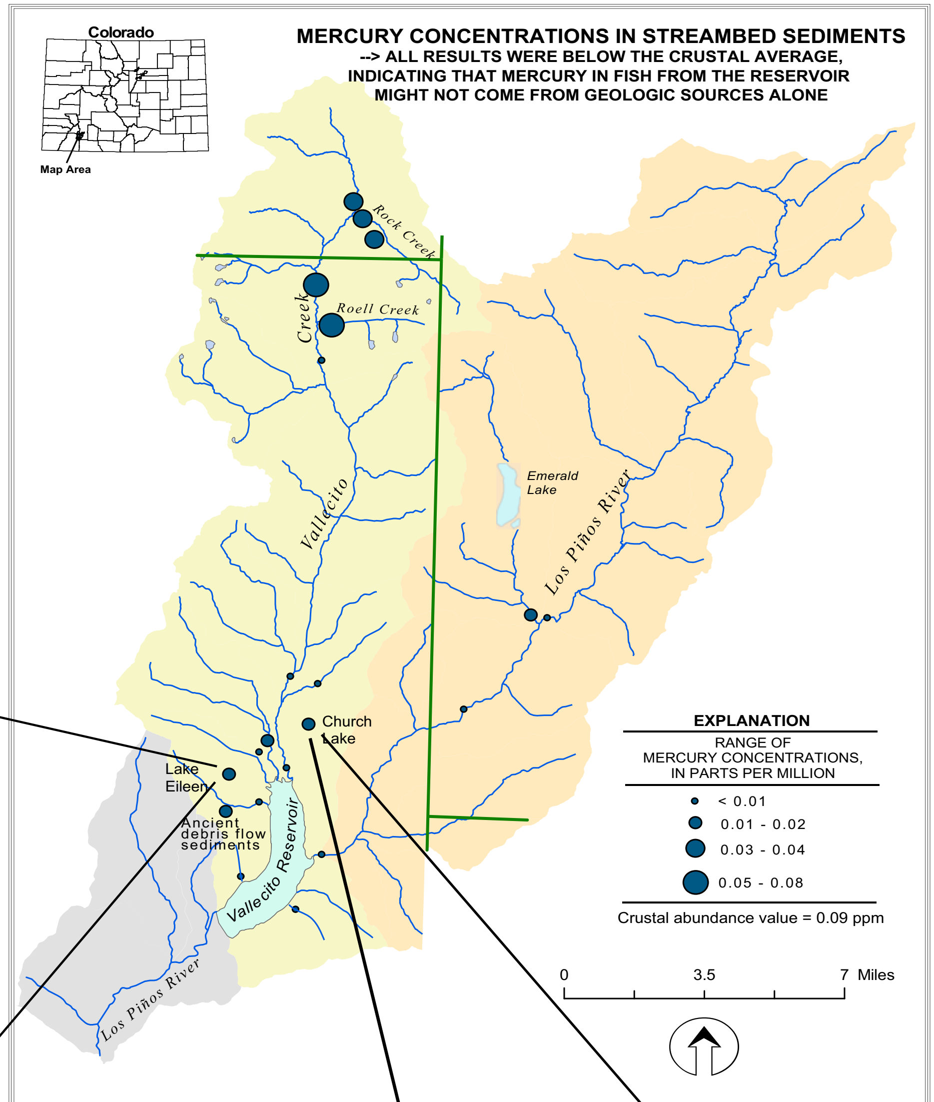
Mercury fluxes in lake sediments increased over recent time from 12 to 68 nanograms per square centimeter per year ($ng/cm^2/year$), and peaked in the 1970's and 1980's. Mercury concentrations in the ancient debris-flow sediments (dating back 3,000 years) ranged from < 0.01 to 0.02 ppm.

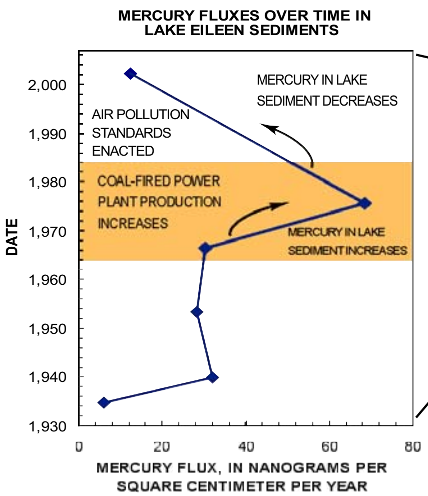
The increase of mercury in lake core samples may be due to increased production by coal-fired power plants. Air pollution controls implemented in the 1980's and 1990's has slowly decreased mercury concentrations in the lake sediments to near baseline values. Urbanization of the desert southwest and subsequent transport of dust by storms may have affected the watershed; however, decreasing mercury fluxes in lake sediments after the 1980's show evidence for the benefits of air pollution prevention.

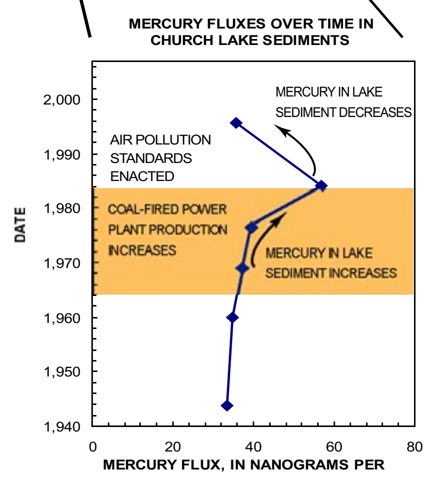
Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 7. Mercury in streambed sediments, and mercury over time in lake sediments.

Photos by Sunny Halauer and Bob Thompson







8.0 MERCURY IN RAIN AND SNOW

Almost 19 Grams of Mercury were Deposited on the Surface of Vallecito Reservoir During 2007. About 50 percent May Have Come from Coal-Fired Power Plants.

Even though lake sediment samples show that mercury deposition has decreased since the 1980's, concentrations of mercury in rain and snow were as high as 72 ppt during 2007. Baseline mercury concentrations were on the order of 3 to 5 ppt. Computer models were used to show that higher mercury concentrations in rainfall came from the Four Corners area, location of coal-fired power plants.

An automatic precipitation sampler was installed near Vallecito Reservoir during 2007. A special sensor on the sampler detects when it is raining or snowing, then a lid automatically uncovers three funnels that direct water to different sample bottles, which are preserved for different analyses. Samples were processed according to clean protocols, quality assurance samples were collected, and the samples were analyzed using trace-mercury methods (EPA method 1669).

Mercury concentrations in rain and snow ranged from 1.9 to 72 parts per trillion (or nanograms per liter). The highest concentration of 72 ppt was measured during a rainfall event on July 19, 2007. Atmospheric dispersion and backtrajectory analyses of the event shows that the concentration of mercury came from the Four Corners area (**Figure 8**).

From the rain and snow events sampled, nearly 19 grams of mercury were deposited on the surface area of Vallecito Reservoir over a period of eight months. Through analysis of the weather events, mercury deposition, and subtraction of the baseline mercury concentrations (ranging from 3 to 5 ppt), about 50 percent of the mercury deposition on Vallecito Reservoir came from the Four Corners area.

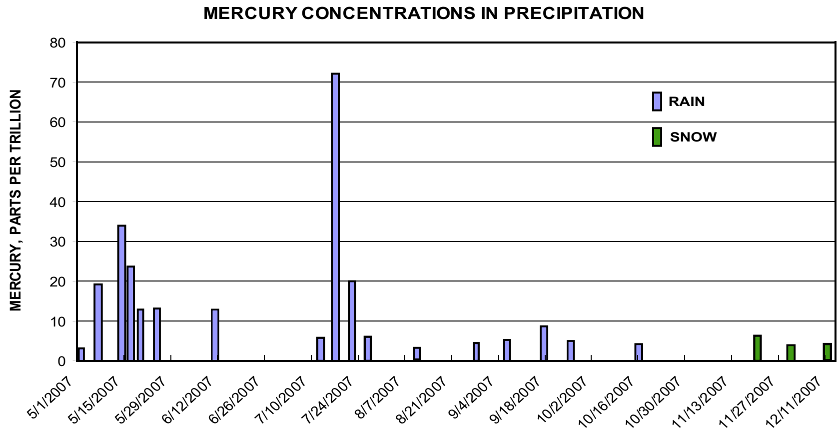
Almost 150 grams of selenium were deposited on the surface of Vallecito Reservoir in 2007. Selenium is known to be correlated to mercury in fallout from coal-fired power plants. Other constituents were detected in rain and snow including ammonia, boron, chloride, manganese, nitrate, and sulfate. The pH values of rain and snow ranged from 3.38 to 5.57, with a median of 3.8.

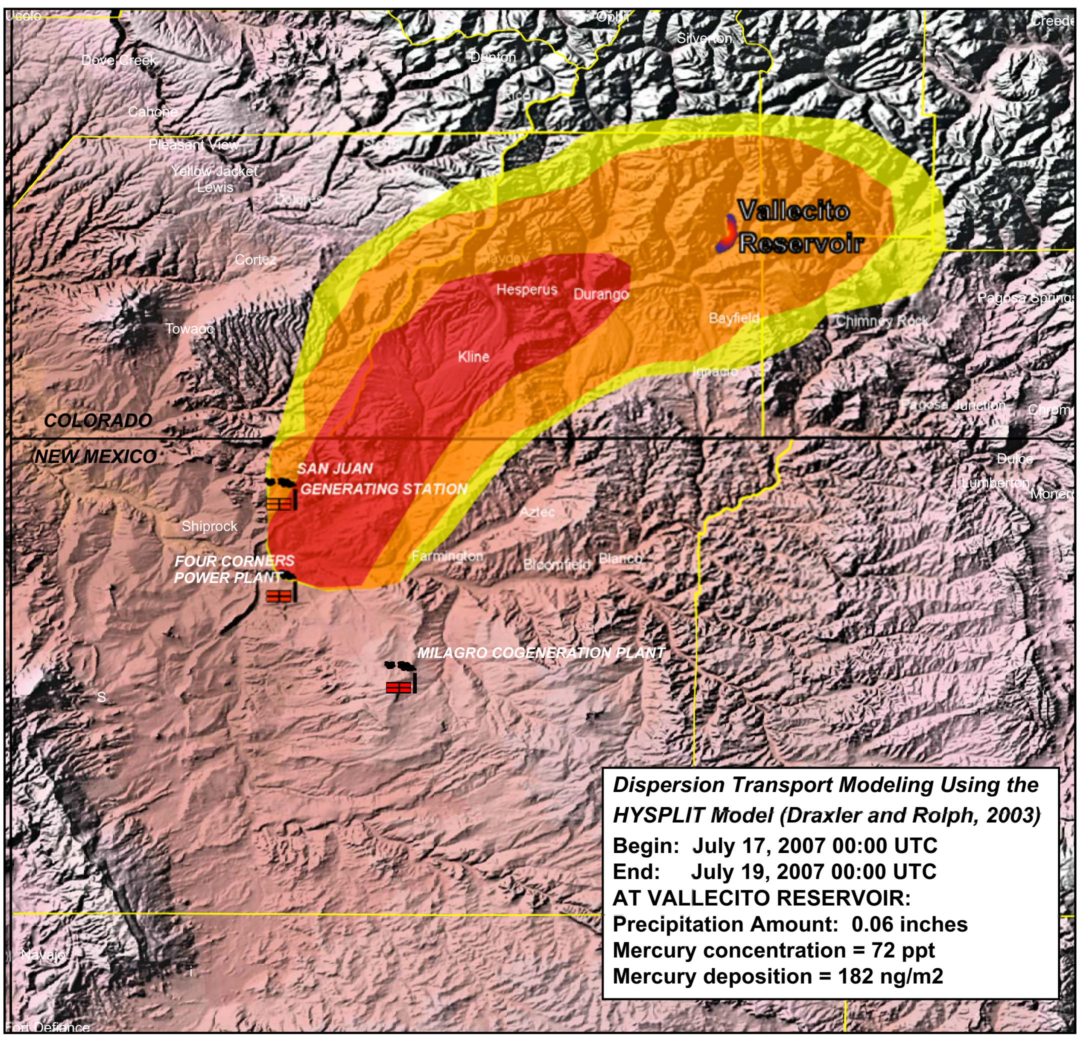
Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 8. Mercury concentrations in precipitation at Vallecito Reservoir for 2007, and example of dispersion modeling results for July 19, 2007.

Photo by Jerry McBride/HERALD

Automatic precipitation sampler near Vallecito Reservoir





9.0 POTENTIAL FOR FLOODS

Flood Danger has Diminished in Wildfire-Affected Drainages and Small Creeks. Flood Danger Remains in the Vallecito Creek Valley, North of the Reservoir.

Studies of rainfall-runoff in side creeks (burned areas) show that the recovering forest can absorb small rainfall events without flooding. However, heavy rain (or rain on snow in the high country) can cause flooding in the Vallecito Creek valley.

The Pine River watershed, including the upper Pine River and Vallecito Creek drainages, have evolved over millions of years, with structural uplift, volcanic activity, glacial action, erosion, and the flow of water over the surface creating the topography we know today. The majority of the changes created by water have come in sporadic episodes called floods.

A number of side creeks have flooded during past history. Flooding in the mountain drainages creates alluvial fans that form due to deposition of gravels, rocks, and flood debris. After the wildfire, several debris flow events caused flooding and damage to houses located near the side creeks (**Figure 9**).

The rainfall-runoff characteristics of the side creeks around Vallecito Reservoir were studied during 2006. The side creeks did not show a tendency for flooding during small rainfall events. It appears as though the burned drainages have recovered somewhat from the wildfire. However, given large rainfall events, floods and debris flows are still possible in the steep mountain catchments.

Vallecito Creek, where it flows through the Vallecito Valley, has the greatest potential for floods that could impact large numbers of houses, property, and people. The highest known flow in Vallecito Creek occurred in 1970 when 7,050 cfs (cubic feet per second) was recorded at the USGS stream gage, located north of the Vallecito Valley (**Figure 9**). During October 2006, warm rain fell on an early snowpack in the high mountains north of Vallecito, increasing flows to 3,600 cfs. Only 1.5 inches of rain were recorded in the Vallecito area; however, the stream turned into a roaring river, overflowed its banks, and threatened many houses in the valley (**Figure 9**). The La Plata County Office of Emergency Management was quick to respond to the need for floodplain mapping. The new mapping results show that many properties would be affected by a 100-year flood of 9,200 cfs.

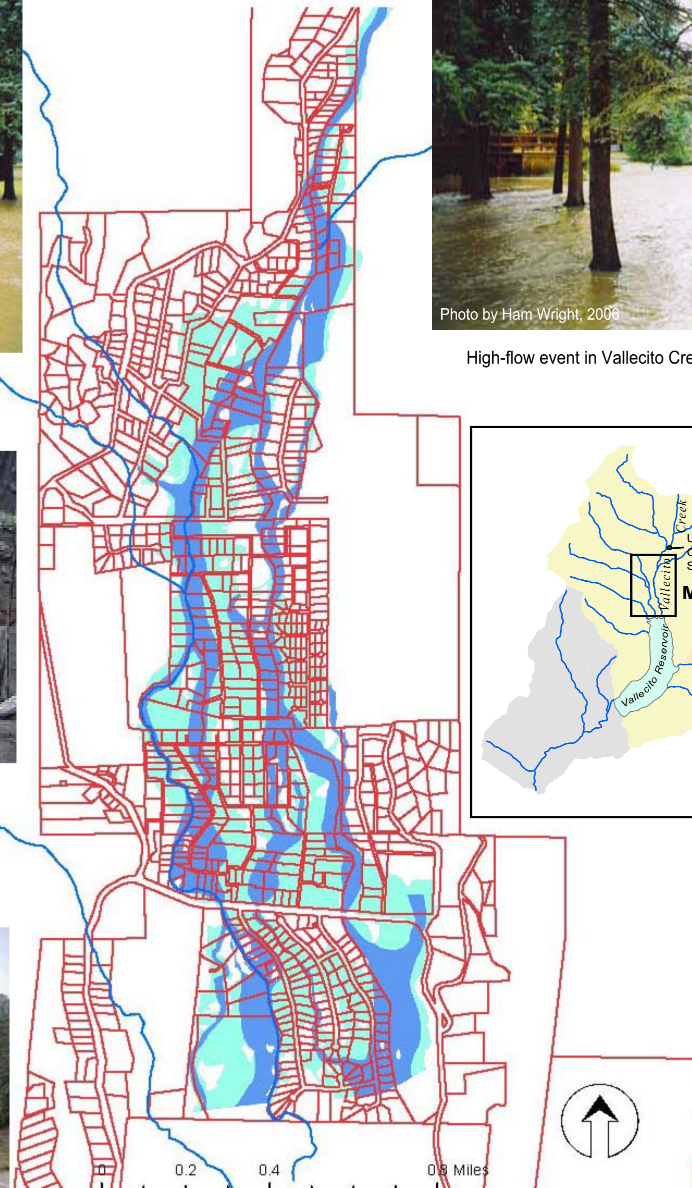
Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

Figure 9. 100-year floodplain, floodway, and property boundaries in the Vallecito Valley, north of the reservoir.

High-flow event in Vallecito Creek, October 6-7, 2006

High-flow event in Vallecito Creek, October 6-7, 2006

Flood and scouring event, September 2002



Floodplain mapping by Anderson Associates, 2006
La Plata County Office of Emergency Management

Debris flow damages house, September 2003

La Plata County flood hazard warning sign

Pine River Watershed Group

10.0 STATE OF THE WATERSHED

The State of the Watershed is Cautiously Good, and On the Way To Recovery.

After decades of atmospheric deposition, then the wildfires and drought of 2002-2003, the watershed is slowly recovering. The fishery in Vallecito Reservoir may shift as kokanee salmon are replaced by trout.

The upper Pine River watershed has provided some of the purest, most pristine water in the world, and continues to do a pretty good job, although there are a few problems, and the purity is not quite as high as in the past. Most watershed damages tend to arise from things like mining, industry, and human-caused impacts. There was very little mining in the watershed in the past, and there is none today. There is no industry in the watershed, and there are few locally caused human impacts in the watershed.

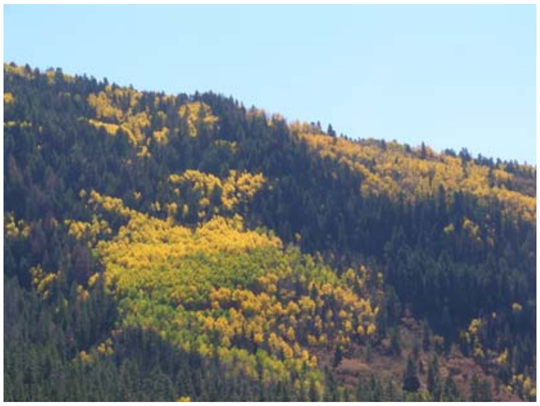
Unfortunately, forces outside of the watershed area are having deleterious impacts on the area. Pollution emanating from other areas is depositing acid rain, mercury, and probably numerous other things on the land and in the waters. Pollutants deposited in the watershed have the potential to negatively impact the water quality, along with the quality of life in the area. Mercury is, by far, the most toxic of the pollutants, and certainly the longest lasting.

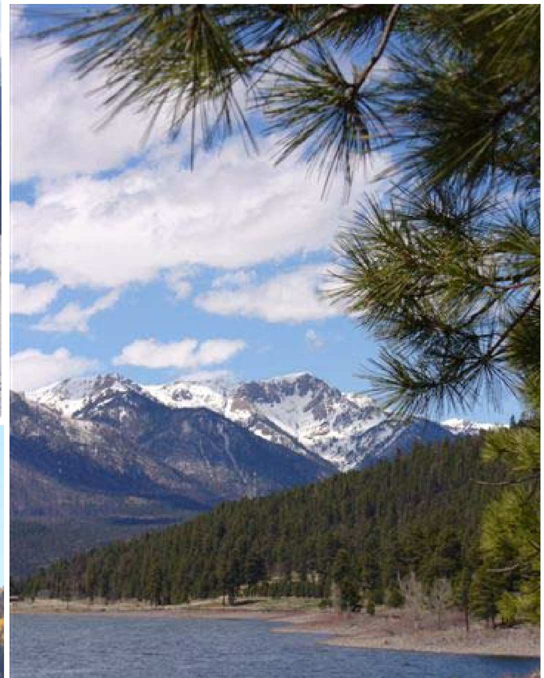
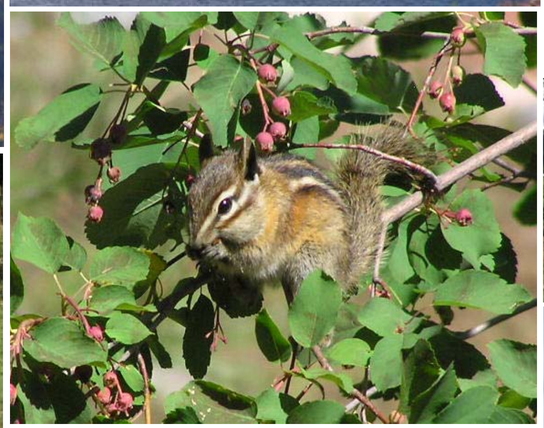
The fishery at Vallecito Reservoir seems to be suffering the most damage. The kokanee salmon have all but disappeared. There may be an effort to stock trout in the reservoir instead of salmon.

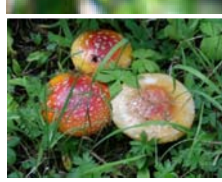
When looking at the data concerning water-quality parameters in streams and rivers, the water quality of the Pine River and Vallecito Creek upstream from the reservoir continues to be very good. The sediments and fish of Vallecito Reservoir, however, are absorbing the pollution impacts. Pollutants are being stored in the lake sediments, and fish are absorbing pollutants from the sediments. The state of the watershed in 2008, therefore, is cautiously good, and on the way to recovery. Full recovery will not occur unless the paths to pollution prevention are fully realized.

Continued monitoring of the air, water, and fish is necessary to know what is going on in the upper Pine River watershed. Volunteers provide the back bone of data collection. No one knows their watershed more than the people who live in the watershed.

Support has been provided by the Colorado Watershed Protection Fund, La Plata County, Pine River Irrigation District, Southwestern Water Conservation District, and the San Juan Resource Conservation and Development Council

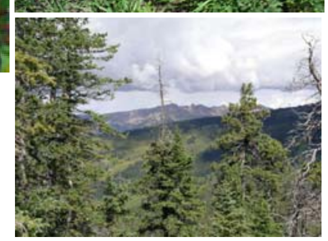











Photos by Sunny Hallauer, Bob Thompson, and Marilyn McCord

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