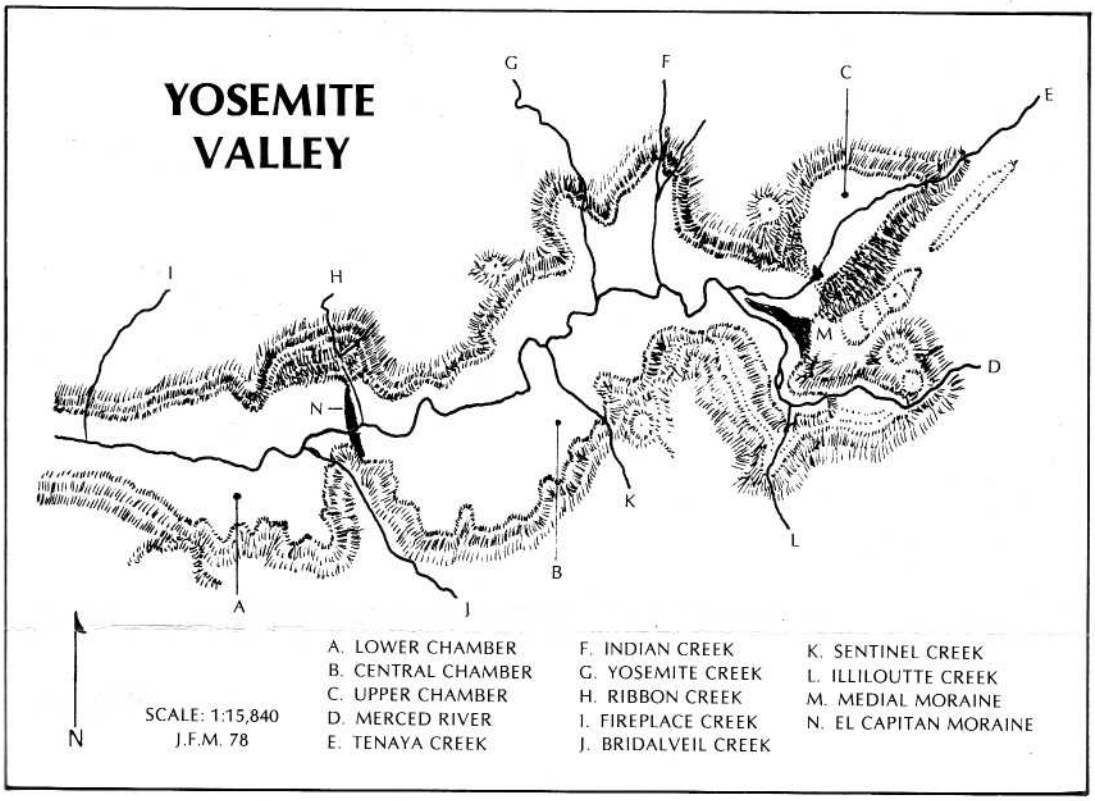
YOSEMITE

JANUARY, 1979 VOLUME FORTY-SEVEN, NUMBER 5

Published for members of Yosemite Natural History Association



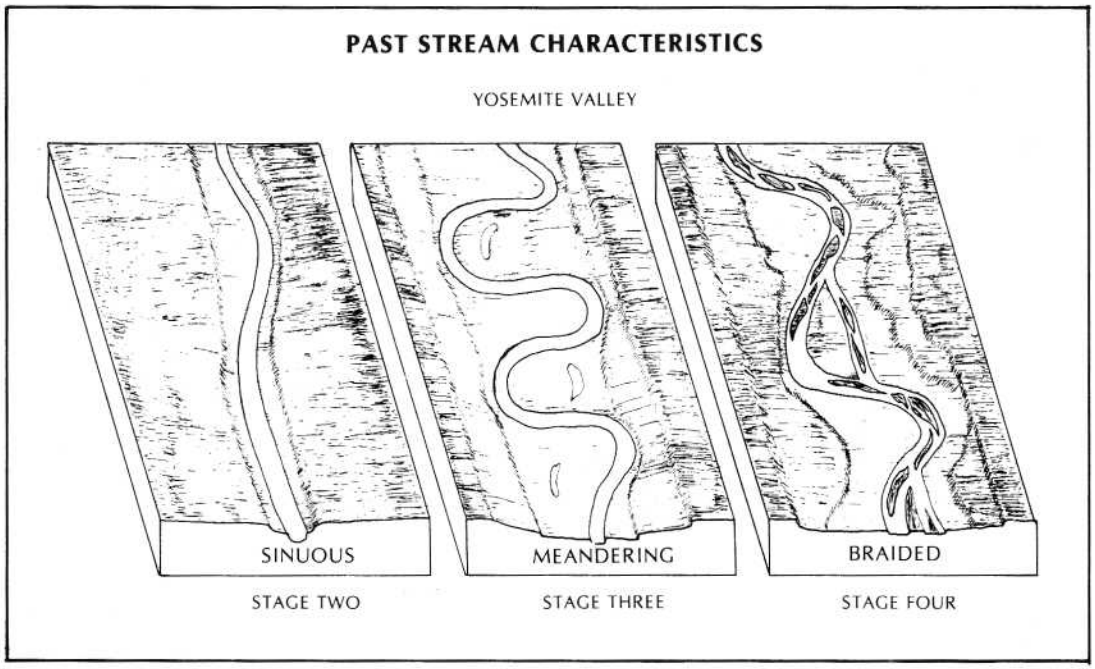
Yosemite Valley's Forgotten Natural Process: The Stream System

YOSEMITE VALLEY'S STREAM SYSTEM IS UNIQUE. Where else in the world do waterfalls or cascades like the Yosemite, Nevada, Vernal, Bridalveil, Ribbon, Staircase or Tenaya pour over massive granite cliffs, down through narrow gorges to feed a stream system which lies on an almost level valley floor of huge meadows and encroaching forest of oak, pine, and cedar?

The Merced River has flowed through Yosemite Valley for thousands of years, even before the time of the glacial advances which were responsible for creating these famous landform features which hang on the Valley walls today. Following the glacial retreat some ten thousand years ago, the pristine aboriginal streams of Yosemite Valley had the appearance of a dynamic system. Rapidly eroding stream banks sloughing off into the shallow stream channel, the streams transporting the alluvium[1] between the numerous mid-channel islands and eventually depositing them on the point bars[2] or one of the many timber debris jams. Huge undermined Black Oaks and Alders could be seen hanging over steep stream bank providing cool shade which oxbows and low lying meadow lands flooded with backwater, built up behind the El Capital Moraine. All these features of the riverian environment contributed to the creation of the Valley floor as it was seen during the time of white discovery in 1851.

Since the retreat of the Yosemite Glaciers, the stream system of the Valley has passed through a sequence of orderly events. A summary of the events which led to the formation of the Valley's stream system in 1851, is as follows:

STAGE ONE: Filling of Ancient Lake Yosemite.
Fed by the Tioga and Tenaya stage glaciers, Tenaya Creek and the Merced River were mainly responsible for the filling in of the ancient lake basin in the Central Chamber. Through coalescing of the streams and expanding deltas, a continuous plain of stream sediments eventually filled the ancient lake to the crest of the El Capitan Moraine.



STAGE TWO: The Merced River a Sinuous Channel.
Throughout a relatively short period of time, a series of breaches in the moraine dam stimulated stream rejuvenation. The river cut down through the old delta plain some fifteen feet. This caused a change in channel morphology[3]. The Merced River now devoted most of its energy to vertical erosion and as a result its sinuosity decreased. The Merced River developed a large gently curving channel, made up of long straight reaches.

STAGE THREE: The Merced River, a Meandering Stream.
As the Merced River approached its new base level, stream sinuousity increased since a lower gradient had developed. The river slowly began to evolve from a sinuous channel[4] to a meandering channel[5]. Stream degradation (down cutting) still occurred, however, lateral migration of the river flourished. During this fluvially active period the final stages of the new floodplain construction were completed.

STAGE FOUR: Braided Stream[6] Patterns Develop.
The Merced River, not able to down cut any further since large boulders blocked the river gap in the Moraine dam, could only migrate laterally. Sediments from accelerating bank erosion in addition to annual flood deposits, overwhelmed the stream's capacity to transport, resulting in a shift in channel morphology from a meandering stream to predominantly braided channel conditions. In many locations, the river spread out and divided by forming mid-channel point bars composed of alluvial sand and gravel. This condition existed in the lower four of the five and one-half miles of the Central Chamber. This change in channel morphology coincides with the coming of modern man to Yosemite Valley in 1851.

For the next twenty-eight years Yosemite Valley maintained a natural riverscape appearance. One of the most noticeable conditions were the swampy meadow lands which existed in the lower end of the Central Chamber. The combination of permanent rock dams formed by glacial moraines and the numerous log-jams found throughout the natural riverscape were largely responsible for contributing to swampy meadow conditions. The most important and permanent cause of the swampy meadows on the Valley floor was the El Capital Moraine. This landform left by the glacial advances, controlled the base level of erosion and influenced surface water drainage.

It was not until 1879 that the stream system was seriously disturbed by modern man. An early guardian of Yosemite Valley named Galen Clark, succeeded to alter the elevation of the base-level, lowered the water table, increased surface drainage and initiated channel degradation in the Central Chamber. Early accounts of Yosemite Valley describe the meadow lands as being swampy. Galen Clark realized the influence of the El Capital Moraine on the hydrology of the Central Chamber. In an attempt to open potential grazing land, and access to various areas of the Valley, Clark, in 1879, found a quick and sure method of draining the low lying meadows. The following letter written by Clark in 1907, titled "Cause of Swift Erosion," describes the incident.

It may be interesting to the public to know the cause of there being in recent years so much more activity in the river currents cutting away the river banks than during the earlier known history of

Yosemite. When the El Capital bridge was built in 1879, it was located across the narrow channel of the river between the two points of what remains of an old glacial terminal moraine.

The river channel at this place was filled with large boulders, which greatly obstructed the free outflow of the flood waters in the spring, causing extensive overflows of the low meadow land above, greatly interfering with travel, especially to Yosemite Falls and Mirror Lake. In order to remedy this matter, the large boulders in the river channel were blasted and the fragments leveled down so as to give a free outflow of the flood waters. This increased the flow of the river currents, which now commenced greater eroding work on the river banks, and as the winding turns became more abrupt the destructive force annually increases. Some thorough system of protection should be promptly used to save the river banks from further damage.

A detailed study of the El Capitan Moraine dam was completed during the Fall of 1977. Taking advantage of the low water during this drought year, the observations revealed the location of where Galen Clark blasted the moraine boulders in order to increase surface drainage and lower the water table. The study determined the width, length and depth of the blasted area. By measuring boulder fragments, tributary stream terrace levels, conifer hierarchy[7] on the stream terrace levels and surveying of six cross-sections of the Valley floor, the original height of the El Capitan Moraine prior to the blasting was determined. Since 1879, tributary stream channels have down-cut to an average depth of 4.5 feet. This means that the present river gap in the El Capitan Moraine must be 4.5 lower than in 1879 prior to Clark's blasting. This figure is important because the river-gap elevation represents the base-level of erosion for the entire Central Chamber. Since 1879, the stream system's accelerated rate of degradation above the moraine has remained unchecked.

Photographs taken of Yosemite Valley by Watkins and Fiske in 1866, fifteen years before the El Capitan Moraine was blasted, show photo after photo of heavily eroded stream banks five to six feet high, undermining trees and exposing roots of tall pines, cedars and oaks. Throughout geologic time, Yosemite Valley's stream system in the Central Chamber repeatedly shifted its channel. Oxbow bends, abandoned stream channels and sloughs scar the floors of every large meadow in Yosemite Valley. Swampy meadows developed in the depressions of the fluvial scars. Stream bank erosion was as much a part of the aboriginal landscape in Yosemite Valley as the waterfalls.

Despite the fact that the processes of lateral erosion were normal, early guardians and the managing Board of Commissioners for Yosemite saw this natural phenomena as destructive to Yosemite meadows. In all actuality, no one noticed the river's dynamic character until it began to undermine bridges, roads and lodges constructed in the meander belt of the stream system. Galen Clark had begun the campaign of altering the pristine aboriginal riverscape by rejuvenating stream degradation, while the Commission sought methods to halt lateral erosion.

In 1882, the State Engineer, W. Hall, visited Yosemite Valley and inspected the river system to suggest improvements at the Commissioners request. The following quotes are from his pamphlet, "To preserve from defacement and promote use of the Yosemite Valley" (1882). The following quotations document that braided reaches of channel existed and that numerous amounts of logs and unchecked lateral erosion were natural features in the riverscape.

. . . several notable obstructions lay in the river channel. Waters must be brought into one channel.

. . . above the Upper Iron Bridge, I found the river channel to be in especially bad condition, in fact, it divided up, spread out, obstructed and torturous in its course. . . result in unregulated overflow of large portions of available meadow lands in the Valley.

. . . the streams of the Valley must be cleared and regulated.

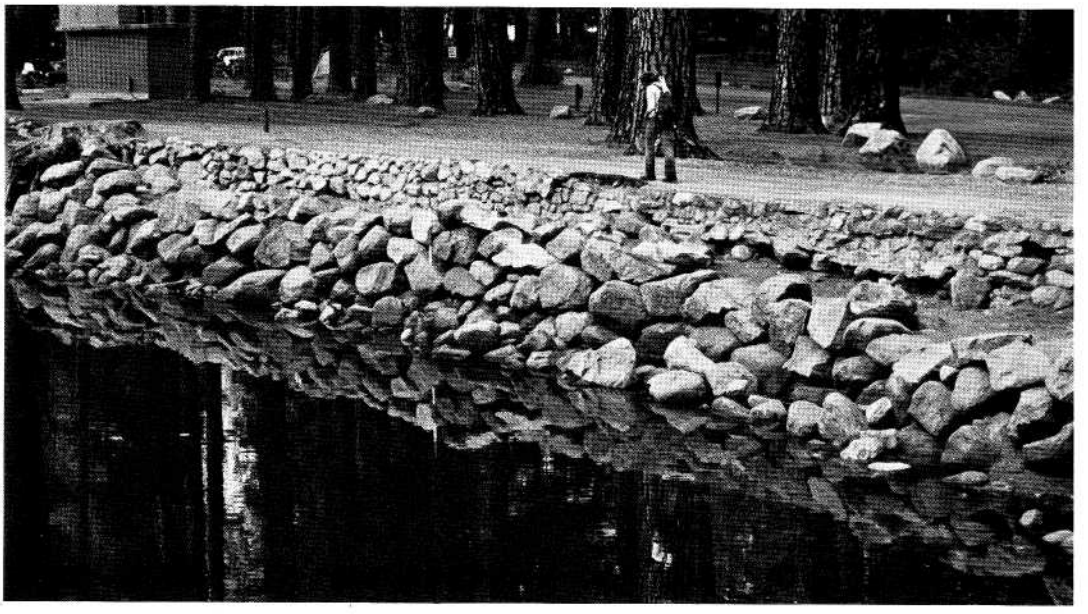
. . . Rivers are constantly demolishing their banks at some points and building up in others.

From the above quotations one can get a good physical description of the river's behavior. Lateral erosion was very evident and was augmented by natural debris in the stream.

Beginning in the early 1880's modern man installed the first physical amorment to protect the stream banks from eroding. Large granite boulders called rip-rap revetments are strategically placed to cover entire sections of river bank subject to stream erosion. This type of armor requires thousands of cubic yards of granite rock.

In the fall of 1977, the first complete inventory of all artificial structures found in the riverscape of Yosemite Valley was completed.

The total length of every rip-rap revetment site found in Yosemite Valley stream system was measured. The total length came to 14,518 feet. To clarify the magnitude of this figure imagine turning the length vertically with the base at sea level. Comparing such a stack of revetment stones to the height of Mount Whitney leaves a tower of rip-rap some twenty-two feet above the mountain top.



Having installed this mammoth amount of granite boulders along the eroding river banks of the stream system, the source of alluvium required to maintain the original braided channels was cut off. Combined with Galen Clark's blasting of the El Capitan Moraine, which resulted in the present down-cutting of the stream, the channel in most locations has been narrowed.

As seen by the evidence presented here, there have been many changes to the stream system of Yosemite Valley in the last one hundred years. Unfortunately, most of these changes which have produced the present day stream system are a product of man's manipulation of the natural stream system.

Had modern man not observed the natural stream processes as a destructive process and instead recognized this process as being responsible for creating the present topography of the Valley floor, then one could, to this day, visit Yosemite Valley and view a pristine aboriginal riverscape.

Alas, we are left with a river of which many reaches are artificially controlled, with sections of river bank sloped by machine, armored with tons of rip-rap revetment and with a channel choked with constricting bridges and pipe dams. The irony of such a dilemma is that these artificial controls are found within the heart of a great National Park. We should take a closer look at means of protection for the pristine aboriginal environments within Yosemite Valley from such human ravages.

James F. Milestone

I am indebted to Dr. Rene Barendregt and to William Milestone for their constructive criticism and direction during the writing of this paper.

OPERATIONAL DEFINITIONS

1. ALLUVIUM: Stream sediment deposits laid down in river channels by the process of erosion.
2. POINT-BAR: Sediment deposited on the inside of a growing meander loop.
3. CHANNEL MORPHOLOGY: The form, structure and pattern of a stream channel.
4. SINUOUS STREAM: A channel made of long straight reaches with slight curvature in its pattern determinted by the ratio of channel length to valley length.
5. MEANDERING STREAM: Characteristic habit of mature rivers described as winding freely on a broad flood plain with some degree of symmetry to the curvature. Determined by the ratio of channel length to valley length.
6. BRAIDED STREAM: Braided stream is one flowing in several dividing and reuniting channels resembling the strands of a braid, the cause of division being the obstruction by sediment deposited by the stream.
7. CONIFER HIERARCHY: Describes the age of conifer growth in relation to stream terrace levels determining the relative age of the stream terraces.

REFERENCES

Clark, G. (1907) Cause of Swift Erosion; *Yosemite Nature Notes,* Vol. VI, No. 2-2-27.

Commissioners (1877-1904) Commissioners to Manage Yosemite Valley and the Mariposa Big Tree Grove; *Biennial Report,* California State Printing Office.

Hall, Wm. Ham (1882) To preserve from defacement and promote use of the Yosemite Valley. *Report of State Engineer;* California State Printing Office.

Matthes, Francois E. (1930) *Geologic History of the Yosemite Valley.* U.S. Geological Survey of Professional Paper, p. 160.

Milestone, J.F. (1978) *Influence of Modern Man on the Stream System of Yosemite Valley;* S.F. S.U. Master Thesis; Geography Department.

Schaffer, Jeffrey (1977) *Glacial History of Yosemite Valley* - California Geology.

The preceding article was written and illustrated by James Milestone for YNHA. Since 1973, he has worked as a volunteer naturalist in Yosemite and at Fort Cronkhite, as an interpreter at Alcatraz Island, and a backcountry ranger at Mt. Rainier NP, a park technician at Stinson Beach and Marin Headlands, (parts of the Golden Gate National Recreation Area), a physical science technician at Redwoods NP and a work project coordinator for the Youth Conservation Corps. He has his Masters degree in physical geology from San Francisco State University. He's twenty-four years old and we predict that if he keeps as busy in the future as he has in the past five years, he's headed for success.

Enclosed is the 1979 summer seminar catalog — hot off the presses! Of special note are a few new classes that have been added.

Botany for Beginners — A course designed for those who are interested in botany, but have never had any formal botanical or ecological training. An ideal preparation for the traditional alpine and subalpine botany classes. *Spring Botany Weekends* — Carl Sharsmith is back on the YNHA staff again this year and will be teaching two weekend botany classes in addition to alpine botany in the summer. The foothills should be EXPLODING with flowers in the spring — an excellent opportunity for serious student and amateur alike.

Subalpine Botany For Backpackers — Bob Fry will be leading a subalpine botany course this summer that will take place entirely in the backcountry of Yosemite. Each day the lecture area will be in a different place, with the participants camping out at night in the Lyell Canyon, Townsley Lake, Vogelsang Lake, and Rafferty Creek. This is a good opportunity to study botany in various subalpine areas of the park. This should be a popular course — so sign up early if you are interested. *Paint Yosemite* is being offered again this year. Bring along water colors, oils, pastels, and charcoals, and join Jane Gyer in an artistic exploration of Yosemite Valley. If you are artistic but don't feel like 'roughing it' in Yosemite, YNHA has reserved a small block of rooms for the participants of this course.

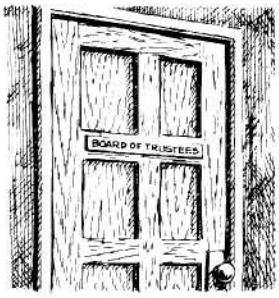
Bob Fry is offering an *Advanced Ethnobotany* course for all those who feel that they would like to delve a little further into the things they studied in Ethnobotany. The course will provide opportunities for 'hands on' activities and there will be field trips into several different areas.

WINTER TRIPS — Members have received the announcement of our winter programs. Predictably, Carl Sharsmith's ecology classes filled promptly.

We trust that we'll have a good share of members among those on the Ostrander Lake Ski trips and on the Trans-Sierra trips. We find few experiences as rewarding as a trek through the winter woods. While we do a good deal of huffing and puffing and occasionally find ourselves hung up in a manzanita bush — we put it all down as part of the fun. Then, when there's a chance for a long stretch of downhill, the agonies disappear. Perhaps best, though, is the quiet that seems to accompany winter in the forest. One's skis may scrunch a little and occasionally snow plops from a branch. But mostly, it's soundless. Ski touring may not be everyone's idea of heaven, but in our book it beats the pants off jogging!

The Trans-Sierra trip, though covering a total of 50 miles, is done in comparatively easy stages, eight miles being the longest. Plainly, it's not for beginners but, on the other hand, it's not like climbing McKinley. And the sight of all the fabulous Tuolumne landscape — under snow — is difficult to compare.

The Ostrander Trips are April 7-9 and April 21-23; the Trans-Sierra Trips are March 18-24 and March 25-31. If you're interested but have lost the little blue folder, let us know.



DANA MORGENSON RE-ELECTED TO BOARD. Mr. Dana Morgenson, who has served on YNHA's Board of Trustees since 1946 and as its Chairman since 1973, was re-elected by the membership to a six year term. Also running for the vacancy was Mr. Ken Salzberg, a Southern California attorney. Mr. Salzberg presented his nomination petition at the September member's meeting.

We mailed 1,075 ballots to members on November 14. According to YNHA By-Laws, these were to be returned by December 15. A tally at the close of that day showed that 364 were returned; 261 votes for Morgenson; 94 for Salzberg; one write-in vote for Jack Walston, one blank ballot; one on which votes were cast for both nominees; seven received after the deadline.

The association wishes to thank Mr. Salzberg for his interest in the organization as evidenced by his placing his name in nomination; we hope that his interest will continue.

At its January 27 meeting, the Board will elect its chairman.

With Mr. Morgenson's re-election to the Board of Trustees, there now is a full complement of seven voting members, plus a National Park Service representative, a non-voting member. Under the terms of the Cooperating Association Agreement (with NPS) the National Park Service Board member may not vote but he/she may participate in discussions and offer counsel, except in connection with matters that pertain to the distribution of YNHA funds to NPS.

Here are the people who direct the policies of your association.

DANA C. MORGENSON: Education: Degrees from University of Pacific, Stockton, CA; Stanford University. Currently, Director of Guest Relations, Yosemite Park and Curry Co. On YNHA Board of Trustees since 1946; Chairman, 1973-present. Mr. Morgenson is author and illustrator (photos) of YOSEMITE WILDFLOWER TRAILS published by YNHA and "Four Seasons of Yosemite," published by the Yosemite Park and Curry Co. He leads the popular "Camera Walks" for YPCCo. and had directed seminars on "Photography for the Botanist" for YNHA.

STERLING S. CRAMER: Education: A.B. Degree from Stanford University; M.B.A. from Graduate School of Business, Stanford University. Vice President Finance and Treasurer for the Yosemite Park and Curry Co. from 1935-1969; presently Accounting and Management Consultant for the Fontana East Apartment Corporation, San Francisco. Member of the Mariposa County Planning Commission; California Olympic Commission; California State Park Commission; International Executive Service Corps (Indonesia); Citizens Advisory Trails Committee at Golden Gate National Recreation Area. Mr. Cramer has been a member of the Yosemite Natural History Association Board of Trustees since 1942. He and his wife are frequent park visitors, skiing in winter and hiking in summer.

LEWIS S. EATON: Graduate of Stanford University; served in World War II from 1942 to 1946. President of Guarantee Savings and Loan Association since 1956. Mr. Eaton has been active as President of the Fresno City Board of Education from 1959 to 1962; President of the Fresno County-City Chamber of Commerce in 1967; Trustees of Fresno Community Hospital since 1965; Chairman of the Board of Governors, Fresno Regional Foundation since 1966; Trustees of the California Museum Foundation since 1971; President of the Stanford Alumni Association 1975-76; Chairman of the National Parks Advisory Board, Western Region 1972 to 1978.

MRS. MICHAEL (JEANNE FALK) ADAMS: Has studied at San Francisco State University, University of Munich, Fresno State, University of Colorado Language Institute, and Stanford University. Mrs. Adams has a Secondary Teaching Certificate in Social Studies. Taught high school in Fresno, St. Louis, and Bitburg, Germany. Chaired Fresno Housing Management Task Force, and lectured at California State University, Fresno; Vice President of The Ansel Adams Gallery.

FREDERICK HARPER, D.D.S.: Graduate of University of Southern California, Master of Science and Doctor of Dental Surgery, University of Southern California School of Dentistry. Served in United States Army Dental Corps in West Germany. In general practice of dentistry in Los Angeles. Editor, The Western Dental Society Bulletin; Fellow, International College of Dentists; President, Westwood Academy of Medicine and Dentistry. Associate Clinical Professor, School of Dentistry, University of Southern California; Essayist: Western Dental Society. Dr. Harper is active in Southern California Red Cross, Boy Scouts, United Way, and Chamber of Commerce organizations. He reports that his particular non-professional interests lie in the natural history of the Sierra Nevada, backpacking and climbing, and cross-country skiing.

THOMAS J. SHEPHARD: Education: A.B. Degree from U.C. Berkeley; J.D. from UC Berkeley. Mr. Shephard has been on the Legislative Counsel; Deputy County Counsel, San Joaquin County; and Attorney with the San Joaquin County Flood Control and Water Conservation District. He is presently a partner in the firm of Neumiller & Beardslee, Stockton. He is also the General Counsel for the Stockton-East Water District; Attorney for Stanislaus River Flood Control Association. He has been a member of the Board of Trustees of the Yosemite Natural History Association since 1974 and the Vice-Chairman of the Board since 1978. He is on the Board of Trustees at St. Joseph's Hospital, Stockton; member of the Board of St. Mary's High School, Stockton; Vice-President, University of California Berkeley Alumni Association; Past President of the Greater Stockton Chamber of Commerce, the San Joaquin County Board of Education, and Catholic Charities of the Diocese of Stockton.

LESLIE P. ARNBERGER: Education: B.S., Arizona State College, Flagstaff, AZ. Mr. Arnberger served in the U.S. Army Air Corps from 1944-1945. He began working for the National Park Service in 1945 at Grand Canyon National Park. He was transferred to Casa Grande in 1948; Southwest National Monuments in 1950; Blue Ridge Parkway in 1955; Santa Fe in 1956; and in 1965 he became the superintendent of Point Reyes National Seashore. Mr. Arnberger served in the Operations Division of the National Park Service in the Washington Office in 1967. He was the superintendent of Cape Cod National Seashore from August 1968 until assigned to Yosemite National Park as the superintendent in 1974.

DR. HARVEY B. RHODES: Education: Bachelor degrees in physical education and biological science, San Jose State University; M.S. biological science, USC; PhD, higher education, UC Berkeley. Presently, President, Columbia College, Columbia, CA. Dr. Rhodes has had a distinguished career in educational fields. He was selected in 1967 as director of the yet to be built Columbia College, and its president in 1968, upon completion of the present school facility. Dr. Rhodes has held a host of positions in the field of education during his 32 year career and has served on numerous state and federal boards and commissions treating many facets of education. He has been on the YNHA Board of Trustees since 1974.

NAMES AND MEANINGS FOR YOSEMITE VALLEY. Throughout the past 126 years, determining the true names and their meanings for Yosemite Valley has been a source of heated debate. So much discussion and disagreement have taken place that today one is left confused regarding the true meaning of "Yosemite" and "Ahwahnee."

When the Mariposa Battalion entered Yosemite Valley in 1851, the area was inhabited by Indians the soldiers called the "Yosemites." It was not until 1877 that Stephen Powers in his *Tribes of California* identified this as primarily a Miwok group. There was, to be sure, a great number of Mono Lake Paiute people who had intermarried with the Yosemite Miwok, and it seems from ethnographic data that the Mono Lake Paiute tongue and a sub-dialect of Southern Miwok were spoken here concurrently.

Lafayette Bunnell, a member of the Mariposa Battalion, stated that the meaning of the name Yosemite was not generally known when it was bestowed upon the Valley. Major James Savage, the Battalion's leader, told Bunnell that "Yo-sem-ity," as it was pronounced by Chief Tenaya, meant "full-grown Grizzly" (Bunnell, 1880, pp. 61-65).

This description was incorporated into Bunnell's widely read book *Discovery of the Yosemite*. He also provided information which was the basis for several editorials included in the California Chronicle, the Sacramento Union, the Mariposa Gazette and other papers, which probably contributed to the widespread acceptance of this definition.

Dr. A. L. Kroeber, the late dean of California anthropologists, writing in 1921, stated that Yosemite was a corruption of "uzumati" or "uhumati" meaning grizzly bear (Hall, 1921). He based his thoughts on the fact that the Miwok had divided themselves into moieties: a clan-like system. Various animals belonged to the two moieties, and the grizzly bear was generally identified with membe[redacted]

Karen. AHWAHNEE in "Yosemite," newsletter of the Yosemite Natural History Association, Vol. 43, #1, April, 1973.

John Sensor, Columbia Junior College

NEW MEMBERS. We welcome to membership in Y.N.H.A. the following good people:

Mrs. B. Janik
William Todd
Dr. & Mrs. Conroy-Lappin
Helen Bradfield
Paula Negley
Carol Kipps
Leadership Wilderness Co.
George Kaminski
Donna Miguelgorry (L)
Jean Dravér
Margaret Jenkins
Trevelyan Houck
Curtis Jones
Harry Namitz
Robert Cook
Richard Wilkins
Lakeview Motel
Madelyn Miller
Dennis Corcoran
Sheldon Ames
Bruce Montgomery
Keith Kuhnhardt
Jennifer O'Hara
Meredith Reeve
Barbara Clites
Mark De Wett
D & A Lange
Jeffrey Keay
Larry Perkins
Marcy Burks
William Clark, M.D.
Howard Wurlitzer
Steven Newman
Joe Norman (L)