# Investigation of Groundwater Production Impacts on Surface Water Discharge & Spring Flow, Mammoth Community Water District

## Background

Mammoth Community Water District (MCWD) is in the small resort community of Mammoth Lakes on the eastern slope of the Sierra Nevada mountains at an elevation of approximately 8,000 feet above sea level. The area is surrounded by lands administered by the Inyo National Forest, and the economy of the area is primarily based on recreation and tourism, with a majority of the visitation coming during the winter ski season.

The MCWD is the principal water purveyor and wastewater treatment entity in the Mammoth Basin area. MCWD has developed a water supply plan to meet the current and future water demands using a combination of local water resources, recycled water, and imported water. This plan includes potential for long-term increases in groundwater production. The study area, located on the eastern flank of the Sierra Nevada mountain range approximately 30 miles north of the community of Bishop and almost directly west of Lake Crowley encompasses a total area of about 175-square miles, of which 155-square miles lay within and forms the Long Valley Caldera and some 20-square miles that are south and outside the caldera boundary. Of primary interest to this study is the watershed area of Mammoth Creek and Hot Creek that extends 13 miles eastward from Mammoth Mountain to a surface flow gaging station on lower Hot Creek. The topographically defined area of the Mammoth Basin is about 71-square miles and has maximum west-east and north-south dimensions of 13 and 9 miles, respectively.

The Mammoth Basin occupies a topographically diverse area on the eastern flank of the Sierra Nevada Mountain Range. Surface elevations range from about 12,500 ft-msl at Bloody Mountain in the southern part of the Basin to about 6,900 ft-msl at the far eastern extreme of the Basin. Surface topography ranges from flat to undulating in the Mammoth valley to sharp and craggy in the western mountainous elevations. The topography may be characterized as an alpine glaciated surface superimposed with extrusive volcanic terrain.

Wildermuth Environmental Inc. (WEI) was retained by the MCWD to conduct an investigation to estimate the impacts of historical and future MCWD production on spring discharge in the Valentine Reserve and the Hot Creek headwater springs area.

*Study area in Mammoth, California*

## Investigation of Groundwater Production Impacts on Surface Water Discharge & Spring Flow, cont'd

The purpose of this investigation was to estimate the impacts of past and current groundwater production in the Mammoth Basin area on the AB, CD, and H23 headsprings near the Hot Creek Fish hatchery, and the discharge in Hot Creek at the flume.

The AB spring discharge channel and Hot Creek are habitat for the endangered Owens Valley tui chub (Gila bicolor snyderi). The AB, CD, and H2,3 headsprings are the sole sources of water to the Hot Creek Fish Hatchery.

### Project Tasks

The Scope of Work for this project consisted of three tasks: collecting and compiling data and reports; updating time history characterization of district groundwater production impacts on spring and surface water discharge; and preparing a summary memorandum.

The first task included: the collection of hydrogeology and other related water resources reports, well construction information, groundwater chemistry, production time histories, and piezometric time histories. The sources of these data included the MCWD, the United States Geological Survey, and the Department of Water and Power. These data were compiled into a database structure in order to facilitate more efficient use in this and subsequent investigations.

WEI collected geographical information system data from MCWD and other entities that described the location of wells, springs, surface water discharge, gaging stations, topography and other physical features, and geology. The second task consisted of: updating the hydrologic analysis presented in Hydrologic Impacts of the Snowcreek Golf Course Expansion on the AB and CD Headwater Springs prepared in 1996 for the Dempsey Construction Company by Mark J. Wildermuth, Water Resources Engineer (Wildermuth Environmental, Inc.). This report analyzed available hydrologic data to determine the impacts of historical pumping by MCWD and others on the discharge at the AB and CD headwater springs and at Hot Creek at the Gorge. In this task, the tables and time history plots of surface water discharge for Mammoth Creek, Hot Creek, AB springs, CD springs

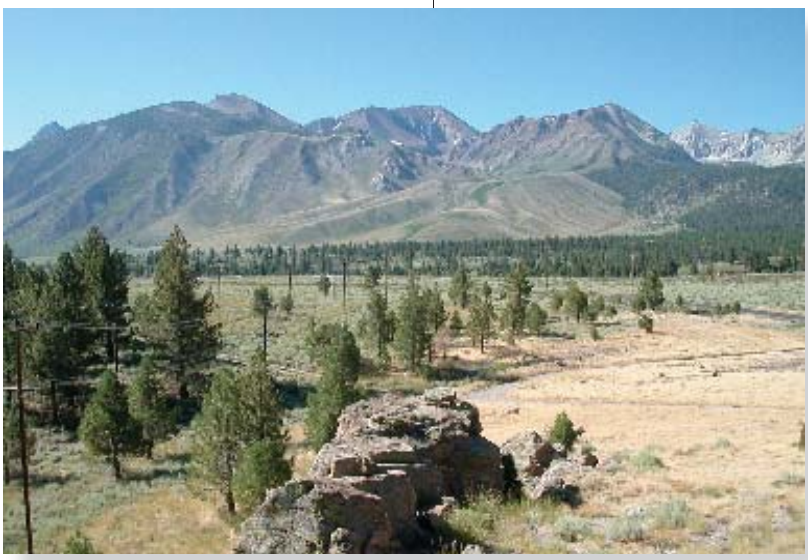
*Spring flow in the Mammoth area*

## Investigation of Groundwater Production Impacts on Surface Water Discharge & Spring Flow, cont'd

and other springs were extended from 1995 to the present. Double mass curves were extended for Mammoth Creek and the April 1 snow survey, Hot Creek and the April 1 snow survey, and data permitting, for the headwater springs and the April 1 snow survey. The time histories and double mass curves were reviewed to determine if there had been an observable impact on surface discharge by historical pumping. The third task consisted of the preparation of a summary memorandum describing the work done in Tasks 1 and 2. The memorandum was submitted to MCWD.

### Conclusion of Evidence

Increases in groundwater production, necessary to meet future water demands, would not significantly impact the springs that discharged to Hot Creek. Further analysis of piezometric level data at MCWD wells suggested that a groundwater barrier exists between the Valentine Reserve and the deep production wells operated by MCWD and Snowcreek. In fact, the shallow and deep piezometric levels west of this barrier (as measured at MCWD wells 5M and 5A) and adjacent to the Valentine Reserve are at or near the ground surface.



*Murphy Gulch Sedimentation Basin in Mammoth, California*

In addition, analysis of discharge data for Mammoth Creek at Old 395 shows that there has been no detectable decrease in discharge due to MCWD or Snowcreek groundwater production.

*Spring flow in the Mammoth area*