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The Slide

THE SLIDE

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Cover: *Fig. 1. View looking southwest down Slide Canyon at The Slide on Slide Mountain near north boundary of Yosemite National Park. This giant rockslide, more than 840 feet wide, roared down with such energy that it climbed more than 120 vertical feet up the opposite side of the canyon.* Photograph by Robert W. Cameron, 1982. © Cameron and Co.; used with permission.

INTRODUCTION

"The Slide" on Slide Mountain in northern Yosemite National Park may well be one of the largest individual cataclysmic landslides in the central Sierra Nevada (fig. 1), although very large debris flows are also known. The first known written description of The Slide is by 1st. Lt. Nathaniel F. McClure, who came upon it in 1894 while exploring some of the canyons in Yosemite north of the Tuolumne River. He obviously was impressed by it: "After traveling three and one-half miles down the cañon, I came to the most wonderful natural object that I ever beheld. A vast granite cliff, two thousand feet in height, had literally tumbled from the bluff on the right-hand side of the stream with such force that it had not only made a mighty dam across the cañon, but many large stones had rolled up on the opposite side. As it fell it had evidently broken into blocks, which were now seen of almost every size, piled one upon another in the wildest confusion. The smaller particles had settled between the crevices, leaving great holes among the larger blocks, some of which weighed many tons. To look at it, one might think that it had occurred but yesterday; but it was, in all probability, ages ago, as the ground just above the slide [upstream] is two hundred feet or more higher than that just below, showing that earth has accumulated on the upper side for many years."[1]

McClure's first impression was not surprising, as the landslide, or perhaps better referred to as a rockslide, may have occurred only about 150 years before he discovered it. The rockslide did pond the stream, but McClure overestimated the elevation drop across the dam; it is actually less than 40 feet. A small pond upstream from The Slide, also mentioned by McClure, has since been filled in to form a somewhat marshy meadow.

King Huber's interest in The Slide was aroused while studying aerial photographs during compilation of a geologic map of Yosemite National Park and the preparation of a book on the geology of the park, in which an oblique aerial photograph of The Slide (Fig. 1) was used as an example of a process of continuing landscape evolution.[2] In 1988 he finally was able to visit the site in the company of Jim Snyder, Yosemite Park Historian. They both were as impressed with the fresh appearance of this mass of jumbled rock as was Lt. McClure.

Two questions immediately came to mind: what might have been the triggering mechanism for the rockslide event, and when might it have occurred?

PHYSICAL SETTING

The Slide occurs in a remote part of northern Yosemite National Park near the head of Slide Canyon, the glaciated valley of Piute Creek, only a little more than a mile from the Sierran drainage divide, which is also the northern boundary of the Park (Fig. 2).

The elevation of the ridge on Slide Mountain at the head of the rockslide is about 10,600 feet, and Slide Canyon at the base of the rockslide is at about 9,200 feet, a drop of about 1,400 feet (Fig. 3).

At the time of the rockslide, blocks of granitic rock broke loose from the upper 480 feet of the west canyon wall over a width of about 840 feet and quickly became a rapidly moving mass of blocks streaming down the hill towards Piute Creek. This hurtling mass of granitic blocks behaved like a snow avalanche that starts out as a slab failure and then accelerates to dramatic speeds as it becomes fluidized. The rapid speed at which the rock avalanche moved is suggested by crude transverse waves and a raised rim where it stopped abruptly in a forest of hemlock trees. This rock avalanche achieved speeds in excess of 140 miles per hour when it crossed Piute Creek to ramp up 120 feet in height on the opposite side of the valley (Fig. 4).

Talus blocks continue to accumulate on the upper slopes, but the morphology of the main rockslide indicates that it occurred as a single cataclysmic event. The granitic rocks on Slide Mountain are well jointed. The geometry of the joint system includes a series of lineaments that have been interpreted as the result of long-term lateral spreading toward Slide Canyon along steeply-dipping joints that parallel the slope face.[3] A Tioga-age (latest Pleistocene) glacier once filled Slide Canyon to the top of the headwall (Fig. 3).

Following glacial retreat, more than 10,000 years ago, the removal from the oversteepened valley slopes of the lateral support supplied by the ice would enhance such spreading. This type of gravitational deformation would have contributed to destabilization of the rock mass – a mass made ready for subsequent cataclysmic failure.

The volume of the rockslide has been estimated as at least 67 million cubic feet.[3] The deposit consists of an open framework of unsorted, angular, boulder-size blocks that average about 10 feet across, with many blocks in excess of 20 feet. The blocks have a freshly-broken appearance and plant cover, except for small, scattered patches of lichens and mosses, is almost entirely lacking on the deposit.

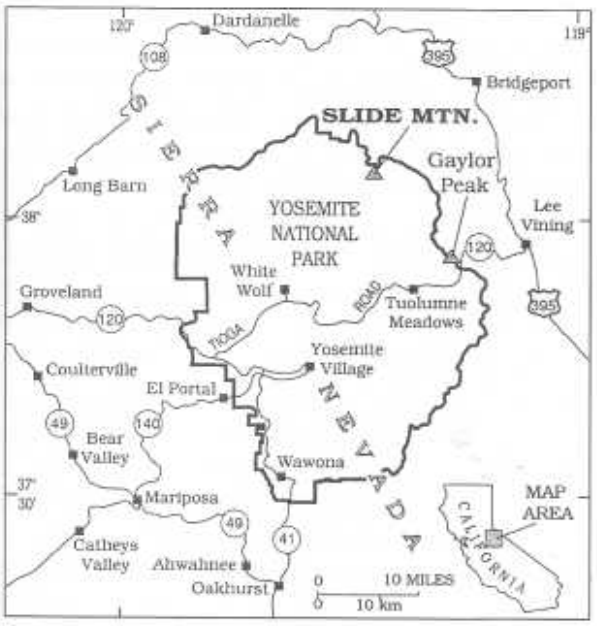

Fig. 2. Index map showing location of Slide Mountain in northern Yosemite National Park. Near Slide Mountain, the park boundary follows the Sierran drainage divide.

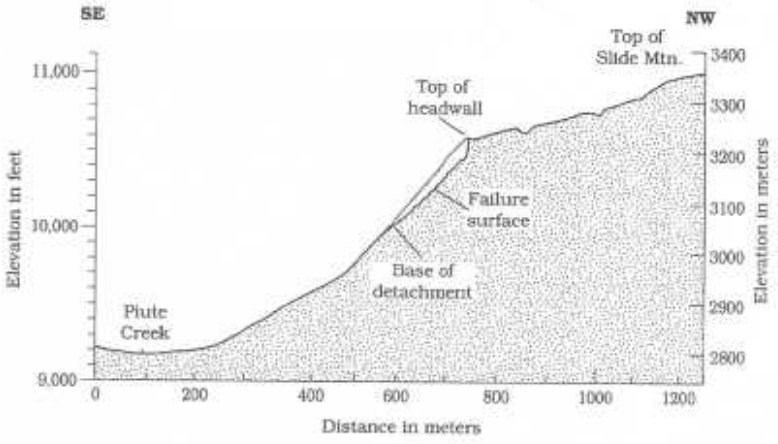

Fig. 3. Schematic profile of the west side of Slide Canyon in the vicinity of The Slide. (After Bronson and Watters, 1987).

SPECULATIONS ON ORIGIN

François Matthes concluded that most of the rock waste below cliffs in Yosemite Valley accumulated as talus derived by a continuous process of weathering and episodic spalling of rock debris from cliff faces. At the same time, he described "several masses of rock debris of enormous extent and wholly distinct from the ordinary sloping taluses..., which can scarcely be accounted for save by the agency of earthquakes."[4] One such mass obstructed Tenaya Canyon to impound Mirror Lake. Matthes believed that this mass was derived from avalanches that fell from both sides of the canyon at the same time; if true, an unlikely event unless triggered by an earthquake.

In their study of rockfalls in Yosemite Valley, Wieczorek and Jäger concluded that for events with documented triggering mechanisms, rain storms and rapid snowmelt triggered more numerous slope movements than earthquakes, but that earthquakes were responsible for a greater cumulative volume of material.[5]

With specific reference to the Owens Valley earthquake of March 1872, one of the strongest historic earthquakes to hit California, John Muir eloquently described a major rockfall in Yosemite Valley from north of Union Point above the Old Yosemite Village.[6] That earthquake also triggered a major rockfall from Liberty Cap; visitors to Nevada Fall can still see the light-colored scar up on the side of that dome that was the source area for the fall. The much smaller May 1980 Mammoth Lakes earthquake sequence triggered several thousand rockfalls and slides throughout the central Sierra, including nine in Yosemite Valley.[3] Such evidence suggests that many of the very large rockfalls and slides in the Sierra are probably earthquake-generated.

CAN WE DATE THE SLIDE?

Three different approaches have been used in an attempt to determine the actual date of the rockslide-lichenometry, radiocarbon dating, and dendrochronology. Lichenometry involves the study of certain slow-growing and long-lived species of lichen and has been used to estimate the exposure age of rock surfaces. Attempted applications of lichenometry to The Slide only indicated a relatively "young" age.[7] Radiocarbon dating proved equally equivocal, with potential calendar-ages ranging from 1633 to 1802, as determined on a bulk wood sample from The Slide debris.[8] Indeed, lichenometry and radiocarbon are both statistical approaches and can only yield a general age, rather than a specific one. Dendrochronology, on the other hand, has the potential of providing a specific age, and thus is left as our best hope.

DENDROCHRONOLOGIC RESULTS

Dendrochronology, or tree-ring dating, is the study of the chronological sequence of annual growth rings with the goal of establishing the exact year in which each ring formed. Other things being equal, rings tend to be narrow in cold or dry years and wider in warm or rainy years, and over a long enough period of time, the sequence of narrow and wide rings is never repeated exactly. It is this recognizable sequence of wide and narrow rings that makes possible crossdating, or the matching of ring patterns in one specimen with corresponding ring patterns in another. A pattern established using a live tree (known year of outer ring) may be used to crossdate older dead trees or wood fragments that grew under similar environmental conditions.

Fig. 4. View upstream toward The Slide in 1988 showing run-up of rock debris on east (right) side of Slide Canyon.

With the hope of using dendrochronology to help date The Slide, during his visit King obtained two cross-section disks from tree stumps found among jumbled blocks of the rockslide on the valley floor. The trees were probably whitebark pine, a slow-growing alpine tree that presently grows near the upper part of the rockslide.

These samples were compared with one from a live whitebark pine, but proved to be non-definitive and only suggested that the rockslide was older than the 1872 Owens Valley temblor.[9] Subsequently a more concentrated effort to date The Slide was undertaken by Bill Phillips and Bill Bull from the University of Arizona. Their efforts proved to be more productive than King's.

Samples from wood pinned beneath rockslide boulders were crossdated with a local tree-ring chronology that was constructed from living mountain hemlock trees growing in the vicinity of the deposit and which extends from A.D. 1488 to 1992. An impact scar on a living mountain hemlock tree on the margin of the deposit was also dated.

Although the first-year scar-ring of that tree was not intersected by the coring device, the data restrict scar-formation to between 1735 and 1762. Two samples from logs pinned beneath boulders were especially informative in that they retained preserved bark, which assured us that the outermost annual ring at the time of the rockslide was preserved. Outermost rings of both samples date to 1739 and possess "latewood." This limits the time of slope failure to between the growing seasons of 1739 and 1740. An additional pinned log sample without preserved bark gives a minimum date of 1728 (maximum possible age).[10]

SUMMARY

Two questions were posed above: what might have been the triggering mechanism for the rockfall event, and when might it have occurred? It now appears that we have a reasonable answer for the latter question, which brings us back to the first one. Although a date of 1739-40 for the event rules out the 1872 Owens Valley earthquake, one cannot rule out an earthquake as the cause. It is still tempting to suggest seismic shaking as a trigger for the event because slope failures are commonly initiated by earthquakes and because The Slide is close to significant, frequently active faults along the eastern side of the Sierra Nevada. Because we cannot associate the slope failure with a known historic seismic event, its specific cause remains unknown. It could be seismic, climatic, or random failure of an unstable slope not tied to any one specific cause.

Nevertheless, along with Lt. McClure, we remain in amazement as we gaze at the awesome result of this catastrophic slope failure known as The Slide!

FOOTNOTES

1. N. F. McClure, 1895, Explorations among the cañons north of the Tuolumne River: Sierra Club Bulletin, v.1, no. 5, pp. 168-186.

2. N. K. Huber, 1987, The Geologic Story of Yosemite National Park: U. S. Geological Survey Bulletin 1595 (Reprint by Yosemite Association, 1989).

3. B. R. Bronson and R. J. Watters, 1987, The effects of long term slope deformations on the stability of granitic rocks of the Sierra Nevada, California: Engineering Geology and Soils Engineering Symposium, 23d, Logan, Utah, Proceedings, pp. 203-217.

4. F. E. Matthes, 1930, Geologic History of the Yosemite Valley: U. S. Geological Survey Professional Paper 160, p. 108.

5. G. F. Wieczorek and Stefan Jäger, 1996, Triggering mechanisms and depositional rates of postglacial slope-movement processes in the Yosemite Valley, California: Geomorphology, v. 15, pp. 17-31.

6. John Muir, 1912, Earthquake Storms (in) The Yosemite: Reprint by Sierra Club Books, San Francisco, 1988.

7. W. M. Phillips, W. B. Bull, and Thomas Moutoux, 1994, Written communication, unpublished data.

8. R. J. Watters, 1992, Written communication, unpublished data.

9. T. M. Yanosky, 1992, Written communication, unpublished dendrochronologic data.

10. All data from Phillips, et. al., 1994.

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BY ROBERT L. ROCKWELL, PH.D.

GIARDIA IN THE SIERRA NEVADA

HOW BIG A THREAT IS IT?

Ask average outdoors persons about *Giardia lamblia* or giardiasis, and they have certainly heard about it. Almost always, however, they are considerably misinformed about both the organism's prevalence in wilderness water, and the seriousness of the disease if contracted.

With the advent of the Internet, the amount of information one can easily find on the subject is voluminous. Unfortunately, most of it is flawed in important aspects, being unsubstantiated, anecdotal, or merely quoting other unsubstantiated and anecdotal articles. Official sources, such as many informational publications put out by the U.S. government, are not immune to this criticism.

This paper is the result of a critical distillation of relevant articles, retaining only those from scholarly, peer-reviewed, or otherwise professional and trustworthy sources. (Editor's note: The articles to which the author refers in this paper are not cited here, but those citations are available at the Yosemite Association web site. Visit www.yosemite.org/naturenotes/Giardia.htm to see them.)

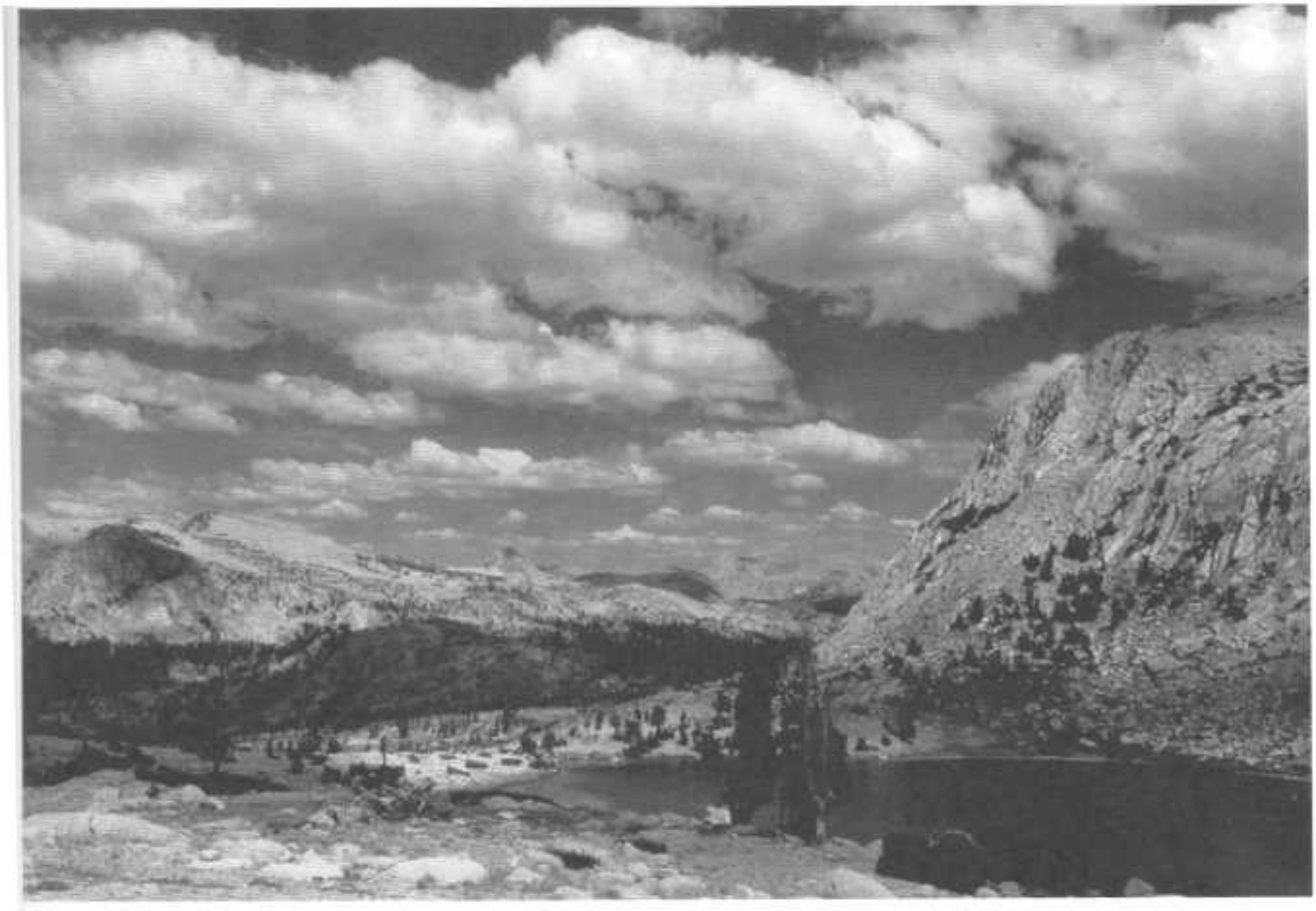
One conclusion of this paper is that you can indeed contract giardiasis on visits to the Sierra Nevada, but it won't be from the water. So drink freely and confidently: Proper personal hygiene is far more important in avoiding giardiasis than treating the water.

First, an excerpt written by a highly regarded wilderness physician:

"In recent years, frantic alarms about the perils of giardiasis have aroused exaggerated concern about this infestation. Government agencies, particularly the United States Park Service and the National Forest Service, have filtered hundreds of gallons of water from wilderness streams, found one or two organisms (far less than enough to be infective), and erected garish signs proclaiming the water 'hazardous.'"

And another, by researchers who surveyed the health departments in all fifty states and scanned the medical literature looking for evidence that giardiasis is a significant threat to outdoor folk:

"Neither health department surveillance nor the medical literature supports the widely held perception that giardiasis is a significant risk to backpackers in the United States. In some respects, this situation resembles (the



Vogelsang Lake.

threat to beachgoers of a) shark attack: an extraordinarily rare event to which the public and press have seemingly devoted inappropriate attention."

I explored this subject in 1987 and again in 1996 with an update in 1997. The conclusions have always been that the "*Giardia* problem" in Sierra Nevada water is grossly exaggerated, and that the cases of giardiasis subsequent to wilderness visits are wrongly blamed on the water. After incorporating the recent information for this paper, those prior conclusions are not only still valid but also considerably reinforced.

JUST WHO IS THIS LITTLE GUY, ANYWAY?

Giardia lamblia, now also known as *G. intestinalis* or *G. duodenalis*, was first observed in 1681 by Anton van Leeuwenhoek, inventor of the microscope. The parasite was named in 1915 for two scientists who studied it: Prof. A. Giard in Paris and Dr. F. Lambl in Prague.

Giardia is a flagellated (having whip-like appendages for locomotion) protozoan that, in the trophozoite (active) form, attaches itself with an adhesive disk to the lining of the upper intestinal tract of the host animal. There, it feeds and reproduces. Trophozoites divide by binary fission about every 12 hours. Thus, a single parasite can theoretically result in more than a million in 10 days and a billion in 15 days.

At some time in its active life, the trophozoite releases its hold on the bowel wall and floats in the fecal stream. As it makes its journey, it transforms into an egg-like structure called a cyst, which is eventually passed in the stool. Duration of cyst excretion, called shedding, may persist for months. Once outside the body, the cysts can be ingested by another animal. Then, they "hatch" into trophozoites due to stomach acid action and digestive enzymes, and the cycle repeats.

The trophozoite is 9 - 15 microns long, 5 - 15 microns wide, and 2 - 4 microns thick. Unlike the cyst, it cannot live for long outside a host. Cysts are 8 - 12 microns long by 6 - 9 microns in diameter; so a million could fit under a fingernail. Cysts can survive for as long as 2 to 3 months in cold water, but they cannot tolerate freezing.

A significant infestation can leave millions of trophozoites stuck tight to the intestinal lining. There, they cripple the gut's ability to secrete enzymes and absorb food, especially fats, thereby producing the disease's symptoms. The symptoms typically appear one to two weeks after ingestion, with an average of nine days, but four weeks is not uncommon. Symptoms can vanish suddenly and then reappear. They may hide for months. They may not appear at all.

There are three ways that giardiasis, the disease caused by ingesting *Giardia* cysts, can be contracted: contaminated water, contaminated food, and direct fecal-oral. A person who has just come down with the disease and who wishes to identify the source needs to reflect on not only the possibility of each of these, but in a suspect period ranging from typically one week to four weeks earlier.

THE BAD NEWS: *GIARDIA LAMBLIA* IS ALMOST EVERYWHERE

Giardiasis has been most often associated with travel to such places as Latin America, Africa, Asia, and the former Soviet Union. However, *Giardia* has always been present in wilderness streams, in the water supplies of most cities around the world, and even in the municipal water of large US cities. In fact, in the 1930s and 1940s, before regulated municipal water treatment plants, everyone was drinking *Giardia* all the time.

Currently, *Giardia lamblia* is the most commonly diagnosed intestinal parasite in North America. It is the most frequently identified cause of diarrheal outbreaks associated with drinking water in this country. Fully 20 percent of the world's population is infected, and up to 7

percent of Americans, most without any symptoms at all. The Centers for Disease Control and Prevention (CDC) estimates that as many as 2,500,000 cases occur annually in the US or almost one for every 100 persons.

Infestation rates of 60 percent of the children in day care centers across the country have been noted. Institutions for mentally retarded persons can have high rates. Other high-rate populations include promiscuous male homosexuals, international travelers, patients with cystic fibrosis, and family members of these individuals.

In an incident in New Jersey a child had a "fecal accident" in a 700,000-liter swimming pool, and nine swimmers came down with the disease. How many *Giardia* cysts might have been involved? The number of cysts shed in feces is highly variable but has been estimated as high as 900 million per day for humans.

Municipal water utilities must use filters to remove the organism. San Francisco water, coming primarily from the Hetch Hetchy watershed in Yosemite National Park, has repeatedly tested positive for *Giardia*, although at very low levels: typically 0.12 cysts per liter. This water is of such high quality that the US Environmental Protection Agency and the California Department of Health Services have granted Hetch Hetchy water a filtration exemption, meaning that filtration treatment to ensure its safety from Giardia and other organisms is not required. The Los Angeles Aqueduct, which transports water to that city from the eastern slopes of the Sierra Nevada, averages 0.03 cysts per liter.

Drinking highly contaminated water is one way to get the disease. Less common in developed countries is direct passage from stool to the hands of a food preparer and then to the food itself. When 16 people got sick from the salad at a Connecticut picnic, the CDC tracked the source to a woman who had mixed the salad with her hands. She didn't have giardiasis, but one of her children did—without any symptoms. A similar situation occurred in New Jersey, with the salad preparer testing positive for *Giardia* along with her child and pet rabbit.

Contaminated food may be a less-common source for the general population, but for wilderness visitors, it may be the most important one. Put another way: If the water is clean, food-borne and direct fecal-oral routes are the only pathways.

On a recent climbing expedition to Tibet, members of our party came down again and again with what was undoubtedly giardiasis. Our water came from glacial melt, but all our food in advanced base camp and below was prepared by Sherpa cooks. Much of the food they prepared—potatoes, rice, cauliflower, cabbage, onions—came from Nepal. We were continually assured that the cooks were practicing good hygiene, yet we had major intestinal problems that prevented many of the participants from getting high on the mountain.

The disease has been referred to as "beaver fever" because of a presumed link to those water-dwelling animals known to be carriers. However, it has been suggested that it is more likely that humans have carried the parasite into the wilderness and that beavers may actually be the victims. In particular, there is a growing amount of data showing that beavers living downstream from campgrounds have a high *Giardia* infection rate compared with a near-zero rate for beavers living in more remote areas.

In any case, beavers can and do contract giardiasis. Being water-dwellers, they are thus able to contaminate water more directly than an animal that defecates on the ground.

Other animals that can harbor *Giardia* are bighorn sheep, cats, cattle, coyotes, deer, dogs, elk, muskrats, pet rabbits, raccoons, and squirrels. And naturally occurring infections have not been found in most wild animals including badgers, bears, bobcats, ferrets, lynxes, mar-

mots, moose, porcupines, rabbits, and skunks. In the past, horses and domestic sheep were thought to be Giardia-free, but more recent studies have shown that they can sometimes be infected. Indeed, in some cases the issue seems to one of degree and not a black-or-white situation.

If "It's everywhere!" why is it not *more* of a problem?

THE GOOD NEWS: MOST OF THE TIME, THE CONCENTRATION OF *GIARDIA* CYSTS IS VERY LOW

Outside of places where dirty diapers congregate and cities where water treatment plants break down or are ineffective, there is little room to worry. A few *Giardia* cysts now and then will cause no harm and in fact may be useful in developing an immunity as will be expanded upon later.

How many cysts does it take to get the disease? Theoretically only one, but volunteer studies have shown that 10 or so are required to have a reasonable probability of contracting giardiasis: About one-third of persons ingesting 10 – 25 cysts get detectable cysts in their stools.

But be careful with statistics: Animal droppings containing 100,000 *Giardia* cysts deposited at the edge of a 10 million liter lake may be an average of only 0.01 per liter for the lake as a whole, but in the immediate vicinity of the deposit, the concentration can be much higher.

A comforting observation is that significant cyst inactivation, as high as 99.9 percent, can occur as a result of anaerobic digestion in sewage sludge. Of course, using a simple cat hole is not exactly a good approximation to the sewage plant process, but this points out the wisdom of doing something better than just leaving it on the ground or under a rock. On the other hand, cysts perish in a day on dry surfaces, so smearing it over a rock slab makes some sense when burial is not feasible.

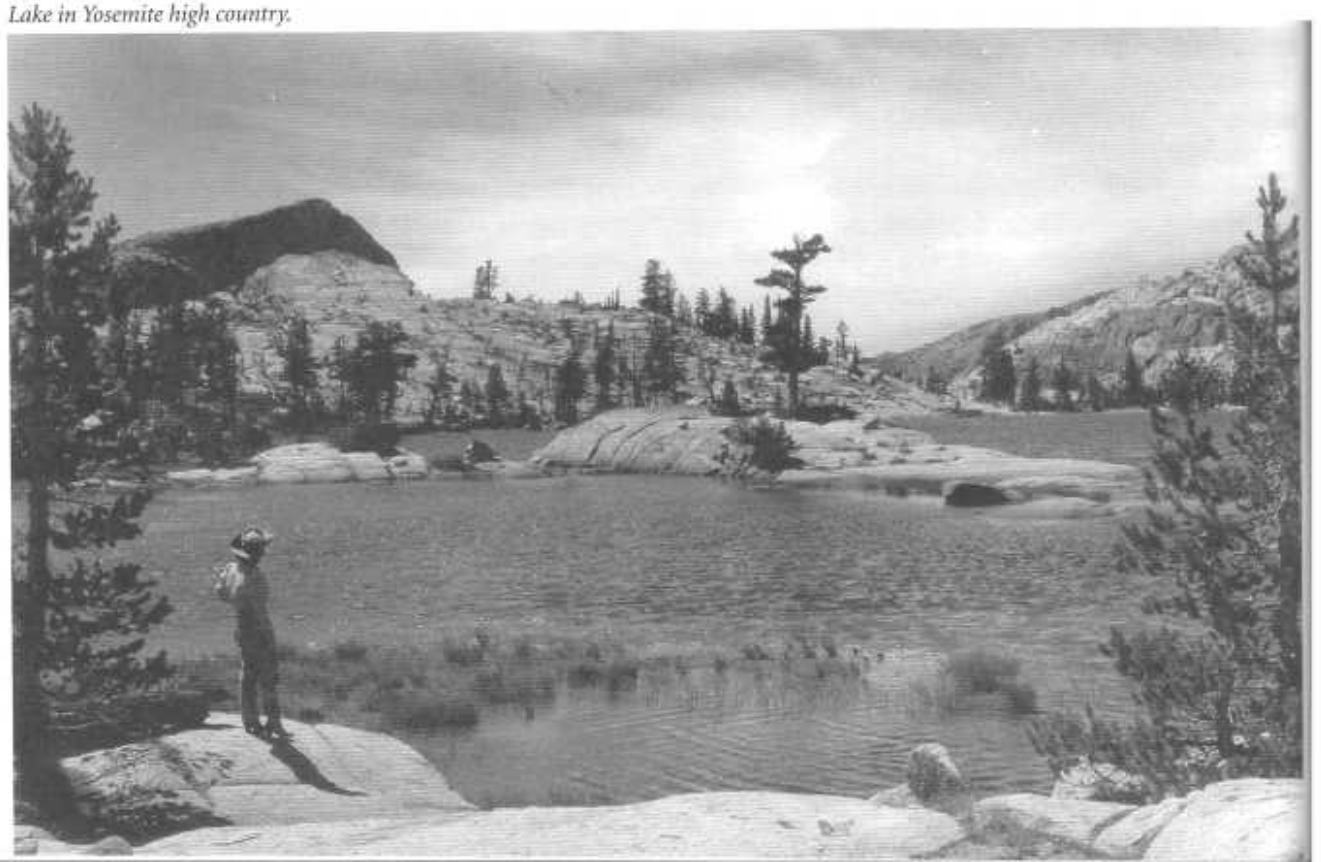
Since cysts that "winter over" in the Sierra Nevada are either in liquid water for considerably more than 2 to 3 months or exposed to freezing temperatures, it would appear that few will survive the harsh Sierra winters. So, except for pollution by winter mountaineers and non-hibernating animals, *Giardia* contamination in the high country must begin essentially anew each spring.

MORE GOOD NEWS: IF YOU HAVE A *GIARDIA* INFESTATION, YOU WILL LIKELY HAVE NO SYMPTOMS

The symptoms of giardiasis vary widely. Characteristic symptoms, when they occur, are mild to moderate abdominal discomfort, abdominal distention due to increased intestinal gas, sulfurous or "rotten egg" burps, highly offensive flatulence, and mild to moderate diarrhea. Stools are soft (but not liquid), bulky, and foul smelling. They have been described as greasy and frothy, and they float on the surface of water. Nausea, weakness, and loss of appetite may occur. Studies have shown that giardiasis can be suspected when the illness lasts seven or more days with at least two of the above symptoms.

However, most infected individuals have no symptoms at all! In one incident studied by the CDC, disruption in a major city's water disinfection system allowed the entire population to consume water heavily contaminated with Giardia. Yet only 11 percent of the exposed population

Lake in Yosemite high country.



developed symptoms even though 46 percent had organisms in their stools. These figures suggest that (a) even when ingesting large amounts of the parasite, the chance of contracting giardiasis is less than 1 in 2, and (b) if you are one of the unlucky ones to contract it, the chance of having symptoms is less than 1 in 4. But perhaps the most telling statistic is that drinking heavily contaminated water resulted in symptoms of giardiasis in only 1 case in 9.

IF YOU HAVE SYMPTOMS IT MAY NOT BE GIARDIASIS

Many people claim that they "got it" on a particular trip into the wilderness. Yet upon questioning, they usually report that the presence of *Giardia* was not confirmed in the laboratory. (Only 8 percent of persons with a diarrheal illness in this country seek medical care.) Depending on the situation, other possible offenders are Campylobacter, Cryptosporidium, Salmonella, Shigella, Yersinia, Aeromonas, Clostridium, and Escherichia coli, with the last being the most common cause of traveler's diarrhea worldwide. Food poisoning is also a possibility.

Cryptosporidiosis, in particular, is a growing problem in this country, and currently, there is no effective treatment for it. An outbreak in Milwaukee in 1993 caused 403,000 people to become ill and 100 to die. A year later, 43 people in Las Vegas died from the same disease. The severity of cryptosporidiosis depends on the condition of the host's immune system. In immunologically normal people, symptoms and duration are similar to those of giardiasis. But in persons whose immune systems have been compromised (e.g., AIDS victims), symptoms can be profound: Frequent (6 to 25), voluminous (1 to 25 liters) daily bowel movements, serious weight loss, and cyst shedding often persist for months.

The diarrhea being blamed on *Giardia* from that climbing trip a week ago may instead be due to some spoiled food eaten last night or Campylobacter in undercooked chicken four days ago. Or because the incubation period is usually from one to four weeks, even if it is giardiasis the uncertainty range indicates that the culprits could have been ingested anytime during a full three weeks worth of meals and beverages. People in high-risk groups for *Giardia*, such as family members of children in day care centers or promiscuous male homosexuals, have even more possible sources to consider. To indict a particular stream or lake under such circumstances, without being able to at least verify that cysts are indeed there at all, is illogical at best.

The type of diarrhea can help in the diagnosis: If it is liquid and mixes readily with water rather than floating on top and is not particularly foul smelling, the problem is likely something other than giardiasis. Diarrhea which lasts less than a week, untreated, is probably not from giardiasis.

Upper Chain Lake.

ALMOST ALWAYS, GIARDIASIS GOES AWAY WITHOUT TREATMENT

If you are unlucky enough to get giardiasis with symptoms, the symptoms will probably go away in a week or so without treatment. You may still be harboring the cysts, however, and can unknowingly spread the disease. Thus, practicing commonly recommended wilderness sanitary habits—defecating 100 feet from water, burying or packing out feces and toilet paper, washing before handling food, etc.—is an excellent idea.

The US Food and Drug Administration, observing that giardiasis is more prevalent in children than adults, suggests that many individuals seem to have a lasting immunity after infection. Furthermore, citizens of cities and countries where the parasite is numerous clearly seem to have few if any problems with their own water, which also points to an acquired immunity. So there is a possible bright side to contracting the disease.

Looking for cysts and trophozoites in stool specimens under the microscope has been the traditional method for diagnosing giardiasis, but it is notoriously unreliable. Now, however, an immunologic test (enzyme-linked immunosorbent assay, or ELISA) for the detection of *Giardia* antigens in stool samples is available. The antigens are present only if there is a *Giardia* infection. ELISA

is a big improvement over the microscopic search, with detection sensitivities of 90 percent or more.

Rare individuals not only do not spontaneously rid themselves of the organisms but instead develop serious symptoms of malabsorption, weight loss, ulcer-like stomach pain, and other chronic disturbances. Fortunately, this occurs in fewer than 1 percent of those with infestations. These unlucky people need medical treatment.

Metronidazole (Flagyl) has been the standard medication, with about a 92 percent cure rate. Recommended by the CDC, it is not approved by the FDA for giardiasis because it can have some serious side effects and is potentially carcinogenic. Quinacrine (Atabrine) and furazolidone (Furoxone) are also prescribed. Tinidazole (Tinebah) is highly effective in single doses and is widely used throughout the world, but it is not available in the US; it can be purchased over-the-counter in many developing countries.

Giardiasis has been called a disease of "somes." Some people do not contract it even from heavily contaminated sources. Some infestations vanish with no treatment at all. Some people become asymptomatic carriers. Some evidence suggests that some people acquire a natural immunity to some strains. And some strains seem more virulent than others.

Even horses and mules have been shown to carry Giardia.

The problem may not be whether you are infected with the parasite but how harmoniously you both can live together. And how to get rid of the parasite when the harmony does not exist or is lost.

SO, WHAT ABOUT THE SIERRA NEVADA?

In 1984, the US Geological Survey in cooperation with the California Department of Public Health examined water at 69 Sierra Nevada stream sites that were selected in consultation with Park Service and National Forest managers. Forty-two of the stream sites were considered "high-use" (high probability of human fecal contamination), and 27 were "low-use." Cysts were found at only 18 (43 percent) of the high-use sites and at 5 (19 percent) of the low-use sites. The highest concentration of Giardia cysts was 0.108 per liter of water in Susie Lake, south of Lake Tahoe. The next highest was 0.037 per liter near Long Lake, southwest of Bishop. Samples taken in the Mt. Whitney area varied from 0 (most sites) to 0.013 (Lone Pine Creek at Trail Camp) per liter. The concentration was 0.003 per liter in Lone Pine Creek at Whitney Portal.

Recall that San Francisco water can contain a concentration of 0.12 cysts per liter, a figure now seen to be higher than that measured anywhere in the Sierra. San Francisco city officials go to great lengths to assure their citizens that the water is safe to drink, and if true—as it most assuredly must be—this comparison alone is quite revealing.

Even Los Angeles Aqueduct water, with only 0.03 cysts per liter, has a higher concentration of *Giardia* than all but two of the 69 Sierra sites examined.

Taking the highest concentration measured in the Sierra (0.108), we can make some calculations. The probability of finding 10 or more cysts in a liter of water—to have at least a one-third chance of contracting giardiasis—is about 10-17. Ten cysts in 10 liters of water, about 10-7. In fact, one would have to drink over 89 liters to have a 50 percent probability of ingesting 10 or more cysts.

A word of caution: The concentration is never uniform, as suggested by the "lake incident" above.

Another reason for caution: 1984 was some time ago, and areas of the Sierra may be differently contaminated now: perhaps more, perhaps less. Also, while so much attention is being given to *Giardia*, there are worse organisms to worry about such as Campylobacter, Cryptosporidium, E. coli, and the other organisms mentioned earlier.

In an informative study, investigators contacted thousands of visitors to one of the high-use sites during the summers of 1988 through 1990. Water samples taken on 10 different dates at each of three locations exhibited Giardia cyst concentrations between 0 and 0.062 (average 0.009) per liter. A goal was to enlist volunteers who were cyst-negative before their trip, verified by stool analysis, and then determine what fraction were cyst carriers after the trip. Unfortunately, stool collection is not a particularly enjoyable task, and only 41 people agreed to participate. Of these, two acquired *Giardia* cysts during their trip, but neither came down with symptoms. Six of the others exhibited post-visit intestinal symptoms, but none tested positive for *Giardia* (interestingly, all six had filtered their water). In sum, no cases of laboratory-con-

Near Polly Dome Lakes.

firmed symptomatic giardiasis were found.

The water that wilderness travelers are apt to drink, assuming that they use a little care, seems almost universally safe as far as *Giardia* is concerned. The study referred to earlier, in which the researchers concluded that the risk of contracting giardiasis in the wilderness is similar to that of a shark attack, is telling. What they did find is that *Giardia* and other intestinal bugs are for the most part spread by direct fecal-oral or food-borne transmission, not by contaminated drinking water. Since personal hygiene often takes a backseat when camping, the possibility of contracting giardiasis from someone in your own party—someone who is asymptomatic, probably—is real. Recalling that up to 7 percent of Americans, or 1 in 14, are infected, it is not surprising that wilderness visitors can indeed come home with a case of giardiasis contracted not from the water...but from one of their friends.

This theme, that reduced attention to personal hygiene is an important factor for contracting giardiasis in the wilderness, is becoming more frequent in the literature.

Outside of the Sierra, *Giardia* cysts in concentrations "as high as four per gallon" have been detected in untreated water in northeastern and western states. But even with this concentration, one would have to consume over nine liters of water to have a 50 percent chance of ingesting 10 or more cysts.

Indeed, there may be as much unwarranted hysteria surrounding *Giardia* in wilderness water in these other areas as there is for the Sierra. For example, an oft-cited report describing acquisition of the disease by 65 percent of a group of students hiking in the Uinta Mountains of Utah is now viewed with considerable skepticism. Specifically, the attack rate was far beyond that usually seen with water-contracted giardiasis, no cysts were identified in the suspect water, there was no association between water consumption rates and the likelihood of the disease, and the authors categorically discounted food-borne or fecal-oral spread, stating that it had never been reported (correct at the time).

PERSONAL OBSERVATIONS

I started visiting the Sierra Nevada in the early 1950s and have spent much of my free time there. I have never treated the water, and I have never had symptoms of giardiasis as a consequence of my visits. My many similarly active friends and acquaintances also drink the water with no ill effects. But because of other organisms possibly present, we are always careful to "drink smart":

- Drink from large fast-flowing streams whenever possible, preferably those entering from the side rather than those paralleling the trail.

- Drinking water from a lake is best advised at the

inlet, with the next best place at the hopefully fast-flowing outlet.

- Few *Giardia* cysts survive harsh Sierra winters. Contamination begins essentially anew each year, so springtime water is safer than summer or fall.
- Water at higher elevations is safer than lower, partly because of reduced human and animal presence up high, and partly because water flowing to lower elevations picks up more contaminants the more distance it travels.
- The colder the water is, the more likely it is freshly melted, meaning less opportunity for contamination.
- Because filtration of water through soil removes *Giardia* cysts, deep well water is considered safe. By implication, springs in the wilderness should be, too.
- One would think that after a heavy snow year, when streams run full and long, some kind of "flushing out" effect of lakes and streams must be occurring. Conversely, it makes sense to be more cautious in dry years.
- Avoid water that likely could have passed through an area subject to heavy human or animal use.
- If it doesn't look good—it's cloudy or has surface foam—treat it or don't drink it.

If in doubt, treat it—but how? While useful in many instances, chlorine is not in general effective for *Giardia* disinfection, which is why swimming pools are primary sources for the disease. The best filters work, although they are costly, heavy, and bulky, and many are somewhat awkward to use.

Boiling is usually inconvenient, but if you are preparing hot water for meals anyway, you may as well take advantage. *Giardia* cysts are highly susceptible to heat, and simply bringing water to 150° F. for five minutes, to 176° for a minute, or 190° momentarily, will kill them. But boiling for a few minutes at altitude is usually recommended because of the other organisms that may be present. At 10,000 feet elevation, water boils at 194°; at 14,000 feet, 187°.

Iodine is probably the best treatment choice, being inexpensive, convenient, and safe. Iodine is effective against most bacteria and viruses, too—and over a wide range of temperatures. (But Cryptosporidium may be resistant to iodine.) A popular system uses iodine crystals in a saturated water solution. Methods exist to mask or remove the iodine taste.

SUMMARY FIGURES

Here are some of the *Giardia* cyst concentrations discussed in various places above. Units are cysts per liter.

Concentration	Comment
~1000	Typical swimming pool contamination
~100	Giardiasis is plausible
~10	Minimum needed to contract giardiasis
~1	Some wilderness water outside California
0.12	San Francisco water
0.108	Worst Sierra Nevada water
0.030	Los Angeles water
0.013	Mt. Whitney at Trail Camp
0.003	Mt. Whitney at Whitney Portal

CONCLUSIONS

In a recent letter the Supervisor of the Inyo National Forest admitted: "As to whether or not *Giardia* exists in the Sierra, we are not in a position to state a fact one way or the other." This is a significant admission. So why do they persist in informing everyone that giardiasis is a potential hazard when visiting the Sierra Nevada?

First: They know that some waters might be contaminated by something, and *Giardia* is the organism on people's minds so needs no elaboration. Contaminated water is certainly possible at lower elevations and in some locales. Noting in particular that novice hikers cannot be expected to make correct choices of which sources may be safe to drink, they point out that a conservative approach is to treat all water.

Second: If a person believes, albeit incorrectly, that they contracted giardiasis from Sierra Nevada water, they cannot accuse the Forest Service of not warning them. Potential confrontations are therefore avoided.

Unfortunately, this approach results in an incorrect perception of overall water quality in the Sierra by the general public. It also means that if someone contracts a gastrointestinal illness after a visit, they will be more apt to blame the water, having been "forewarned" that all water is suspect. And so the myth is perpetuated.

Untreated Sierra Nevada water should be, almost everywhere, safe to drink—if you "drink smart." If you don't "drink smart" you may ingest diarrhea-causing organisms. But it won't be *Giardia.*

Because up to 1 in 14 of us carries the *Giardia* parasite, we all need to do what we can to keep the water pure. Defecate away from water, and bury it or carry it out.

Camp cooks in particular need to pay special attention to cleanliness. Wash hands thoroughly, especially before handling utensils and preparing meals. If you contract giardiasis in the backcountry, blame your friends...not the water.

High Sierra water has far too few *Giardia* cysts for you to contract an infestation from it. Even if you go somewhere where the concentration is high, you probably won't get giardiasis. If you do get giardiasis, you probably won't have any symptoms. If you have symptoms, they will probably go away by themselves in a week or so. If they don't or you develop serious persistent symptoms, you should seek medical treatment. Finally, those contracting giardiasis may develop immunity to it, thus lowering the likelihood that they will get it again.

There is certainly no reason for anxiety about giardiasis. Fewer than 1 percent of those who have an infestation, or about 5 percent of those with symptoms, need medical help.

Rodgers Lake.

RECOMMENDATION

Our wilderness managers are in a position to educate the outdoor public about the real culprit in the Giardia lamblia story: inadequate human hygiene. When they acknowledge that Sierra Nevada water has fewer *Giardia* cysts than, for example, the municipal water supply of the city of San Francisco, maybe they will turn their attention to it.

The thrust of the following observation is long overdue:

> *"Given the casual approach to personal hygiene that characterizes most backpacking treks, hand washing is likely to be a much more useful preventative strategy than water disinfection! This simple expedient, strictly enforced in health care, child care, and food service settings, is rarely mentioned in wilderness education materials."*

REFERENCES

The articles to which the author refers in this paper are available at the Yosemite Association web site. Visit www.yosemite.org/naturenotes/Giardia.htm to see them.

Bob Rockwell is an active mountaineer who made his first trip into the Sierra Nevada in 1952 to climb Mt. Whitney, and he repeats this climb several times annually. He has a bachelor's degree in Physics from U.C. Berkeley, and a Ph.D. in Aeronautical and Astronautical Engineering (Biomechanics) from Stanford. In the course of making over a thousand ascents of hundreds of individual Sierra Nevada mountains, he has never filtered or otherwise treated the water and he has never contracted symptoms of giardiasis. Retired since 1990, he is now able to fully indulge in his favorite pastime and spends more time there, never treating the water, than ever before.

MEMBERS PAGES

Featured Speaker for 27th Annual Meeting is James D. Houston

The critically acclaimed author James D. Houston will speak at the Yosemite Association's 27th annual Members' Meeting, which will be held at Wawona on Saturday, September 14, 2002. Born in San Francisco, Houston has spent most of his life in northern California. In seven novels and several nonfiction works, he has explored the history and cultures of the western US and the Asia/Pacific region.

His fiction includes the trilogy, *Continental Drift, Love Life,* and *The Last Paradise,* which received a 1999 American Book Award. His latest novel, *Snow Mountain Passage,* is based upon the experiences of a family who came west from Illinois with the infamous Donner Party in 1846-47. *The Washington Post's* Book World lauded *Snow Mountain Passage* as "a powerful narrative of our shared American destiny." For more information about this book and to order it in advance of the Members' Meeting, please see page 17.

Among Houston's nonfiction works are *Californians, In the Ring of Fire: A Pacific Basin Journey,* and *Farewell to Manzanar,* co-authored with his wife, Jeanne Wakatsuki Houston, the story of what befell her family during and after World War II internment of Japanese Americans.

Houston has been a popular and entertaining speaker at our first and second annual winter literary conferences. Attendees at the upcoming members' meeting will hear of some of the intriguing insights Houston gained during his research for *Snow Mountain Passage,* as well as be treated to a reading from this novel.

Members were mailed details about the meeting and the room lottery for lodging in July. In addition to the keynote address by Houston, the day will include naturalist walks, lunch on the hotel lawn, wine and cheese reception after the meeting, our popular fundraising raffle and auction, and an old-fashioned evening barn dance. Houston will be available to talk with members during the reception and will sign copies of his books.

There is always a greater demand for accommodations than there is space at the Wawona Hotel, but other lodging is available both inside and outside the park. For suggestions and other questions, please call the membership department at (209) 379-2317. We hope to see you at Wawona in September!

Winter Literary Conference Dates Set

The third annual Yosemite Winter Literary Conference will be held February 23-27, 2003, at the Ahwahnee Hotel in Yosemite Valley. Past presenters have included Gary Snyder, Pam Houston, Terry Tempest Williams, and Maxine Hong Kingston. A conference announcement will be sent out in the fall to all members. Don't miss this wonderful event! For more information call Beth Pratt at (209) 379-2646.

YA Benefits from Your Online Shopping

Help the Yosemite Association when you shop online. Access your favorite merchants, like Amazon and Lands End, through www.yosemite.greatergood.com and 5% or more of your purchase will go directly to YA at no extra cost to you.

GreaterGood.com
Shop where it matters.

Farewell to Two Key NPS Partners

This spring, the park and YA bid farewell to two long-time friends of the association. Rick Smith, formerly the National Park Service's Chief of Interpretation in Yosemite, accepted an assignment as the Projects Manager/Chief of Interpretation at Rosie the Riveter WWII National Historic Park in Richmond, California. Kate McCurdy, formerly the NPS Wildlife Biologist in charge of Yosemite's bear management program, transferred to Santa Monica Mountains National Recreation Area, situated above the Los Angeles basin, where she will be tracking mountain lions and studying for a graduate degree.

Both Rick and Kate have addressed audiences at numerous YA member events over the years. Most recently, Rick represented the National Park Service at our 26th annual members' meeting in 2001 in Tuolumne Meadows. Behind the scenes, Rick served since 1995 as one of our primary management contacts within the NPS in the day-to-day operations of YA, and he frequently attended our board meetings.

Kate gave members an update on the accomplishments of the park's bear awareness program at our Spring Forum in March of this year, and has spoken at other Forums and members' meetings as well. She will take time off from her Santa Monica assignment to return to Yosemite Valley to co-lead our "Bear Patrol" outdoor adventure in August. Additionally, we collaborated regularly with Kate in the development of bear awareness ("Keep Bears Wild") educational campaign materials, and we watched with delight as her Karelian bear dog Logan matured into a vital (but mischievous) part of the park's bear patrol.

We will miss both Rick and Kate, and wish them well in their new adventures!

Obata Art Show in Merced through September 7

A major exhibition of paintings and woodblock prints at the Merced Multicultural Arts Center surveys the American career of Chiura Obata, the late Japan-born art professor at University of California at Berkeley.

The exhibit focuses on a series of artworks Obata developed as a result of a trip to Yosemite National Park, a visit he would later characterize as "the greatest harvest for my whole life and future in painting."

At the heart of the show are examples from Obata's "World Landscape Series," a portfolio of 35 woodblock prints Obata created to introduce his works on Yosemite and the high Sierra to the general audience.

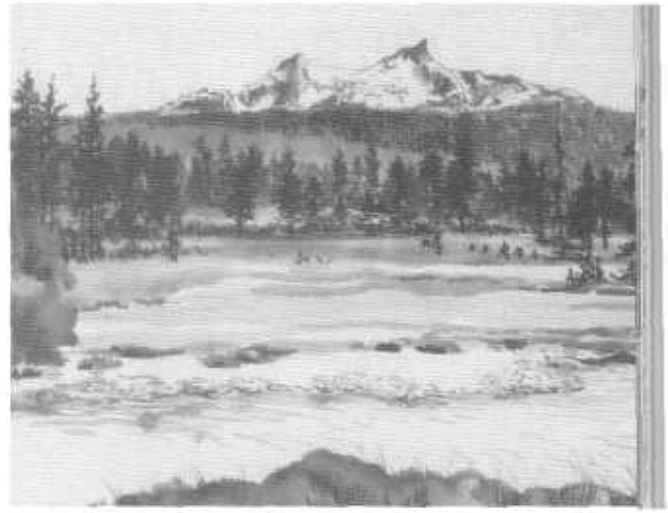
Obata entrusted the job of reproducing his watercolors to artisans in Tokyo. Thirty-two wood-carvers, eight artists and 40 printers took 18 months to complete the project. Each of the finished works involved 120 to 205 hand printings.

In the 1930s, the University of California selected Obata to introduce the first course in Japanese painting in an American university. His university career was interrupted by World War II when he and his family were interned in a relocation center in Topaz, Utah.

In Topaz, Obata promptly opened an art school which ultimately involved 16 instructors and several hundred students.

He also produced paintings and sketches depicting life at Topaz, many of which are included in the exhibition.

The Obata show is augmented by an exhibit which explores the World War II internment experience of members of the Merced community. Both shows continue through Sept. 7.



This article originally appeared in the *Fresno Bee* on June 23, 2002 and is used with permission.

Your Opinion Counts!

YA wants to serve you and the park better. As a member, your opinions are important to us. Enclosed with the Annual Meeting invitation we mailed to members in July is a brief survey asking for your input on several aspects of the association. We thank the 1,000 members who have already responded! If you have not, won't you please take a few minutes to complete this member survey and return it to us? Response instructions are included on the survey form; we've also included a pre-addressed envelope in the mailing in which you can enclose your survey. If you have any questions or concerns, don't hesitate to call the Membership Department at 209-379-2317 for assistance. All information is confidential and will not be exchanged with other organizations. Thank you for helping us to improve YA.

Leaving a Yosemite Legacy

Since 1923, thousands of individuals and families have helped the Yosemite Association undertake its important educational, scientific, and research programs, with gifts of time, services, and money. Each year we receive critical support for Yosemite in the form of charitable bequests from wills and estate plans. Such bequests play a vital role in our future funding.

We encourage you to consider including a gift to the Yosemite Association in your will or estate plan. It's a way to ensure that others will enjoy Yosemite far beyond your lifetime.

For information about leaving a Yosemite legacy, call (209) 379-2317, or write to P.O. Box 230, El Portal, CA 95318

New Collectible Annual Park Pass

Since June, the National Park Service has been offering a collectible Yosemite Annual Park Pass for $40 at all entrance stations. This collectible plastic pass is valid for unlimited entrance into Yosemite National Park for one year from the date of purchase. Each year, the pass will feature a different photograph showcasing Yosemite's spectacular scenery. Start your collection now and renew the pass every year.

"It's a wonderful way for frequent visitors to access and enjoy the beauty of Yosemite National Park," said Superintendent David Mihalic. "Additionally, users will have the pass as a keepsake to remind them of their time in Yosemite."

Association Dates

September 14, 2002
27th Annual Members' Meeting, Wawona

October 24, 2002
Yosemite Flora Celebration Event, Strybing Arboretum, San Francisco

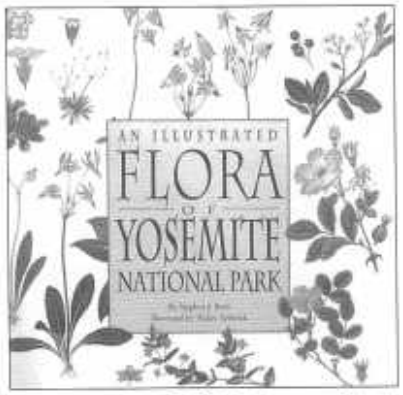
February 23-27, 2003
3rd Annual Yosemite Winter Literary Conference, Yosemite Valley

March 29, 2003
Spring Forum, Yosemite Valley

September 13, 2003
27th Annual Members' Meeting, Tuolumne Meadows

Member Info Line 209/379-2317

If you're planning a trip to Yosemite and have questions, give our phone line a call between the hours of 9:00 a.m. and 4:30 p.m. Monday through Friday. We don't make reservations, but we can give appropriate phone numbers and usually lots of helpful advice.



New Limited Edition Print from Yosemite Flora

The Yosemite Association is pleased to announce that a new limited edition giclée print entitled "Wild Lupines of Yosemite National Park" is now available for sale. The piece is an exact replication, reproduced at the full size of the original watercolor painting by Walter Sydoriak from *An Illustrated Flora of Yosemite National Park*.

The Yosemite flora is the landmark book depicting every known vascular plant species in the park, and it took Sydoriak over seventeen years to complete the more than 1,100 watercolor paintings featured in the volume.

The 11 x 14 inch print is the first to be reproduced from the book, and is limited to an edition of 100 signed and numbered prints. Over half the edition is already gone, as the work was presented as a gift to major donors to the flora. Each print is crafted with great care, precisely capturing the vibrance and beauty of the original watercolor. Sydoriak individually inspects and signs each print.

Created on Somerset Photo Enhanced Velvet, 100% cotton, mouldmade archival paper from St. Cuthberts Mill in England, with archival pigment inks using the giclée process, this piece of fine art has a life expectancy of over 100 years. As with any work of art, it should be displayed away from direct sunlight.

The print showcases the intricate detail and radiant grace of the lupines, whose purples and greens combine to create a well-balanced, colorful composition. Species included in the painting include *Lupinus arbusutus, breweri* var. *breweri, covillei, lepidus* var. *confertus, benthamii, fulcratus,* and *formosus.*

The edition was printed for the Yosemite Association by West Coast Imaging of Oakhurst, California, a company that specializes in fine giclée printing. Yosemite Association members receive a 15% discount on the print (reducing the price to $85). Please call us at (209) 379-2648 or visit www.yosemitestore.com for more information or to order the print.

Celebrate the Yosemite Flora in San Francisco!

Members of the Yosemite Association should note on their calendars that on Thursday, October 24, 2002, at 7 p.m., a special event to celebrate the completion and success of Yosemite's illustrated flora will be held at the Strybing Arboretum in San Francisco.

The celebration will mark the first time that author Stephen Botti and illustrator Walter Sydoriak will have been together in the Bay Area since the flora was completed. The pair will be making a presentation on the history of the project that resulted in the award-winning *An Illustrated Flora of Yosemite National Park*. Later in the evening they will be available to sign copies of the volume.

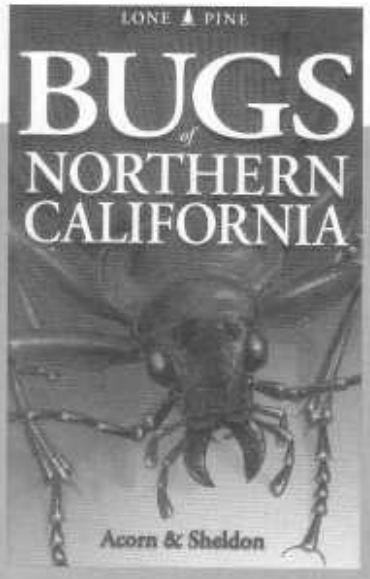
Thousands of hours of field work were involved in compiling and documenting the species included in the flora, and the completion of the 1,100 watercolor paintings required more than 17 years. Botti, a rare plant specialist in Yosemite for many years and now a fire ecologist, and Sydoriak, a technical illustrator and biologist, will discuss the challenges and discoveries of this mammoth undertaking.

The event is jointly sponsored by the Yosemite Association, the Strybing Arboretum, and the California Native Plant Society. An announcement with additional details will be made available later this summer.

Are You Receiving YA's Electronic Newsletter?

In February, YA began sending an informative newsletter by e-mail to its electronic mailing list. Issued about every two weeks, the newsletter lets members know about special offers for books and other products, provides them news about what's going on in the park, announces special Yosemite-related events—we even sponsored our first contest to identify a bird whose photo was snapped by our web camera. People receiving the newsletter have been complimentary about the service, and we already have about 8,500 addresses that we mail to.

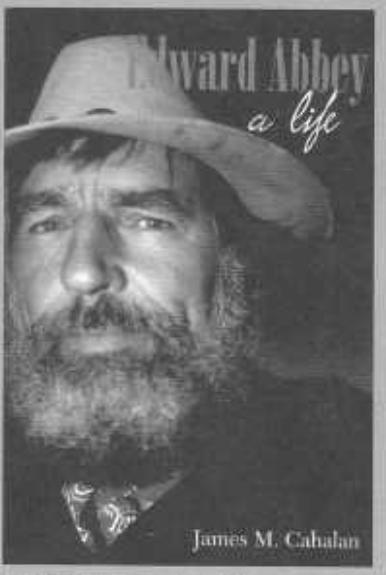
If you're not receiving the e-mail newsletter and would like to be included, please send us an e-mail message that lets us know you're a YA member and that you'd like to be added to our newsletter mailing list. You can remove your name at any time, and we don't share your e-mail address with other businesses or groups. Send your e-mail to: info@yosemite.org, or call us at (209)379-2317.



Bugs of Northern California
by John Acorn; illustrated by Ian Sheldon
From beautiful butterflies to scary spiders, northern California has about 20,000 species of bugs. The author, a naturalist and avid 'bugster,' describes 125 of the most interesting species in this book, which are grouped into 13 sections and color coded.

The included species were selected using four criteria: 1) they had to be big, 2) they had to be colorful, 3) they had to be hard to miss, and 4) they had to be extremely weird!

The book is meant to be an introduction to northern California's insects, not a comprehensive treatment. The full-color illustrations are not only beautiful, they are reproduced at a large size to make identification easier. 160 pages; 5.5 x 8.5 inches; illustrated in color with maps; paperback with sturdy cover; copyright 2002, Lone Pine Publishing. $12.95; **member price $11.01**



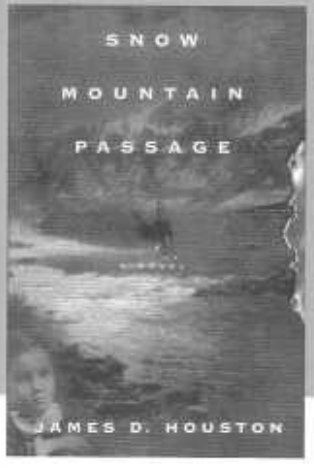
Edward Abbey—A Life
by James M. Cahalan
He was a hero to environmentalists and the patron saint of monkeywrenchers, a man in love with desert solitude. James Cahalan has written a definitive biography of this contemporary literary icon whose life was a web of contradictions.

This book sets the record straight on "Cactus Ed," giving readers a fuller, more human Abbey than most have ever known. It separates fact from fiction, showing that much of the myth surrounding Abbey—such as his birth in Home, Pennsylvania, and later residence in Oracle, Arizona—was self-created and self-perpetuated. Cahalan studied all of Abbey's works and private papers, and interviewed many people who knew him—including the models for characters in *The Brave Cowboy* and *The Monkey Wrench Gang*—to create the most complete picture to date of the writer's life.

More than a biography, the volume is a corrective that shows that he was neither simply a countercultural cowboy hero nor an unprincipled troublemaker, but instead a complex and multifaceted person whose legacy has only begun to be appreciated. 357 pages; 6 x 9 inches; 30 black-and-white photos; case bound with dust jacket; copyright 2001, University of Arizona Press. $27.95; **member price $23.76**

Snow Mountain Passage
by James D. Houston

This novel is a powerful retelling of the most dramatic of pioneer stories—the ordeal of the Donner Party, with its cast of young and old risking all, its imprisoning snows, its rumors of cannibalism.



The story is told from the perspective of the James Frazier Reed family, that included Mr. Reed (one of the leaders of the Donner Party), his wife, and four children. As they travel across county in the Palace Car, a huge, specially-built covered wagon, the stage is set for trouble.

Trouble, in fact, comes in the fateful choice of a wrong route, which causes the group to arrive at the foot of the Sierra Nevada too late to cross before the snows block the way. To complicate matters, Reed is exiled from the group and is forced to cross the mountains alone ahead of the snows.

The book features the imagined "Trail Notes" of Reed's daughter Patty, who recollects her experiences as a child. This is an extraordinary tale, and all that happens to the fated party—who dies, who survives, and why—is brilliantly, grippingly told.

320 pages; 6.5 inches x 9.5 inches; maps on endpapers; casebound with dust jacket; copyright 2001, Alfred A. Knopf. $24; **member price $20.40**; paperback version $14.00; **member price $11.90**

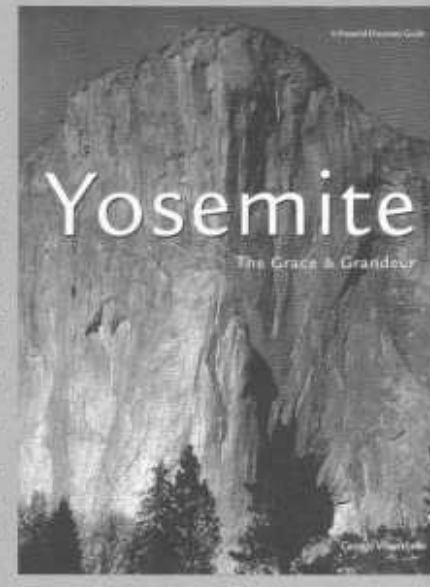
To see an expanded list of the Yosemite-related books, maps, and products we offer for sale, visit the full-featured, secure **Yosemite Store** on the internet at: http://yosemitestore.com

Kindred & Related Spirits—The Letters of John Muir and Jeanne C. Carr
edited by Bonnie Johanna Gisel

Jeanne C. Carr was 35 years old, wife of a chemistry professor, and a mother of four boys when she first met John Muir in 1860. It was clear to her that Muir, a 22-year-old inventor, was a young man of remarkable talents and potential, and by the time he left the University of Wisconsin three years later, a lifelong friendship had been initiated.

While Muir's letters to Carr were published in 1915 and have enjoyed an illustrious history, Carr's letters to Muir remained unpublished, and the extent of Carr's influence on her friend over the next three decades, unappreciated. Their friendship, characterized by an ecstatic spiritual celebration of the natural world, nurtured and sustained Muir from his obscure beginnings as an amateur botanist and continued as he grew into one of the most influential preservationists and natural historians of our time.

This unprecedented trove of letters reveals the nature of John Muir's enduring gratitude to a woman named Jeanne Carr. 412 pages; 6.5 inches x 9.5 inches; illustrated with black-and-white plates; casebound with dust jacket; copyright 2001, University of Utah Press. $34.95; **member price $29.71**



Yosemite—The Grace & Grandeur; A Pictorial Discovery Guide
by George Wuerthner

This photographic work offers an appealing combination of expert yet down-to-earth text and memorable color photography. The author explores the revered terrain of Yosemite National Park in this handsome keepsake volume.

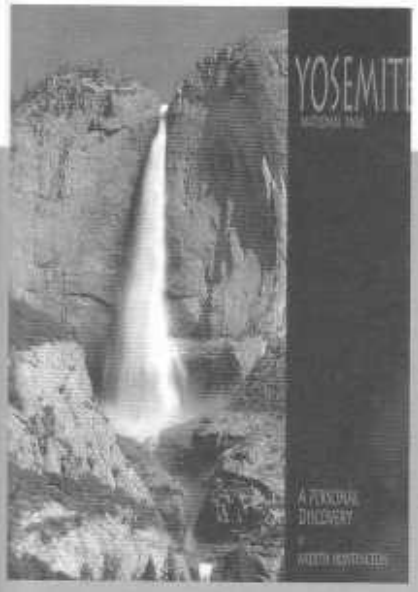
Climb Half Dome, wander endless green meadows, feel the mist of Yosemite Falls, and behold the majesty of the giant sequoias. It's a great way to immerse yourself in the rich experience of Yosemite, a land beckoning expeditions, promising renewal, and enriching our souls.

The book is 144 pages; 9 x 11 inches; illustrated with color photos; case bound with dust jacket; copyright 2002, Voyageur Press. $29.95; **member price $25.46**

Yosemite Association T-Shirts
by Artforms.

Here is a colorful way to show off your affiliation with the Yosemite Association. These 100% cotton t-shirts have been silk-screened with an eye-ca ing representation of Yosemite Valley from Tunnel View, in shades of purple, green, and teal. Available in three colors—lilac, steel (gray) and brook (green)—the shirts also bear the name the Yosemite Association.

A color image of the shirts can be viewed on the Yosemite Association web site (www.yosemite-store.com). The t-shirts are available in the following sizes: lilac (M - XXL), steel (M - XXL), an brook (L -XXL). Please indicate color and size when you order. $18 (XXL–$19); **member price $15.30** (XXL–$16.15)



Yosemite, A Personal Discovery

by Ardeth Huntington

Yosemite has long been beloved by artists, writers, and travelers from every corner of the globe. This book explores the extraordinary, glacially-sculpted landscape known and revered by generations of visitors as one of the most beautiful places on Earth.

This colorful publication provides the answers to the most commonly asked questions, and offers remarkable information that only a long-time resident and explorer would be familiar with. Colorful maps help orient the visitor and illuminate the size and scope of one of North America's premier national parks.

In addition, the book presents the breathtaking imagery of many of America's finest landscape photographers, whose photos are presented in full color and in a size appropriate for so grand and beloved a subject. 64 pages; 10 inches x 13 inches; illustrated with color photos and maps; copyright 2001, Sierra Press. Paperback version, $8.95; **member price $7.61;** clothbound version, $18.95; **member price $16.11**

FIRST EDITION WILL SOON SELL OUT!

The High Sierra of California

poems and journals by Gary Snyder; woodcuts and essays by Tom Killion

Combining the dramatic and meticulous work of printmaker Tom Killion—accented by quotes from John Muir—and the journal writings of Pulitzer Prize–winning poet Gary Snyder, *The High Sierra of California* is a tribute to the bold, jagged peaks that have inspired generations of naturalists, artists, and writers.

For over thirty years, Tom Killion has been backpacking the High Sierra, making sketches of the region stretching from Yosemite south to Whitney and Kaweah Crest, which he calls "California's backbone." Using traditional Japanese and European woodcut techniques, Killion has created stunning visual images of the Sierra that focus on the backcountry above nine thousand feet, accessible only on foot.

Accompanying these riveting images are the journals of Gary Snyder, chronicling more than forty years of foot travels through the High Sierra backcountry. "Athens and Rome, good-bye!" writes Snyder, as he takes us deep into the mountains on his daily journeys around Yosemite and beyond.

Originally printed in a limited, handmade, letterpress edition, *The High Sierra of California* is now available in an affordable, full-color trade edition. The book is 128 pages, 10.5 x 8.5 inches, illustrated in color and black-and-white, casebound, and copyright 2002 by Heyday Books and Yosemite Association. $50; **member price $42.50**

Pajaro Field Bag

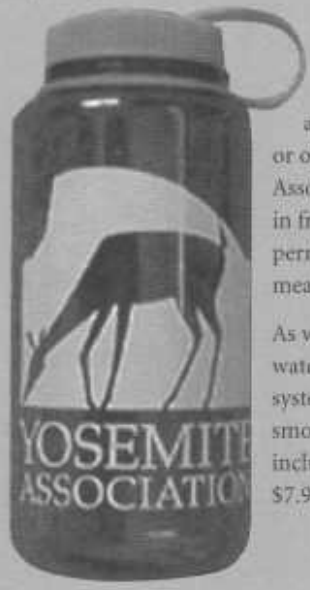
This waist pack features seven pockets for everything you'll need when you're hiking or enjoying time in the outdoors. The main pocket is sized to accommodate field guides, travel books, or binoculars. There are smaller pockets (including one with a zipper) for note pads and maps, and specialized pockets for pencils, pens, and sunglasses. Best of all, a secret pocket sealed with Velcro keeps keys, credit cards, and other valuables safe. It's the best such pack we've found.

Made in the U.S.A. of durable Cordura in navy blue, forest green, or black by Pajaro. (please specify color) $29.95; **member price $25.46**

Yosemite Association Water Bottle

by Nalgene.

This highly functional wide-mouth Nalgene bottle is made of super-tough, smoke-gray lexan polycarbonate. You'll never lose its easy-to-open, attached, screw-top cap.



The bottle is virtually leak-proof, won't conduct heat or cold (you can pour boiling liquids directly into it), and doesn't affect the taste of water or other liquids. Besides the Yosemite Association graphic with a deer grazing in front of Half Dome, the bottle features permanent gradation marks to make measuring powdered foods and drinks easy.

As well, the bottle screws directly into MSR water filters, dromedary bags, and hydration systems to make the transfer of water smooth and spill-free. Weight 5.3 ounces including attached cap; from Nalgene. $7.95; **member price $6.76**

Yosemite Wilderness Pin

Here's a beautiful enamel pin commemorating Yosemite's unparalleled wilderness. It's circular in shape with a high country scene rendered in blues, grays, and greens. A real treasure for collectors. Approximately 1 inch in diameter. $4.00; **member price $3.40**

Yosemite Association Patch

Our Association logo is embroidered on colorful, sturdy fabric for placement on daypacks, shirts, blue jeans, jackets, or wherever! The patch is available in three attractive colors: dark blue, forest green, or maroon. $3.00 (please specify color); **member price $2.55**

Yosemite Association Mug

This distinctive and functional heavy ceramic mug feels good with your hand wrapped around it. Available in two colors (green or maroon), it's imprinted with our logo and name in black and white. Holds 12 ounces of your favorite beverage. $6.50 (please specify color); **member price $5.53**

Yosemite Black Bear Stuffed Animal

This soft and fuzzy stuffed black bear (actually dark brown with a lighter muzzle) comes fitted with an authentic ear tag - just like those used by National Park Service rangers to research and track the bears in Yosemite.

The Yosemite black bear is part of an awareness program designed to educate the public so that bears will be roaming the Sierra Nevada for years to come. All proceeds from our sale of the stuffed be be donated to the program and aid Yosemite

The yellow ear tag is a replica of those actually used in Yosemite, and securely a Washable with warm water and mild soap, the cuddly bear is a great gift for childre bear lovers alike. Available in two sizes: large (14 inches from tail to snout) and small inches). Large bear, $14.95; **member price $12.71**; small bear, $9.95; **member price**

Order Form

Credit card orders call: **(209) 379-2648** Monday–Friday, 8:30am–4:30pm
We Accept VISA, Mastercard, American Express, and Discover

	Qty.	Color	Description	Price Each	Total
1					
2					
3					
4					
5					
6					

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Address:

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SUBTOTAL	
7.75% Sales Tax (CA customers only):	
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TOTAL ENCLOSED:	

Yosemite Association, P.O. Box 230, El Portal, CA 95318

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Welcome to our newest members! You've joined over 8,000 like-minded individuals, families, and businesses helping the association make Yosemite an even better place.

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Bear Canister Donations: Susan Kanfer, Leland Rickman, Ann Robinson

Public Comment Sought for Draft Yosemite Fire Management Plan/Environmental Impact Statement

Yosemite National Park Superintendent David Mihalic announced recently that, with the notice published in the Federal Register, the 60-day public comment period on the Draft Yosemite Fire Management Plan/ Environmental Impact Statement opened June 28 and will close August 27, 2002. The Draft Yosemite Fire Management Plan/ Environmental Impact Statement was released in May this year. That gave the public additional time to review the document that provides a wide spectrum of alternatives.

A series of public meetings to be announced will be scheduled in Yosemite National Park, Oakhurst, Mariposa, Sonora, and Mammoth Lakes.

The public is invited to provide comment on the plan. "We feel that the Draft Fire Management Plan provides a broad range of alternatives that are based on sound science," said Mihalic. "However, we recognize that the public's involvement in the planning process and the input we receive from them can only make the plan better."

The Draft Yosemite Fire Management Plan/ Environmental Impact Statement is available on the Internet at http://www.nps.gov/yose/planning/fire. To receive a copy of the plan, or to submit comments, please write to Superintendent, P.O. Box 577, Yosemite, CA 95389, fax 209/379-1294 or email YOSE_Planning@nps.gov.

Yosemite National Park Receives Donation of TH!NK Neighbor Electric Vehicles

Yosemite National Park received 47 TH!NK Neighbor electric vehicles through a donation made possible through the generous support of the Ford Motor Company and the National Park Foundation.

500 TH!NK Vehicles were donated throughout America's National Parks in California. Yosemite's 47 vehicles will be used by the National Park Service as well as park partners Yosemite Concession Services and the Yosemite Association.

These electric vehicles have zero emissions and quiet engines so will reduce noise and air pollution in the park. The TH!NK Neighbor vehicle has a range of 30 miles per charge and can be recharged at a standard electrical outlet.

"Yosemite National Park is grateful for the donation of the TH!NK Neighbor electric vehicles," said Superintendent David Mihalic. "National Parks should be the innovators of new and alternative technology and the partnership with Ford Motor Company and the National Park Foundation allows us to accomplish this goal."

Much of the day-to-day trips for business conducted in the park can now be done in these vehicles. Activities like delivering mail, supplies and equipment, or cleaning restrooms and picking up trash and litter will now be completed in the TH!NK vehicles. Summer volunteers for the Yosemite Association are using YA's vehicle for accomplishing many of their volunteer tasks.

Yosemite Association
Post Office Box 230
El Portal, CA 95318

Return Service Requested

Join the Yosemite Association

The Yosemite Association initiates and supports interpretive, educational, research, scientific, and environmental programs in Yosemite National Park, in cooperation with the National Park Service. Authorized by Congress, the Association provides services and direct financial support in order to promote park stewardship and enrich the visitor experience.

Besides publishing and selling books, maps, and other materials, YA operates an outdoor adventure program, the Art Activity Center, the bear canister rental program, and the Wilderness Permit Reservation system. Revenues generated by these activities fund a variety of National Park Service programs in Yosemite.

You can help us be successful by becoming a member. Individuals, families, and businesses throughout the country have long supported the Yosemite Association with their dues and participation in our programs.

Won't you join us in our efforts to make Yosemite an even better place?

MOVING?

If you are moving or have recently moved, don't forget to notify us. You are a valued member of the Association, and we'd like to keep in touch with you.

MEMBER BENEFITS

As a member of the Yosemite Association, you will enjoy the following benefits:

* *Yosemite*, the quarterly Association journal;
* A 15% discount on all books and products and a 10% discount on Outdoor Adventures offered by the Association;
* NEW! A 10% discount on Yosemite Concession Services lodging in the park and at Tenaya Lodge (some restrictions apply) AND a members-only YCS lodging reservation phone number;
* NEW! A 10% discount on lodging at The Redwoods in Yosemite (Wawona);
* A 10% discount at The Ansel Adams Gallery in Yosemite Valley (some restrictions apply);
* The opportunity to attend member events and to volunteer in the park;
* and much more!

When you join at one of the following levels, you will receive a special membership gift:

Supporting: the award-winning video, "Yosemite: The Fate of Heaven."

Contributing: Yosemite—The Promise of Wildness, an elegant book of essays and photographs.

Sustaining: Tradition and Innovation, A Basket History of the Indians of the Yosemite/Mono Lake Area, a beautifully illustrated, finely printed book.

Patron: a matted color photograph by Howard Weamer, "Half Dome—Storm Light."

Benefactor: an Ansel Adams Special Edition print, "Yosemite Valley—Thunderstorm."

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Website: http://yosemite.org Cover inset photo courtesy of the National Park Service

Please enroll me in the Yosemite Association as a . . .

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___$100 Contributing Member
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___$1,000 Benefactor Member
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Mail to: **Yosemite Association,** PO Box 230, El Portal, CA 95318. 209/379-2646