



A WATER CONSERVATION PLAN¹

Yosemite National Park

INTRODUCTION

As part of the proposed reconstructed water system for Wawona, water for domestic use and irrigation will continue to be diverted from the South Fork of the Merced River. The proposed water system and its environmental effects are discussed in the Environmental Assessment, Reconstruct Water System, Wawona Area, Yosemite National Park, April, 1985.

The National Park Service considers the South Fork to be a prime aquatic and riparian resource that must be protected from any unnecessary deleterious impact as a result of this project. This river has been inventoried by the Heritage Conservation and Recreational Service for possible inclusion within the National Wild and Scenic Rivers System. In 1984 legislation was introduced in the U.S. Congress to declare the South Fork a Wild and Scenic River. The Environmental Impact Statement for the Sierra National Forest Management Plan recommends wild and scenic protection for almost the entire river. In this joint planning effort, the National Park Service provided the analysis for that portion of the South Fork inside Yosemite, and concurred in the recommendation for wild and scenic status. The river has also been declared a Wild Trout Stream by the state of California. The river is an important aesthetic and recreational resource for the community of Wawona, and for thousands of park visitors who visit the Wawona area each year.

In order to preserve river values and the aquatic environment, this plan establishes mandatory water conservation measures that will be implemented on a year-round basis as well as mandatory emergency measures to be implemented during low flow periods. By pointing out the severe conflicts between domestic water demand and river values, the park hopes to stimulate a permanent conservation attitude in Wawona so that mandatory measures will seem less severe when it becomes necessary to implement them. This original plan was approved and implemented by Superintendent Jack Morehead on June 9, 1987.

BACKGROUND

The Wawona Water System has the capacity to divert 1.1 cubic feet per second (cfs) from the river, with the expected maximum demand for both domestic use and irrigation being about 0.59 cfs. Maximum treated water demand is expected to be about .21 cfs for domestic use and .07 cfs for irrigation. Maximum untreated water demand is expected to be about .31 cfs for golf course irrigation. Up to 1.2 cfs of treated and untreated water was diverted by previous National Park Service sanctioned diversions in Wawona. The new water system will serve existing visitor and National Park Service facilities, as well as some private residences and commercial facilities in Section 35.

¹ Retyped with minor corrections from original scanned document.

Flow data for the South Fork were recorded between 1958 and 1968 at the U.S. Geological Survey gauging station, number 11-267300, located about one-half mile downstream from the South Fork Bridge on the Wawona Road. The median monthly flow rates in cubic feet per second recorded at this station are:

October	5.9
November	14.5
December	32.7
January	99.5
February	100.5
March	129.5
April	1356.5
May	569.5
June	171
July	16.2
August	9.7
September	9.3

These data have been corrected for the constant .05 cfs diversion for the old water system, since that diversion was above the gauging station. The extremes of record are 1.3 cfs minimum (September 5, 1960), and 15,000 cfs maximum (calculated by the U.S.G.S from flood marks on December 23, 1955). It is important to note that the data from the gauging station include inflow from Chilnualna Creek, which flows into the South Fork about one mile below the water system diversion site. A proposed new gauging station will not include these flows since it will be located above the confluence at the point of diversion. Since the drainage basin of Chilnualna Creek comprises about 20 percent of the total river drainage basin above the 1958-1968 gauging point, the inflow is significant. Consequently, median monthly flows at the point of diversion will be significantly less than those in the above table.

For the purposes of water conservation, low flow conditions are of much more importance than high flow conditions. During the months of August, September, and October in most years natural flows in the South Fork can fall low enough that diversions for the Wawona Water System will have a significant impact on the aquatic ecosystem. Between 1958 and 1968 flows at the gauging station were 3 cfs or below 9 percent of the time and 2 cfs or below 3 percent of the time. Low flows typically coincide with the period of peak visitor use in the months of August and September. In September flows of 3 cfs or less occurred 51 percent of the time and flows of 2 cfs or less occurred 14 percent of the time. In August and September of 1960 river flows were below 2 cfs for 47 out of 61 days. Even more severe droughts have occurred, such as in 1976-1977, and during such periods critically low flows probably persisted for even longer periods than during 1960.

An instream flow study conducted on the South Fork in 1983 by the U.S. Fish and Wildlife Service confirmed that substantial losses in trout habitat are occurring under the present diversion and will continue to occur under the new system when the river flows will continue to occur under the new

system when the river flows fall below 6 cfs. For example, a withdrawal of .65 cfs during a river flow of 2.0 cfs would reduce available habitat for juvenile rainbow trout by 30-80 percent (Table 9, page 51, Environmental Assessment, Reconstruct Water System). Aesthetic and recreational impacts also will be significant when flows fall below 6 cfs since potential 10 to 100 percent of the river could be diverted.

MANDATORY EMERGENCY WATER CONSERVATION MEASURES

Based on the 1983 South Fork Instream Flow Study, a river flow of 6 cfs or less is considered critically low and would trigger mandatory water conservation. A goal of these conservation measures is to reduce habitat losses for juvenile rainbow trout to 20 percent or less from the water system diversion. The water system diversion rate will be metered so that the rate can be gradually decreased as natural flows fall below 6 cfs. The following table shows the permissible diversion rates and the percentage of maximum domestic and irrigation demand that could be satisfied. Maximum demand refers to the situation in which all residences and visitor facilities including campgrounds are fully occupied. The demand figures are derived from the project environmental assessment.

River Flow (CFS)	Diversion Rate (CFS)	Domestic Demand (%)	Irrigation Demand (%)
7	0.59	100	100
6	0.59	100	100
5	0.5	100	75
4	0.4	100	50
3	0.3	100	24
2	0.2*	95	0
1	0.1*	48	0
0.5	0.05*	24	0

1 CFS= 646,275 gallons

*Pump and store twice indicated daily diversion for 12 hour period between 9 p.m. and 9 a.m. and make no diversion from river flow between 9 a.m. and 9 p.m. This action would significantly mitigate adverse effects of low flow diversions on fish, other aquatic organisms and aesthetic values.

Flows of 6 cfs or less occurred 63 percent of the time in August and September between 1959 and 1968, after being adjusted for the water system diversion of .60 cfs. Water conservation measures could be imposed more often than these data would indicate once the new gauging station at the diversion site becomes the standard on which decisions are based. Recording flows at the new gauging station will provide better protection for the approximately one mile reach of river between the diversion and the confluence with Chilnualna Creek, and will more accurately reflect the percentage of water diverted.

When flows fall to 10 cfs Yosemite National Park and the Concessioner will begin dispersing information to residents and the public warning that water is becoming a scarce resource and encouraging conservation. This information will explain the need for giving priority to domestic use and streamflow preservation needs during low river flow conditions.

Irrigation of the Wawona Golf Course with water from the Wawona Water System would only be permitted within the limits of the above diversion rates. Domestic uses will always take precedence over irrigation. In the event that river flow drops below 3 cfs, then no irrigation of the golf course from this system will be permitted until flow rises to or above 3 cfs for two scheduled flow readings. However, waste water plant effluent will also be available for golf course irrigation.

When flows fall to 3 cfs, (private Section 35 residents) will be notified by mail that critical water shortage conditions exist and that maximum demand may exceed the permitted diversion rate. This will allow residents to plan their use of water accordingly. Yosemite National Park and the Concessioner, residents and facilities will be notified through administrative channels. Additionally, the Concessioner will be asked to take steps primarily of an educational nature, such as serving water in the hotel dining room only upon request.

Signs will be installed in the Wawona Campground, Ranger Station and Entrance Station advising campers about a water shortage and the need for water conservation. Fee Collectors and rangers will pass on the above information during public contact and all interpretive programs.

In the event that water demand exceeds the maximum allowable diversion rate, the water level in the storage tanks will begin to drop. If these levels drop below a required storage of 250,000 gallons in the lower zone tanks or 500,000 gallons in the upper zone tanks, then additional steps to conserve water will have to be taken. If all outside irrigation at the Wawona Hotel had not been stopped, this would be the first step. The next step would be to close overnight visitor use facilities, i.e. the Wawona Hotel and Wawona Campground or supplement flows with water from alternate sources. Flow projections developed by a park hydrologist would be used to predict as far in advance as possible with the above measures would be required.

Based on present data, river diversion rates in this plan should be able to provide adequate water for residential and critical visitor service facilities at even the lowest anticipated river flow. However, in the event that an adequate water supply was still not available after taking the measures listed above, a serious water supply emergency would exist. Under the direction of the park Superintendent, immediate steps would be taken to ensure an adequate water supply without endangering the aquatic resources of the South Fork of the Merced River. Examples of the above would be transporting water in from another source or activating an existing well.

EMERGENCY IMPLEMENTATION PROCEDURES

The Office of the Superintendent is responsible for coordinating and implementing the emergency water conservation plan and for notifying appropriate National Park Service and Concessioner officials of actions to be taken. The Resources Management and Science Division will obtain and disseminate long-range water availability forecasts from the California Department of Water Resources. By May of each year that Department is able to predict stream runoff fairly accurately for the next five months. At that time, by comparing the current year's forecast with previous streamflow records, the Resources Management and Science Division will be able to predict flow conditions in the South Fork of the Merced River for the upcoming summer and fall months and the likelihood of any low-flow emergency.

The Resources Management and Science Division will notify the Superintendent, the Wawona District Ranger and the Business and Revenue Management Division of the above conditions each year by the end of May. The latter will notify the park Concessioner.

If a low-flow emergency is predicted, the Office of the Superintendent will then notify Wawona residents of that fact and when water conservation measures, including increased water rates, can be expected. Periodic updates of water conditions will be provided by the District Ranger throughout the dry season, especially when the river flow drops to 10 cfs or below. Low periods at other times of the year will also be monitored according to these procedures.

To implement this plan, a river flow gauging system will be installed by the National Park Service on the South Fork at the point of diversion. This gauge will be checked by National Park Service Maintenance Division personnel routinely and no less than daily once flows fall below 10 cfs. Increasing restrictions or relaxation of mandatory conservation measures will be determined by the District Ranger on a bi-weekly basis based on the river gauge data. For accounting purposes, increases or decreases of domestic water rates will be adjusted on a monthly basis. Therefore, individual user water meters will be monitored monthly by National Park Service Maintenance personnel so that appropriate charges can be levied.

Residents and Concessioners will be notified in writing by the Superintendent concerning implementation of any of the mandatory conservation measures. They will be notified in the same way when such measures are lifted. Letters concerning implementation of such measures will be prepared in the office of the Wawona District Ranger and reviewed and approved by the Superintendent before being distributed by the Public Information Office.

Information hand-outs required at flows of 10 cfs or less, warning the public and residents of water shortages and encouraging conservation, will be written by the National Park Service Public Information Office who will be responsible for mailing the hand-outs to each Wawona resident and for supplying the appropriate National Park Service and Concessioner officials with copies of the hand-outs for public dispersal. Maintenance personnel will be responsible for operating the water treatment plant so as not to exceed the specified diversion rates. In addition, they will be responsible for the monitoring of storage in the water tanks. In the event that fire storage drops below a total of 500,000 gallons in the upper zone tanks or 250,000 gallons in the lower tanks, the Wawona District Ranger will be responsible for implementing required water conservation measures as described above.

MANDATORY YEAR-ROUND CONSERVATION MEASURES

In order to better preserve flows and maintain the integrity of the river's natural ecosystem, the following conservation measures will be enforced year-round at National Park Service and Concessioner-owned facilities in Wawona:

1. Low-flow fixtures will be installed in all new and existing National Park Service and Concessioner-owned facilities, including residences.
2. Non-native landscaping will not be expanded. Where new areas are landscaped, they will be planted with native, drought-resistant species.

3. The National Park Service water system (mains, lines, valves, tanks, and connections) will be inspected each spring and fall, and any leaks repaired within 30 days.
4. Fixtures in National Park Service and Concessioner-owned facilities will be inspected for leaks and any leaks will be repaired within one week.
5. Interpretive programs in the Wawona area will contain a message apprising the public of seasonally low flows, the need for year-round conservation in order to protect the natural ecosystem, and encouraging water conservation practices.

In addition, the following general policies will be enforced to prevent demand on a very limited water resource from increasing in the future:

1. The National Park Service will defend its federally reserved and other water rights in the Wawona area to prevent further reductions in river flows beyond those imposed by the Wawona Water System and this conservation plan.
2. The National Park Service will not issue special use permits for the diversion of water from the South Fork.
3. National Park Service owned houses not under special use permit will be connected to the water system only if long-term continued use is contemplated. Other structures will be removed.

YEAR ROUND IMPLEMENTATION PROCEDURES

Low-flow fixtures will be purchased and installed by the National Park Service or by the Concessioner, according to facility ownership. Existing fixtures which are not low-flow will be replaced with low-flow types by June 1, 2014.

Fixtures in year-round government or Concessioner residences will be inspected yearly for leakage. Any leaks will be repaired each time a resident moves out, and repaired as above. In public facilities, and office buildings, fixtures will be inspected monthly and repaired as above. In public facilities and office buildings, fixtures will be inspected monthly and repaired as above. All inspections will be made by National Park Service or Concessioner maintenance personnel, according to the area of responsibility.

Landscape vegetation used for landscaping purpose will be approved through the National Park Service Resources Management and Science Division prior to planting. A list of approved species will eventually be developed by the Resources Management Office and attached as an Appendix to this plan.

The Wawona District Interpreter will be responsible for ensuring that water conservation messages are incorporated into all appropriate district interpretive programs.

FUTURE PLANNING/DEVELOPMENT

Maintaining adequate streamflow in the South Fork is of paramount importance in the preservation of the natural and aesthetic resources of the river. Maintaining fire protection and an adequate supply of potable water for Wawona residents and day use visitors is also considered essential for public health and safety. Based on existing river flow data, and on the water conservation measures described in this plan, it is anticipated that all these needs can be met under all foreseeable conditions. However, if it is determined that the above resource preservation and water supply requirements cannot be met, then immediate emergency measures will be implemented as described in this plan. In order to prevent the occurrence of such emergencies, long- term park planning will be conducted, as personnel and funding permit, to reduce water usage and/or develop additional water supplies. If necessary, actions may be taken such as reducing park housing in Wawona or developing supplemental groundwater supplies.

DATE OF IMPLEMENTATION

This plan will become effective on the date that the new Wawona Water System becomes operational.

[Insert approval signature of the superintendent on the revised plan]

APPENDIX A

1. **Table 7***: Percent changes in available habitat for rainbow trout juveniles as a result of 1 and 2 cfs withdrawals during insufficient water months of normal, dry and critical years.
2. **Table 8***: Percent changes in available habitat for rainbow trout spawning and juvenile life stages as a result of 1 and 2 cfs withdrawals during insufficient water months on normal, dry, and critical years.
3. **Table 9***: Percent changes in available habitat for rainbow trout spawning and juvenile life stages as a result of 1 and 2 cfs withdrawals during insufficient water months of normal, dry and critical years.
4. **Table 9****: Percent Decrease in Available Habitat for Rainbow Trout Juveniles as a Result of Maximum Withdrawals Under Each Development Alternative During Low Flows.

* Source: Final Report, South Fork Merced River Instream Flow Study, Yosemite National Park, United States Department of the Interior, Fish and Wildlife Service.

** Source: Environmental Assessment, Reconstruct Water System, Wawona Area, Yosemite National Park, California, U.S. Department of the Interior, National Park Service, April 1983.

APPENDIX B

VOLUNTARY ALL-YEAR CONSERVATION MEASURES

A permanent water conservation attitude must be stimulated in the Wawona area for the Water Conservation Plan to be most effective. Further increases in water conservation will only serve to better protect the aesthetics of the South Fork, and the integrity of the natural ecosystem. The following voluntary measures are recommended:

Indoor Water Conservation Practices

1. Put two plastic bottles in your toilet tank.
Your toilet can probably flush just as efficiently with less water than it now uses. To cut down water waste, put an inch or two of sand or pebbles in each of two plastic quart bottles to weight them down. Fill them with water and then put them in your toilet tank, safely away from the operating mechanism. In an average home, the bottles may displace 10 gallons or more of water a day. This method is preferred over placing bricks in the tank because bricks may disintegrate and damage plumbing. In some toilets, this measure may not work. Consider having a low-flow toilet installed.
2. Check your toilet for leaks.
A leak in your toilet may be wasting more than 100 gallons of water a day. To check, put a little food coloring in your toilet tank. If, without flushing, the coloring begins to appear in the bowl, you have a leak. Adjust or replace the flush valve or call a plumber.
3. Stop using your toilet as an ashtray or wastebasket.
Every time you flush a cigarette butt, facial tissue or other small bits of trash down the toilet, you waste five to seven gallons of water.
4. Check faucets and pipes for leaks.
Even the smallest drip from a worn washer can waste 50 or more gallons of water a day. Larger leaks can waste hundreds.
5. Take shorter showers.
Long hot showers waste five to ten gallons of water every unneeded minute. Limit showers to the time it takes to soap up, wash down, and rinse off.
6. Install water-saving shower heads or flow restrictors.
Most shower heads put out five to ten gallons of water a minute, while three gallons is actually enough for a refreshing, cleansing shower. Your local hardware or plumbing supply store stocks inexpensive, water-saving shower heads that you can install yourself. For even less money, you can purchase a small plastic insert that will limit flow through your present shower head.
7. Turn off the water after you wet your toothbrush.
After you have wet your toothbrush and filled a glass for rinsing your mouth, there is no need to keep water pouring down the drain.
8. Rinse your razor in the sink.

Before shaving, partially fill your sink with a few inches of warm water. This will rinse your blade just as efficiently as running water, and far less wasteful.

9. Keep a bottle of drinking water in the refrigerator.

This ends the wasteful practice of running tap water to cool it off for drinking.

10. Don't let the faucet run while you clean vegetables.

You can serve the same purpose by putting a stopper in the sink and filling the sink with clean water.

11. Use your automatic washing-machine only for full loads.

Your automatic washer uses 30 to 35 gallons of water in a cycle. That's a lot of water for three T-shirts.

12. During critically low flow periods (5 cfs or less), use paper service rather than regular dinnerware.

This will save on water used for washing dishes.

Outdoor Water Conservation Practices

1. Plant native, drought-resistant trees and plants.

There are many beautiful trees and plants that are native to the area and thrive on far less water than other species.

2. Put a layer of mulch around trees and plants.

A layer of mulch will slow the evaporation of moisture.

3. Use a broom to clean driveways, sidewalks, and steps.

Using a hose to push around a few leaves and scraps of paper can waste hundreds of gallons of water.

4. Don't run the hose while washing your car.

Soap down your car with a pail of soapy water. Then use a hose just to rinse it off.

5. Teach your children that your hose and sprinklers are not toys.

There are few things more cheerful than the sound of happy children playing under a hose or sprinkler on a hot day. Unfortunately, there are also few things more wasteful of precious water.

6. Water your lawn only when it needs it.

Watering frequently can be very wasteful as it doesn't allow for cold spells or rainfall that can reduce the need for watering. A good way to see if your lawn needs watering is to step on some grass. If the grass springs back up when you move, it doesn't need water.

7. Deep-soak your lawn.

When you do water your lawn, do it just long enough for water to seep down to the roots where it won't evaporate quickly and where it will do the most good. A light sprinkling, which sits on the surface, will simply evaporate and be wasted. A slow, steady fall of water is the best way to irrigate your lawn.

8. Water during the cool parts of the day.

Early morning is better than dusk since it helps prevent the growth of fungus.

9. Avoid watering on windy days.

Wind causes much of the water to be carried off before it hits the ground.

10. Don't water the gutter.

Position your sprinklers in such a way that water lands on your lawn and garden, not on concrete, where it does no good.

11. Check for leaks in pipes, hoses, faucets, and couplings.

Leaks outside the house may not seem as unbearable since they don't mess up the floor or drive you crazy at night. But they can be just as wasteful as leaks in the line from the water meter, even more wasteful. To check for leaks, turn off all water faucets in your home. Check your water meter. Check your water meter again in 65 minutes. If the reading has changed, you have a leak which should be repaired.

12. Use a spray nozzle on your hose that has an "on-off" setting.

13. Keep weeds out of your lawn and gardens.

Weeds compete with your planted vegetation for water.

14. Aerate your lawn each fall to help water travel to roots.

15. Fertilize less.

Fertilizer absorbs water.