

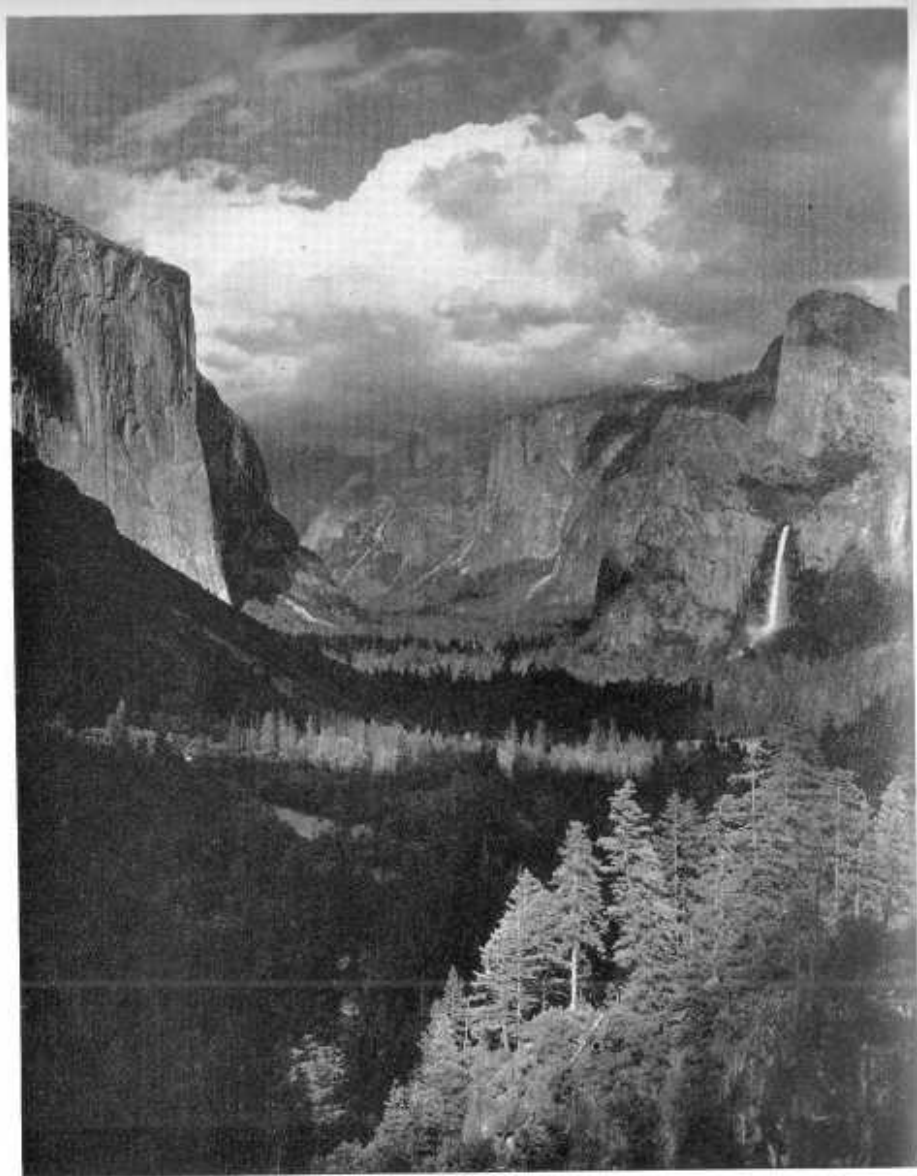
YOSEMITE NATURE NOTES

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Winter Forest Detail
—Ansel Adams



Yosemite Valley. By Ansel Adams from "Yosemite and the Sierra Nevada." Reproduction by kind permission of Houghton Mifflin Company.

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Yosemite Nature Notes
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THE FLOODS OF YOSEMITE VALLEY

By Emil F. Ernst, Park Forester

Floods, particularly to those who have endured them, are an intriguing subject. Human nature, being as it is, has the same general attitude toward floods as it has toward automobile and other accidents, and that is: it can't happen to me!

Even those who have suffered from flood conditions all too often lapse into a peculiar psychological complex, where the conditions they have just undergone and the lessons they should have learned are as if they never happened and definitely shall not happen again. The 13 years between December 1937 and the middle of November 1950 were just such a period of complacency for a large number of the residents and visitors in Yosemite Valley. Except for the rather usual limited overflowing of the banks of the Merced River during the late spring run-off each year, the possibilities of floods were far removed from the thinking of most inhabitants. Psychologically this tendency to forget the bad and remember the good is necessary for the well-being and balance of the individual. But the individual, and the community, can benefit materially from the lessons of the past provided they are remembered and taken advantage of.

A resume of the known floods, other than the usual spring run-off overflows, will undoubtedly come as a surprise to many who little realize that floods can be considered a normal experience in Yosemite Valley and that they may occur at any time, particularly so in the late fall and early winter months. The normal periods of Yosemite flood expectancy are the months of November and December and again in the spring run-off, both periods being dependent upon the temperatures prevailing in the higher elevations draining into Yosemite Valley. Information on floods in the valley before settlement by the white man is not available, but some well-founded assumptions can be made by comparison with conditions known to have existed elsewhere in California.

The heavy snowfall now occurring in the Sierra Nevada has already been compared with that of late October and November of 1849, when many of the slow travelers and late starters among the emigrants crossing the plains from the Missouri River were trapped and suffered unbelievable hardships. For an interesting account of sufferings and difficulties of some of the emigrants caught in the early 1849 snows the reader is

referred to J. Goldsborough Bruff's great journal published in *Gold Rush*. The run-off of the spring of 1850 was considerable, causing the flooding of the lowlands around Sacramento and Stockton with resultant sickness and much discomfort among the ill-fed and ill-housed miners overwintering in those then flimsily built towns.

Acting Regional Engineer Hohl of the National Park Service's Region Four office in San Francisco, in a memorandum to the assistant regional director dated December 21, 1950, offers the suggestion that there must have been more floods in Yosemite Valley than appears at first glance. He quotes from weather records for San Francisco that 1849 had 18 inches of precipitation by the end of the calendar year and an additional 8.34 inches in January 1850. The seasonal total for 1849-50 was 150% of normal.

He says that 19.52 inches was reported in 1852 to the end of the calendar year, December being the heavy month, with the following January also showing very wet conditions. The seasonal total was 160% of normal. In 1861 the temperature and precipitation conditions were very favorable for floods and this is covered in the report that follows for 1861-62. In 1866, 18.62 inches was the total to the end of the calendar year with a seasonal total 159% of normal. In 1877 the two months of January and February had 24.99 inches, which was equivalent to 112% of the total normal for San Francisco for an entire season. In 1889 the total to the end of the calendar year was 23.99 inches with an additional 9.6 inches in January. He concludes that these data indicate a severe flood potential frequency of once in 20 years for the San Francisco precipitation area.

The Great California Flood of 1861-62

Of particular interest to students of Yosemite history is the great flood of 1861-62. It was during this winter that James M. Hutchings made his 11-day test to determine whether or not Yosemite Valley was habitable in the winter. Tales were rampant that the valley filled with snow hundreds of feet deep. Hutchings was not so clairvoyant as to foresee that he would make his test under the severe weather conditions which, fortunately for his purposes, developed that fall and winter. *The History of Merced County*, dated 1881, says that "California was visited in the autumn and winter of 1861-62 by a most disastrous flood. The rain commenced falling on the eighth of November and continued almost without interruption to January 24, 1862, when the floods attained their greatest height. The north fork of the American River rose fifty-five feet. On the second day, November 9th, the flood reached the lowlands of the Sacramento Valley, and Sacramento City was the greatest sufferer. The streams, swollen by protracted rains throughout California, as well as Oregon and Nevada, flooded the valleys, inundated towns, swept away animals, and destroyed property to the amount of \$10,000,000. The Stanislaus, Tuolumne, and Merced Rivers were all overflowed, and houses and villages swept away."

The files of the *Mariposa Gazette* for January and February 1862 contain numerous stories of the flood and its impact upon the life and economy of the mining towns. Flood conditions were so bad that Hutchings was compelled to put off his trip to Yosemite Valley until March 1862 when, after parting from his companions, James Lamon and Galen Clark, near Chinquapin, he entered

the valley alone. It can be reasonably assumed from later-known facts that the floor of the valley was flooded during this period of heavy rains.

The 1861-62 flood has been reported to have resulted in a lake 20 miles wide extending from Stockton to Tehama, a distance of approximately 150 miles. There are numerous stories stating that travel between many of the lowland towns, such as Snelling, Millerton, and Stockton, could be made only by means of boats. Spanish records and tales by men living in 1849 indicate a great flood occurring early in the 1800's in the San Joaquin Valley which exceeded the 1861-62 flood.

The Flood of 1864

Clarence King, in his *Mountaineering in the Sierra Nevada*, mentions that November 1864 was a period when flooding of many streams of the Yosemite region occurred. In the 1872 edition of his book he says: ". . . I saw that the [Merced] river had risen nearly to our cabin door, covering the broad valley in front of us with a sheet of flood. [Later] we walked up to see the Merced [and] I never beheld such a rapid rise in any river . . ." At that time apparently there were only six structures in Yosemite Valley: Lamon's original cabin and his later "winter" cabin; Hutchings House, known earlier as the Upper Hotel; and the Lower Hotel with two neighboring small cabins. The two last-named shelters were the ones used by King and his survey party at the time of their visit and the flood of the middle of November 1864. In his book he relates: "We had chosen, as the head-quarters of the survey, two little cabins under the pine-trees near Black's Hotel [A. G. Black was then owner of the Lower Hotel]. They

were central; they offered us a shelter; and from their doors, which opened almost upon the Merced itself, we obtained a most delightful sunrise view of the Yosemite."

The Flood of 1867

After James Lamon had pre-empted his homestead in Yosemite Valley in 1859, he became the first permanent resident of the valley in the winter of 1862-63 and was followed by Hutchings and his family in the winter of 1864-65. Since then the valley has been occupied by various inhabitants the year round. A flood of notable proportions occurred on December 23, 1867. Lamon, according to Muir in *The Yosemite*, had built in 1863 his second cabin near the Royal Arches. And Hutchings also by 1867 had constructed and was occupying his winter cabin near the foot of Yosemite Falls. Fortunately for him and his family there were two stories in this cabin. Hutchings in his *In the Heart of the Sierras* says that "On December 23, 1867, after a snow fall of about three feet, a heavy down-pour of rain set in, and incessantly continued for ten successive days . . . The whole meadow land of the Valley was covered by a surging and impetuous flood to an average depth of nine feet. Bridges were swept away, and everything floatable was carried off." Hutchings refers to this flood also in various editions of his *Scenes of Wonder and Curiosity in California*, while Muir says that Lamon later liked to describe the great flood of 1867.

The Flood of 1871

John Muir in his *The Yosemite* tells of another flood 4 years later which apparently did not assume the proportions of its predecessor for he is

the only one so far found who mentions it. He says that "During the night of the 18th [of December 1871] heavy rain fell on the snow [and then] about midnight the temperature suddenly rose to 42°, carrying the snow-line far beyond the Valley walls, and next morning Yosemite was rejoicing in a glorious flood." Hutchings did not witness this flood, for he was lecturing on the Yosemite at Tremont Temple in Boston that week.

Spring Floods of 1890 and 1907

On the whole the history of floods in Yosemite Valley has had to be pieced together mostly from records from outside sources, such as books written by well-known individuals. Very little information on floods is revealed in studying the reports of the boards of commissioners which managed Yosemite Valley when it was under State control, or the reports of the acting superintendents of Yosemite National Park when it was under cooperative management by U. S. Army detachments and the Department of the Interior. There was a spring flood either in 1890 or 1891 that was responsible for considerable damage to improvements, particularly for the destruction of one of the iron bridges across the Merced River. The reference to this damage in a *Biennial Report of the Commissioners to Manage Yosemite Valley and the Mariposa Big Tree Grove* is hazy on just when this flood occurred, except that it was a spring flood.

The writer has so far been able to uncover only one other account of floods in Yosemite Valley from the time of Muir's record of the 1871 flood until the great flood of December 1937. This was an oral report of flood conditions having existed sometime in the spring of 1907. These

conditions were not the normal spring run-off of the past winter's accumulated snowpack but a situation out of the ordinary for that time of the year. Hohl records, again for San Francisco, that in the second half of March 1907, 8.42 inches of precipitation fell in very warm weather and also that this combination caused one of the worst floods on record for the State of California. The season's total for that year actually was very little above normal. The writer assisted, while employed by the Pacific Gas and Electric Company in 1930, in the plotting of the 1907 flood marks on the Mokelumne River. The passage of 23 years had not obliterated the evidence left by the 1907 flood in that watershed.

The Great Flood of December 1937

Along with all of northern California, Yosemite Valley experienced flood conditions in the middle of December 1937. This flood came as a surprise to practically every individual residing in or visiting the valley at the time. That floods could be expected under the right circumstances was understood by some people but most had not read or heard of floods ever affecting the valley during historical times.

The storm responsible for the tremendous damage throughout northern California began unportentously in Yosemite Valley with a light rain at 9:30 a.m. on December 9. By night the rain became torrential, and within 24 hours had accumulated a total of 4.52 inches in the gauges. All the streams were swollen and the most westerly of the Cascades bridges had been swept away at 6:30 a.m. on the 10th. By 4:00 p.m. on the 11th the rain gauges showed that the total had increased to 10.86 inches. The storm then slackened off and rain



Photo by Lowell Adams



Photo by Ralph Anderson

(Above) Yosemite Valley, vicinity of Government Center, at crest of flood on December 11, 1937. Note flooded home of park superintendent in right background. (Below) Normal summer appearance of same portion of Yosemite Valley.

finally ceased at 2:00 a.m. on the 12th with a recorded total of 11.54 inches.

The United States Geological Survey maintains three stream-gauging stations in Yosemite Valley: One on Tenaya Creek below Mirror Lake, one on the Merced River at Happy Isles, and one on the Merced River at Pohono Bridge. The last one records the entire flow of the Merced out of the valley. The Geological Survey reports the following data on run-off at the Pohono Bridge station for December 1937:

Date	Cubic feet Per second
9	40
10	2,960
11	16,000
12	6,420
13	3,000
14	1,200
15	900

The flow at this station gradually decreased to 207 cubic feet per second on December 31, which is slightly higher than normal for the Merced at that time of the year.

The temperatures prevailing at the time of heavy precipitation act as

the controlling factor in the occurrence of flood conditions in Yosemite. The reader is referred to John Muir's foregoing observation for the flood of 1871. The storm of December 1937 carried the following temperatures:

Date	Maximum	Minimum
9	46	31
10	51	40
11	53	44
12	51	34

The peak of the flood was reached at 3:00 p.m. on Saturday the 11th, and thereafter its recession was fast, the river being back within its banks during that night. It is estimated that there are 3.8 square miles in the nearly level floor of Yosemite Valley, and that 55% or 2.1 of these square miles were under water. An estimate of the damage to Government improvements in the park made on January 31, 1938, amounted to \$271,750. Actual costs of repair, which occupied a year of endeavor, closely approached the estimate. The principal concessioner—the Yosemite Park and Curry Company—suffered substantial losses amounting to approximately \$150,000. Private losses sustained by some employees of the Government and the concessioner were individually considerable but no estimate is available. Fortunately no lives were lost in Yosemite National Park but there were several serious injuries from falling trees and other accidents due to the storm.

The Floods of 1950

In November 1950 the same precipitation and temperature combinations responsible for flood conditions in Yosemite Valley and northern California were at work again. However, the series of storms which caused the three peaks of flooding in 1950 extended over a longer period than for the flood of 1937.

The three 1950 peaks in Yosemite occurred on November 19, December 3, and December 8. The first and highest came to within 7 inches of the bronze cap near Government Center marking the upper limit of the flood of December 11, 1937. But in the Old Village this 1950 crest was reported to be 4 inches higher than in 1937, with the floor of the Old Village Store being submerged under 44 inches of water. The lower floor of the park superintendent's house was covered to a depth of 26 inches at the first 1950 peak, whereas the second peak did not quite reach the floor level, and the third came at the same point as the second. Again it was estimated that 55% or 2.1 square miles of the floor of the valley was inundated, and again there was no loss of life or serious injury.

The tip-off of flood-to-be again occurred with severe damage to, and later complete destruction of, the most westerly of the Cascades bridges and, as in 1937, a radio report that Downieville was being flooded. By December 12 it was estimated that damages to Government improvements in Yosemite National Park would amount to \$508,600, and losses to the Yosemite Park and Curry Company would be another \$200,000. In 1937 there was more damage to outlying roads and trails than in 1950, so the damage was more concentrated in the 1950 floods. In 1937 there was very little snow on the mountains of the park prior to the flood-producing storm, while there was a definite snow line at approximately 9,000 feet elevation remaining after the passage of the floods of 1950.

A base for the 1950 floods was built up in October with a total of 3.59 inches of precipitation in Yosemite Valley and an initial snow-pack on the higher areas draining into it. Again without portent of what

was to come, rain amounting to only .07 of an inch fell in the valley on November 13, to begin 9 consecutive days with rainfall. The first 5 days accumulated a total of only 2.74 inches, nothing in itself to cause concern other than that the base was being increased to approach flood conditions. Then on November 18 torrential warm rains added 5.63 inches, melting some of the snow on the uplands and causing the Merced River to overflow. The flood reached its peak at 2:45 a.m. on the 19th. The Yosemite Valley gauge showed less than 10 inches for both the 18th and 19th together, a period of 48 hours, but only a few miles to the north Hetch Hetchy station on the Tuolumne River reported that 13 inches fell in the 24 hours from 5:00 a.m. on the 18th to 5:00 a.m. on the 19th. At Huntington Lake to the south of Yosemite 9.5 inches fell in the 24 hours beginning at 3:00 a.m. on the 18th. It appears from these records that the line of extremely heavy precipitation must have occurred just north of Yosemite Valley at the headwaters of Yosemite Creek, Tenaya Creek, and the upper Merced River. The 9-day series of storms amassed a total of 14.52 inches in the valley gauge, and was followed by a period of recuperation to end all too soon on November 30. A little more than three-fourths of an inch fell on the first 3 days of the second series of storms which embraced a period of another 9 days. On December 3, 4.80 inches of rain fell on the saturated land and the second 1950 flood peak was reached at 5:00 p.m. that day. By 4:00 p.m. of the 8th another 4.92 inches fell, with the third peak occurring at 5:00 a.m. that morning.

Of interest is the following table showing precipitation and temperature relations at the times of the 1950 flood peaks:

Date	Precipitation Inches	Maximum Temp.	Minimum Temp.
Nov. 13	.07	53	40
14	1.14	37	32
15	.31	41	25
16	.83	40	39
17	.39	50	37
18	5.63	51	43
19*	4.18	53	47
20	1.15	53	46
21	.82	62	47
Nov. 30	.55	50	36
Dec. 1	.14	49	35
2	.10	42	29
3*	4.80	52	37
4	1.70	50	36
5	.00	49	34
6	.34	49	39
7	1.76	49	43
8*	1.12	52	45
9	.00	52	34

*Dates of flood peaks

Unfortunately for comparison purposes the U.S.G.S. stream-gauging station at the Pohono Bridge, which records the outflow from Yosemite Valley, was put out of order in the 1950 flood. Another comparison, however, exists in a record of 59,000 cubic feet per second at peak flow of the Merced River, including its south fork, into the Exchequer Reservoir for December 11, 1937, against 88,000 for peak flow in 1950.

The third week of January 1952 saw flood conditions existing in the San Joaquin Valley with the environs of Merced under water. Concern was felt on the 24th and 25th over the heavy rains and high temperatures then prevailing in Yosemite Valley. Had the temperatures of the valley itself become established in the higher elevations immediately surrounding it, flooding would more than likely have occurred. A study of the precipitation and temperature records shows that the valley was just on the verge of flooding. Fortunately two storms reported on the way for the 26th and 27th did not materialize, and the famed valley passed another of the undoubtedly numerous critical periods of its history.

"CHALKY"

By Ginnie Ann Sturm, 8th Grade, Yosemite Grammar School¹

It was around the second week of school last fall when the little blue-fronted jay first decided to get an education. For many days he came to the window and pecked at it. Tom Christensen was the first to succeed in getting the bird into the school-room.

Most everyone has a favorite subject. You usually get one of your higher grades in it. Mr. Jay's favorite subject was pecking on the encyclopedias. His grade was the highest in the class—"AA." He got so good that we had to put magazines on the tops to keep him from ruining the books.

If he felt like doing some reading he would go through the book file picking out a card and dropping it on the floor. This usually kept up until Mr. Moore, our teacher, chased him out.

Playing tug-o-war with a pencil and picking on erasers were very common tricks, but stealing chalk was the jay's favorite. "Chalky," as we named him, had his first experience with chalk at a vacant desk in the corner of the room. This was only a small piece. Satisfied, he flew out the window with it.

One night after school was out he came back to visit Mr. Moore. Again he found a piece of chalk on the rear desk. He hopped up to Mr. Moore's desk and found a larger piece. Mr. Moore had just put brand new chalk in the tray. Now the little jay was really surprised. He picked up a large piece and managed to get just a little of it down his throat. With one end of it in his throat he put the other end on Mr. Moore's

clean blackboard. While he was trying to swallow the chalk he was making little white dots on the board.



Tom Christensen was no longer Chalky's friend. This bird's new trick was landing on Tommy's head. Now it was he that was chasing the bird out.

One noon hour after Thanksgiving Day Chalky was especially friendly with Gloria Chapman. She was very happily eating on her turkey leg when Mr. Jay perched himself on the other end of it. Very nonchalantly he began picking on the turkey. Gloria just sat there.

In the bottom of one of our fluorescent light fixtures on the ceiling is a blackboard eraser. Once when Mr. Moore tried to remove Chalky from the room he flew up on the fixture. Mr. Moore thought tossing the eraser might convince the bird. Chalky just hopped out the window as the eraser landed inside the fixture.

1. Editor's Note: This composition about the antics of a remarkable blue-fronted jay (*Cyanocitta stelleri frontalis*) was chosen as the best of several submitted by children of the local grammar school.

A STATEMENT TO OUR SUBSCRIBERS

At the 1952 annual meeting of the board of trustees of the Yosemite Natural History Association, Inc., publishers of *Yosemite Nature Notes*, it was revealed that there was a loss of nearly \$1,000 in the publication of the booklet during the fiscal year 1951. Although there has never been any idea of making money from this activity, the deficit has become so excessive that the board felt steps should be taken to reduce this loss. It decided, therefore, that the yearly subscription price should be increased to \$1.50. It is obvious that this will merely cut the deficit in half under the existing circumstances and that the Yosemite Natural History Association will have to continue to underwrite the difference from other funds. Even though it would be desirable to have *Yosemite Nature Notes* carry all of its cost of publication, this move to reduce the annual deficit by only one-half is consistent with the policy of the association to have the booklet serve as an outlet for new and interesting information on natural and human history of Yosemite National Park, and to make it both a record of ever-increasing accumulation of such information and a stimulation for continued and growing appreciation of park values in Yosemite among its visitors and friends.

A special offer is made to present subscribers in giving them the privilege, when their current subscription expires, of renewing for a 2-year period at \$2.00. After this 2-year period the cost will be \$1.50 per year. All new subscriptions, and renewals on the single-year basis, will be \$1.50 per year beginning with the March 1952 issue. We feel confident that not only will our many friends continue their valued support of this publication program, but also will help us to add new supporters for this service.—Ed.

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Dan Anderson