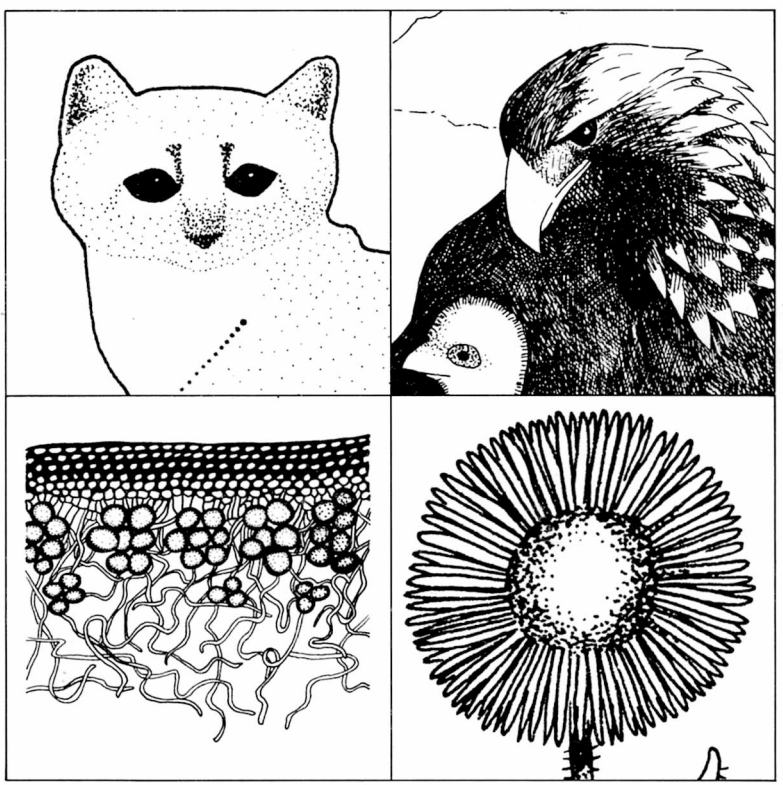
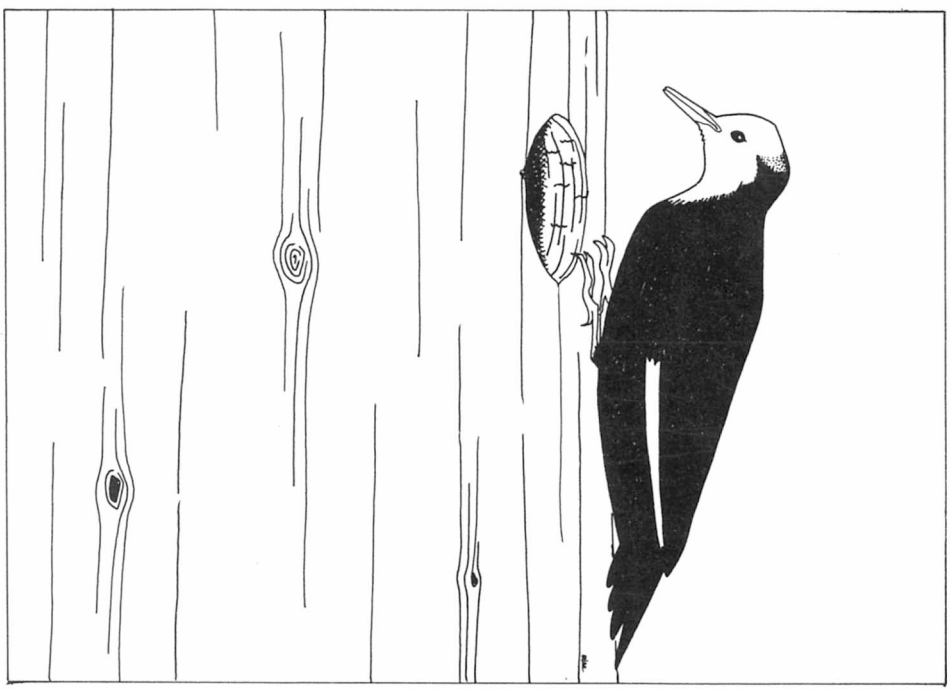
YOSEMITE NATURE NOTES



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YOSEMITE NATURE NOTES

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THE MOUNTAIN DUCK

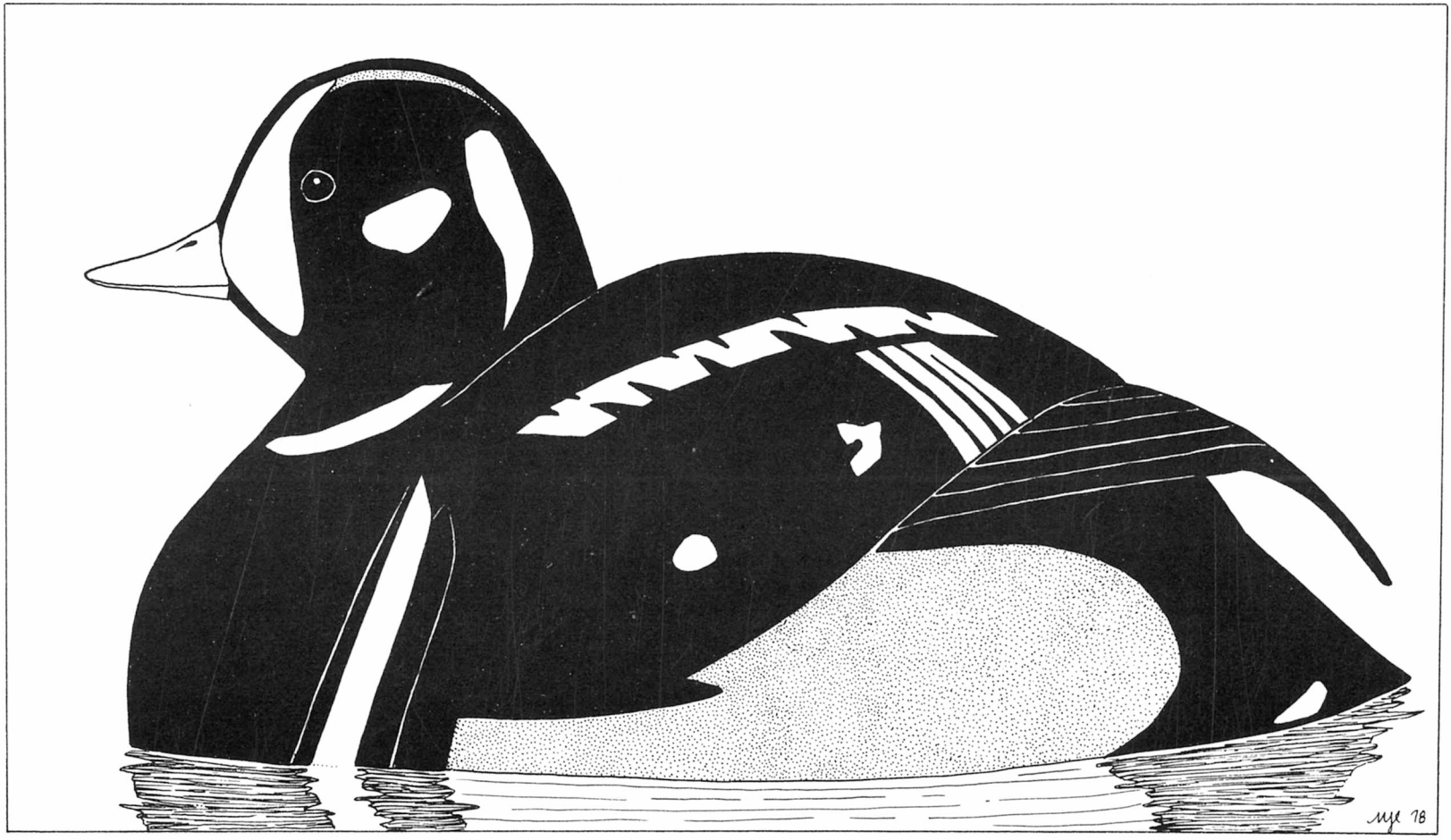
Bill Dengler

During late May, 1977, reports were received of a curious duck bobbing about on the South Fork of the Merced River near the Pioneer Yosemite History Center. One observer said that it looked like a small Canada Goose but with very faint markings. The bird was verified on June 22 as a female Harlequin Duck, rare now, but apparently once fairly common on swift streams in the Sierra Nevada.

A check in *Birds of North America* shows that the Harlequin Duck, *Histronicus histronicus pacificus*, is a sea duck whose Western range is centered along the coast of Canada and Alaska. Its habitat is described as swift rivers and arctic shores during summer and heavy surf along rocky coasts in winter. Curious strands of summer range project inland from the Pacific Ocean. Thus, our sea duck may prefer to summer in the mountains!

Sightings of Harlequin Ducks in the Sierra Nevada and Rocky Mountains were first reported in the late 1800s. Belding saw many Harlequin Ducks on the principal streams of Calaveras and Stanislaus counties during the late 1870s. He shot a juvenile and sent it to the Smithsonian Institution in 1879 or 1880 (Dawson, 1923). Dr. E.W. Nelson and Major Bendire submitted other early reports in 1887 and 1898 respectively (Bent, 1925). Belding states that fishermen killed many, and the ducks were greatly reduced in numbers even within his time. The loss was due to a very unfortunate misconception as the ducks rarely if ever take fish.

The earliest sighting recorded in Yosemite National Park was made on May 2, 1915, when six Harlequin Ducks were observed on the South Fork of the Merced River just below the Wawona Fish Hatchery (Newsome, 1915). The next record, and the first for Yosemite Valley, was in April, 1916, when one in-


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dividual was observed near Sentinel Bridge. Apparently this was a member of a breeding pair, as two adults and four young were observed in the same area a month later. Other sightings in Yosemite Valley were recorded in 1920, 1921, 1922 and 1927 (Grater, 1943). During the spring of 1921, Charles W. and Enid Michael made some significant observations and photographed a pair of Harlequin Ducks in Yosemite Valley which they reported in the January, 1922 issue of *The Auk*.

After 1927, there is a gap of 13 years before a female was sighted near Wawona on October 20, 1940 (Grinnell and Miller, 1944). This apparently is the only fall observation recorded in the Sierra. After this single encounter, another 32 years elapsed until April 9, 1972, when two observers named Herbert and Gerughty sighted a lone male on Tenaya Creek, ¼ mile below Snow Creek. The next observation reported was the female at Wawona in 1977.

The male Harlequin cannot be confused with any other duck. His basic color is gray, with random splotches of white and black and chestnut sides. One legend holds that the male Harlequin Duck was initially gray. Being dissatisfied with his drab color, the duck asked Mother Nature for some brighter trim. She complied with his wish and hurriedly dabbed splotches of white, black and chestnut here and there, transforming the male gray Harlequin into one of the most wildly colored of ducks. In contrast, the female is a blend of light and dark browns with three faint white patches on the head.

The color and habitat of the Harlequin Ducks have led to a number of appropriate synonyms. Among these are Lord and Lady, Painted Duck, Rock Duck and Mountain Duck.

Dr. Paul A. Johnsgard describes the breeding distribution and habitat of Harlequin Ducks as "curiously disruptive." The primary breeding center is in the forested mountains of western North America with a smaller, secondary population in northeastern North America. The major center is to the north, including coastal Alaska and the Aleutian Islands inland to the Brooks Range and in Western Canada including much of British Columbia and Western Alberta. South of Canada the Harlequin Ducks are confined as breeding birds to the Western mountains. Frequency declines as one moves south with breeding birds commonest in Washington, then Oregon, then California. Some birds move inland into the Northern Rocky Mountains as far as Yellowstone National Park, but apparently not into Colorado (Johnsgard, 1975).

California is the southern extension of the Harlequin Duck's range in both summer and winter. The mid Sierra Nevada marks the southern extent of the summer range and a sighting at Playa del Rey south of Santa Monica on December 22, 1946, marked a new southern range extension at that time (Kent, 1947).

The preferred breeding habitat is a cold, rapidly flowing stream frequently, but not always, surrounded by forests. Breeding may take place near saltwater, especially in the north, but is apparently always accomplished on a freshwater stream. Nests are located on the ground close to the water. The clutch of 4-8 eggs is well concealed by dense vegetation. Predation on nests is apparently low due to the location of the nest and the ability of the ducklings to successfully hide in the grass.

The male appears to desert the female shortly after incubation begins, yet there are very few sightings of Harlequin Ducks between the Sierras and the coast. The first such sighting was recorded on January 4, 1948: a male at the Sacramento National Wildlife Refuge (Dehnel, 1948).

Both sexes winter along the coast, usually in rocky areas of rough surf. During all seasons the Harlequin Ducks prefer fast-moving, rough water.

Feeding is accomplished by diving or dabbling, depending upon the depth and speed of the water. The ducks show no preference for deep water but readily wade-about in shallows and walk or stand on rocks or logs. Michael (1922) states that Harlequin Ducks walk about on the bottom like a Dipper, moving against the current. Both the wings and feet are used to reach the bottom, then the wings are closed as the bird uses the force of the current to keep it submerged. After remaining submerged for 15 to 25 seconds the duck bobs to the surface like a bubble, where it resumes swimming to remain stationary or to move against the current.

To move downstream the ducks simply relax and float with the current, bobbing along, occasionally through some rough water. Upon reaching the desired location, paddling is resumed and control quickly regained as they move about facing the current.

Food varies with the season and habitat. Johnsgard (1975) lists the winter food as 57% crustaceans, 25% mollusks and 10% insects. Decapods (e.g., smaller crabs) and soft-bodied crustaceans (e.g., amphipods and isopods) are apparently favored and comprised half the volume of the samples analyzed. During the summer, insect species typical of rapidly flowing streams (i.e., stone flies, water boatmen and midge larvae) were more prevalent.

Although the Michaels never observed the Harlequin Ducks eating natural vegetation, the birds readily ate vegetables from a tray floated in the river to lure them into camera range. Food items accepted from the tray included cooked potatoes, macaroni, meat, raisins and bread. They never observed the ducks eating fish or any large object, and speculated correctly that their major food was aquatic insects.

The female on the South Fork of the Merced River during the summer of 1977 was last observed on July 28. Interestingly, July 28 was the last day the Michaels saw the birds they were observing in Yosemite Valley in 1921. Probably, declining water level forces the birds to depart for the coast by midsummer. Although 1977 was a very dry year, isolated rapids and meager pools of water remained into mid-July.

Undoubtedly there are many, many miles of remote Sierra streams on which the Harlequin Ducks may still be found. However, from the recorded observations, it appears that the number of these little ducks in the Sierra has declined drastically over the last 100 years.

So, strange as it may seem, sea ducks are numbered among the wildlife one may encounter in the Sierra Nevada. They are one more species to be alert for while exploring the wonders of Yosemite.

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PLATE TECTONICS AND YOSEMITE

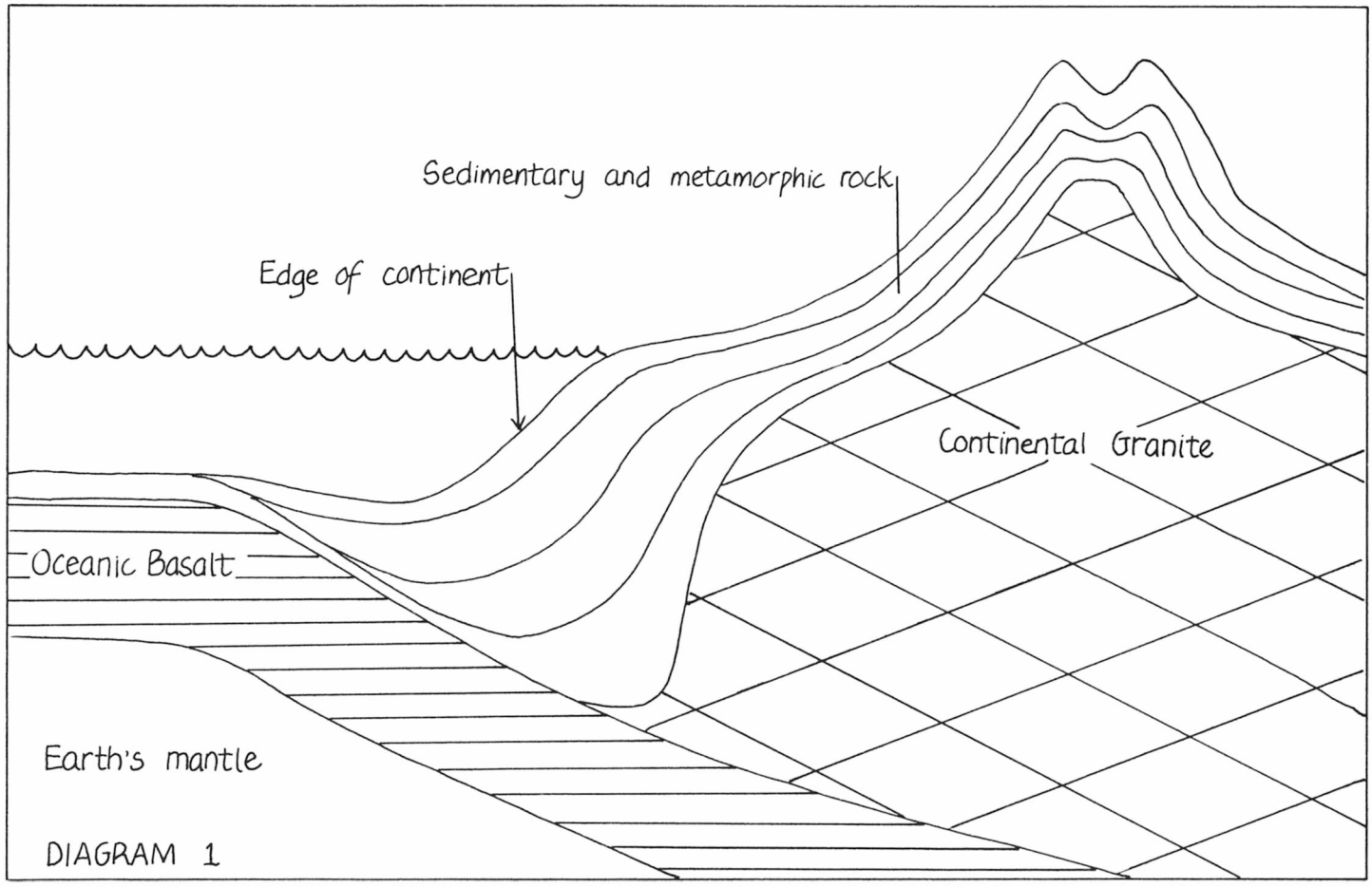
Gary Avedesian

Most of the stories of the geology of Yosemite restrict themselves to the immediate vicinity of Yosemite. The rocks in the park lend themselves to this type of interpretation but we are located within one of the major structural features of the state of California: the Sierra Nevada.

If we expand on our view to include rocks of the entire state, our story gains interest. It shows Yosemite as a unit in the story of the growth of a continent. The concept of plate tectonics gives us a unifying principle with which to tie it all together. It has struck many geologists as odd that ancient rocks (those of the Precambrian or Early Paleozoic) are not found west of the crest of the Sierra Nevada. These rocks are found in abundance in the mountain ranges east of the Sierra and on the eastern escarpment of the Sierra. Yosemite and the greater part of western California were not a part of the North American continent 300 million years ago. This seems reasonable, as the usual story of Yosemite says that "500 to 150 million years ago most of the west was a shallow sea, and sediments were deposited on the sea floor." The surprise is that Yosemite was not part of a shallow sea but part of the continental shelf and deep ocean basin.

The earth is divided distinctly into two main parts — continents and ocean basins — as shown in Diagram 1. Often in the past the oceans have lapped high up on the continents, forming shallow inland seas. They can deposit great thicknesses of sediment which bow the continent down. During times of mountain-building the oceans retreat and only inundate the margins, or continental shelves, as shown by the present west coast of North America.

The continental material is made mostly of a lightweight rock called granite. The continents are piles of granitic material swept around like froth by the movement of the heavier oceanic rock called basalt. Since the oceanic and continental rocks are relatively rigid, they are broken into great plates by the


Sedimentary and metamorphic rock
Edge of continent
Continental Granite
Oceanic Basalt
Earth's mantle
DIAGRAM 1

forces which set into motion the plastic material of the earth's mantle. Three types of boundaries are thought to exist between these great plates, as shown in Diagram 2.

What happens when the continental mass is brought to the boundary of two plates? California provides an example of this relationship. From about 200 million years ago to about 80 million years ago, what was to become California was involved in a great subduction zone against the North American plate (Diagram 3). Great slabs of what is now known as the Calaveras and older formations, were scraped downward against the granites of North America. Some of this rock material stuck to the granites as it was moved by. Pieces of the sea floor basalts themselves were scraped off and now show as bands of serpentinite in these rocks. This process was not continuous and probably stopped or slowed for a time while new sediments formed at sea. Once again the process started up and scraped off the younger rocks to the west of the Calaveras Formation. These younger rocks now are known as the Mariposa Slates or tombstone rocks; these may be seen on the way to Yosemite along the Merced road. Much of the sea floor rock material was not scraped off but was drawn deep into the earth where it melted. As the molten sea floor rock moved upward it melted much of the sedimentary material as well, creating granite magma. Again, this was not a continuous process but had many starts and stops, creating first the Western Series of darker igneous (plutonic) rocks, then the El Capitan and related granites, the Sentinel and related granites, and finally the Tuolumne Series of plutonic rocks (Diagram 4).

About 60 to 80 million years ago, a change in the nature of the plate boundaries took place. Both the Pacific and North American plates began to move northwestward in the vicinity of California. The Pacific plate is moving slightly faster than the North American plate (the present boundary seems to be at the San Andreas Fault). Subduction has stopped and rotational movement has begun (refer again to Diagram 2). Both plates are moving the same way but, relative to each other, the Sierra side is moving southeast and the coastal side is moving northwest. This motion should bring Yosemite directly across from Los Angeles in another 40 million years.

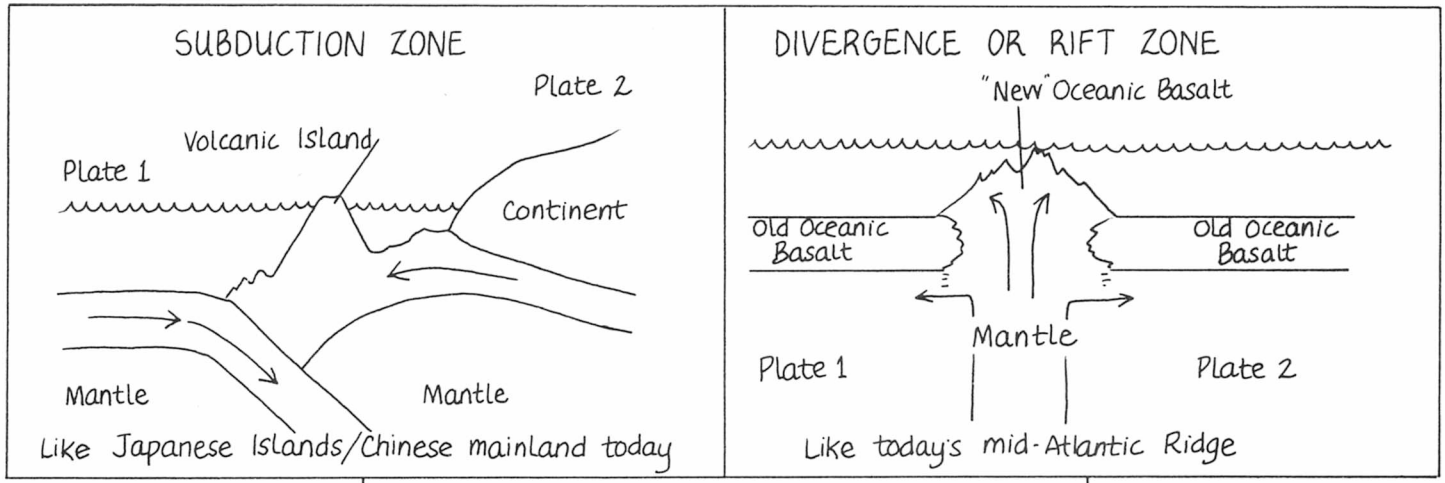
At about the time of this change in motion, the ancestral Sierra stood high above the ocean and was firmly attached to the North American plate as new continental material. The North American continent had grown!

A long period of quiet internal forces in the Sierra ensued as this rotation began. The Sierra was acted upon by the external forces of weathering and erosion. Deep soils formed and erosion stripped away most of the rock material above the granites. About 60 million years ago, this area was one of low rolling foothills with granite exposed in places.

A warm tropical climate must have followed for the next 40 million years as deep red soils formed in the foothills. The redwood forests, needing a cooler climate, were still to the north and east. About 10 to 20 million years ago the forces which were pulling California northwestward created tension in the Sierra. Volcanoes erupted and renewed uplift occurred. The volcanoes spilled mud and lava into the old stream channels burying them and the gold which had been washed into them.

The climate cooled and the redwood forests began to migrate south and west. New rivers began to flow southwestward cutting across the old river channels. The Merced and Tuolumne Rivers were two of these new rivers. The cutting of the present Yosemite Valley started at this time.

About 5 to 10 million years ago the tension created by the motion of the two great plates on this part of the earth's crust began to stretch and crack it


SUBDUCTION ZONE
Plate 2
Volcanic Island
Plate 1
Continent
Mantle
Mantle
Like Japanese Islands/Chinese mainland today
DIVERGENCE OR RIFT ZONE
"New" Oceanic Basalt
Old Oceanic Basalt
Old Oceanic Basalt
Mantle
Plate 1
Plate 2
Like today's mid-Atlantic Ridge

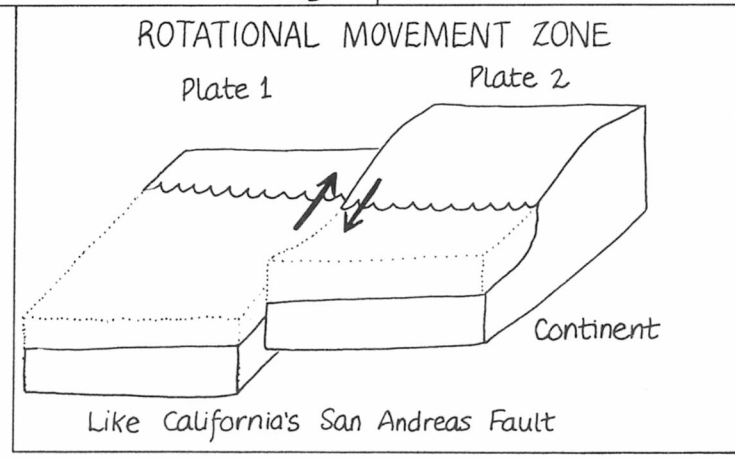
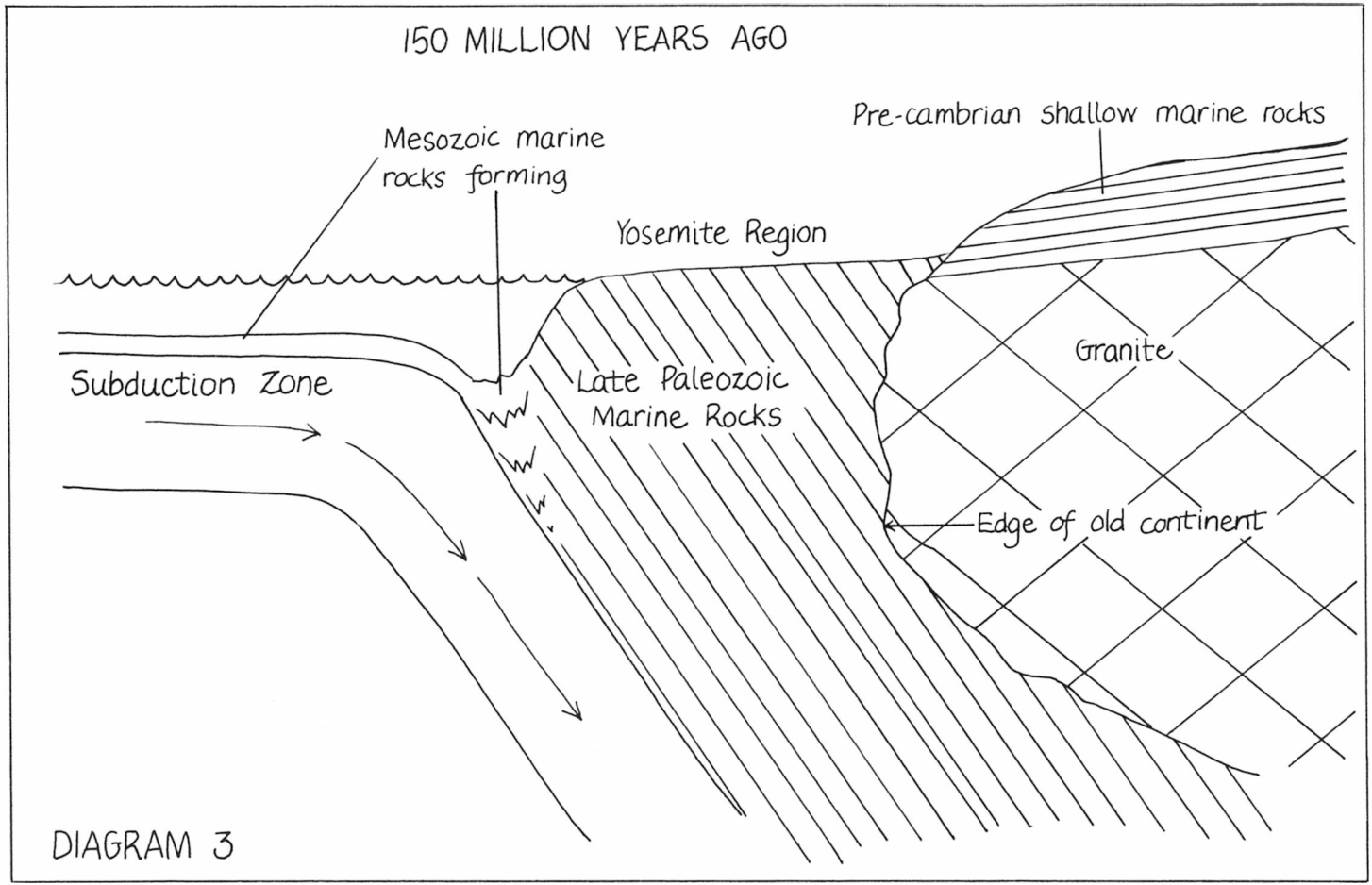
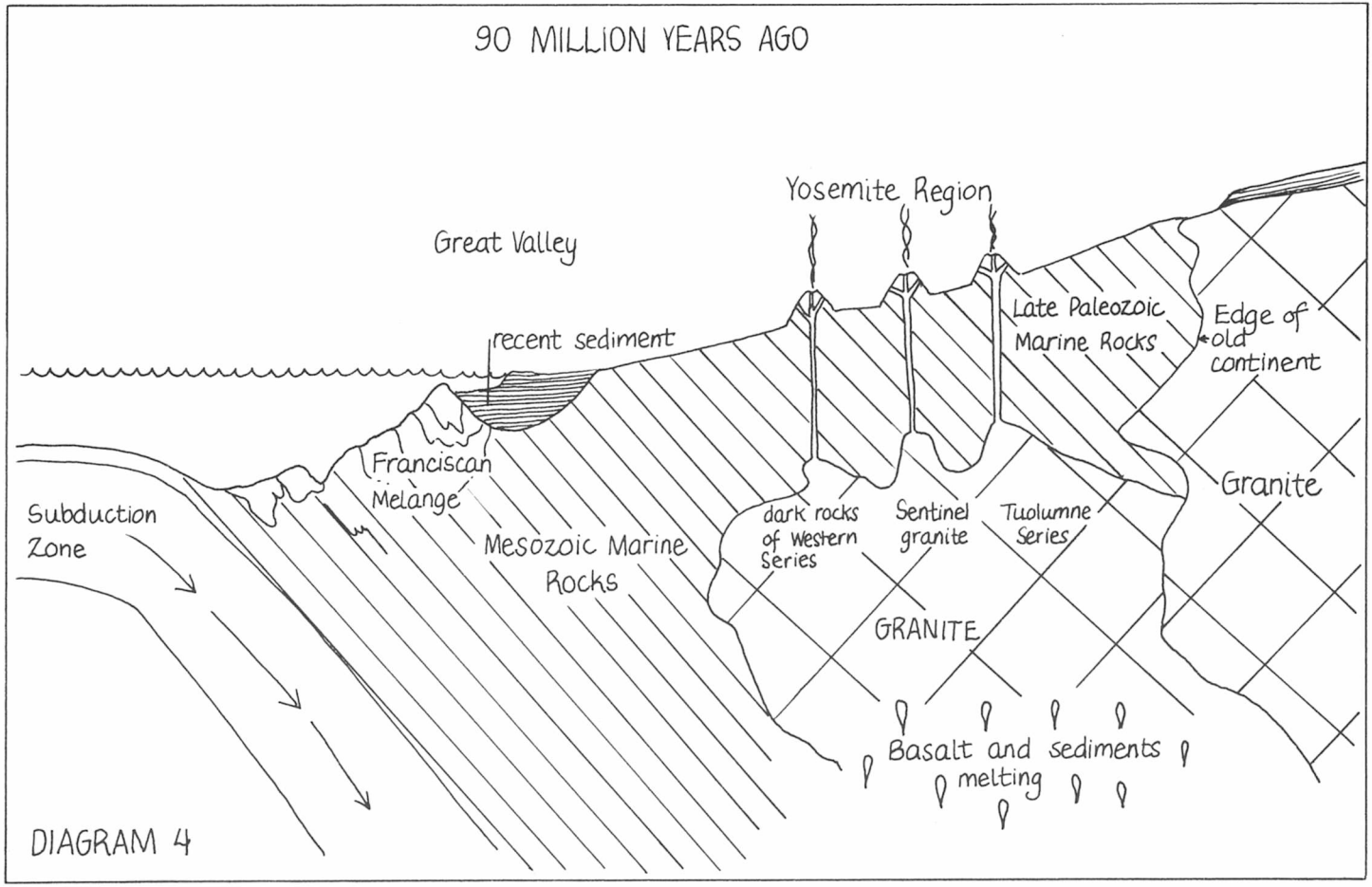
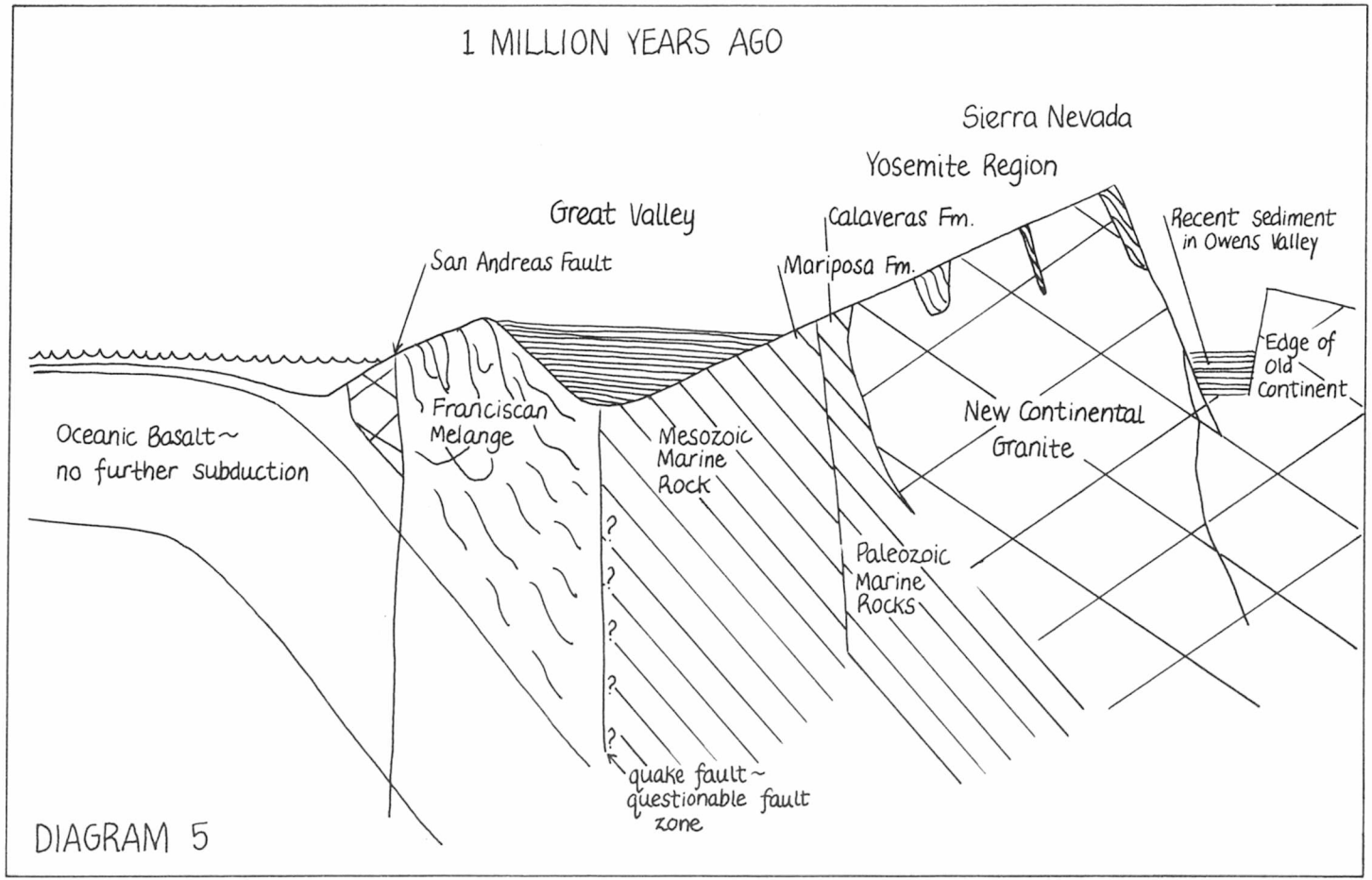

ROTATIONAL MOVEMENT ZONE
Plate 1
Plate 2
Continent
Like California's San Andreas Fault

DIAGRAM 2


150 MILLION YEARS AGO
Pre-cambrian shallow marine rocks
Mesozoic marine rocks forming
Yosemite Region
Granite
Subduction Zone
Late Paleozoic Marine Rocks
Edge of old continent
DIAGRAM 3


90 MILLION YEARS AGO
Yosemite Region
Great Valley
recent sediment
Late Paleozoic Marine Rocks
Edge of old continent
Franciscan Melange
Subduction Zone
Mesozoic Marine Rocks
dark rocks of Western Series
Sentinel granite
Tuolumne Series
Granite
GRANITE
Basalt and sediments melting
DIAGRAM 4


1 MILLION YEARS AGO
Sierra Nevada
Yosemite Region
Great Valley
Calaveras Fm.
Mariposa Fm.
San Andreas Fault
Recent sediment in Owens Valley
Edge of Old Continent
Franciscan Melange
Oceanic Basalt~ no further subduction
Mesozoic Marine Rock
New Continental Granite
Paleozoic Marine Rocks
?
?
?
?
?
quake fault~ questionable fault zone
DIAGRAM 5

into large blocks. The Sierra is one of these blocks, broken on the east and perhaps on the west. The Sierran block tilted to the west forming a steep eastern face like a great wall facing the state of Nevada, as shown in Diagram 5. Can you imagine the 49ers' dismay after crossing the rugged Rockies, facing the heat and drought of the desert, to finally be required to cross the great wall of rock of the Sierra? That so many made it is an amazing story. The streams flowed down the long western slopes cutting into the granite. The Merced cut a canyon two-thirds or more of the present depth.

About one to three million years ago, the glacial story begins. The glaciers carved and sculpted the present landscape of Yosemite. They melted completely away as recently as 10,000 years ago. The present glaciers are remnants of the little ice age of 3,000-4,000 years ago.

The eastern boundary of the Sierra is still being pulled upon by the motion of the North American and Pacific plates. Present studies show an upward movement of the Sierran block of 20 to 30 inches per century.

And so the rotational movement and mountain-building started many eons ago continues at the present time.

YOSEMITE'S CONTRIBUTION TO BOTANICAL HISTORY

Bill and Mary Hood

Few visitors can pass through Yosemite in summer without being impressed by the display of wildflowers. The layman is excited by masses of lupine, shooting star and corn lily, or by a perfect snow plant growing alone. The botanist enjoys all this, but his greatest thrill may come from finding some inconspicuous little plant growing out of its recognized range or perhaps belonging to a new species. Most visitors do not realize that study of the wildflowers of Yosemite reveals a history not only of the botany of Yosemite, but of the Sierra. Many plant names are those of men prominent in botany or those of well-known Yosemite pioneers.

The reason for the early botanical activity in the Yosemite region was that it was chosen to be mapped by the Whitney California State Geological Survey between 1863 and 1867. The collection of botanical specimens was an important part of the survey's assignment. The result was that the type localities of over 100 species of plants were documented within the present boundaries of Yosemite National Park.

The type locality for a plant is the place where the type specimen was collected, that is the plant specimen from which the species was first described and named. This type specimen, dried and preserved in an herbarium, is the documentation for the correct application of the name and is an important historical record. Often the botanist may need to revisit the type locality of a species in order to study the area and the plant variation which occurs there. Thus, a record of type localities is important to present day botanists and provides a valuable indication of past botanical activity. "*Illustrated Flora of the Pacific States*" by Leroy Abrams gives a complete record of type localities, as does "*A Report on the Boreal Flora of the Sierra Nevada*" by Frank Jason Smiley. However, many of the records from early collections are incomplete because specimens are present for which the exact location of collection, the date, and the name of collector were not recorded. For the type specimen of *Calochortus leichtlinii, Hook. f.*, the familiar white mariposa lily, the only accompanying documentation cites collection as "In the Sierra Nevada of California."

Plant collections from Yosemite were sent to specialists for identification, and many of the early collections contained new species which were then described and named. The full scientific name of a plant is the genus name

followed by a species name and then by the name of the describer. The species name is usually a Latin descriptive adjective, but it may be formed from the name of a man. The man may be a statesman or explorer or colleague of the describer, but often, the species is named for the collector of the type specimen.

Early botanists who were important in the description of the new plants from Yosemite include Dr. Asa Gray and Dr. John Torrey. Dr. Asa Gray was appointed Professor of Natural History at Harvard University in 1842 and built up the largest and most valuable herbarium of that time in the United States. By the time specimens first arrived from Yosemite in 1864, he was well prepared to study them. Gray visited Yosemite in 1872 and had as his guides Galen Clark and John Muir. He collected around Peregoy Meadow and obtained Sierra primrose on Clouds Rest. He returned in 1877 with the great English botanist Sir Joseph Hooker and they made the first collection of Yosemite aster near Vernal Fall.

Dr. John Torrey was Gray's teacher and lifelong friend. Torrey visited Yosemite in 1865 and first saw his namesake plant, *Collinsia torreyi* Gray when he visited Mariposa Big Trees with Galen Clark. Torrey described hundreds of plants, many sent in by the explorer James Fremont, including *Sarcodes sanguinea* Torrey, the snow plant, discovered on the Yuba River. In a letter to Gray, Torrey tells of his pleasure in seeing living specimens of the snow plant in Yosemite.

Fortunately, in the 1860 decade there were two very competent and energetic botanical collectors, Brewer and Bolander, who worked in the Yosemite region. They were among the first to collect extensively in the Sierra Nevada, and they sent their specimens to the herbarium at Harvard University, where they could be properly identified and preserved.

William Brewer came to California in December, 1860, as "Principal Assistant," in charge of the "Botanical Department" for the Whitney Survey. He fitted in his collecting with his many duties as a leader of field parties and surveyor.

By June of 1863 he had travelled, as related in his book "*Up and Down California,*" through the inland valleys from the Santa Ana River to Mt. Shasta, and had collected over 1,600 specimens. He had yet to visit the Sierra Nevada. On June 15, 1863, he camped at Crane Flat and next day visited the Tuolumne Grove. On the way to Yosemite Valley at the 6,000 foot elevation he collected specimen No. 1634, a new lupine later described by Asa Gray as *Lupinus breweri* Gray. Brewer left the Valley June 23rd and camped on successive nights at Porcupine Flat, Tenaya Lake, Soda Springs and at a point 3 miles west of Mono Pass. By the time they reached Mono Lake via Bloody Canyon on July 7th, he and his cartographer, Charles Hoffmann, had climbed Mt. Hoffmann, Mt. Dana twice, and Ragged Peak. Additionally, soft snow turned them back 200 feet below the summit of Mt. Lyell. On their climbs they recorded compass bearings and determined altitudes by barometer. At 10,800 feet on Mt. Hoffmann, Brewer collected a new species of stonecrop, *Sedum obtusatum* Gray. At a similar altitude on Mt. Dana he found a new Indian paintbrush, *Castelleja breweri* Fernald. Named for him is the familiar red heather, *Phyllodoce breweri* (Gray) Heller, which he collected on Mt. Hoffmann, although the type specimen is one he later obtained in Eldorado County. Twenty-three of 200 specimens collected on this trip were types for new species; 7 of them were named "*breweri.*"

Brewer continued north through the mountains to Lake Tahoe, collecting extensively in the Sonora Pass and Ebbetts Pass areas. The next year he ex-

plored the upper reaches of the Kings and the San Joaquin Rivers, crossing over to Owens Valley via Kearsage Pass and back into the Middle Fork of the San Joaquin River. During this time he collected on the slopes of a noble peak later to be called Mt. Brewer.

He travelled from Clark's at Wawona to Mono Pass and back before returning east to become Professor of Agriculture at Yale University in 1864. During his four years in California, Brewer traveled 15,105 miles, 7,564 on horseback, 3,101 on foot and 4,440 by public conveyance. He collected over 2,800 specimens; 38 new species were designated *"breweri."*

Brewer's successor on the Whitney Survey was Henry Bolander. He worked for several summers in the Mono Pass area, and collected many specimens on the Mariposa Trail between Clark's at Wawona and the Valley floor. He provided the type specimens for 53 new species from the Yosemite region (18 in the Upper Tuolumne area, 12 in Yosemite Valley, 8 around Peregoy Meadow and 15 in the Wawona Mariposa Big Tree area.) Fourteen new Yosemite species were named *"bolanderi,"* and a slender saxifrage, *Bolandra californica*, collected at Artists Point was the first of the two species of a new genus. In his description Dr. Asa Gray states: "For the last few years no one has done so much as Mr. Bolander for the botany of his adopted state and perhaps no one is likely to do so hereafter."

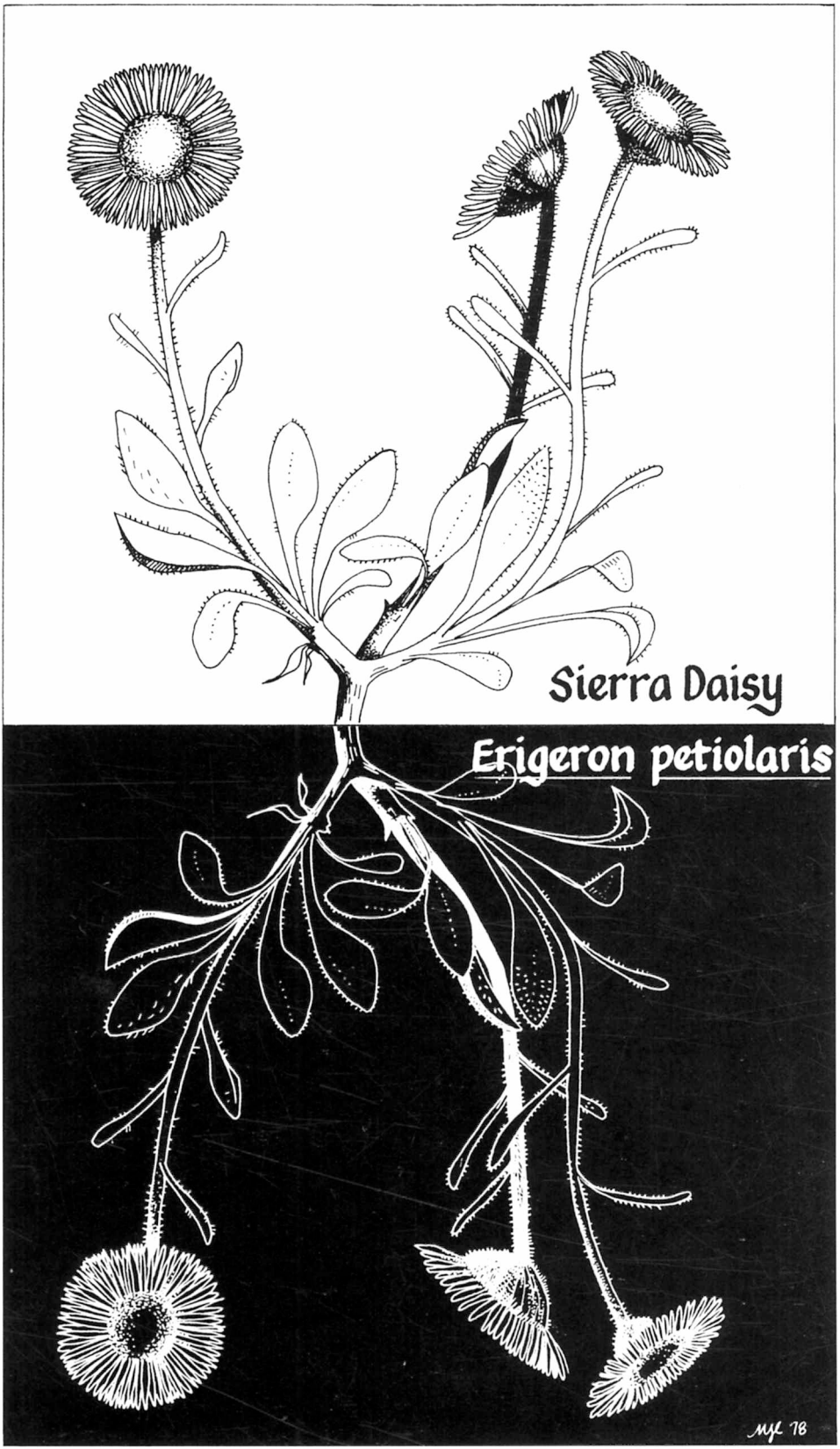
Some 54 plant species are designated by the name *"bolanderi."* A clover, *Trifolium bolanderi* Gray, has its locality in Westfall's Meadow near Bridalveil campground. It is easily found in the meadows between there and the South Rim of the valley, but is very rare elsewhere.

Bolander collected the type specimen of a handsome groundsel, *Senecio clarkianus* Gray. Asa Gray wrote: "This striking tall species may well bear the name of the valued guide and mountaineer Galen Clark, in whose meadow it grows and who has done so much to make the Mariposa Grove accessible." Bolander often stayed at Clark's hotel and his photograph appears in Galen's album.

The early pioneers Galen Clark, John Muir and James Hutchings earned some pocket money collecting seeds and plant specimens for eastern botanists. Asa Gray wrote of a yellow mousetail, *Ivesia muirii* Gray: "I have with great pleasure named this plant after my friend and valued correspondent, Mr. John Muir, an ardent explorer of the Sierra."

Brewer and Bolander were not the first to collect in the Yosemite region. Thomas Bridges collected plant and animal specimens in California from 1856 until his death in 1865. Most of his collections, which included many seeds, went to Europe. Unlike Brewer and Bolander, his name is attached to only a few species, and there is little record of his work in California. He collected the spectacular cone flower, *Rudebeckia californica* Gray, in the Mariposa Grove. He also visited Yosemite Valley, but there is no account of any trip that Bridges might have made to the high country. In his name, the scarlet penstemon seen on the Tioga Road between Yosemite Creek and Olmsted Point is designated *bridgesii.*

The history of botany in Yosemite is an important one. Botanists working here, particularly William Brewer and Henry Bolander, in conjunction with associates in the east like Asa Gray and John Torrey, laid the foundations for the botany of the Sierra Nevada.


Sierra Daisy
Erigeron petiolaris
MJC 78

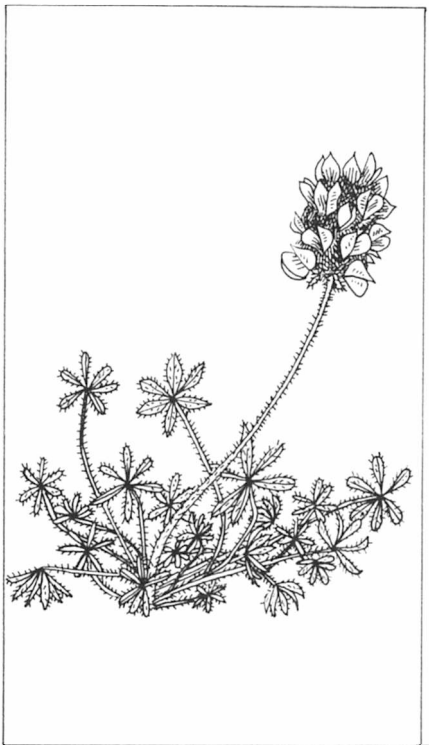
THE FLOWER SEASON NEAR AND ABOVE TIMBERLINE DURING SUMMER OF 1977

Carl W. Sharsmith

What kinds of response will the plants near and above timberline show at the beginning of a Yosemite summer that follows immediately upon a winter of very scanty snows? Furthermore, what if that summer is an almost rainless one as well? Would there be any flowers to see? What were the effects of the winter? And how, in general, would the plant life fare as the extremely dry summer progressed?

The answers to these questions were not altogether what we expected them to be. It was the summer of 1977 when the above conditions prevailed, and I say "we" because then, almost each week, from mid-June until well into September, I was privileged to lead to these high places groups of our Park visitors, all of which were as interested in these questions as was I. I was, however, luckier than they. I alone was able to see and watch the progress of the whole floral show from start to finish.

To begin with, early in the season, damage and death showed themselves all too clearly in many sites exposed to the full force of the winter winds. Laden with ice-crystals, these winds had gnawed at and torn away the soil from beneath low dense cushions of perennials such as Buckwheats which later in the season would have been bright with flowers. Many of them, their long, tough, deep taproot almost completely exposed, had toppled over, and now clung by the few root-branches that remained in the soil. Others had been uprooted entirely. Among the willow thickets the all too numerous dead, blackened branches, showed the result of the scorching effect of the same drying winds. These results, however, were to be expected. Likewise expected was the lack of the usual abundance of flowers on the early bloomers of mid-June.



Lyall Lupine
Lupinus Lyallii



Steer's Head
Dicentra uniflora

By this time the tiny pink bells of the Dwarf Bilberry (*Vaccinium nivictum*), which although always half concealed among the low mats of its foliage, should have been present in myriads; now we had to look hard to find any at all. Even on the tough Kalmia (*Kalmia microphylla*) that borders the lakelets and streamsides, flowers were few and, as to the little Steer's Head (*Dicentra uniflora*), we were lucky to find merely the leaves, for of flowers there seemed to be none.

It became an altogether different story with the arrival of the warming cloudless days that now began and continued to succeed each other almost uninterruptedly week after week. This was particularly the case in certain localities on the rocky heights. The bloom was more profuse than I can remember seeing in them in the past, and I have revisited them year after year. Some of the more striking instances must be mentioned. In certain warm, wind-sheltered nooks high on a slope in dark metamorphic rocks, gardens of alpine Wall Flowers (*Erysimum perenne*) were each a mass of clear beautiful yellow. As we approached, even at a distance the perfume they emitted delighted our senses, and as we stood on the slope immediately below them the glorious effect of the sun shining behind them delighted another. Then, on another occasion, nearby on a slope fully exposed to the winter winds, were myriads of lavender-rayed Sierra Daisies (*Erigeron petiolaris*). I had never before seen so dense a stand of this species in our mountains. Again, on another day, there came a still greater surprise: a bright yellow daisy (*Erigeron linearis*) that has no really appropriate common name. This right on top of the fact that, a few minutes earlier I had said to the group "If a flower looks like a daisy (*Erigeron*) or an Aster, and has *yellow rays*, in Yosemite it just isn't either of them." Now I was a bit embarrassed, for here indeed was a yellow-rayed daisy; two flourishing colonies of it, each highly localized. We saw it nowhere else. It was very special. We were beholding a flower that is very rare in all of Yosemite. I myself had never before seen it in our Park, and had even been inclined to doubt of its existence here. Later, at another locality and occasion, were astounding hosts of the white stars of a Sand Wort (*Arenaria Kingii*); and again, at still another place, high above timberline, a haze of blue, easily visible from afar, covered completely the large expanse of a distant slope. An extraordinarily extensive and dense stand of Lyall Lupines (*Lupinus Lyallii*) was the cause. If such a rich and wide display of this flower was usually appeared on this particular slope, it would have caught my eyes long ago. Likewise the Snow Willow (*Salix nivalis*), the tiniest of our alpine willows, that forms mats scarcely an inch high, with small, deep green, shining roundish-tipped leaves, and catkins only about six to eight millimeters long. A mile or so from our blaze of lupines, close to an altitude of 12,000 feet, yards of its carpets were developed, and they continued on and on. In previous seasons we considered ourselves fortunate to find in this whole area even one scrawny patch of it.

With the waning of the short alpine summer the remarkable though ever-changing show still continued. The lichens, now, came to attract more of our attention. This was not simply because the bloom of the wild flowers which earlier claimed most of our notice had now mostly passed their prime. Along the windward side of certain ridges, spots among the broken slates were ablaze with color. The fragments of rock which we were loath to disturb by our footsteps were encrusted by red, orange, canary yellow, chartreuse, gray, black, and even blue, lichens, not only of unusually luxuriant growth but also of a greater diversity of kinds than I had hitherto seen in these places. Color, too, though from another source, was deepening in the meadows below us. The rich purple of the soft, silky grass which we have come to call "Purple

Mist" (*Calamagrostis Breweri)* because it was appropriately so described by John Muir, densely covered often very large areas, and showed by the uncommonly deep, rich color of its panicles an effect of a very dry year.

This closing note pointing out the drought conditions as being responsible for the unusual depth of color shown by the Purple Mist brings up the question as to why, despite the drought, was the growth and flowering so luxuriant in the other instances mentioned above. For this we had no answer. To be sure, it might be said it was the results of the scanty amount of winter snows and the lengthy drought conditons of the summer, but this explanation seems not altogether satisfactory. Anyway, it was a glorious alpine flower summer!

STOCK USE IN THE YOSEMITE BACKCOUNTRY

James Sano
Alexander Moad

On August 25, 1916, the National Park Service was created by an Act of Congress "... to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." In Yosemite National Park, where total visitation was over 2.75 million people last year, the National Park Service is faced with a rather perplexing dilemma: that of preserving the park resources for tomorrow's visitors while providing a recreational experience for today's visitors.

Particularly vulnerable to the adverse influence of overuse are Yosemite's backcountry areas. Increased visitation in backcountry areas, 10 to 20 percent greater each year, has resulted in considerable environmental damage. Such problems as trampling of fragile meadows, creation of new trails, improperly placed firerings, and the accumulation of litter has received considerable attention within the past decade and has resulted in the creation of the Wilderness Permit System by the Park Service. This system was established to determine how and where the backcountry is being used, to limit the numbers of visitors to the highly impacted and fragile areas, and also to provide a quality wilderness experience for as many people visiting the backcountry as possible (we're sure you wouldn't want to hike 10 miles to a backcountry lake and find 200 other people camped there).

One facet of park use which has received less attention is the use of stock in and its impact upon the Yosemite backcountry. The use of stock in Yosemite precedes its genesis as a National Park. Explorers introduced stock into

Yosemite in the mid-1800's, the cavalry regularly patrolled the area on horseback around the turn of the century, and both the Park Service and the park concessioners have consistently made use of stock in their operations. Currently, stock use in Yosemite can be divided into four categories: the National Park Service (horse patrols, backcountry patrols, cleanup of the backcountry, and trail crews) comprises 15.6% of the total usage; the Yosemite Park and Curry Company (recreational rides, and supplying the High Sierra Camps) 40.7%, other permitted packers 1.3%, and private parties 42.3%.*

At present, the effects of stock on the Yosemite ecosystem are only generally known. Stock impact can essentially be divided into three types: (1) the physical impact of stock on trails and meadows (2) grazing effects and (3) aesthetic factors.

Although the use of stock constitutes less than 3% of total backcountry use, the physical impact of a horse on both trail and off trail areas is generally much greater than that of a human. This disproportionate impact is perhaps greatest in wet areas, particularly in alpine and subalpine meadows, where studies indicate between 10 to 100 times the impact of a single human. The animal's greater weight carried upon it's narrow sharp hooves easily punch holes in wet meadows and create new trails (i.e. Mono Pass and vicinity, around Sunrise High Sierra Camp, around Elizabeth Lake and Nelson Lake, and the trail between Delaney Meadows and the Dog Lake junction). Studies indicate that in fragile wet meadows, all it takes is 2 or 3 animals to get a trail underway. On established trails stock often deepen and dig up the soil by dragging their feet (especially packstrings) — backpackers, avoiding loose soil, rutted trails, or manure, then walk along the margins of these trails, widening them or creating new trails.

During the later part of the 1800's grazing of domestic animals, including stock, resulted in considerable damage to Sierran meadows. One of the primary reasons John Muir and other conservationists advocated the need for the establishment of Yosemite National Park was to eliminate this grazing damage. Muir wrote in 1882, "Most of the level floor of the Valley is fenced with barbed wire and about three hundred head of horses are turned loose every night to feed and trample the flora out of existence. I told the hotel and horsemen that they were doing all they could to prevent lovers of wild beauties from visiting the Valley. . ."

Studies by Park Naturalist Carl Sharsmith have shown that stock grazing is highly selective with regard to species chosen, sometimes resulting in the elimination of certain species, in favor of other species, often non-native. Besides species composition changes within the meadow vegetation, there are also indications that grazing along meadow forest fringes disturbs the topsoil, enhancing the encroachment of lodgepole seedlings.

Finally there are the aesthetic problems associated with manure on trails (John Manure Trail, anyone?). We are not particularly offended by the presence of manure on trails, although we have never really learned to become fond of it. However, we realize that some people are bothered by it, and thus it does present a problem.

The use of stock in the backcountry is currently being regulated by the Park Service to minimize environmental damage. Overnight stock parties like backpacking groups, are limited to 25 head (25 backpackers are considered to have the same impact as 25 people and 25 head of stock.) The use of stock off of park trails, the shortcutting of switchbacks, and the grazing of stock in

*Use determined by estimated animal unit month of use per group

meadows near High Sierra Camps are prohibited. Although grazing is allowed in meadows other than those surrounding High Sierra Camps, stock users are asked to use picket lines stretched between trees instead of staking stock in meadows.

We have found the issue of stock impact to be a highly controversial one, fraught with emotional overtones. On the one hand we have encountered individuals who are vehemently opposed to stock, largely based upon emotional responses rather than careful analysis of the issue. We have also encountered stock users who refuse to admit that stock may have any adverse effects upon the environment. Research conducted on stock use indicates that both of these positions are unrealistic — stock can have adverse environmental effects, but it represents only one component of total backcountry use resulting in environmental impact.

The consensus of most researchers is that off trail stock use is highly detrimental, especially in wet meadow environments, and it seems obvious that the Park Service should continue to prohibit cross-country travel by stock. However, there exists some confusion as to what constitutes an established trail suitable for stock use. A possible solution to this problem is for the Resources Management Office to determine which areas and trails are appropriate for stock use — thus closing areas and trails to stock where major deterioration of the ecosystem results from such use.

With respect to established trails there is a general agreement among Park Service employees involved with stock use, that the impact of stock is not so much a problem of stock but rather insufficient trail maintenance. There are methods of trail construction that minimize the adverse impact of stock. However, these methods are expensive — the Park Service has only limited funding available for trail maintenance. One means of sharing the additional burden of trail maintenance would be to charge a small fee to private parties bringing stock into Yosemite. Also, the cost of maintaining trails to and from the High Sierra Camps could be shared with the park concessioner. Furthermore, additional attention should be given to the question of overnight and day party sizes of stock, currently the same as hikers, in view of the greater impact of stock.

Research has shown that extensive grazing on meadows can result in elimination of species and the general deterioration of this environment. What is not known is how much grazing constitutes overgrazing. Until further quantitative research is conducted to determine this, extreme care must be taken to preserve fragile high altitude meadows, which require long periods of time to recover from damage. Possible means of doing this might include rotational grazing of certain areas to allow rest periods for the meadows, the avoidance of grazing in the early part of the season when the meadows are wet, and a moratorium on grazing in the alpine and subalpine meadows until the grazing impact can be determined.

Whatever one's attitude toward stock it must be remembered that the use of stock plays an integral role in the management of Yosemite National Park. Horses are regularly used for campground and backcountry patrols, saddlestock are used in trail maintenance, and to pack out trash. The alternative to these uses would be the intrusion of helicopters into the backcountry. Stock when used on maintained trails have only slightly more impact than hikers. However, stock when used improperly can have a much greater impact than hikers alone. If Park resources are to be preserved for future generations stock users, both public and private sectors must therefore take great care to minimize their impact.

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TRAIL EROSION IN MOUNTAIN MEADOWS

Jim Snyder

Trails formed in Yosemite meadows for the simple reason that open meadows offer easy access and a place to get one's bearings and survey the country. Ruts developed in some boggy areas around the turn of the century, but the problem was usually confined to small areas, stirring no complaint. After World War II, when backpacking began to increase rapidly, the problem of multiple trails through meadows became severe.

Though rut scars on high mountain meadows have been most often attributed to stock — and, indeed, recreational stock-use earlier in the century probably contributed to present rut formation — foot travel early in the season has been the largest cause of trail erosion. The reason is timing. When meadows are still wet, in the spring and early summer, they are ill-prepared to withstand the use they receive. Spring travellers walk on grass which has not yet had a chance to establish itself in soil still loose and mushy from the year's runoff. It does not take much to crush and churn the sod until a path is formed not only for hikers but for the runoff itself. Once the trail becomes a water channel too, then water can, with the aid of people, cut through the sod and begin to rut and gully the meadow.

A trail rut acts as a runoff channel, gathering the meadow runoff and directing it. Early in the season, then, meadow trails often fill with water. To keep their boots dry, hikers step up on the grass along the trail's edge. Soon another path forms which also begins to rut. In a decade, a meadow trail may become six or eight lanes at places wet and boggy during April, May, and June. Resulting erosion varies greatly with soil, vegetation, and drainage pattern.

Popular solutions to meadow erosion from trails have been 1) to limit stock use, and 2) to reroute trails around meadows. The impact of stock in Yosemite's backcountry in the past has been greater in grazing than in trail use. Proposals to limit stock use to solve meadow trail erosion problems have not taken into account pressures applied by foot travelers. The problem of erosion is not a matter of one mode of transportation compared with another so much as the patterns of use and relative numbers involved at critical times of the year.

Private stock use in Yosemite has declined since World War II as pack stations on the east and west sides have gone out of business. Though the number of privately owned horses in California has grown by many thousands in the

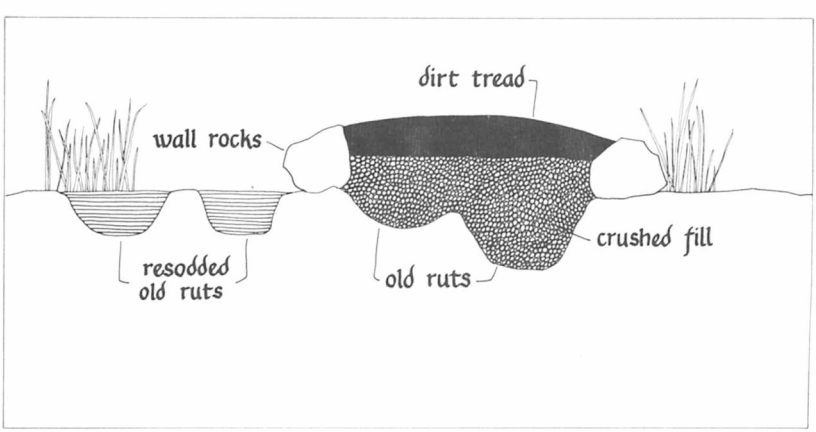
last two decades, that increase has not been reflected in backcountry stock use, which is, in large part, confined now to concession operations along the High Sierra Loop and government backcountry maintenance and patrol. The latter stock is not present in the backcountry normally before the end of June or early July and then only for about two and a half months. Stock impact, as a result, has been limited naturally by economic changes in recreation patterns.

The building of reroutes around meadows has had effects opposite to original intentions. Reroutes, far from reducing impact, have in fact doubled the damage to local environments. There are two major reasons for this. First, the planning for reroutes failed to account for the reasons trails went through meadows. Late melting snows most often constrict travel in areas such as Rafferty Meadow to the meadow itself well into June. Since the Rafferty reroute was never blazed (that mountaineer's practice having been discontinued since the early 1950's), the only guide to the reroute early in the year is the Vogelsang phone line, along which more than one party has lost its way. The meadow is more direct; certainly meadows are more scenic. Meadow trails continue, therefore, to draw considerable traffic.

Second, reroutes failed because their construction included no real effort to fix the original meadow damage simultaneously. Signs prohibiting use on the old Rafferty Meadow trail are widely ignored, and the gullying of that meadow would continue even if they were not. Efforts to stop gullying on the old Soda Springs-Glen Aulin trail were based on an assumption that the ruts could fill in by themselves, but they cannot without a source of sod or fill. In these two cases, the reroute trails were laid out poorly, without adequate drainage or tread preparation, so that the reroutes also have deteriorated with heavy use. The policy of rerouting around meadows, as a result, has not stopped or even slowed meadow trail erosion, while the reroute practice has spread erosion to include forest as well as meadow areas.

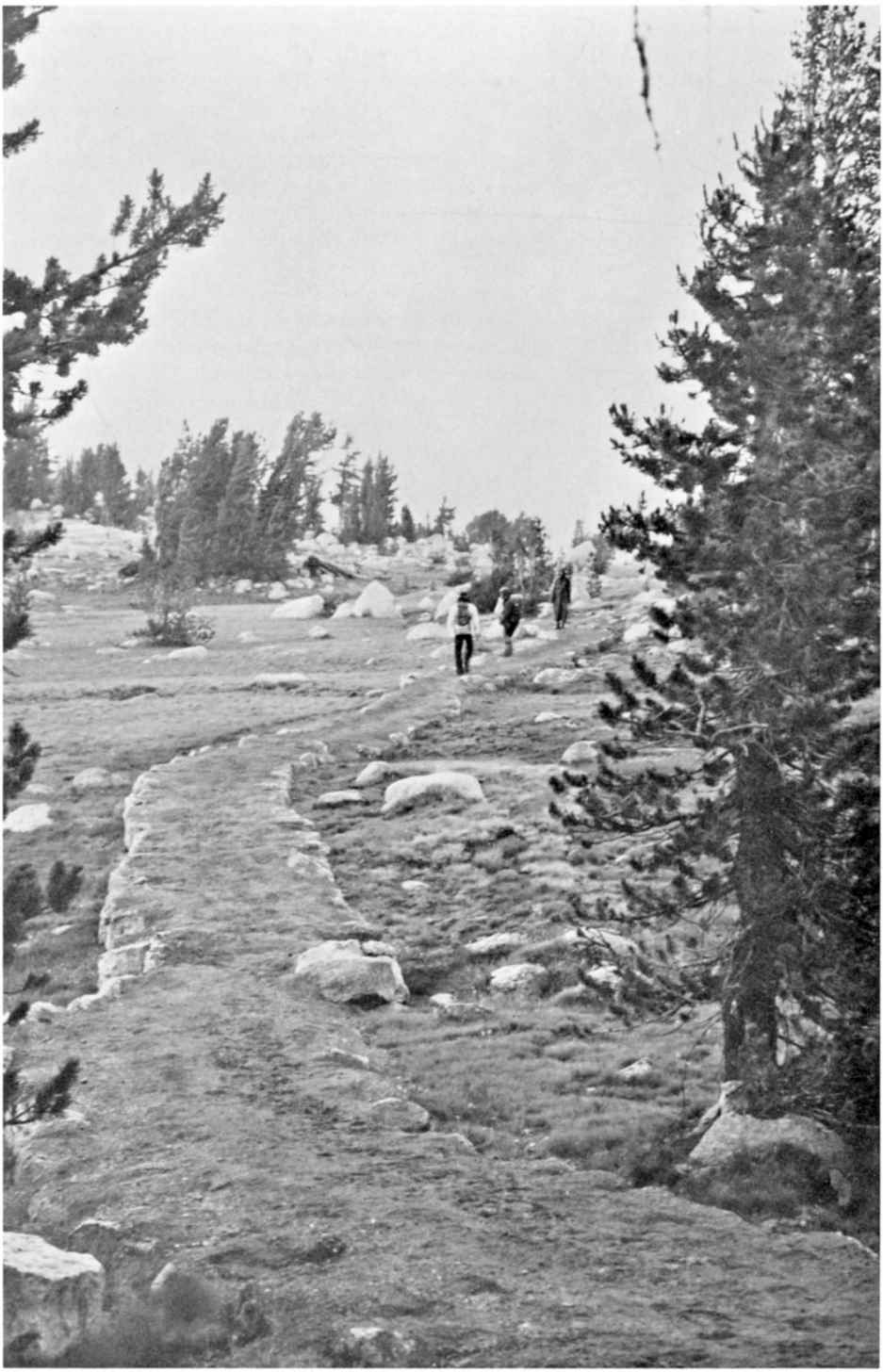
Rerouted trails are rarely necessary. Work should be concentrated most often on repairing the old trail correctly in the first place. That was how trail crews came up with a solution for the meadow trail erosion problem. Tuolumne Pass below Vogelsang was the site for the first meadow project during August, 1975. Crews completed a second meadow project at the slick rock three miles below Soda Springs on the Glen Aulin trail in September, 1976. Their method is relatively simple. It developed after four seasons of rebuilding the Merced River canyon trail through several different environments.

A cross section of a meadow trail causeway looks like this:





The trail at Tuolumne Pass before work, early August, 1975.



The same trail with causeway and new sod in late July, 1976.

A causeway is laid through the widest and deepest ruts, leaving other ruts to be resodded later. Walls about ten inches higher than the meadow surface hold a fill of crushed granite, which fills in the old ruts but keeps the trail itself porous for drainage. On top of the fill is laid a tread of dirt, packed in by mule, and the compacted soil is removed from the ruts to be resodded.

Trail crews attempt to do sections of the meadow causeway in sequence from start to finish so the finished trail can be used to haul materials through the meadow for each successive section. That reduces impact on the meadow from the construction, as does working the site late in the season when the meadow is dry. When the trail itself is done, the remaining ruts are resodded, using sod containing species of plants identical to those of the meadow, taken from far off the trail in an area with a demonstrated rate of rapid recovery. Crews currently are working on a means to eliminate transplanting altogether by producing meadow turf artificially for resodding old ruts.

Because the work includes as much effort in restorative camouflage as it does in acutal construction, the signs of construction have nearly disappeared by now. The dirt pit at Tuolumne Pass is a gentle swale of lupine and grass. The sod strips are coming back more slowly, but new grass is growing into them. The pulling mules, Katie and Belle, hauled tons of rock over the meadow grass with a stoneboat, a large, flat piece of steel with broad runners to distribute the weight of the load widely over the ground with little impact. This stoneboat, discovered in the Merced River by Bill Sabo, had been used in the building of the El Portal Road in the 1920's, but the technique had been all but lost in Yosemite since that time.

The results at Tuolumne Pass are apparent in the photographs of the trail before work started and the same trail a year after the causeway was finished. The new sod has taken hold.

Though it is still too early to tell, the research done by John Schelhas, a trail crew member and botanist, on the relationship between trail erosion and meadow vegetation suggests that the meadow causeway has made it possible for some species sensitive to trampling to give up their retreat from the trail and finally return to its very edge. The causeway, it seems, has permitted the meadow to work as a meadow once more. Trail erosion has been eliminated, and hundreds of people still can use the meadow route to get where they want to go.

MONO PASS AND BLOODY CANYON

Dick Ewart

For centuries, the Indians used this pass to cross the Sierra; then came the pioneers and miners. Today, backpackers and hikers explore the area without knowing its long and exciting history.

Mono Pass, with Bloody Canyon descending to the east, is located on the boundary of Yosemite National Park and Inyo National Forest about 3.5 miles (5.7 km) southeast of Tioga Pass, at an elevation of 10,600 feet (3210 m). The pleasant, but moderately strenuous walk to Mono Pass, provides majestic views of the high Sierra, as well as an excellent opportunity to explore points of geological, glacial, and historical interest.

Joseph Walker and party, in 1833, were the first non-Indians to see Yosemite. Though some historians claim that he came up Bloody Canyon and over Mono Pass, it is unlikely, and the broader opinion is that he chose a northern route (near the East Walker River), and then followed a route somewhere between the Tuolumne and Merced Rivers. Later, in 1851, Major Savage and the Mariposa Battalion came into Yosemite Valley to roust the Ahwahneechees, the Indian tribe that had lived in the Valley for hundreds of years. That year the white men chased them as far as Tenaya Lake. It wasn't until the following year that the crest of the Sierra was reached by the whites, who once again were pursuing the Ahwahneechees.

Lt. Tredwell Moore led a detachment over Mono Pass and down Bloody Canyon in pursuit of the tribe. Before returning, they explored the area around Bloody Canyon and brought back favorable reports of mineral deposits. After hearing the news, a party led by Lee Vining left to prospect for gold.

By 1857, miners were crossing the Sierra to get to Dogtown and Monoville, mines on the eastern Sierra near Mono Lake, thus the Mono Trail was blazed. It followed the route of an old Indian trail, from Big Oak Flat, through Tamarack Flat, past Tenaya Lake, Tuolumne Meadows, Mono Pass, and Bloody Canyon.

Carl Russell, in *One Hundred Years in Yosemite*, states that the Tioga Mining District, established in 1878, extends from Kings Ranch, at the base of Bloody Canyon to Soda Springs in Tuolumne Meadows. However, others including Mary DeDecker in her book *Mines of the Eastern Sierra*, say the Tioga District ends at the pass, which is also the dividing line between Tuolumne and Mono Counties. The Prescott Mining District then continues down Bloody Canyon.

At the peak of the mining days, there were 350 mining locations in the Tioga area, including Bloody Canyon. Until the Tioga road was built in 1833, Bennettville and other Tioga mines were supplied by Mexican packers, first by the route up Bloody Canyon and later up Lundy Canyon.

The *Homer Mining Index,* one of the few papers in the area at the time, states that Fuller and Hayt (or Hoyt) discovered antimonial silver in Mono Pass and called their claim the Golden Crown. The *Mammoth City Herald*, another newspaper of the day predicted that within a year, thousands of miners would be working in Mono Pass at the Golden Crown (the row of cabins that was built there is still standing and is easily accessible to today's hikers). Later, in 1881, when these men sold their claims to a New York company, it was shown that Fuller owned the Golden Crown, and Hoyt owned other claims, which he called the New Brunswick, the New York, and the Kalamazoo. H.P. Brady owned the Ella Bloss mines, also situated in Mono Pass. Either these cabins and mining claims changed hands, or names in the early records were incorrect, for in 1958, the Ella Bloss claim (that row of old whitebark pine cabins commonly called the Golden Crown) was sold to the National Park Service. So, these cabins began their life as part of the Golden Crown, and ended up as part of the Ella Bloss. Though the claim is principally in the Tioga Mining District, it is partially over the pass, therefore in Mono County and part of the Prescott Mining District. Another source states that the Golden Crown cabins were built by four men, Gus Cordes, Andy Thompson, Louis Amiot, and James Camble, before the Fuller and Hoyt discovery. Of particular importance was Gus Cordes, an early packer working the Bloody Canyon route, who did the last work on the trail in the 1890's.

Early accounts say that Bloody Canyon was named because the route down the canyon was precipitous and rocky, and the legs of the horses frequently were lacerated. Others feel that the metamorphic rocks which fill the canyon have a reddish tone which gives the canyon a blood-like color.

Walker Lake, named for Joseph Walker, lies at the foot of Bloody Canyon and Mono Pass is named for the Indians of the Eastern Sierra Nevada, the Monos or Monachi, as some of the neighboring tribes called them.

None of the mines in the Mono Pass area became famous, nor did they pay off as expected. They simply passed into obscurity as did many of the mines of the time. Early cabins often reveal much of the person who built them — their personality, character, experience and heritage often are typified by the way the cabins were built. Most all old miners' cabins have the simplest construction — round logs with V notches; however, the Ella Bloss cabins display different techniques, one having square logs and box corners.

Access to Mono Pass and the historic mines is from two directions: the long, steep trail from the eastern side of the Sierra up Bloody Canyon, or the easier trail from Tioga Road. In the Park, about 2 miles (3.2 km) west of the Tioga Pass entrance station is the Mono Pass parking area and trailhead. Once on the trail, one follows an old dirt road used to truck out gravel for the realignment of the Tioga Road. It gradually gains altitude for the next 2 miles (3.2 km), over a series of glacial moraines. A short distance along, Mono Pass

joins Parker Pass (the next pass to the south). The trail bears to the left, first passing a tumbled-down cabin, perhaps that of a sheepherder, though more likely that of a miner, and then a large granite rock on the right containing Indian mortar holes. Along this section of the trail, the more observant hiker will notice older parallel trails. At one point, there are three discernible trails, and one wonders if the oldest one was that trod by the Indians. Before reaching the next old cabin on the right of the trail, one-half mile (.8 km) from the pass, one may notice many old trees scarred with hatchet marks. These marks are roughly rectangular, about 3 to 4 feet (1. m) high and from 2 feet (.6 m) wide and some completely girdle the tree trunk. For what purpose, no one seems to know.

After passing this last cabin and upon entering the meadow, there is to the left, a huge, spreading, multi-trunked old whitebark pine, possibly the largest in existence. And finally, across the meadow at the crest of the pass are the Ella Bloss cabins. These cabins are 100 years old and of great historic importance. Treat them gently and disturb nothing, so that others may enjoy their beauty and wonder about their history. Continuing over the pass, there is a beautiful alpine lake, Sardine Lake, named after the cargo which fell into this lake, along with the unfortunate mule transporting it. This metamorphic environment abounds in a diversity of plant life, along with splendid views of Mono Lake and the eastern side of the Sierra Nevada.

Though at times history gets confusing, one cannot deny the tremendous importance of this trail over Mono Pass, the original trans-Yosemite trail.


MK 78

THE MANAGEMENT OF GOLDEN EAGLES IN YOSEMITE NATIONAL PARK

Gary Tanaka

With its six and a half foot wingspan, the soaring golden eagle (*Aquila chrysaetos*) is one of the most impressive sights in the Yosemite sky. From as early as 1929, observers have recorded their awe. Although the record is sparse and sporadic, it is, nonetheless, sufficient to designate golden eagles as having been both native and fairly common to the Yosemite area.

Fortunately, the Yosemite golden eagle population and its environment have remained relatively intact through the twentieth century. However, on a national scale since 1940, the *Code of Federal Regulations* has listed the species as endangered. This situation could indicate that Yosemite acts as a valuable sanctuary or island for the population.

But because the presence of golden eagles has not interfered with the administrative procedures of the park, these birds have been virtually ignored. Lest the tides of our rapidly changing times should change disfavorably for the population, this policy seems hazardous. Wild birds, especially endangered ones, and their environment often must be manipulated for their own good. In order to determine which factors should be monitored, something of the birds' lifestyle must first be known.

LIFE HISTORY

The diet of golden eagles consists of: 83.9% mammals, 14.7% birds, 1.0% reptiles, and 0.4% fish; rabbits and rodents may comprise from 70% to 98% by weight of an eagle diet, depending upon locality.

Golden eagles form breeding territories which are maintained from generation to generation. As a measure of carrying capacity, the density of breeding pairs has been determined to range from approximately 35 to 66 square miles per pair for various habitats and states (Table 1). Within the boundaries of each territory are feeding, roosting, nesting, and soar-playing areas. The size of the territory depends to a large extent upon the availability of food, nest sites, and suitable terrain for flying.

Nest site studies of golden eagles have indicated different uses of habitats as well as elevations. The predominant habitat preference is cliffs, which are both plentiful and widespread in Yosemite (Tables 2, 3, and 4.) The preferred nest site altitudes range from 4,000 to 6,000 feet, a common geography in Yosemite (Table 5.)

Golden eagles usually have a number of alternate nests, ranging from 1 to 14, although 2 to 3 is the usual number. The same nest may be used by a pair during consecutive nesting seasons, although they often repair alternate nests and visit them regularly until the eggs are laid.

A study of the reproductive rate of golden eagles reveals a disturbing discrepancy between the average number of eggs laid per nest (2.1, Table 6) and the average number of birds fledged per nest (1.32, Table 7.) Further, studies indicate that approximately 70% or more of the young birds do not survive to sexual maturity. Based on this evidence, it is calculated that an adult pair is responsible for rearing 0.4 potential adult replacements per year. Or in other words, it would take a mating pair more than five years to replace themselves.

TOLERANCE TO HUMAN ACTIVITIES

Nest defense against human beings seems to be almost universally lacking. The adult eagles are extremely wary when someone comes near the eyrie and in many cases will be gone before the observer is even aware of the nest. The major consequences of human visiting active eyries include: (1) possible desertion by parent eagles of their eggs and young; (2) the increased chance of egg breakage by parent birds, as well as the increased chance of cooling, overheating, loss of humidity, and avian predation of eggs; (3) possible chilling or overheating of the newly hatched birds in the absence of brooding; (4) possible premature fledging by older nestlings resulting in broken bones at the end of a futile first flight or nights spent on the ground where vulnerability to predation is high; (5) possible scent trails guiding predators to the eggs or young; (6) the possible attraction of the attention of other humans.

Golden eagles studied for chemical contamination contained measurable amounts of organochlorine, pesticide, and mercury residues. Thankfully, all concentrations were well below toxic levels. This good fortune can be attributed to the relatively short food chain of golden eagles wherein contaminants are prevented from concentrating within successive stages.

RECOMMENDATIONS

On the basis of the preceding brief survey of golden eagle requirements and behavior, it appears that natural conditions pose no threat. The effect of humans, however, can be significant. In light of the restrictions placed upon any wildlife management plan by both public and administrative interests as well as financial constraints, the following list of recommendations is offered in the order of their management priority and feasibility.

TABLE I

Density of breeding pairs for various studies and states.

SQ. MILES/PAIR	LOCATION	SOURCE
36	San Diego Co., Calif.	Dixon, 1937
38	Utah	Camenzind, 1968
66.3	Montana	McGahan, 1968
35.5	Southwestern Idaho	Kochert, 1973

TABLE II

Differential utilization of habitats by nesting golden eagles in Colorado, 1970-1972 (Olendorff and Stoddart 1974)

	UNBROKEN GRASSLANDS	CREEK BOTTOMS	CLIFFS	CULTIVATED LAND
Percent Use	14.5	32.7	52.8	virtually 0

TABLE III

Differential use of supporting structures for nesting golden eagles in Colorado, 1970-1972 (Olendorff and Stoddart 1974)

	TREE	ROCK OUTCROP	CREEK BANK	CLIFF	GROUND	MAN-MADE STRUCTURE
Percent Use	25.5	5.4	16.3	52.8	0	0

TABLE IV

Percentage of golden eagle nests in various sites in Montana (McGahan, 1968)

NEST SITES	1963 UNOCCUPIED	1963 OCCUPIED	1964 UNOCCUPIED	1964 OCCUPIED	ALL NESTS
Cliff	59	71	67	70	62
Douglas Fir	28	26	29	23	29
Cottonwood	2	3	2	7	3
Ponderosa Pine	3	0	0	0	2
Dead Snag	4	0	0	0	2
Ground	4	0	2	0	2
TOTALS	100	100	100	100	100

TABLE V

Percentage of golden eagle nests at various altitudes in Montana (McGahan, 1968)

ALTITUDE RANGES (feet)	1963 UNOCCUPIED	1963 OCCUPIED	1964 UNOCCUPIED	1964 OCCUPIED	ALL NESTS
3,000 - 4,000	4	4	6	0	4
4,000 - 5,000	48	37	58	41	46
5,000 - 6,000	36	37	27	41	35
6,000 - 7,000	10	11	7	11	10
7,000 - 8,000	2	11	2	7	5
TOTALS	100	100	100	100	100

TABLE VI

Comparison of clutch sizes from different areas (McGahan, 1968)

AREA AND INVESTIGATOR	NUMBER OF CLUTCHES IN SAMPLE	FREQUENCY OF DIFFERENT CLUTCH SIZES (PER CENT)		
		1 EGG	2 EGGS	3 EGGS
California (Dixon, 1937)	unknown	10	80	10
Montana (McGahan, 1968)	20	5	80	15

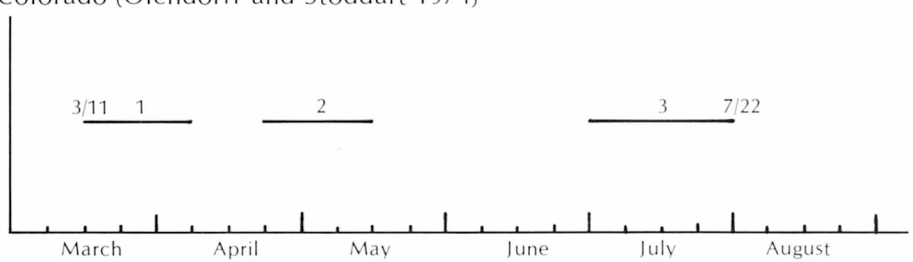
TABLE VII

Young hatched and fledged in Montana, 1963-1964 (McGahan, 1968)

Average number hatched per nest	1.59
Average number fledged per nest	1.37
Percent hatched that fledged	86.4

FIG. 1

Dates and durations of the three stages of nesting for golden eagles in Colorado (Olendorff and Stoddart 1974)



1 = laying period
2 = hatching period
3 = fledgling period
x/y = dates first eggs laid and last young fledged

(1) In order to initiate a management program, the primary step must be to determine the present population level and distribution. The rugged terrain and modest dimensions of the park suggest that airborne observations would be the most efficient technique. If these routes were flown in early August at the end of the fledgling period (Fig. 1), not only could the population level and distribution be determined, but also an estimate of the number of nesting sites could be calculated. Furthermore, blanched, uric acid stained nesting sites could be located to indicate active eyries, while eliminating inactive alternate nests.

(2) Eyrie sites should not be made known to the general public. Many people are not aware that golden eagles are protected by law nor do they comprehend the possible consequences of disturbing active nest sites.

(3) Any proposed or current development of Yosemite Park should be studied for the possible impact on the golden eagle population. This is particularly important with regard to the recently increased enthusiasm for backpacking, climbing, and hang-gliding. In some instances, human activity in an area where golden eagles nest or hunt may be sufficient to cause them to desert, even if harassment is neither direct nor deliberate.

(4) Available evidence indicates that golden eagles most frequently and readily desert their nests during the period of incubation. Once the eaglets have hatched, the probability of desertion decreases considerably. Therefore, human activity should be restricted from areas of known active eyrie sites during the period extending from February 1 to June 1.

(5) Adult eagles tolerate human activity in the Oregon-Idaho Snake River Canyon below the nests but are very intolerant of it on the canyon rim above them. Therefore, human activity, particularly along the Yosemite Valley rim should be reduced to a minimum from February 1 to June 1.

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NAMES AND MEANINGS FOR YOSEMITE VALLEY

Craig Bates

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 members of the land moiety. Dr. C. Hart Merriam also agreed with this definition (1917, pp. 202-209). Yet, when one analyzes the term "Yosemite" linguistically, it takes on a different meaning.

Although different ethnographers utilized various phonetic orthographies, the general pronunciation becomes "Yo'hem-iteh,"coming from the stem verb "yohe," meaning to kill. The "miteh" portion is a collective plural suffix, thus the word "yo'hem-iteh" translates as "they are killers" (Barrett, 1919, p. 28; Gudde, 1949, p. 395; Broadbent, 1969, op. cit.).

These definitions are based on direct contact with Southern Sierra Miwok people who spoke their native language fluently. Very few such speakers remain today. One man remembers that his mother said the term Yosemite had something to do with killers (personal contact, John Sensor).

Though white visitors called the valley "Yosemite," the native Miwok people seem to have used the term "Ahwahnee." Bunnell states that he could not understand Chief Tenaya's language. So, by means of signs, Tenaya attempted to indicate what "Ahwahnee" meant. Bunnell says, "I inferred from these signs that it must mean the deep grassy valley," adding that "still, it may not mean that." Others have quoted Bunnell's definition and have cast aside his cautionary remark.

When Ahwahnee is transcribed through linguistic orthography it becomes "?awo-.ni" [*var.* ?owo-.ni] (Broadbent, 1969). The stem word is seemingly "?awo" [*var.* ?owo.-] meaning mouth. Thus, "awo-.ni" becomes "the big mouth" or "place of the big mouth."

This interpretation has been available for some time, but seems to have been discarded for the more romantic "deep, grassy valley."

In a 1933 National Geographic article on the Yosemite Valley we find the first mention of the word "Ahwahnee" interpreted to mean "big mouth." A later reference appears in a letter written by a park naturalist in 1940 in which is stated: "However, Chief Lemee, one of our local Indians explained Ahwahnee as big mouth."

Inquiry among native Miwok speakers today reveals little memory of the word. Those that do remember it recall it as a term for the Yosemite People (with addition of -che, meaning people of). They think that it may have something to do with the "place you go to pound acorn" or the "place you go and play" (perhaps from the stem "?aw.i" - play games, or "?aw.i?" - a playground).

The foregoing statements may serve only to further confuse the issue of the true meaning of the terms "Yosemite" and "Ahwahnee." The discussion should help to point out that when searching for the translation of a specific native American term, one can never be too careful, nor ultimately correct.

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My thanks to: Dr. Sylvia Broadbent, University of California, Riverside
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F.K. LANE — A CLUE TO THE PAST

Jim Huning

The merits of Hetch Hetchy Reservoir as a water storage facility for the City of San Francisco have been argued for decades. Regardless of one's personal feelings, two general observations seem reasonable. First, Hetch Hetchy Valley cannot serve to relieve the congested seasonal camping facilities in Yosemite Valley; that is, Hetch Hetchy has been effectively removed from 'use' by future generations of Americans and international visitors. Second, a seeming injustice was done to the American people when a portion of our National Park trust was used for a purpose not in line with National Park objectives.

For those familiar with the long and politically volatile 'battle' over Hetch Hetchy[1], a visit to the Hodgdon cabin in the Pioneer Yosemite History Center at Wawona may be of particular interest. Carved into the door frame is the following inscription:



Could this have been carved by *the* F.K. Lane, City Attorney of San Francisco under Mayor Phelan and author, in part, of many of the city's early legal briefs in the fight for Hetch Hetchy? In 1903, San Francisco city officials first applied to the Interior Department for rights to use Hetch Hetchy Valley. The application was denied by then Interior Secretary Hitchcock. Franklin Knight Lane later went on to become Secretary of the Interior Department under President Woodrow Wilson and, not too surprisingly, supported the City of San Francisco's application to dam Hetch Hetchy Valley (authorized by the Raker Act of 1913).

The carving on the Hodgdon cabin door frame appears old. It is weathered and, according to a number of individuals at the Pioneer Yosemite History Center, the carving has been there for as long as anyone can recall. It is very possible that the carving might well be the handiwork of the same F.K. Lane. To be sure, much more historical research would be required in order to determine, with a high degree of confidence, if F.K. Lane had visited the Hodgdon cabin[2]. Then, too, one may never really know if it was the same F.K. Lane of political significance who was responsible for the carving.

As one gleans the graffiti on the Hodgdon cabin door frame, the historical struggle between those who wished to dam Hetch Hetchy Valley and those who sought to preserve its status quo within Yosemite National Park, led by John Muir and the Sierra Club, comes into clear focus. On a quiet day at the History Center one can almost hear the eloquence of John Muir: "Dam Hetch Hetchy. As well dam for water-tanks the peoples' cathedrals and churches, for no holier temple has ever been consecrated by the heart of man."[3]

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WAWONA SCHOOLS

Beverly Ortiz

The schools of Wawona provide interesting insight into the early education of the people of the area. There are several opinions as to where the first school was located. At this time, all that can be said is that it was either run in the home of the Bruces, an early homesteading family, in the 1880's, in the parlor of the Wawona Hotel, or in each of these places. It does seem clear that Azelia Bruce, who went to State Normal School, was Wawona's first teacher. Her sizable family, five boys and two girls, could have made-up an entire school enrollment.

At any rate, the school moved to more comfortable quarters in a building which was located near the present Sequoia building at the Wawona Hotel, but apparently the site was poorly chosen since, being close to where the stage drivers lived, the children were learning more than their basic 3 Rs.

It wasn't until 1891 when Frances M. Hall, who had also taught at the Yosemite Valley School, became Wawona's first teacher at the third schoolhouse, which was located on a flat below the Wawona Hotel and next to the South Fork of the Merced River. It is interesting to note that included among this school's first teachers was a man, Mr. George Congdon, who taught in the latter part of 1893 and in 1894, and a married teacher, Mrs. J. E. Hall, who taught in the earlier part of 1893. Anyway, about all that remains of the handsome shake building that was the schoolhouse are small ditches where the girls and boys outhouses stood, some rocks piled in such a way as to indicate they may have been part of the foundation, and the stump that Miss Jones tripped over in the 1930's, breaking her collarbone while playing darebase with the children, as well as the natural rock backdrop where the children held plays in the '30s. Now there is nothing to indicate the struggle of many students to learn their ABC's, nor is there anything which could make it possible to know that it was here that a troublesome deer named Jiggs. raised by the Civilian Conservtion Corp., died when he ran into the schoolyard fence and broke his neck as he fled from the teacher trying to shoo him away.

For her teaching efforts at this third school in 1896, Nettie Craighan, at the age of 23, could boast $306.70 in state and county payments. Nettie had acquired considerable experience by this time, having taken a teaching examination in 1892 to qualify for her Primary Grade Certificate (grades 1-5) with an average score of 87¾% and having qualified with a score of 90+% on her Grammar Grade Certificate (grades 6-9) test in 1893. In the 1890's, the only way an applicant without experience could be exempted from examination was to have graduated from State Normal School, and have an Educational or Life Diploma, or a diploma from the California State University when recognized by the faculty of the university. The Mariposa County School Board met every year, apparently to revise the questions for and administer examinations to prospective teachers, and students who wanted an eighth grade diploma, as well as to revise the curricula. In the '90s the teachers' examination consisted of 19 subjects, including mental as well as written arithmetic, oral grammar, penmanship, bookkeeping, vocal music, physiology and natural philosophy. By comparison, eighth grade diploma seekers weren't tested in as many subjects as the teacher and did not have to receive as high a score. The board, of course, had to be satisfied as to a teacher's "good moral character."[1] A far more interesting rule is the one which stated in 1889 that "if a board member has an interest in an applicant's success he shall not participate in preparing questions or marking papers."[2]

A revised Mariposa County curricula of 1895 reveals some interesting entries. For one thing, it included a lengthy and specific list of the books and apparatus which could be purchased by the trustees. The most notable book on the list is Hutching's *Heart of the Sierras*, for it was Hutching's *California Magazine* that alerted many to the wonders of the Yosemite in the late 1800's. The curricula itself is a very precise rendition of the course of study for each grade level, including the authorization of McGuffey's reading books as the primary text. Subject matter kept to the basic 3 R's, music and drawing until the fourth grade, when local geography was added along with U.S. history, physiology and philosophy being added in later years. If a student were lucky enough to be able to get to a high school, he or she could begin learning the history of England in the ninth grade. The most notable part of the curricula, however, seems to be that starting from the first grade on "pupils must be taught to read in a connected, natural manner, to stand erect, open their mouths, hold book in left hand, read without pointing, etc., etc. Distinct articulation, good conversational tones and expression must be secured" and students were to be taught "manners and morals, and physiology and hygiene, with special reference to alcoholic drinks and narcotics."[3]

In 1917 at the age of three, young Wawona Washburn, the granddaughter of early artist Thomas Hill's daughter Estella, and John Washburn, who helped start the Wawona Hotel, probably became the school's youngest scholar. Three students were needed to keep the school open at this time, so Wawona was enrolled along with her older brother Thomas, age seven, as well as the teacher's son, Paul Gilson, who was about seven years of age also. The only residents of Wawona who did not get their education from Wawona's teacher were the wealthy guests of the hotel who brought governesses along with them to teach their children. Anyway, Mrs. Gilson, who taught at the Wawona school for many years in the 1900's, came to Yosemite for her son's health. During her teaching sessions, Mrs. Gilson played hymns on the organ. Water had to be hauled from a spring several yards down the road from the school, and a woodburning stove on one side of the classroom provided heat. The school was mainly a summer school, but as Wawona Washburn Hartwig

pointed out, and as the irregular pay periods of the teachers suggest, the school was open in both the winter and summer as long as there were enough students and weather permitted. For students such as Wawona, this meant that they went to school the whole year around.

Finally, the fourth and last Wawona school to date, which is the first building on the left that one sees upon entering North Wawona, was dedicated September 9, 1937. It was really quite a dedication with an invocation led by Reverend James Asa White, songs by the students and speeches by John B. Wosky, the Assistant Superintendent of Yosemite National Park, and teacher, Mrs. Stockton. By one account, this school got its start when the National Park Service, saying that it could not authorize the building of the school at this site could authorize the building of a boarding house 'by gosh.' However, it managed to get authorized, the construction was done by the Civilian Conservation Corp. At one point, this school closed after World War II since there was only one student and one teacher, but it reopened again, finally closing its doors for the last time in 1971.

Now, with students being bussed to Oakhurst, an era in the history of Yosemite's educational institutions has closed.

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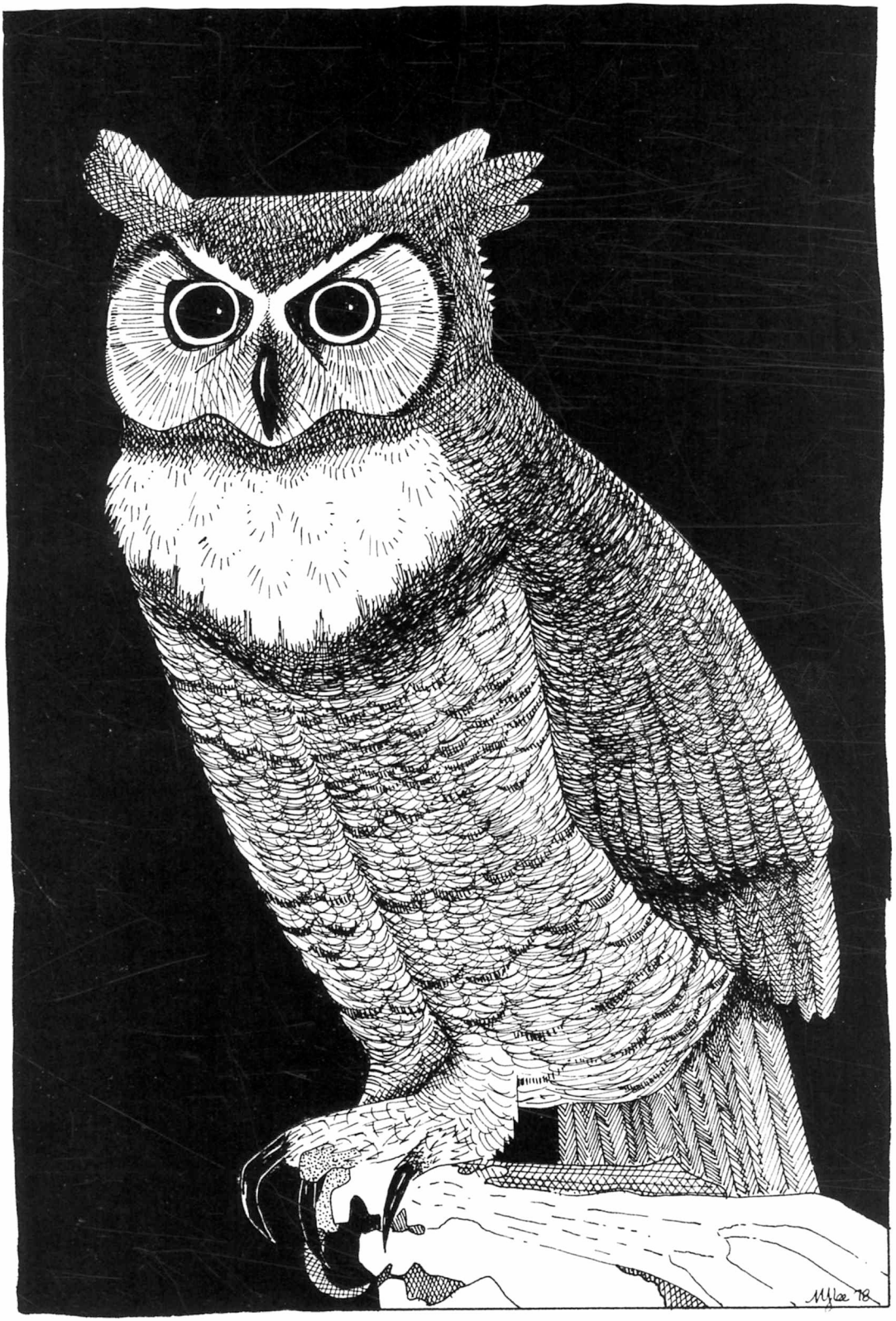
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[6]Many thanks are also due to Norman May, Wawona Washburn Hartwig, and Hester Stephans for their personal accounts of the Wawona schools. Special thanks are extended to Norman May for taking me to the site of the third schoolhouse.



BIRDS OF THE WAWONA AREA: AN ANNOTATED LIST FOR THE SUMMER OF 1977

Mark Gatewood

Wawona has long been neglected by park visitors, who see it as little more than a brief stop on the way to somewhere else. Even birders have largely ignored Wawona, leaving few records of sightings. After by-passing Wawona many times in my own travels, I stopped there in June, 1977, and spent the summer working at the Pioneer Yosemite History Center. In the months to follow I took the opportunity to bird extensively in the Wawona area and found it a lively and fascinating place. What impressed me most was the wide variety of habitats available to the birder; on any morning I could visit one or more of the following habitats:

Wawona Meadow — this is the best birding site in the area, in terms of variety of species. The meadow is lush and damp, and willow-lined watercourses provide variety in plant cover. An impressive white fir forest borders the meadow on the west, giving the best of several worlds. Characteristic birds include yellow warblers, red-wing blackbirds, lesser goldfinches and song sparrows. August brought ash-throated and willow flycatchers.

Ponderosa pine/incense-cedar/California black oak woodland — the Alder Creek Trail off North Wawona Road gives good birding in a dry, open forest habitat. Bushtits, acorn woodpeckers, red-and-white-breasted nuthatches and black-throated gray warblers range through this area. In openings of manzanita and *Ceanothus,* wrentits, scrub jays and California thrashers occur.

South Fork of the Merced River — this rocky, tumbling river was a watering place for many species through the summer and was home to the kingfishers and dippers. The South Fork enjoyed brief ornithological fame during the latter part of June, when Wawona District Naturalist Bill Dengler spotted a harlequin duck near the covered bridge.

Wawona Hotel and golf course — the hotel buildings furnish nesting sites for barn swallows, and the irrigated, manicured lawn and golf course appeal to robins, Brewer's blackbirds and chipping sparrows.

THE BIRD LIST

From 11 June until 15 September, 1977, I spent approximately fifty hours birding in the Wawona area. I was usually accompanied by my wife and one or more members of the History Center and Mariposa Grove interpretive staff. We made an average of two trips each week, dividing our time among the four habitat areas described above. Trips were made between 6:30 a.m. and 10:00 a.m.

The weather during this period was remarkably constant. Virtually every day dawned clear and cool, and warmed by 10:00 a.m.

This list, with remarks on frequency of occurrence for each species, is just a first step towards determining the resident/transient status for the birds of the Wawona area. I hope it will serve as a basis for future work by myself and other birders.

GREAT BLUE HERON — one sighting along the South Fork on 14 September.
TURKEY VULTURE — one sighting in early July over the History Center.
RED-TAILED HAWK — one sighting in early July over Chilnualna Falls.
MARSH HAWK — in Wawona Meadow, mid-August.
CALIFORNIA QUAIL — one sighting in September on west edge of Wawona Meadow.
MOUNTAIN QUAIL — seen in June, lower Alder Creek Trail.
AMERICAN COOT — seen once on South Fork, July.
MOURNING DOVE — present all summer.
GREAT-HORNED OWL — heard all summer; seen once in Tent City.
COMMON NIGHTHAWK — sighted once in June, once in August.
VAUX'S SWIFT — seen in large flock in August.
BLACK SWIFT — seen once in June, once in August, over Wawona Meadow.
BELTED KINGFISHER — present all summer on South Fork.
COMMON FLICKER — present all summer.
PILEATED WOODPECKER — present all summer in fir forest west of Wawona Meadow; made two appearances in Tent City.
ACORN WOODPECKER — present all summer on lower Alder Creek Trail.
YELLOW-BELLIED SAPSUCKER — occurred occasionally through the summer.
HAIRY WOODPECKER — occasional.
WHITE-HEADED WOODPECKER — two sightings for the summer.
WESTERN KINGBIRD — appeared in Wawona Meadow in mid-August; possibly a fall vagrant wandering up in elevation.
ASH-THROATED FLYCATCHER — seen once in August, Wawona Meadow. Possibly another fall vagrant.
BLACK PHOEBE — seen occasionally along South Fork and in willows in Wawona Meadow.
WESTERN WOOD PEWEE — this must be the most numerous and most vocal summer bird in the area. Present from 11 June through 30 August; less vocal after mid-August.
OLIVE-SIDED FLYCATCHER — numerous and vocal from 11 June through mid-August.
VIOLET-GREEN SWALLOW — one sighting over Wawona Meadow in mid-August. Possible migrant flock.
ROUGH-WINGED SWALLOW — one sighting in June.
BARN SWALLOW — seen mostly in early August; nested under eaves and porches at Wawona Hotel (must have had interesting consequences for guests dining on the veranda.)
STELLER'S JAY — present all summer; counted fifteen feeding on chicken feed thrown out for chickens in History Center.
SCRUB JAY — occasional sighting in scrub manzanita/*ceanothus* thickets on Alder Creek Trail.
COMMON RAVEN — occasional.
MOUNTAIN CHICKADEE — common but sporadic on Alder Creek Trail and in fir forest.

PLAIN TITMOUSE — one sighting on lower Alder Creek Trail.
COMMON BUSHTIT — very sporadic; three sightings on Lower Alder Creek Trail. In flocks of 8-12, loosely associated with mountain chickadees.
WHITE-BREASTED NUTHATCH — very occasional in black oaks and on dead snags on lower Alder Creek Trail.
RED-BREASTED NUTHATCH — very common and vocal on Lower Alder Creek Trail and on Meadow edge.
BROWN CREEPER — sighted individuals all summer; never seem to associate.
WRENTIT — in *Ceanothus* thickets on Alder Creek Trail; more often heard than seen.
DIPPER — occasional on South Fork.
LONG-BILLED MARSH WREN — two sightings in Wawona Meadow in late August. Migrant or late vagrant.
ROCK WREN — one sighting, Alder Creek Trail.
CALIFORNIA THRASHER — one sighting, early June, Alder Creek Trail.
AMERICAN ROBIN — present all summer.
HERMIT THRUSH — one sighting in mid-August. Probable migrant.
WESTERN BLUEBIRD — sporadically common, usually over golf course and meadow.
TOWNSEND'S SOLITAIRE — one sighting at top of Chilnualna Falls.
GOLDEN-CROWNED KINGLET — one sighting in early August.
SOLITARY VIREO — sighted once in early June on Alder Creek Trail, once in late August on edge of Wawona Meadow.
ORANGE-CROWNED WARBLER — seen only in early summer on Alder Creek Trail and on Wawona Meadow edge.
NASHVILLE WARBLER — one sighting in June on Alder Creek Trail.
YELLOW WARBLER — seen and heard all summer in willows, Wawona Meadow.
YELLOW-RUMPED WARBLER — seen occasionally in early summer, then flocks of immatures in Wawona Meadow on 14 Weptember. Must be migrants.
BLACK-THROATED GRAY WARBLER — seen in oaks on Alder Creek Trail in early summer and on Wawona Meadow edge in September.
HERMIT WARBLER — one sighting in firs on 14 September; must be migrating down.
MacGILLIVRAY'S WARBLER — seen occasionally throughout the summer in willows and meadow edge.
RED-WING BLACKBIRD — seen in Wawona Meadow in June; apparently breeding. By early August, only females and immatures were seen.
BREWER'S BLACKBIRD — abundant in corrals, lawns and on golf course.
BROWN-HEADED COWBIRD — very occasional.
WESTERN TANAGER — occasional throughout the summer.
BLACK-HEADED GROSBEAK — common nesting species; seen all summer. Last recorded 30 August.
LAZULI BUNTING — sighted twice in Wawona Meadow, August. Probable breeding species as male and female were seen in both sightings.
EVENING GROSBEAK — seen or heard daily from 19 July til end of observation period. Immatures present in first sighting; I doubt that they nest here.
CASSIN'S FINCH — sighted once in early summer in Wawona Meadow.
LESSER GOLDFINCH — commonly seen in Wawona Meadow from mid-July through mid-August.
GREEN-TAILED TOWHEE — seen once on 14 September in Wawona Meadow.
RUFOUS-SIDED TOWHEE — fairly common in willows in Wawona Meadow.
LARK SPARROW — sighted once on 15 September in dry east edge of Wawona Meadow.
DARK-EYED JUNCO — common nesting species along lower Alder Creek Trail.
CHIPPING SPARROW — seen occasionally throughout the summer. Must have nested on drier east side of Wawona Meadow.
SONG SPARROW — very common nesting bird in willows in Wawona Meadow. Seen all through the observation period.

WELCOME TO THE WALDORF HAUSTORIA

Steve Gold

Many visitors to Yosemite wonder — what is that chartreuse growth on the trunks and branches of the pines, firs, and cedars? Often it is referred to as "that green moss" by Park visitors who are asking me if it is harming the trees. It is not a moss growing there in the virtual desert of a tree's trunk. In fact, I am hard pressed to tell the inquirer that it is a plant at all.

If we were to cut a thin cross section from this branching growth, and examine it under a microscope, its hidden secret would be revealed. Enclosed by the brightly colored outer cortex is a dense pith of compacted and interwoven threads. The center may be less dense, or even hollow. Scattered throughout this white mass, most abundantly just below the cortex, are small green specks (fig. 1).

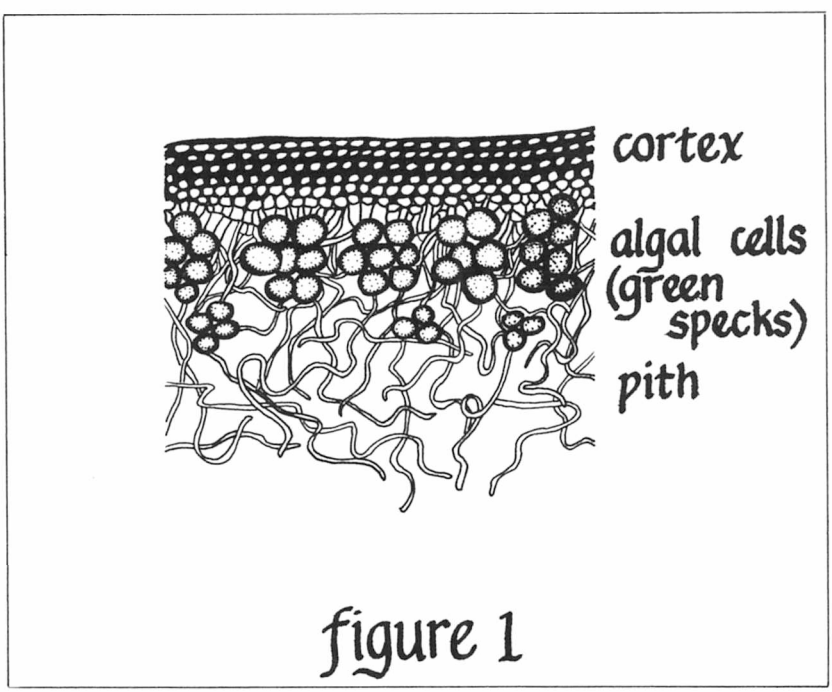


figure 1

Focusing our attention on a single green speck, we increase the magnification until its structure becomes discernable — it is a cell containing green chloroplasts; the organelles possessing the photosynthetic pigment chlorophyll. Ah ha!! If it can photosynthesize, producing its own food using the sun's energy to power the food factory, it must be a plant! In fact, this minute green cell is one of the most ancient of plants: a green algae.

But what is algae doing on the side of a tree trunk? They need moist, sheltered environments — in oceans, damp soil, lakes, and streams. How could it survive on the sun baked skin of a pine?

If we move our specimen slightly, so that we are looking at the white threads, another discovery strikes us. These threads are also made of cells, joined end-to-end instead of solitary, and without any chlorophyll. Unable to manufacture their own carbohydrates, these cells must take their nourishment from other sources. Similar threads can be found elsewhere in nature — on bread, running through rotten logs, in soil, even on damp carpets. These threads are the body of a fungus — an organism which is neither plant nor animal, but belongs to a separate kingdom of parasitic or saprophytic organisms.

Moving the microscope slide once more, and switching to a higher power, let's examine the edge of an algal cell (fig. 2). The fungus is wrapped all around it, and actually penetrates the alga with a specialized organ called a haustorium. It is here that the key interaction between fungus and alga takes place. Through some unknown persuasion, the fungus causes the alga to produce extra quantities of the sugar ribitol. This sugar is produced by an alga on its own only in very small amounts. The fungus absorbs this sugar, and quickly converts it to manitol, another sugar, but one that is not usable by the alga. Manitol is the fuel that powers the metabolic engines of the fungus.

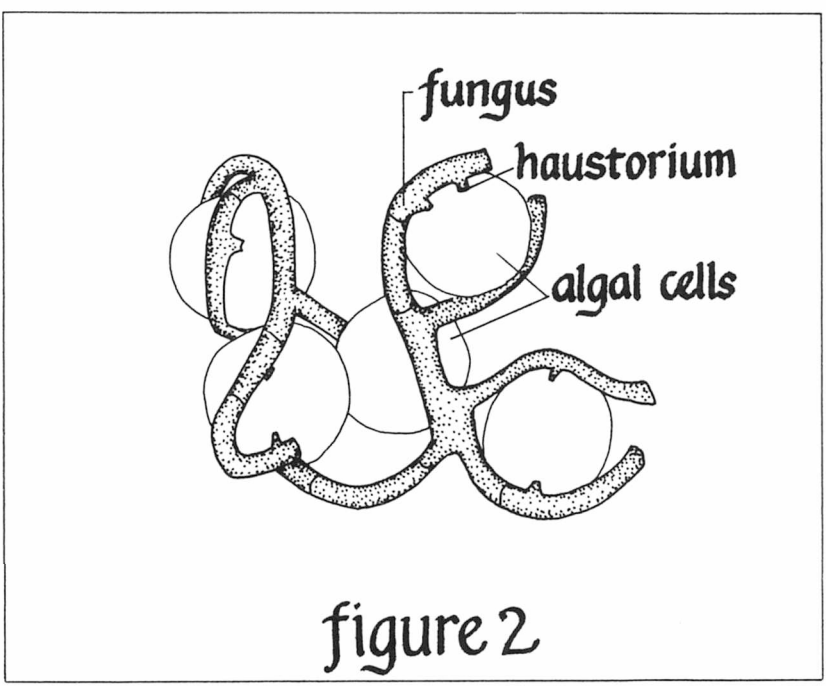


figure 2

The alga feeds the fungus. What does the alga get out of the deal? Protection, for one thing. The fungus surrounds the alga, and screens out the ultraviolet radiation with its bright outer pigmentation. In addition, the miles of thread comprising the fungal body has a very large surface area, enabling rapid absorption of water and atmospheric trace elements, some of which are then passed on to the alga. Almost all nutrients are taken from the air, the tree is little used except for support. Only through this mutual protection and feeding are these two separate organisms able to survive in the unhospitable environment of a tree trunk.

This green wonder of cooperation is called a lichen. More specifically, its name is *Letharia*, the Wolf Lichen. There are many types of lichen, ranging from the leafy arctic groundcover known as Reindeer Moss (really a lichen), which may take 100 years to grow and is the caribou's equivalent of wheat, to the brightly colored crusts of life that embellish rocks high above the Sierra timberline.

Lichens have a long and interesting role in the affairs of humans. Many lichens yield dyes when variously treated. The original Scottish tweeds were colored by a lichen dye soluble only in ammonia. In those days, ammonia was not readily available in large quantities, so all the men of a village would urinate into a large vat. Into this fermenting mess, the lichen and material to be dyed were then placed. Not surprisingly, this colorful and odiferous practice has been replaced by more mundane, modern methods.

Due to their absorbent properties, certain lichens have been used for padding material, or as a dressing for wounds. Also, because of these attributes, lichens today play an important role in the cycling of atmospheric pollution. Not only does the fungal partner absorb useful materials from the air, but harmful ones as well, including radioactive fallout. Most fallout comes to earth near the poles, where in some places Reindeer "Lichen" forms a near continuous carpet over the earth. Such materials as cesium, and stronium-90 become concentrated within the lichen. Since the caribou subsist almost entirely on this lichen, they accumulate these radioactive substances in their bodies, concentrated by a lifetime of eating the lichens. What of the wolves, grizzlies, and people that dine on the caribou? Some Eskimos are so affected by the bone-brittling poisoning from cesium that they can break a leg trying to pull on a boot.

The relationship between the fungus and algae in a lichen is called symbiosis — a mutual give-and-take relationship, in which each partner has something to offer, something to gain. Lichens in turn are involved in a larger relationship with air, soil, water, and fellow organisms; using some perhaps as support, providing nutritional or even economic support for others.

We too are involved with our fellow organisms; and the earth and the sun which supports us all. Could our relationships with cats, cattle, or corn be compared to a lichen symbiosis? Surely we are all tangled up together — dependent upon each other in one way or another.

Lichens make me think of human civilization. If the fungus took too much from the alga; alga, then fungus, would perish. Does not the earth support us as the fungus is supported by the alga? Do we give the earth anything in return to make it a symbiosis, or is it more of a parasitic relationship? Whether consciously or not, the fungus cares for its host.

Have we as much self-preserving wisdom as that microscopic thread?

NURSING BEARS

Chris Russo

Upon arriving in Yosemite National Park, visitors frequently ask me "Where's the wildlife?" Although unstated, I know the wildlife picture is of deer, mountain lions, foxes and bears. Directing anyone to a guaranteed find is unpredictable by the very nature of nature.

However, if directed toward a concentrated area of smaller wildlife (beetles, millipedes, frogs) the visitors are less likely to be disappointed — especially if perchance a bear or buck happens along. Tune-in on nature's more subtle beauties and often the more spectacular ones will find you. Experience has proved me out.

Time and again, while poking around a stagnant water hole looking for mosquito wigglers, I have been rewarded with the visit of a curious squirrel or a dipper looking for lunch in a nearby stream. But try telling a Park visitor looking for wildlife to spend his time in stagnant ponds and he'll probably be sorry he asked and walk away mumbling, "You're crazy." After all, he reasons, bears don't hang out in scummy ponds. He has missed the point.

For example, my interest in the lodgepole pine needleminer moth is what lured me for an all-day hike to needleminer study plots with Dr. Thomas Koerber, United States Forest Service. As a result of the needleminer hike, we saw a sight we will never forget. After a satisfying day of work visiting the study plots, we were returning by way of a little used fishermen's trail. Listening, while following Tom down the trail, I heard movement in the distance. The wildlife making the sound was bears — the animal everyone wants to see!

The shade made the bear appear black, but she was a cinnamon color with an orange ear tag. Of course it was big: all bear stories are about big bears. We soon noticed that the big bear had two cubs. They saw us, too. Communication began quickly. A nose turned toward her cubs, a grunt, and the cubs headed up a tree. Taking a breather after their quick ascent, the cubs peeked around the trunk to look at us. Mother bear remained at the base of the tree eyeing us, as we tried to see her identification number. With the cubs safely up the tree, the mother bear ignored us to take a rest.

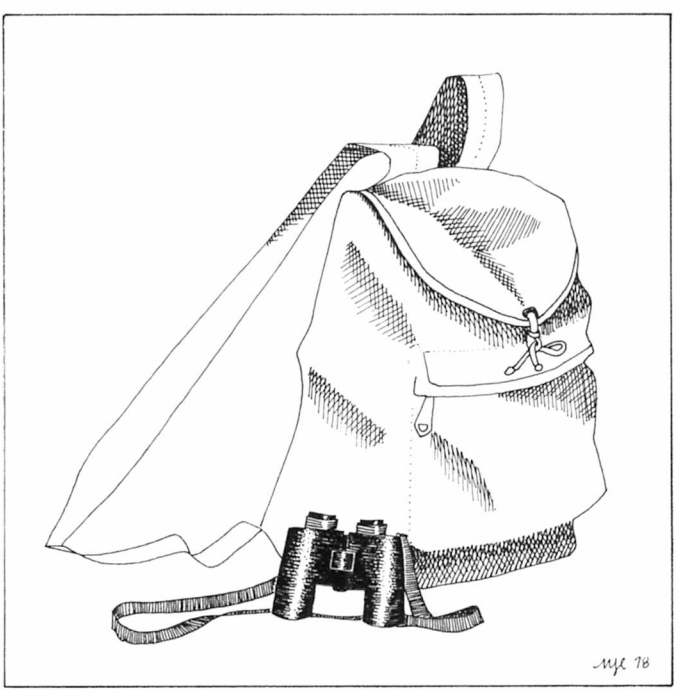
We circled around to a granite outcrop to get a closer look. Imagine sitting 140 yards from three bears, only to have mother bear snooze. Time passed. Now and then she'd reshift her hips for further comfort, raise her head effortlessly, give a few snorts, and flop down again. If there was a distant sound she would show brief concern with another lift of the head. Finally she appeared knocked out, so the cubs thought.

Backing down the tree, the cubs awoke mom and up they went twice as fast. The hip shifting, a few snorts, a flop of the head and she's out again. The cubs and us grew restless. Tom and I began discussing the snoozing mother's behavior. We concluded it must be lots of work raising cubs and were satisfied she had an opportunity to rest. Next, the cubs quietly crept down the tree again and pounced on mom.

Having few options now, the bear rolled on her back, right paw and hind foot in the air, left paw and foot dangling, relaxed and nursed her young — an unexpected and unusual sight for us. Eight minutes later a distant sound interrupted the mood and up they sprang. The alarm ended the nursing. The cubs, filled with energy-providing milk, became playful and a nose-pawing episode began among the three. Mom soon tired of the game, and snoozed-out again. The cubs took a few minutes to sniff the area and they too fell asleep. Nothing seemed to bother them now. One hour and fifteen minutes were well spent and this we felt was the appropriate exit time.

Upon returning to camp, we told of our summer's highlight experience to the Berkeley bear study people. Without the bear identification number the bear study people had no knowledge of the bears we had seen. Tom and I found out why the mother was so anxious to sleep: this bear and her cubs were notorious for staying up nights searching through backpacks for food at a popular lake where backpackers stay. From where we found her she still had an uphill journey that evening of a few miles. It seemed almost impossible that the bears we saw would spend their time rummaging through aluminum-framed backpacks full of food. I guess if I were a bear, I'd lift my paws for freeze-dried filet mignon or squeeze-tube honey, even if it meant giving up a few daylight hours of roaming.

It was once said, "A bear in the wilds is worth more than twenty at a feeding trough." I think Tom would agree that this certainly is the truth.



WITH A BEE IN MY BONNET AND A SANDWICH IN MY PACK!

Wilma Bouman

I suffer from that common disease called "looking at," a disease Will Neely so clearly described in "Pine Trees, Barnacles and Everything" (*Yosemite Nature Notes, 1977*). However, now that I've completed six seasons in Yosemite's granitic dome palaces under the influence of fiercely dedicated naturalists, I am beginning to feel at home in the mountains.

The beatific side of warm friendly slopes — their faces of the morning sun — is beginning to offset the cold and haughty grandeur of their evening side. Maybe this is a stage in convalescence; I feel the mountains are to be both loved and feared.

To help counteract the illness of just "looking at" nature, I have to keep telling myself that I must be part of nature and then the "unthinking, unformed moments" will enrich the mind and spirit as well as the senses. The song of the mountains will sing eternally in the ears, its imagery will be indelibly impressed so that it can be recalled at the touch of a wish.

One day I planned to hike to Young Lakes. I had no obsidian to trade with the Young Lakes Indians; no acorns to exchange; I mustn't go just to "look at." What then was to be my objective? Why, then I would see how far I could walk in a day and thereby prove myself in other ways. Perhaps that, too, had its merits, at least as a physical feat.

So, on a clear, sunny August morning, I started out, sprightly of step and feeling, along with the postman of old, that "neither hail, nor sleet, nor dead of night" could stop me in my worthy endeavor, (although I wasn't so sure about that "dead of night").

Dark-eyed juncos "tched" encouragingly from trail-hugging shrubs; an occasional chickaree undulated across the path; the sun got hotter and hotter and finally forced me to put my sweater in my scanty-weight daypack.

There along the trail, just at its edge, grew a green gentian. It barely peeked-out as though apologizing for its dwarfish appearance. Unlike its tall showy sisters, this one was less than eight inches high. Perhaps it had been injured in some way, a naturalist later suggested. It looked like a single branch of a larger plant, a branch which had been thrust into the ground, later to take root and finally burst into a shower of green and lavender blossoms.

Taking the short trail to Dog Lake from the one encircling Lembert Dome, I froze in my tracks at the appearance of a Pine Marten who also froze on the spot, he eyeing me and I him. The fixed moment did not last long. I just had time to take in his overly long Siamese-catlike body, puppy-dog face, and bristling blackish tail — and then he was gone and yet he wasn't gone! His weasel-like image continued to hang in the air like that of the Cheshire cat in Alice in Wonderland. Even today it refuses to fade.

It had been an exchange of "looking ats" and yet we were both part of the same small drama. What a wonderful beginning for a day's hike that had only the counting of miles as its principal objective!

Dog Lake, hardly awake, was beautiful as it hung quiet in an early morning stillness. The desire to stay was there, but I couldn't afford the time so pressed on toward Delaney Creek.

It is past the creek and in the Delaney Meadow, once one is clear of the forest, that one is forced to walk backwards. Here was a view that awed and overwhelmed. Here is the marvelous Cathedral Range of high sculptured peaks that begins well south of Mt. Lyell and continues the panoply in a majestic sweep that swings westward and then to the north around Ragged Peak and on eastward.

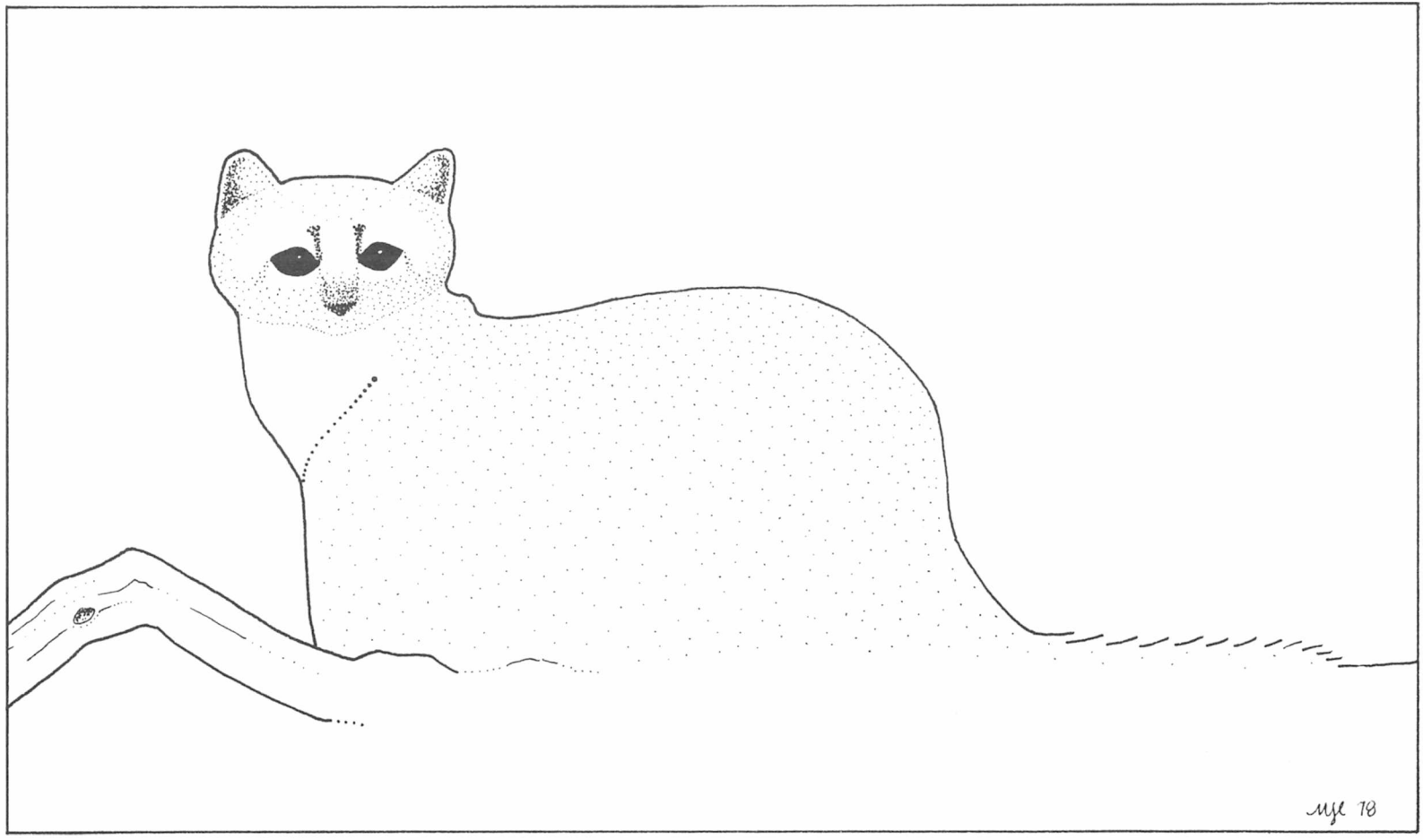
A series of shining white summits piercing a sky whose azure seems to soften the dazzle. But what are words? One can describe but not yet "see"; much like the old man in Robert Frost's "The Mountain" describes the spring on the summit and then says he has never seen it. There are various ways of seeing.

But here one seems to stand in the presence of almost too much grandeur. To cut off such a view abruptly wouldn't be at all fitting and so one leaves the place after several over-the-shoulder looks until one is swallowed-up in other scenery. And even the less dramatic scenery is eventually given up to that of foot-watching on stony ascents as one begins to circle Ragged Peak.

After looking at the splendor of distant peaks — which gives a feeling of infinity and eternity — it is almost like holding a giant's hand lens to one of them when you come in close to the vertical rising of Ragged Peak's north side, its craggy character arranging and rearranging its mosaics from lake to lake to lake. Who can look at a mountain at such close range and not stand in awe?

The first lake, pooled in contentment, lay without a ripple; the second, like a small handmirror. But the third was larger, more cupped, more full of sky — to be inhaled like the scent of fine wine. There is something about a lake that is restful and cleansing, to be had by just looking at it. But viewing the lakes, after having been humbled by that grand display of peaks in Delaney Meadow, at least for me, was anticlimactic — a denouement in the day's play come too soon. Still, one has to recognize that Nature does not arrange her drama by means of artifice. She may draw night's curtain at the close of each day, but she fills each new day with dramas different from those of the preceding day. She seems to write an eternal epic poem for anyone who wants to wonder and be touched by it.

I had my first real rest as I dangled my feet in the water of the second Young Lake while I ate a sandwich and banana. "A well-earned rest," I said to


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myself as I lolled about, knowing the day would be too short. But after a while, my improvident mind was heckled by the haunting thought that I might get back after dark if I didn't begin the homeward trek. And so I left.

Watching my feet over stony trails is a chore, but the descent around Ragged Peak had to be made. And who knows what joys may await the hiker on his homeward journey? So with that in mind, I picked up my lagging feet and flagging spirits.

Around the dome, just north of the Delaney Meadow, there was a sound: leaves rustled and feathers whirred as a great bird took off and soared directly over my head. It was a goshawk and, as I watched from so near, dazzled by the broadly barred gray and white wings and long tail, he set his course toward Glen Aulin. I sat down on the ground and said "Oh, Oh, Oh" to the skittering squirrels and stately pines — they were part of it all, noticing nothing strange on the scene — except perhaps me.

Now, for the entire stretch of the Delaney Meadow, I could walk right into that Cathedral Range experience and imagine Nature improvising a new symphony each day — in, out, and through those peaks and domes of golden splendor.

I rested once again at Dingley Creek and drank from its crystal stream which sang, muffled in an emerald scarf, brilliantly flowered with scarlet paintbrush. Its scarf, a grassy one shot through with reds, blues, and yellows of late flowering plants, was the one gay note carelessly slung across the harvest shoulder of that golden meadow. That bright ribboned stream of gurgling laughter cheered the heart and lifted the spirits.

Now the trail led into the forest again and, nearing Dog Lake, two mule deer, a doe and fawn, caught my eye and the three of us exchanged looks. None of us moved. I enjoyed their large ears, their liquid eyes, their curiosity. But what could I give them in return? After a minute or two I started softly yodeling to them; they seemed to like it. At least they stood a captive audience of two. Then I sang some old songs, including a Scottish one in memory of John Muir, and finally Old Hundredth, that grand old hymn that John Muir said had scattered his audience helter-skelter on the two occasions he sang it. My audience seemed to like that doxology: perhaps the musical taste of contemporary deer is less demanding.

Hiking alone has its perils as well as its joys. At one place on that memorable walk, a bird performed on me, the end result skittering across my glasses to end in a plop on my sleeve, an act so fast I had neither the time nor the inclination to try to "look at" the source of my discomfiture.

Another brief stop at Dog Lake. A cold chill shivering across its surface prompted me to put my sweater on again. And then, well before dark, I was back in camp and the number of miles I had trekked remains what it always was — a mere number to be tossed into the bucket of dull things along with tax receipts and other uninteresting facts and figures.

The wonders of that hike will continue to put a bee in my bonnet and a sandwich in my pack.

THE EFFECTS OF THE DROUGHT ON YOSEMITE NATIONAL PARK

Lauren Tissol

"Valley Visitor Center. May I help you?"

The voice at the other end replied, "Yes. I am calling from Chicago and I am planning to visit Yosemite Park next month. I know California is having a drought and I was wondering if it would be worth my while to visit Yosemite. Is it all dried up and brown?"

I looked out the window at the oaks coming into bloom and the green meadows beyond. He was correct in assuming that if California was having a drought Yosemite would be affected. But most people forget that Yosemite encompasses a great land area, and elevations that range from 2,500 foot foothills to mountain peaks of 13,000 feet. Within its boundaries, each area has a different network of lakes and rivers and a precipitation pattern common to that elevation and terrain. Some areas of the park were severely affected by the dry weather and others very little.

The effects of the past year and a half of drought were reflected in the snow surveys. Each winter, the snow depth and the water content are recorded at eleven snow courses in Yosemite. The Gin Flat snow course, located on Highway 120 just northeast of Crane Flat, is typical of the results gathered at other locations.

GIN FLAT SNOW COURSE
7,000' elevation

SNOW DEPTH (INCHES)

MONTH	1977	1976	AVERAGE	% OF AVERAGE 1977
May	Bare	14.4	78.9	0%
April	17.5	22.7	78.2	22%
March	15.9	29.8	74.3	21%
January	15.3	0.0	59.6	25%

In the winter of 1976-77 at Gin Flat, there was 17% of the average snowfall. This lack of precipitation for the second successive winter necessitated that a Drought Action Plan be formulated. The Drought Plan set up guidelines for what should be done to preserve the natural objects within the park and to provide domestic water. The three phases of this plan required increasingly stringent steps to be taken to conserve water. The Yosemite Park and Curry Company, the main concessioner, also set up water conservation guidelines for its facilities and employees. The park visitor was asked to minimize water use. As the months passed and water became more scarce, areas in the park moved from each current phase of the Drought Action Plan to the next more restrictive phase.

By the beginning of August, the waterways in Yosemite Valley had diminished drastically. Summers in Yosemite are normally dry, but 1976 and 1977 were drier than normal. Tenaya Creek dried completely and Mirror Lake, fed by the creek, was a moist mudflat. The Merced River, a major waterway that passes through Yosemite Valley from one end to the other, continued to flow but at a level that hadn't been observed in many decades.

A decrease in flow in a river will allow dissolved solids to increase in concentration and may also affect the temperature of the water, thus affecting the aquatic plants and animals. The Resources Management Division kept an eye on all the waterways in the Park and whenever possible, reduced the human use of water so that more would be available for the plants and animals. When Bridalveil Creek became very low in July, restrooms and water taps in Bridalveil Creek Campground were shut off and it was made available only to self-contained vehicles. In the latter part of the summer, campgrounds on the western end of Tioga Road had no water, and visitors were asked to bring their own water.

Many people were concerned with the fire danger present during a drought year. Some areas in the Sierra Nevada and the coastal mountains of California experienced fires of great magnitude, but Yosemite fared well. For two days in July, Yosemite Valley was filled with smoke so dense that one could barely see from one Valley wall to the other. It was said that this smoke had blown from the Mt. Diablo fire, located in the coastal mountains some 200 miles to the west.

Backpackers in Yosemite carried a lot more water in 1977 than they had in many years. Only lakes and major rivers could be counted upon to have water when the thirsty backpacker reached his destination. The Backcountry Division asked that all water be purified and stressed the importance of not introducing anything foreign into the waterways. In many areas, there simply wasn't enough water available to dilute the concentration of unnatural pollutants to a tolerable level for consumption by living things.

Some areas of Yosemite were greatly affected by the drought and others very little. If the dry winters continue, more of the Park will be affected and animal and plant distribution and migration may alter significantly. Changes brought about by a drought or other natural phenomena are normal to a natural area like a national park, and Yosemite continues to change every day.

THE FLOOD OF 1977

David Balogh

It was the driest year on record for the Sierra Nevada, the second successive drought year, with less than 40% of normal precipitation. June is normally a cool and beautiful month in the park, and this June started as no exception. The abnormally heavy May rains had filled the meadows with deceptively large amounts of water, but most of the snow in the high country was missing and its melt water, life blood of the meadows, would soon drain away.

By the second week in June, the temperature had climbed to that of August, and as the month wore on, park residents, visitors, and animals sensed a subtle change in the air. The air was not only warm but becoming humid as well. Water vapor in the air is a hopeful sign; it is the raw material of clouds — a byproduct of which would be welcome rain, but the cold air necessary to produce snow was held in check by a great mountain of air to the north and another even larger high pressure area to the west — the great Pacific High (Fig. 1, #I). The cold air could not move south from Canada. All storm fronts were being held and forced northward. The Pacific High dominated the weather charts as the Himalayas dominate Asia, and to the air, it was just as formidable a barrier as mountains are to man. By the second week of June the mornings dawned clear and warm, but as the day progressed clouds appeared above the summit of the Sierra. By 3:00 p.m. the summits of the range disappeared from view at Glacier Point, and flashes of lightning and thunder claps treated the visitors at the Point to one of nature's most magnificent shows. By evening the clouds were disappearing and by 9:00 p.m. the sky was clear again and the summer stars shown clear through freshly-washed air.

As the month drew to a close, clouds began to appear earlier in the day, became larger in the afternoon, and to stay longer into the evening. Forces in the great atmospheric engine of the earth, which make man's machines insignificant by comparison, were slowly, invisibly, and inevitably becoming more and more out of balance.

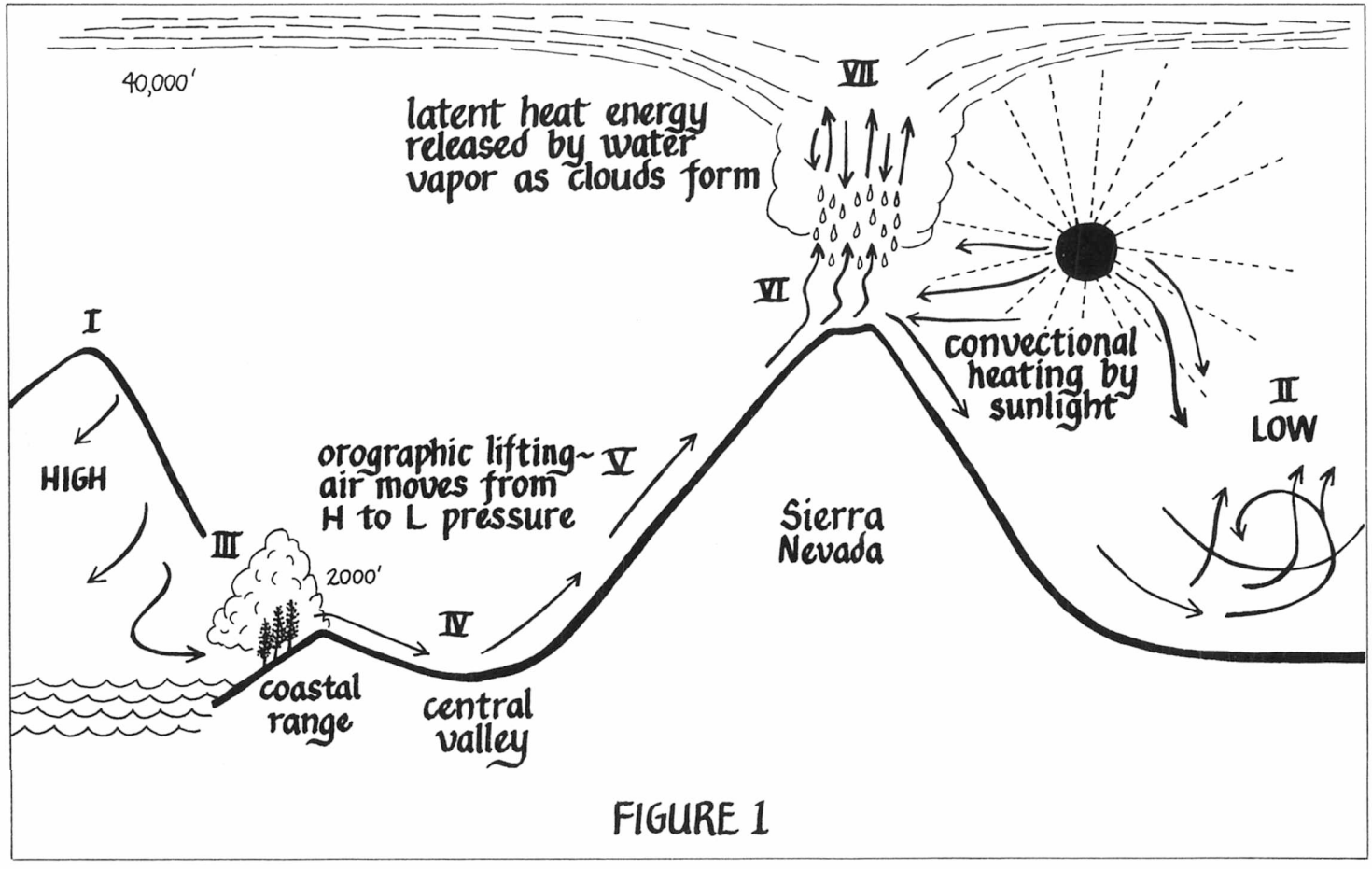

40,000'
latent heat energy released by water vapor as clouds form
VII
VI
I
convectional heating by sunlight
II
LOW
HIGH
orographic lifting~ air moves from H to L pressure
V
III
2000'
IV
Sierra Nevada
coastal range
central valley

FIGURE 1

Although invisible, these forces are measurable by products of man's ingenuity. On June 27, the weather maps showed an area of low pressure to the east and south of the Sierra. The area over Las Vegas had become heated by the desert sun and air, warmed in turn, and forced to rise as a hot air balloon (Fig. 1, #II). Into this vacuum, air tried to move but did so only at the surface. The source of this moving air was the Pacific High, but as this air moved across the vast Pacific Ocean, it evaporated water from the sea and as the air continued in its journey to the south and west, it faced the mighty heights of the Sierra, and as miners and native Americans before it, the air had to climb the mountains to reach the other side.

As man must obey the laws of nature, so must air. Although some of the air's moisture had been left behind in the California Coast range to produce the drip fog so necessary to the coast redwoods (Sequoia Sempervirens) (Fig. 1, #III), the majority of the moisture remained. The air crossed the heated central valley of California by night (Fig. 1, #IV). The lower 2,000' of moisture was removed by the coast mountains. The now drier air moved unnoticed past the grape vineyards, almond orchards and ripening vegetables of the central valley. It was dawn Tuesday, 28 July 1977.

At the Fresno office of the National Weather Service the forecast for Tuesday was posted over the teletype:

NATIONAL WEATHER SERVICE FRESNO CALIFORNIA
0300 PDT JUNE 28 1977

SOUTHERN SIERRA NEVADA
VARIABLE CLOUDS THROUGH WEDNESDAY WITH
SCATTERED AFTERNOON AND EVENING THUNDERSTORMS.
CONTINUED WARM. TEMPERATURES AT THE 5 THOUSAND
FOOT LEVEL MID 80S IN THE AFTERNOONS AND NEAR 60 AT
NIGHT.

The forecast was like those of the previous days and caused no particular reason for concern, for thundershowers had been the rule each afternoon for almost two weeks. What was to happen today was not a question of the accuracy of a forecast, merely one of severity. Any prediction is only as good as the availability of data to use in its preparation. The atmosphere is a three dimensional entity, constantly changing, challenging man to measure its fickle nature.

That morning the clouds formed a little earlier than usual. The ranger naturalist on duty at Glacier Point noticed that the humidity was also high. By 10:00 a.m. visitors to the Point were spending more time engaging the magnificent view from the shade of the trees and less time was spent at the railing in the sun's full light. The people, dressed in shorts and light clothing, some with large brimmed hats, looked more like a beach crowd than visitors to a pine and fir forest at 7,000' above sea level. To the mid-westerner or easterner visiting the Point, the day seemed quite like home. The temperature had risen into the high 70's and the humidity well above the 50% mark. But the view was quite different than that of "home" for nowhere east of the Rockies could one look upward to land 6,000' above while standing 7,000' over the level of the sea.

By 2:00 p.m. the rocks of the Sierra had reached their highest temperatures of the day. All morning, the air, which such a short time ago had

been brushed by the waves of the sea, had been forced to rise up the great body of the Sierra as if being drawn by invisible ropes of low pressure to the east (Fig. 1, #V). Now, the same air was also being lifted by the hotter and less dense air rising from the rocks like heat rises from a stove (V).

The meteorologist would say that the orographic effect of the mountains was being enhanced by the convectional heating of the Sierra Granites. Rising air expands while going up because the weight of the air over it lessens. Whenever a gas expands it cools. Cool air cannot hold as much moisture (in the form of a gas-water vapor) as can warmer air — and today's air was holding a lot of moisture.

The winds are the transportation network of the atmosphere and the passenger is water vapor. Contained in each gram of water vapor are 580 calories of heat energy — almost six times as much energy as required to bring water to a boil from freezing. Whenever one gram of water vapor (a colorless, odorless gas) turns into water liquid (visible as a part of a cloud) this energy, latent since the air left the sea, is released into the air. The energy released warms the air, and the air, now thus warmed, will add to the rising force pulling up air from below which in turn will release its energy and, like a great mushroom, the cloud thus formed will rise to heights dwarfing even the mighty Sierra (Fig. 1, #VII). The more water vapor in the air, the greater latent heat energy. Today, all conditions were correct within a small region of the Sierra Nevada to concentrate their energies into a single and singularly monstrous cloud.

By 3:30 p.m. the view from Glacier Point was awe-inspiring. The towering masses of granite were playing only a secondary role in the scene. The clouds, with their bases at 9,000' and tops above 30,000' now became one in the east. To the west the sun was still shining. Half Dome was radiant with a black-grey background. The top of the cloud became visible due to its size, rather as an ant cannot see the head of a man when the man stands directly above it.

Within the cloud, the energy equal to several atomic bombs is being released. Drops of water are freezing and throwing off tiny pieces of positively charged ice balls which gave them birth. The difference in electrical pressure builds until over 10,000 volts per centimeter are attained over great distances. The pressure becomes unbearable for the moist air and is released. In less than a second about 30 million volts at 100,000 amperes of energy heats the air to 10,000°C — the lightning flashes, the air expands to thunder and reverberates along the canyon walls. Visitors at the point stare at the point. Over 100 people stand transfixed by the sight. The time is 3:45 p.m.

Within the cloud, billions of tiny ice crystals are attracting water vapor at the expense of water droplets. Some droplets are colliding with each other randomly, and still others, larger than their kindred are "falling" into their smaller brothers or drawing them into their wake. Great up-drafts are carrying millions of gallons of water into the cloud and drawing still more moisture-laden air upward to become a part of it. Finally, the size of the drops and ice particles become too large to be held up by the air and they start to fall. Most will fall at about 750'/minute, some of the larger ones over 1,000'/minute.

From Glacier Point the bottom of the cloud seems to erupt, and the whole Merced River drainage above Nevada Fall disappears, enveloped as by a grey curtain; 12,000' high mountains vanish. One cannot see 100 yards into the deluge. The ranger seeing this spectacle encourages the visitors to photograph the scene. "If you ever wanted to take a picture of rain falling from a cloud, this is your chance." Shutters click and are drowned out by another clap of thunder.

Everyone in the area is spellbound, yet the sun still shines at Glacier Point. Slowly, almost imperceptibly the cloud moves northward towards Clouds Rest, the divide between the Merced River drainage, and the narrow glacial canyon of Tenaya Creek.

Rain falls on Half Dome, Clouds Rest completely disappears, not in the cloud, but in the rain. So much water falls on Half Dome that water begins to steak down its massive flanks into cracks, along dikes, the mountain seems to develop a head of white hair as one watches. Thousands of gallons of white water in hundreds of channels flow down to Yosemite Valley. All of Tenaya Canyon disappears from view. A magnificent rainbow forms stretching from Curry Village to Sierra Point. Everyone at Glacier Point looks at the spectacle. The silence of the people is almost as deafening as the thunder. The sun continues to shine on Glacier Point.

4:00 p.m. The cloudburst moves from Clouds Rest toward Mt. Hoffman. When Clouds Rest becomes visible the enormity of the storm becomes apparent. In every possible path on the huge mass of granite, water, not in rivulets, but in torrents descends toward Tenaya Creek. The top of Clouds Rest, covered with white hail and snow give testament that rain began as ice pellets and melted as it plummeted to the earth below. Clouds Rest is white on top from snow and below the 8,000' level from water, sliding, free-falling, pushing, lubricating, washing, turning soil to mud; moving more earth in five minutes than a hydraulic gold mine in a day.

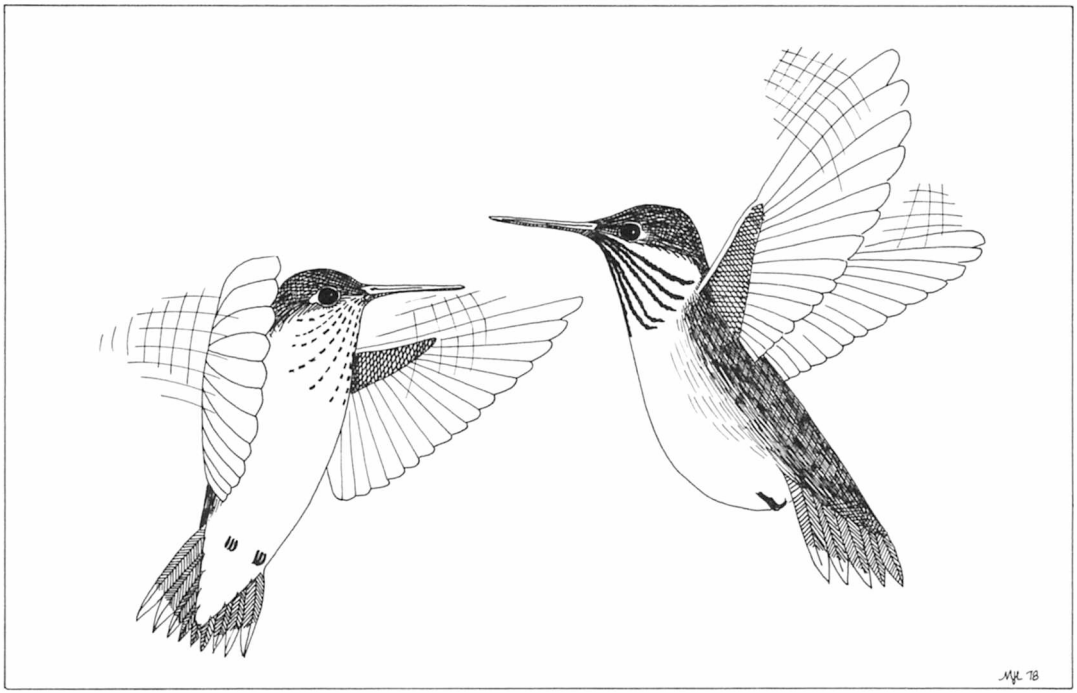
4:05 p.m. — At Glacier Point the visitors are marveling at the scene as lightning now brings its full fury to Mt. Hoffman. The ranger turns and runs to the telephone, for surely with this much water pouring into so narrow a canyon as Tenaya, the creek will overflow its banks. The people in Yosemite Valley could not see beyond Half Dome and may not even know of the severity of the storm over Clouds Rest. If ever Tenaya Canyon was flash-flooded this would be such a day.

And it was. Hikers on the Tenaya Trail switch backs, ran for cover. Most said that they could not see the storm coming until it was upon them. Many escaped with only a few bruises. Two did not. Mudslides and the flash flood took two lives shortly after 4:00 p.m. above Mirror Lake.

Tenaya Creek roared into Mirror Lake like a runaway express train. Almost all of the sand bar marking the most recent filling of the lake disappeared within ten minutes. But the presence of the lake saved further damage and possible loss of life down-stream, for the energy of the running water was dissipated by the lake. Within one-half hour after the ranger made his call, sandbars in the Merced River which had been above water for weeks were covered by rising water.

By 5:00 p.m. — the storm was over. By the evening of the 29th, water in the Merced River and Tenaya Creek was receding rapidly. Within a week virtually all evidence of the flood of '77 was gone.

All of this happened, and the sun never stopped shining at Glacier Point or Yosemite Valley, and no record of the amount of precipitation is available since there were no rain gauges in the area. It is hard to believe that the flood occurred at all, especially on the driest year of record.



"O to see like an eagle by day,
To hear like an owl in the dark,
To taste like a gull in salt spray,
To feel the air lift like a lark!"
Joel Peters (1905), "Wishing"

BIRDS OF TUOLUMNE

Howard L. Ferguson

Suddenly, there I was in Tuolumne Meadows, Yosemite National Park, just having witnessed that marvelously varied spectacle of songbird migration in the Smoky Mountains. Upon first arrival to Tuolumne, I was somewhat discouraged — no formal birdwalks had been scheduled for the summer interpretive program! I immediately organized a formal Sunday morning birdwalk.

To my surprise, and to that of many others, an exciting total of 67 species (Table I) was observed this summer in the immediate Tuolumne area (from Pothole Dome east to the vicinity around Tuolumne Meadows Lodge). The average number of species seen per 2½ hour birdwalk was 17, with a high of 21 species and a low of 12 species.

Of these 67 species, 34 species were determined to have actually nested in the Tuolumne area (actual nest or nesting behavior observed). There were 16 species which were observed throughout the summer but no actual nests were found nor nesting activities noted.

In addition to the common species observed, a number of rare or unusual birds were seen this summer (Gaines 77). These were the following:

Cinnamon Teal
Osprey
Belted Kingfisher
Acorn Woodpecker
Western Kingbird
Rock Wren
Western Meadowlark
Western Tanager
Evening Grosbeak
Lesser Goldfinch
Fox Sparrow

The explanation of bird distribution has been a matter confounding ornithologists and orniphiles for centuries. This summer was preceded by almost two years of severe drought — only 35% of the average precipitation. It is possible to speculate that the unusual bird species observed this summer may have been vertically pushed up the Sierra by the birds in the lower elevations (i.e. birds needed larger territories to obtain their usual amount of water).

Another alternative or possible additional explanation for the unusual bird distribution may have been the two consecutive mild winters which preceded this past summer. Insect population numbers may have been well above average, offering high protein diets to birds passing through the area. The Tuolumne area was literally smothered by lodgepole needleminer moths during late July and early August. In fact, the Acorn Woodpecker and the Western Kingbird were both seen insect-hawking in areas thick with lodgepole needleminer moths.

One problem, however, is that not enough data has been collected in the Tuolumne area to determine if a significant species change has occurred over the years. However, while researching this paper, I came across a 1936 bird list (Comings and Lunt) of the Tuolumne area submitted to Dr. Carl Sharsmith. Dr. Sharsmith stated that he was fairly confident of the authors' accuracy in observation. This list allows us to make at least a rough species comparison of this past summer, 1977, with the summer of 1936. Fifty-three species were observed in the Tuolumne area by Ms. Comings and Mr. Lunt. Forty of these species were observed both in the summer of 1936 and the summer of 1977. The following species were seen only in 1936:

Common Nighthawk
Black Swift
Western Flycatcher
Least Flycatcher
Olive-sided Flycatcher
Nashville Warbler
Winter Warbler
Pygmy Nuthatch
Warbling Vireo
Townsends Warbler
Golden Eagle

Twenty-five species were observed in 1977 that were not recorded in 1936 (refer to Table I).

Whatever the factors affecting bird distribution in the area, the available bird lists show that Tuolumne Meadows offer many exciting and highly rewarding birding moments with rare and unusual species to be seen. In addition, within a one hour radius at least 25 other species can be added to the Tuolumne list (e.g. White Pelican, Cormorants, Terns, Avocets). So, come join me birding in Tuolumne this summer!

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TABLE I

N - Determined to be nesting in the Tuolumne area

? - Birds observed all summer, but no actual nests observed

77 - Birds only observed in the summer of 1977 and not recorded in the summer of 1936

Eared Grebe 77
Mallard 77
Cinnamon Teal
Goshawk ?
Sharp-shinned Hawk ?
Red-tailed Hawk ?
Kestrel ?
Prairie Falcon ? 77
Osprey ? 77
Killdeer N
Spotted Sandpiper N
California Gull
Mourning Dove 77
Great-horned Owl ? 77
Rufous Hummingbird N
Calliope Hummingbird N
Belted Kingfisher ? 77
Common Flicker N
White-headed Woodpecker N 77
Acorn Woodpecker 77
Red-breasted Sapsucker N
Williamson Sapsucker N
Hairy Woodpecker N
Black-backed Three-toed ? 77
Hammonds Flycatcher N 77
Dusty Flycatcher N 77
Western Wood-peewee N 77
Violet-green Swallow N
Tree Swallow N 77
Rough-winged Swallow ? 77
Steller's Jay N
Raven ? 77
Clark's Nutcracker ?
Mountain Chickadee N
White-breasted Nuthatch ?
Red-breasted Nuthatch N 77
Brown Creeper N
Dipper N 77
Rock Wren ? 77
Robin N
Hermit Thrush N
Mountain Bluebird N
Townsend's Solitaire N 77
Golden-crowned Kinglet ?
Ruby-crowned Kinglet ?
Orange-crowned Warbler
Yellow-rumped Warbler N
Hermit Warbler
MacGillivray's Warbler
Wilson's Warbler N
Red-wing Blackbird N
Western Meadowlark 77
Brewer's Blackbird N
Brown-headed Cowbird N
Western Tanager
Western Kingbird 77
Evening Grosbeak 77
Pine Grosbeak N
Cassin's Finch N
Pine Siskin N
Lesser Goldfinch 77
Red Crossbill
Junco N
White-crowned Sparrow N
Fox Sparrow
Savannah 77
Chipping Sparrow N

SNOW — THE MISSING LINK

Jim Huning

Most persons who visited Yosemite last summer were struck by the moderate to low water conditions that existed throughout the Park. At times, visitors were even irate because Yosemite Falls were dry or showed only as a wet streak down the granite walls. Many visitors that I contacted at my campfire program on the California drought were aware of, and accepted, low water conditions in the Park and appeared to carry the 'low water concept' to their urban dwellings and practice conservation measures. I suspect that considerable mass media exposure of the drought has served to make this drought more 'real' to everyone than droughts that had occurred in the past. Perception of drought conditions varied as a function of geographic location and, not too surprisingly, occupation. A farmer or rancher from the central San Joaquin Valley was significantly more cognizant of low water conditions than the urbanite from, say, the Los Angeles Metropolitan area.

Winter precipitation during 1976-77 has gone down on the record books as the driest in California's history. The visitor must realize, however, that droughts occurred in the past, and will occur again in the future. Certainly droughts in the past (1860's, 1890's, 1924, 1931) were of similar magnitude. The primary difference between those droughts and the present one is that with the large population, agricultural and industrial bases that exist today, the perceptions and effects of drought conditions are much more dramatic. Indications are that we are entering a period of increasing precipitation variability.[1] Such a situation implies increasing environmental stress on all biota. Is this a bad or negative situation, one that should have mitigating efforts placed against it? I think not. On the contrary, it will, and is, affording us a chance to observe and examine natural processes at work. One striking example has been the 'bloom' of the lodgepole needleminer moth (*Evagora milleri*). The casual visitor to Tuolumne Meadows could not help but notice the 'rust' colored appearance

of the lodgepole pine (*Pinus contorta* var. *murrayana*), or the apparently dead lodgepole pines along the lower flanks of Mammoth Peak. Would the needleminer moth be as active if it were not for the meteorological conditions which brought on the great drought and associated mild winter conditions for the past several winters? Probably not.[2] But, the needleminer moth has been with us before — to do us a service by thinning the forest — and will be with us in the future. If the higher elevations receive a harsh winter, the needleminer infestation will subside.

The winter of 1976-77 was so mild that every winter month in Tuolumne Meadows, October-March, recorded maximum temperatures above 50°F (10°C). The lowest *daily* minimum temperature occurred in March, −11°F (−24°C). Most minimum temperatures were above 0°F (−18°C), a temperature far too mild to kill the needleminer moth larvae.[3]

How dry was the winter past? Although our precipitation recording network is sparse and of questionable accuracy (in mountainous terrain), it appears that most watersheds within the Sierra Nevada received only from 30-60% of their normal precipitation.[4] The water content of the Sierra snowpack amounted to only about 5% of the normal value on 1 May 1977.[5] In other words, all runoff had occurred by 1 May. The following winter precipitation data illustrate the severity of the drought in Yosemite.

1976-77 Winter Precipitation

	Park Headquarters (3,970')		South Entrance (5,120')	
	RAINFALL	(DEPARTURE)	RAINFALL	(DEPARTURE)
October	.82"	(−.78)	.71"	(−1.32)
November	.82	(−1.58)	.81	(−5.52)
December	.10	(−6.85)	.64	(−7.50)
January	2.00	(−4.51)	1.92	(−6.31)
February	1.87	(−3.66)	2.26	(−4.83)
March	1.85	(−3.25)	2.09	(−4.30)
TOTAL	7.46"	(−20.63)	8.43"	(−29.78)

NOTE: All data given in inches

Source: U.S. Department of Commerce Weather Bureau

Although negative departures occurred each month, the departures were especially great in several months (e.g., December). October-March precipitation at Park Headquarters and South Entrance were 27% and 22% of normal, respectively. In addition, for the calendar year 1976, Park Headquarters received a total precipitation of 14.84 inches, or 22.3 inches below normal, while South Entrance received a total of 13.65 inches, a whopping 32.14 inches below normal. Each annual total represents a precipitation amount only slightly greater than the average for Los Angeles, located in a semi-arid environment.

Yosemite, the Sierra Nevada, California and the western United States have experienced two very dry years. The question in everyone's mind is, "What will the winter of 1977-78 bring?" By the time this note is in print the question will have been answered. The best analysis to-date (September, 1977) indicates the state will have a precipitation total anywhere from 70-80% of normal.

Such a value is not good, but it does represent a substantial increase over the disastrous winter of 1976-77. In order to alleviate the problems associated with the droughts of the last two years, the state needs several years of above normal precipitation. Let us all hope we have 'bottomed' out and the next few years will record normal or above normal precipitation amounts.

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2) *Tom Koerber, U.S. Forest Service entomologist studying the needleminer infestation in Yosemite National Park, personal communication.*

3) *Data furnished courtesy of Tom Koerber.*

4) *LOS ANGELES TIMES, 28 August 1977.*

5) *WATER CONDITIONS IN CALIFORNIA, REPORT NO. 4. California Cooperative Snow Surveys Bulletin No. 120-77, State of California, The Resources Agency, Department of Water Resources, 1 May 1977.*

PETRIFIED LIGHTNING

Betty Jane Pollan

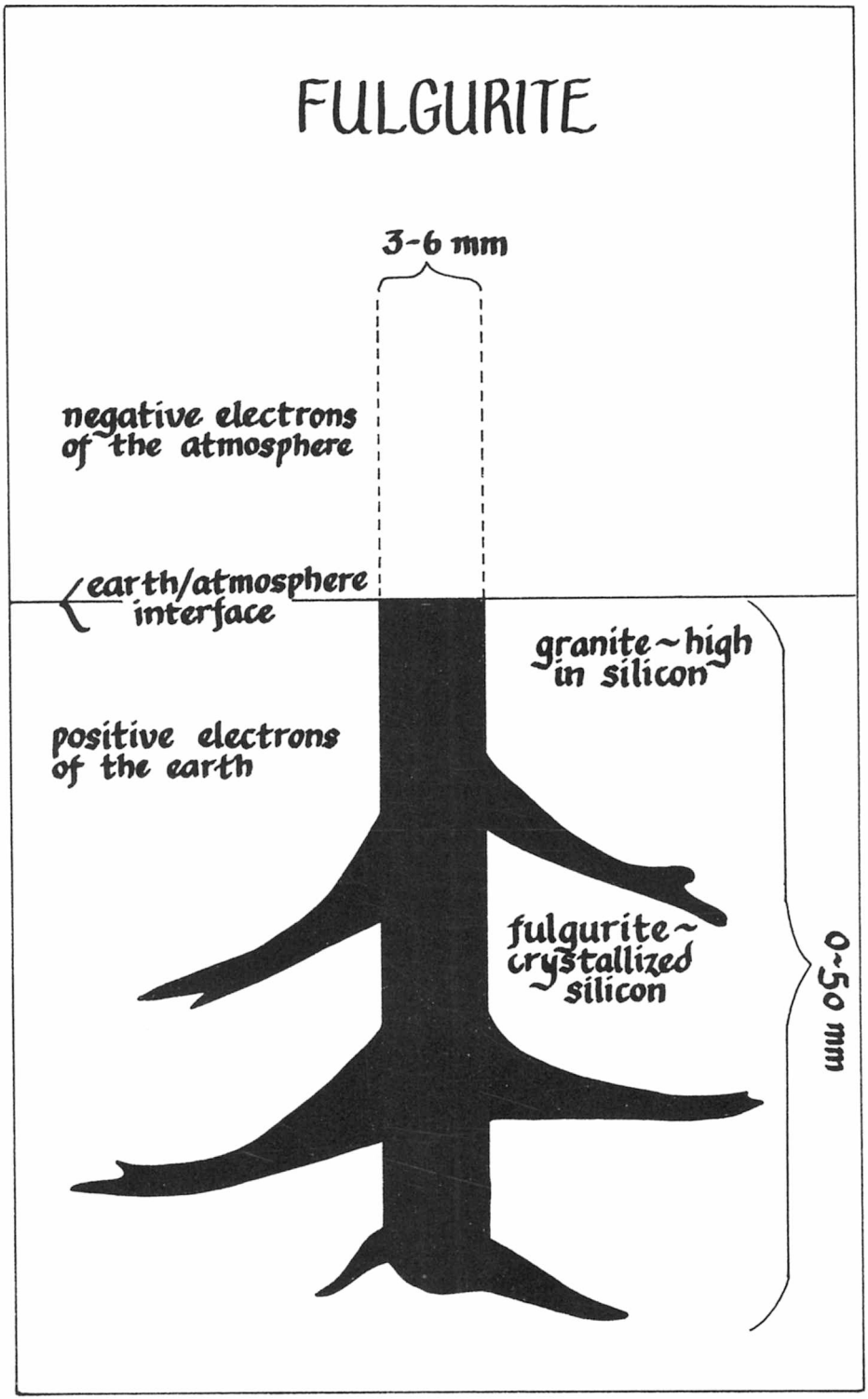
A fossil record of lightning's striking the earth's surface is called "fulgurite," from the Latin word "fulgur," meaning lightning. This "petrified lightning" leaves permanent evidence of lightning's having penetrated the surface of the earth at temperatures high enough to crystallize the available minerals.

Typically, the fulgurite is found on beaches of sand-size particles having a chemical composition high in silicon. The specimen forms when the heat produced in the lightning fuses the minerals.

Silicon is one of the four major chemical constituents of Yosemite granites; others are hornblend, mica and feldspar. It is interesting to consider the possibility of fulgurites existing in Yosemite granites; however, it is unlikely that they exist on the peaks that are routinely capped with the base of the lightning-producing nimbostratus. Lower pressure at the high altitudes induces a lightning discharge, but the extremely tall mountains rarely are struck. This apparent contradiction is explained by the fact that peaks protruding into the cloud base will be in direct contact with the negative charge of the thunderhead. The charge then drains directly into the crust via the mountain peak without igniting a spark which results in the extreme heat (1800-2000 C) necessary to crystallize the chemicals into a fulgurite. Recent studies along the Continental Divide show that lightning has a decreased charge with increased elevation and that likely no lightning ever strikes above 1800 feet.

In considering the Yosemite granites, it is reasonable to assume that those with greater silicon content and rising from approximately 5,000 feet to 10,000 feet above sea level, hold the best potential for fulgurite development.

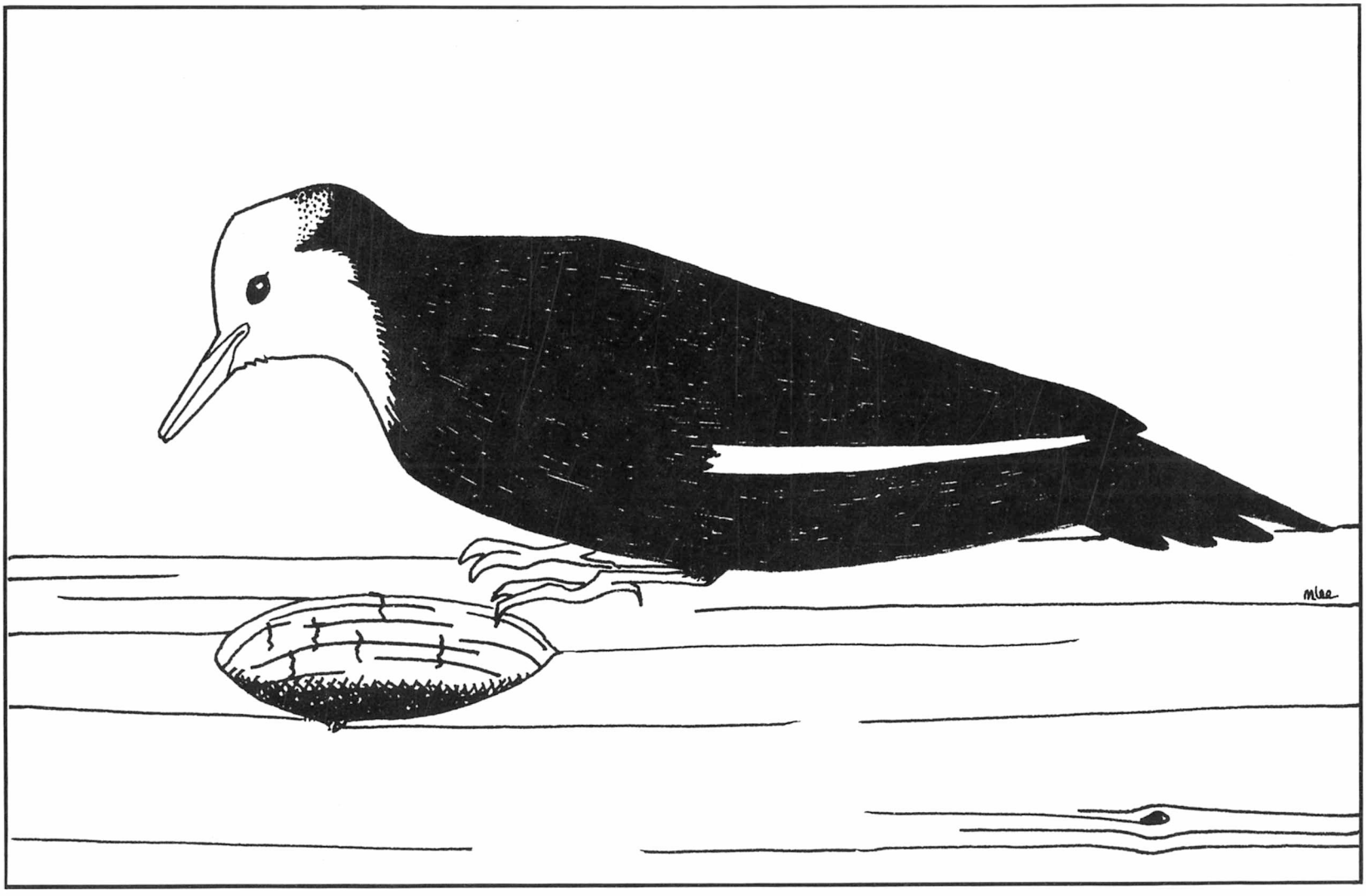
The accompanying diagram depicts the extent of fulgurite dimension and development.


FULGURITE
3-6 mm
negative electrons of the atmosphere
earth/atmosphere interface
granite~high in silicon
positive electrons of the earth
fulgurite~crystallized silicon
0~50 mm

Dr. Carl Sharsmith, who has spent nearly a lifetime in the high Sierra, reports having seen a fulgurite on top of Mt. McClure. To date, the author has not found a fulgurite in Yosemite, but the search continues.

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THE BIRDS THINK THIS IS THEIR HOME

Bob Roney

When we take something from nature and change it in form to suit our needs, is it still part of the natural scene? Most people would say that it isn't. After all, if that were the case, we wouldn't need wilderness areas: we could sit picnicking in our backyards, looking at telphone poles. "Isn't nature grand!"

How does nature perceive our doings? Do animals make a distinction between telephone poles and dead trees; between people and nature? I think not.

Six years ago, when I was a fireguard, I planted barrier logs in Hodgdon Meadow campground to prevent visitors from driving their cars off the paved roads and destroying the vegetation. The logs have served their purpose. Ferns and young pines grow between the sites and wildlife is abundant. Foxes, coyotes, bears, deer and many uncommon birds have been seen in, or near, the campground.

One day, early this summer, as I was wandering through Hodgdon Meadow campground talking to visitors, I made an interesting discovery: a White-Headed Woodpecker had made a nest in one of the logs I had planted six years ago. I visited the nest nearly every day for the next several weeks as the young woodpeckers grew. Sitting on a boulder about fifty feet from the nest, I could hear the young peeping as the adults approached to feed them. By tossing pebbles at the log, the young could be fooled — thinking room service had arrived bringing their lunch, and would begin peeping.

It's easy to become attached to wild animals watching them grow up over a period of weeks. I often wondered what chance these woodpeckers had for survival in their precarious nest. The log that housed their nest was rotting. A carelessly aimed car or a malicious kick could easily knock it over. Fortunately, that campsite was rarely used — that is, until the 4th of July weekend, 1977.

Hodgdon Meadow campground was not filled to capacity over that holiday weekend . . . it was filled far beyond capacity. Walking through the campground on Sunday, I saw that many of the barrier logs had been dug out and were being used for firewood. People had taken advantage of the openings to establish new campsites with their cars, campers and trailers. This once serene area had become a cacaphony of blaring radios, hollering kids, bellowing adults, barking dogs, humming generators, clanking dishes, hacking axes . . . one could barely hear the Steller's Jays!

In the midst of all this I saw two boys shooting at Robins with sling shots. "Hey, boys!," I shouted. "You'd better put those sling shots away before a ranger confiscates them." (I was not in uniform.) They ran away. I was beginning to feel anxious about the woodpecker family I'd been watching.

When I got to the nest site, I saw a boy standing beside the log with a sharp stick in his hand. He had been jabbing his stick into the hole where the woodpecker nest was. "Stop that!" Startled, he hid the stick behind his back. "Are there baby birds in there?," I asked. Silently he stepped back and dropped the stick. "Those birds are defenseless; you shouldn't hurt them. They have a right to live — this is their home!" I didn't seem to be getting through to him, so I changed tactics. "Do you want to see something really neat? If you sit very quietly on that big rock over there and watch this hole, you may see these babies being fed by their parents. You might even get to see the young birds stick their heads out of the hole — wouldn't that be exciting?" He was silent. I couldn't think of anything else to say.

The following afternoon I returned. To my surprise, the campground was nearly deserted — only seven sites were occupied — but the transformation was astonishing. It appeared as though a war had been staged there. Saplings and ferns, conquered by tires, lay dying. The ground was decorated with empty cans, discarded wrappers and other garbage. A throw-away diaper hung from a bush. Corncobs scattered about contrasted with "cone cobs" left over from some squirrel's lunch.

I sat down on the big boulder in this again unoccupied area of the campground. There were no adult birds to be seen, no sound to be heard from the nest. I tossed a few pebbles — still no sound. I walked to the stump and peered down the dark hole — nothing stirred. Pointed sticks were lying on the ground; the log was loose and could be wobbled six inches. Slowly, I returned to my tent to report the sad tidings to my friends. One woman, however — a more knowledgeable birder than I — said that she had visited woodpecker nests earlier, in the mid-afternoon, and the young had been completely silent.

That evening, with a glimmer of hope, I rushed back to the campground. HUZZAH!!!! Young woodpeckers, poking their heads out the hole in the log, were squeaking in their "I'm hungry" voice to their parents, who were feeding them supper. I was overjoyed! The birds had survived our celebration of independence.

The following week the young woodpeckers celebrated their own independence. They left their nest and flew off into the forest, to fend for themselves.

I wonder where they will make their nests when they mature?