Handbook of Yosemite National Park (1921), edited by Ansel F.

Ansel F. Hall

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Overview

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r Ansel F. Hall edited *Handbook of Yosemite National Park*r after arriving at Yosemite in 1920.r The young National Park Service was just established in 1916,r and Ansel Hall, on his own initiative, established the Yosemite Museumr and began continuous, innovativer interpretative programs in Yosemite National Park.r Various sections of the *Handbook* were written by specialistsr in various fields, such as Willis Linn Jepson's chapters on plantsr or A. L. Kroeber's section on Yosemite Indians.r While some chapters drag on with too much detailr on park telephone lines and NPS badge designs,r others, such as Kroeber's "Indians of Yosemite,"r provide concise, authoritative information in a readable, interesting style.r

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r Keep in mind that since this book was published in 1921,r many new discoveries have been made in Yosemite Park history and science.r That said, most of the ideas and facts given in the *Handbook*r are still relevant to Yosemite National Park today.r

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r —Dan Anderson, August 2004r

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- Motoring in Yosemite National Parkr by Wallace B. Curtis

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- Photography in Yosemite National Parkr by Arthur C. Pillsbury

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- Appendixr [Weather,r Lakes,r Streams, &r Tree Identification]r

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- Map of Yosemite National Park

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About the Editor

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r *r Ansel F. Hallr*
r (Merrie Winkler Collection)r r

r r r Ansel F. Hall was born May 6, 1894 in Oakland, California.r He graduated in 1917 from University of California in forestry.r He served first in Sequoia National Park as a ranger,r then served during World War I in France.r After the war, he was a park naturalist in Yosemite National Parkr during 1920 to 1923, when he wrote the *Handbook*.r He established innovative interpretative program in Yosemite,r started the Yosemite Museum Association, made geological models,r native crafts, and mounted natural history specimens.r Mr. Hall rose in the ranks as chief naturalistr of the Park Service and similar positions.r Ansel Hall wrote two other books on Yosemite.r *Guide to Yosemite* (1920)r describes trails in the park (98 pages and map).r r *Yosemite Valley: An Intimate Guide* (1920)r is a pocket book that describes the valley for touristsr (90 pages, maps, and illustrations).r Mr. Hall married June Alexander in 1924, and they had 6 children,r including triplets.r He left the park service in 1938 to operate concessionsr in Mesa Verde National Park.r Later he worked as a consultant in park design and interpretationr and wrote books on the topic.r Ansel Hall died suddenly in 1962.r Ar r biographical sketch of Ansel Hallr by John Bingaman isr inr r *Guardians of the Yosemite* (1961), p. 111.rr r

Bibliographical Information

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r Hall, Ansel Franklin (1894-1962)r *Handbook of Yosemite National Park:r a compendium of articles on the Yosemite region by the leading scientific authorities*r (New York : G. P. Putnam's Sons, 1921).r 347 pp. ill. folded map. 20 cm.r Brown cloth covering with ivory and black lettering and cover art.r Dust jacket with green lettering and art.r LCCN 21014069.r Library of Congress Call No. F 868.Y6 H18r

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r PLATE Ir

r Yosemite Valley from Old Inspiration Point. The view which greeted the men of the Mariposar
r Battalion on March 21, 1851 when they entered this valley of Awahneer
r Photo by A. C. Pillsburyr

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r HANDBOOK OFr
r YOSEMITE NATIONALr
r PARKr

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r A COMPENDIUM OF ARTICLES ON THEr
r YOSEMITE REGION BY THE LEADINGr
r SCIENTIFIC AUTHORITIESr

r r

r COMPILED AND EDITED BYr
r ANSEL F. HALLr
r r U. S. NATIONAL PARK SERVICE,r
r FORMERLY INSTRUCTOR IN FORESTRY, A E F UNIVERSITY,r
r BEAUNE, FRANCE.r r

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r *ILLUSTRATED*r

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r G. P. PUTNAM'S SONSr
r NEW YORK AND LONDONr
r **The Knickerbocker Press**r
r 1921r

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r *Printed in the United States of Americ*ar

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r To Myr
r Comrades of ther
r NATIONAL PARK SERVICEr

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Introductory Note

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INTRODUCTORY NOTE

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r Yosemite National Parkr needs no introductionr to the American public. Much has been written inr appreciation of "The Valley Incomparable" and ofr the eleven hundred square miles of scenic Highr Sierra which have been set aside as a playground forr the people.r

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r Men like Le Conte and Muir were as "a voicer crying in the wilderness" telling the outside worldr of the wonders of the region; others have writtenr of its trails and its scenery; there still remains ther task, however, of satisfying the thousands who nowr ask for definite information concerning the history,r ethnology, botany, geology, camp- and trail-craft,r natural history, and related subjects so well exemplifiedr by the Park. Obviously no one may can ber a master of all these branches of knowledge, so ther Editor presents this collection of articles, each byr an eminent authority.r

r r

r Acknowledgment and sincere thanks are due tor the scientists whose coöperation has made thisr volume possible. These contributors are so wellr known in their respective fields of science that theyr need no introduction. The Editor is indebted tor many others who have supplied photographs and tor Messrs. Herbert Maier and Duncan Dunning whoser drawings appear as chapter headings.r

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r This little volume is offered with the hope that itr will point the way to the better understanding andr the fuller enjoyment of the Yosemite region.r

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r r Ansel F. Hallr r
r In Charge of Information,r
r Yosemite National Park.r

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r *January 1, 1921*r

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r [Editor's note:r Herbert Maier was the NPS Architect who designed the Yosemite Museum.]r

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History of the Yosemite Region

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Handbook of Yosemite National Park (1921)r by Ralph S. Kuykendall

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HISTORY OF THE YOSEMITE REGION

r r

r By Ralph S. Kuykendallr

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r *r N. S. G. W., Fellow in Pacific Coast History,r*
r University of Californiar r

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r r Itr r is probable that the first white men to look uponr Yosemite Valley were members of the Joseph R.r Walker expedition of 1833, which descended ther western slope of the Sierra Nevada along the ridger between the Merced and the Tuolumne rivers. Butr the best contemporary evidence makes it clear thatr this party did not go down into the Valley. Therer are vague reports of hunters having entered ther Valley as early as 1844, but the effective discovery ofr the Yosemite was made in 1851 by members of ther Mariposa Battalion while in pursuit of hostile Indians.r

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THE MARIPOSA INDIAN WAR

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r r When white men flocked into the foothills of ther Sierra in search of gold it was not long before difficultiesr arose with the Indians. On this frontier wasr repeated the old story of the red man's fight to keepr possession of his ancestral home. The struggle wasr short, since the California Indians were not capabler of maintaining a long contest. In this connection wer are concerned with only that part of the struggler which is known as the Mariposa Indian War.r

r r r r

r In the beginning of 1850, James D. Savage had ar trading post and mining camp on the Merced Riverr some twenty miles below Yosemite Valley, whichr was at that time unknown to the whites. During ther spring of that year Indians came down the river andr made an attack on this post. They were driven off,r but Savage thought it best to abandon the place andr remove his store to Mariposa Creek. He also establishedr a branch post on the Fresno River and at bothr places built up a prosperous trade. Savage had severalr Indian wives and obtained quite a remarkabler influence over the tribes with which he was connected.r But there were malcontents among them and ther tribes in the mountains were suspicious and easilyr incited to acts of hostility.r

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r On December 17, 1850, Savage's Indians desertedr the Mariposa camp and on the same or the followingr day his post on the Fresno was attacked and two ofr the three men there present were killed. Adamr Johnston, the Indian agent, visited the place twor days later and describes it as "a horrid scene of savager cruelty. The Indians had destroyed everything theyr could not use, or carry with them. The store wasr stripped of blankets, clothing, flour, and everythingr of value; the safe was broken open and rifled of itsr contents; the cattle, horses, and mules had been runr into the mountains; the murdered men had beenr stripped of their clothing and lay before us filled withr arrows; one of them had yet 20 perfect arrows stickingr in him." Several similar outrages occurred soonr after and signalized the beginning of a general Indianr war.r

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r Under these circumstances the white settlers tookr prompt action to protect themselves. Under the leadr r r r of Sheriff James Burney and James D. Savage, a volunteerr company was formed, January 6, 1851, withr Burney in command. This force had several indecisiver skirmishes with the Indians. Meanwhile ther governor was appealed to and he at once authorizedr Sheriff Burney to call out two hundred militiamen andr organize a battalion for service as the emergencyr might demand. Under this authorization the Mariposar Battalion was formed February 10th, at Savage'sr partially ruined store on Mariposa Creek. Savage wasr elected major, and three companies were organizedr under command of Captains John J. Kuykendall,r John Bowling, and

William Dill. Headquarters werer established on Mariposa Creek and here the battalionr was drilled in preparation for the campaign, and occasionalr scouting forays were made into the enemy'sr country.r

r r

r About this time the United States Indian Commissioners,r McKee, Barbour, and Wozencraft arrived inr California with instructions to make treaties with ther Indian tribes. It was agreed that the commissionersr would go at once to the disaffected region and endeavorr to treat with the hostile tribes, and that ther volunteer battalion which had been raised should ber subject to their directions. If negotiations failed,r force would be used to bring the Indians to terms.r The commissioners arrived at the Mariposa campr about the first of March, and immediately sent outr runners inviting the various tribes to come in andr have a talk. A meeting was arranged for the ninth ofr arch, and on the nineteenth a treaty was made withr six tribes, which were at once removed to a reservationr between the Merced and the Tuolumne rivers. Ther commissioners then went on to talk with the tribesr r r r south of the Merced River, and left part of the volunteerr battalion to deal with the Indians who hadr refused to enter into the treaty.r

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r Among these were the Yosemites, and reportsr brought in by friendly Indians indicated that they hadr no intention of coming in to make peace. It wasr therefore deemed necessary to send a military forcer after them.r

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r On the evening of March nineteenth, the very dayr on which the treaty was signed, Major Savage setr out with the companies of Captains Bowling and Dill.r "The march was over rugged mountains and throughr deep defiles covered with snows and was one of considerabler exposure and hardship. . . . Part of ther march was exceedingly difficult and dangerous. Itr lay along a deep canyon and a part of it had to ber made through the water and a part over precipitousr cliffs covered with snow and ice."r

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r On the morning of the twenty-second, a Nuchu rancheria,r on the South Fork of the Merced River wasr surprised and captured without a fight. At thisr point a camp was established and messengers werer sent ahead to the Yosemites with a request that theyr come into camp. Next day the old Chief Tenaya camer in alone, and after an interview with Savage promisedr that if allowed to return to his people he would bringr them in. Part of the tribe came in and Tenaya wasr sent with them to the camp on the South Fork.r

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DISCOVERY OF YOSEMITE VALLEY

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r r In order to round up the remainder, Savage tookr one of the young braves as a guide and continued hisr march toward the north. Within a short time ther r r r r company came to old Inspiration Point and the fullr view of the Valley was presented to their gaze. Itr must be confessed, however, that the scenic wonderr of this valley made a very slight impression on theser rough men of action, and without much ado theyr hastened down the trail and camped for the night onr the south side of the Merced River, a little belowr El Capitan. The day of the discovery was Marchr 25, 1851.r

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r As the tired campaigners sat about the camp firer that night the events of the day were passed in reviewr and the question arose of giving a name to the valleyr which they had found. Dr. L. H. Bunnell, uponr whom the scenes and events of this campaign made ar deeper impression than upon any of the others, suggestedr the appropriateness of naming it after ther aborigines who dwelt there. The suggestion wasr greed to after some good-natured banter, and sincer the white men called these Indians Yosemites ther name Yosemite was given to the Valleyr

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r The next day was spent in a search of the Valley,r but no Indians were found save an ancient squaw whor was too old and decrepit to make her escape. Indianr huts, evidently deserted but a few hours before, andr large caches of acorns and other provisions werer found and destroyed. The Valley was thoroughlyr explored by the volunteers, one party going up Tenayar Creek beyond Mirror Lake and another ascending ther Merced to a point above Nevada Fall. The searchr proving fruitless and the supplies running low it wasr decided to abandon the chase and return to the campr on the South Fork. From there the Indians who hadr been gathered together were started toward the commissionersr on the Fresno, but before theyr r r r arrived at their destination the negligence of the guardr permitted them to escape and they returned to theirr mountain fastnesses.r

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SECOND EXPEDITION TO YOSEMITE

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r r Early in May, Captain Bowling and his men werer sent out a second time in pursuit of the Yosemites.r His orders from Major Savage were to "surprise themr and whip them well," and in case that proved impossibler then to use any means in his power to inducer them to come down and treat. The following accountr of this expedition is quoted from Captain Bowling'sr report in the form of two letters, one of which isr beyond any question the first letter ever written inr the Yosemite Valley. Writing from the "Yo-Semetyr Village, May 15, 1851," he says[1]:r r [[1]r The following authentic account was recently found by the authorr in the San Francisco *Alta California* for June 12 and 14, 1851,r and differs in some details from the narratives presented in Bunnell'sr *Discovery of the Yosemite*r and Hutchings'r *In the Heart of ther Sierras*. Editor's note.]r r

r r

r "On reaching this valley, which we did on ther 9th instant, I selected for our encampment the mostr secluded place that I could find, lest our arrival mightr be discovered by the Indians. Spies were immediatelyr dispatched in different directions, some of whichr crossed the river to examine for signs on the opposite side. Trails were soon found, leading up and downr the river, which had been made since the last rain.r On the morning of the 10th we took up the line ofr march for the upper end of the valley, and havingr traveled about 5 miles we discovered five Indiansr running up the river on the north side. All of myr r r r companions, except a sufficient number to take carer of the pack animals, put spurs to their animals, swamr the river and caught them before they. could get intor the mountains. One of them proved to be the sonr the old Yosemite chief. I informed them that ifr they would come down from the mountains and gor with me to the United States Indian commissioners,r they would not be hurt; but if they would not, Ir would remain in their neighborhood as long as therer was a fresh track to be found; informing him at ther same time that all the Indians except his father'sr people and the Chouchillas had treated. . . . Her then informed me that . . . if I would let him looser with

another Indian, he would bring in his father andr all his people by twelve o'clock the next day.r

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r "I then gave them plenty to eat and started himr and his companion out. We watched the othersr close, intending to hold them as hostages until ther dispatch-bearers returned. They appeared well satisfiedr and we were not suspicious of them, in consequencer of which one of them escaped. We commencedr searching for him, which alarmed the other two stillr in custody, and they attempted to make their escape.r The boys took after them and, finding they could notr catch them, fired and killed them both. This circumstance,r connected with the fact of the two whom wer had sent out not returning, satisfied me that theyr had no intention of coming in. My command thenr set out to search for the rancheria. The party whichr went up the left toward Canyarthia [?] found ther rancheria at the head of a little valley, and from ther signs it appeared that the Indians had left but a fewr minutes. The boys pursued them up the mountainr on the north side of the river, and when they hadr r r r got near the top, helping each other from rock tor rock on account of the abruptness of the mountains,r the first intimation they had of the Indians beingr near was a shower of huge rocks which came tumblingr down the mountain, threatening instant destruction.r Several of the men were knocked down, and some ofr them rolled and fell some distance before. they couldr recover, wounding and bruising them generally. Oner man's gun was knocked out of his hand and fell 70r feet before it stopped, whilst another man's hat wasr knocked off his head without hurting him. The menr immediately took shelter behind large rocks, fromr which they could get an occasional shot, which soonr forced the Indians to retreat, and by pressing themr close they caught the old Yosemite Chief, whom wer yet hold as a prisoner. In this skirmish they killedr one Indian and wounded several others.r

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r "You are aware that I know this old fellow wellr enough to look out well for him, lest by some stratagemr he makes his escape. I shall aim to use him to ther best advantage in pursuing his people. I send downr a few of my command with the pack animals forr provisions; and I am satisfied if you will send me 10r or 12 of old Ponwatchi's best men I could catch ther women and children and thereby force the men tor come in. The Indians I have with me have actedr in good faith and agree with me in this opinion."r The account is continued in the second letter whichr was written May 29th at the camp on the Fresnor River:r

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r ". . . Notwithstanding the number of our partyr being reduced to 22 men, by the absence of the detachmentr necessary to escort with safety the packr train, we continued the chase with such rapidity,r r r r that we forced a large portion of the Indians to taker refuge in the plains with the friendly Indians, whiler the remainder sought to conceal themselves amongr the rugged cliffs in the snowy region of the Sierrar Nevada.r

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r "Thus far I have made it a point to give as littler alarm as possible. After capturing some of them Ir set a portion at liberty, in order that they mightr assure the others that if they come in they would notr be harmed. Notwithstanding the treachery of ther old chief, who contrived to lie and deceive us all ther time, his grey hairs saved the boys from inflicting onr him that justice which would have been administeredr under other circumstances. Having become satisfiedr that we could not persuade him to come in, I determinedr on hunting them, and if possible running themr down, lest by leaving them in the mountains theyr would form a new settlement and a place of refuger for other ill-disposed Indians who might do mischiefr and retreat to the mountains, and finally entice offr those who are quiet and settled in the reserve. Onr the 20th [of May] the train of pack animals and provisionsr arrived, accompanied by a few more men thanr the party which went out after provisions, and Ponwatchi,r the chief of the Nuchtucs, [Nuchu] tribe withr 12 of his warriors.r

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r "On the morning of the 21st we discovered the trailr of a small party of Indians traveling in the directionr of the Monos' country. We followed this trail untilr 2 o'clock next day, 22d, when one of the scoutingr parties reported a rancheria near at hand. Almost atr the same instant a spy was discovered watching ourr movements. We made chase after him immediatelyr and succeeded in catching him before he arrived atr r r r the rancheria, and we also succeeded in surroundingr the ranch and capturing the whole of them. Thisr chase in reality was not that source of amusementr which it should seem to be when anticipated. Eachr man in the chase was stripped to his drawers, in whichr situation all hands ran at full speed at least four miles,r some portion of the time over and through snow tenr feet deep, and in this four-mile heat all Ponwatchir gained on my boys was only distance enough to enabler them to surround the rancheria while my menr ran up in front. Two Indians strung their bowsr and seized their arrows, when they were told ifr they did not surrender they would be instantlyr killed.r

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r "They took the proper view of this precaution andr immediately surrendered. The inquiry was made ofr those unfortunate people if they were then satisfiedr to go with us; their reply was they were more thanr willing, as they could go to no other place. From allr we could see and learn from those people we werer then on the main range of the Sierra Nevada. Ther snow was in many places more than 10 feet deep,r and generally where it was deep the crust was sufficientlyr strong to bear a man's weight, which facilitatedr our traveling very much. Here there was a larger lake completely frozen over, which had evidently notr yet felt the influence of the spring season.[1]r r [[1]r This was Tenaya Lake, named after the old chief.]r r The trailr which we were bound to travel lay along the side ofr a steep mountain so slippery that it was difficult tor get along barefoot without slipping and falling hundredsr of yards. This place appearing to be theirr last resort or place where they considered themselvesr perfectly secure from the intrusion of the white man.r r r r In fact those people appear to look upon this placer as their last home, composed of nature's own materials,r unaided by the skill of man.r

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r "The conduct of Ponwatchi and his warriors duringr this expedition entitled him and them to much credit.r They performed important service voluntarily andr cheerfully, making themselves generally useful, particularlyr in catching the scattered Indians after surprisingr a rancheria. of the Yosemites, few, if any,r are now left in the mountains. . . .r

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r "It seems that their determined obstinacy is entirelyr attributable to the influence of their chief, whom wer have a prisoner, among others of his tribe, and whomr we intend to take care of. They have now been taughtr the double lesson—that the white man would notr give up the chase without the game, and at the samer time if they would come down from the mountainsr and behave themselves they would be kindlyr treated.r

r r

r Altogether Captain Bowling's command spent aboutr two weeks in the Valley on this occasion. The mainr purpose of the expedition having been accomplished,r a return was made to the headquarters on the Fresnor and the Indians were placed on the reservation.r Tenaya, however, chafed under restraint and appealedr repeatedly for permission to return to the mountains.r Finally, on his solemn promise to behave, he wasr allowed to go back to the Valley, taking his immediater family with him. In a short time a number of hisr old followers made their escape from the reservationr and were supposed to have joined him. No attemptr was

made to bring them back, and no complaint wasr heard against the Yosemites during the winter ofr 1851-52.r

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EXPEDITION OF 1852

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r On the 20th of May, 1852, a party of eight prospectorsr started from Coarse Gold Gulch on a trip to ther upper waters of the Merced River. They had justr entered the Yosemite Valley when they were set upon,r by a band of Indians and two of them, named Roser and Shurborn, were killed and a third badly wounded.r The others got away and after enduring great hardshipsr arrived again at Coarse Gold Gulch on ther 2d of June. The same day about thirty or fortyr miners set out to punish the treacherous Yosemites.r This party found the bodies of the murdered menr and buried them at the edge of Bridalveil Meadow,r where their graves are still to be seen, but they werer compelled to return without punishing the murderers.r

r r

r The commander at Fort Miller being informed ofr these events, a detachment of Regulars under Lieutenantr Moore was at once dispatched into the mountains.r On arriving in the Yosemite Valley this expeditionr surprised and captured five Indians. Clothing saidr to belong to the murdered men being found uponr them, they were summarily shot. The remainder ofr the Yosemites with their old Chief Tenaya made theirr escape and fled over the mountains into the Monor country. Thither the soldiers pursued, but were unabler to catch any of them. The party lost a few horses,r killed by the Indians, explored the region about Monor Lake, discovered some gold deposits, and then returnedr to the fort on the San Joaquin by a route thatr led south of the Yosemite Valley. A diary of thisr expedition, published in one of the Stockton newspapersr about the 1st of October, 1852, contains oner of our earliest descriptions of Mono Lake and vicinity.r r r r After the return of the expedition, a party of minersr under the leadership of Leroy Vining, attracted byr the reported gold discoveries, crossed over the mountainsr and established themselves on what came to ber known as Vining’s Gulch or Creek. (The name appearsr on the maps a little later as Lee Vining Creekr and upon the present maps as Leevining Creek.)r

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DEATH OF TENAYA

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r Tenaya and his fellow tribesmen seem to haver remained among the Monos until the summer of 1853,r when they returned once more to Yosemite Valley.r They repaid the hospitality of the Monos by stealingr a number of their horses. This proceeding stirredr the wrath of the Monos, and they determined tor wreak vengeance upon their erstwhile guests. Theyr put on their war paint and descended suddenly uponr the Yosemites while the latter were in the midst of ar gluttonous feast. Old Tenaya had his skull crushedr by a rock hurled from the hand of a Mono warrior andr all except a handful of his followers were slain. Ther tribe was virtually exterminated, though a few ofr their descendants still survive.r

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EARLY DEVELOPMENT

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r In spite of the exciting events which have beenr related above, Yosemite Valley was little disturbedr by the visits of white men for some years longer.r The Californians of that day, and particularly thoser in the mining region, were on the whole very littler interested in scenery. Early in 1855, however,r one of the very meager descriptions of the Valleyr which had found its way into print came by chancer r r r to the notice of J. M. Hutchings. Hutchings was atr the moment laying plans for the publication of hisr r *California Magazine*,r and for that reason the mentionr of a waterfall a thousand feet high arrested his attention,r and he resolved to investigate the matter.r

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r Early in the summer Hutchings organized what mayr fairly be considered the first tourist party to visitr the Yosemite, consisting of himself, Walter Millard,r and Thomas Ayres, an artist. At Mariposa, a fourthr member, Alexander Stair, joined the party. Somer difficulty was experienced in the matter of a guide,r but finally, through the assistance of Captain Bowlingr and some other members of the Mariposa Battalion,r two Indians were found to perform that essentialr service, and in due time the party found their way intor the Valley, where they spent, says Hutchings, "fiver glorious days in luxurious scenic banqueting." Uponr their return to the settlements these men gave anr enthusiastic account of their experiences. Hutchingsr wrote an article which was printed in the *Mariposar Gazette* of August 16th, and parts of which were quotedr in the San Francisco *California Chronicle* of Augustr 18th. A picture drawn by Ayres was lithographedr and published soon after, and before the year wasr out two other parties made their way into the Valleyr In the same year the construction of the first trailr into the Valley was begun by Milton and Houstonr Mann. It was completed the next year but did notr prove a paying investment and was soon sold to ther county of Mariposa and made free. The old Coulterviller trail was opened within a year or two and ther Valley thus made accessible. from both north andr south; but accessible by rather a hard and painfulr journey. As time went by roads approached everr r r

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r PLATE IIr

r Tenaya Lake where the last remnant of the Yosemite tribe was captured by the Mariposa Battalion on June 5, 1851.r

r r Photo by A. C. Pillsburyr r

r r r r r nearer from various directions, but it was manyr years before they reached the floor of the Valley. Inr the early days it required fortitude as well as enthusiasmr to make a trip to Yosemite, and travelers ofr that time have left us many accounts of their discomfortingr experiences.rr r

r In 1855 the walls of a cabin were erected in ther lower end of the Valley by a party of surveyors whor were seeking water for the Mariposa dry diggings, butr the first house actually completed was built in 1856-1857.r Being severely damaged by snow, it was replacedr in 1858 by a more substantial structure, whichr was kept as a hotel during the next decade by a numberr of different parties. Included in the number ofr these early Yosemite inn-keepers was the Longhurstr whom Clarence King describes as a "weather-beatenr round-the-worlder, whose function .. . . was to tellr yarns, sing songs, and feed the inner man," and whoser flapjacks the same fascinating writer professed a reluctancer to eat, because that would seem like "breakfastingr in sacrilege upon works of art." In 1859 wasr completed the central portion of the building whichr later became known as the Hutchings House, the lumberr all being hewed or sawed out by hand. It mayr be of interest to note that this building (the presentr Cedar Cottage) was the subject of the first photographr ever taken in Yosemite.r [Editor's note:r Charles Leander Weed's first photograph, taken June 18, 1859 was of Yosemite Falls,r not what was latter known as the Hutchings House, which was photographed 3 days later—dea.]r

r r

r The first permanent resident in the Valley wasr James C. Lamon, who took up a preëmption claim inr its upper end in the fall of 1859, built a cabin, andr laid out a garden and orchard which became famousr in after years. From 1862 he resided in the Valleyr both summer and winter until his death in 1876.r

r r

r In the spring of 1864 J. M. Hutchings came tor r r r Yosemite with his family, having purchased a claimr and arranged to buy the building to which his namer became attached. After his advent as a permanentr resident Hutchings was for a decade the leadingr figure in the Valley's history. He was "mine host"r to a large proportion of the people who visitedr Yosemite in that period, and while there is abundantr evidence that as an hotel-keeper he was not an overwhelmingr success, we may, perhaps, assume that hisr hospitable enthusiasm compensated in some degree atr least for the defects of his hostelry.r

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AN HISTORIC SAWMILL

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r In order to make necessary improvements in hisr establishment Hutchings erected a small sawmill nearr the Yosemite Fall, for the purpose of turning intor lumber a lot of trees that had been thrown down by ar windstorm some years before. This sawmill of Hutchings'r has rather a higher claim to notice than is possessedr by most such structures: for nearly two yearsr it was operated by no less a personage than John Muir.r Muir was then on the threshold of his career, engaged,r in the intervals between his work as sawyer and guide,r in gathering the data on which were based his glacialr studies of the high Sierra and in forming that passionater attachment for the "Mountains of Light," whichr proved to be so significant a factor in his life as wellr as in the history of the region.r

r r

r It was also the scene of the first meeting, in August,r 1870, of two men whose names and memories willr forever linger in these mountains—Muir and the elderr Le Conte. The latter has described the meetingr and set down his first impressions of Muir:r

r r r r

r "To-day to Yosemite Falls. . . . Stopped a momentr at the foot of the falls, at a sawmill, to maker inquiries. Here found a man in rough miller's garb,r whose intelligent face and earnest, clear blue eye,r excited my interest. After some conversation discoveredr that it was Mr. Muir, a gentleman of whomr I had heard much from Mrs. Prof. Carr and others.r He had also received a letter from Mrs. Carr, concerningr our party, and was looking for us. . . . I urgedr him to go with us to Mono. [Later in the day we]r learned from Mr. Muir that he would certainly go tor Mono with us. We were much delighted to hear this.r Mr. Muir is a gentleman of rare intelligence. . . .r He has lived several years in the Valley, and is thoroughlyr acquainted with the mountains in the vicinity.r A man of so much intelligence tending a sawmill!—notr for himself, but for Mr. Hutchings. This is California!"r

r r

r It seems singularly appropriate that these two menr should meet thus for the first time in the great templer of nature which both loved so well; and under suchr circumstances, Muir in the rough garb of a mill operatorr and Le Conte in the scarcely less rough garbr of a mountain traveler. It was Le Conte's first summerr in the Sierra, and Muir conducted him and hisr party over the route which he himself had traced outr for the first time only a year before.r

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CREATION OF STATE PARK

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r During the first decade after the Valley was broughtr to general notice the desirability of setting it aside asr a park became manifest. The danger that it wouldr soon fall into private hands led Senator Conness ofr California, in 1864, to secure the passage by Congressr r r r of an act granting to the State of California "ther Cleft, or Gorge, in the Granite Peak of the Sierrar Nevada Mountains . . . known as the Yosemiter Valley," with the stipulation, however, that it shouldr be held for public use, resort, and recreation and shouldr be inalienable for all time.r

r r

r By the same act the Mariposa Big Tree Grove,r four square miles, was also granted to the State underr the same conditions. The act further provided thatr the two grants should be managed by a board ofr commissioners consisting of the Governor and eightr other persons appointed by him.r

r r

r On September twenty-eighth Governor F. K. Lowr issued a proclamation naming Frederick Law Olmsted,r Professor Josiah Dwight Whitney, William Ashburner,r I. W. Raymond, E. S. Holden, Alexander Deering,r George W. Coulter, and Galen Clark as commissioners,r and warning all persons to desist from trespassing orr settling upon either of the two grants. At the firstr session of the legislature thereafter a law was enacted,r April 2, 1866, legally constituting the Board of Commissioners,r making the necessary provisions for ther

control and administration of the trust created byr the grant from the federal government, and making ar small appropriation for the first two years.r

r r

ADMINISTRATION OF STATE COMMISSIONERS

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r r The commissioners first named and those subsequentlyr appointed were, as a whole, well selected,r but circumstances conspired to defeat many of theirr best efforts. They had scarcely entered upon ther discharge of their duties when they found themselvesr involved in a prolonged litigation. The settlers,r r r r Hutchings and Lamon, who had made their homesr in the Valley, refused to surrender their holdings uponr the invitation of the Commission. After some fruitlessr negotiation a test suit was brought against Hutchings,r which in the district court was decided in hisr favor. On appeal to the Supreme Court of the Stater the judgment was reversed, and on being carried to ther federal Supreme Court the position of the Commissionersr was fully sustained. But in the meantimer Lamon and Hutchings had brought their case tor the legislature, and that body, under the influencer of a sympathetic agitation, passed a bill grantingr to each of them a tract of 160 acres in ther Valley, subject, however, to the approval of Congress.r That approval was never given, so thatr finally, in 1875, after a second legal action againstr Hutchings, the Commissioners found themselves inr full and undisputed control, for the State, of the propertyr which they had been appointed to manage. Onr their recommendation the legislature in 1874 appropriatedr $60,000 to compensate Lamon, Hutchings, andr two others for the loss of their claims in the Valley.r

r r

r The Commissioners were unquestionably right inr the position which they assumed, and we cannot dismissr this phase of the subject without remarking uponr the service which they rendered to the State and ther nation in thus pursuing the case to its final settlementr in their favor. The extinguishment of private titlesr has been one of the most perplexing and difficultr problems confronting the administration of the park,r whether state or national. At the same time we cannotr overlook the equities in the case of the settlers,r nor forget the fact that Hutchings in this early periodr did more perhaps than any other one person to maker r r r known to the world the beauties and the wonders ofr Yosemite.r

r r

r This controversy resulted in the creation of a rallyingr point for all forces hostile to the park administration.r The granting of a road privilege on the northr side of the Valley furnishes another example of ther difficulties constantly arising. In 1869 the Commissionersr granted to certain parties interested in ther Big Oak Flat route the exclusive privilege of extendingr a toll road to the floor of the Valley on that side.r These parties having failed to carry out their agreement,r the Commissioners in 1872 granted a similarr exclusive privilege to the Coulterville and Yosemiter Turnpike Company, who went to work at once andr completed their road into the Valley June 17, 1874.r After this privilege had been granted, the Yosemiter Turnpike Road Company, representing the Big Oakr Flat route, applied for the privilege of building a freer road from the edge of the park into the Valley. This,r being denied by the Commission, the company appealedr to the legislature, which gave it the rightr prayed for. This road also was completed in ther summer of 1874, and in the following year the Wawonar road was extended into the Valley.r

r r

r The Commissioners were greatly handicapped byr the litigation described and the hostility which itr engendered; by the action of the legislature in overridingr their decisions, in the cases above mentioned;r by the fact that the public was generally indifferentr except as it was aroused by the distressed appeals ofr adversely affected individuals; by the lack of fundsr with which to work; and to an important degree byr the fact that there was no accepted park practice orr policy to guide them. Opposition to the Commissionr r r r culminated in the legislative session of 1880, when ther Commissioners were incontinently ousted from officer by the action of the legislators and a subsequent decisionr of the Supreme Court of the State. A new lawr was passed and a new board appointed.r

r r

r The new body signalized its entry into office by appointingr as Guardian J. M. Hutchings, in place ofr Galen Clark who had held the office for the precedingr fourteen years. This board profited to some extentr by the experience of its predecessor, especially sincer the controversy over private holdings had been settled,r but it also succeeded in doing many things whichr called forth sharp criticism. It was necessary tor adopt a policy for dealing with such questions asr the granting of hotel, carriage, and saddle-trainr privileges, the use that should be made of the meadowr lands, and the kind of attention that should be givenr to the wooded areas—whether to cut and prune or tor leave the brush and young trees to grow untouched;r and the policy adopted was sure to displease someone.r

r r

r Still, the new Commission was in much better positionr to do effective work than the old one had been,r and the next decade saw important results accomplished—ther roads and trails within the park lines werer freed from the vexatious tolls that had before encumberedr them; new roads and bridges were constructedr within both the Yosemite grant and the Mariposar Big Tree Grove; a pretentious hotel, the Stonemanr House, was erected near the upper end of the Valley,r for which the legislature in 1885 appropriated $40,000.r The new hotel turned out to be an unprofitabler investment, for, as it was not properly constructed,r expensive repairs were necessary. The building wasr finally burned to the ground in the summer of 1896.r

r r r r

r The remainder of the period during which Yosemiter Valley and the Mariposa Grove remained under stater control witnessed slow but steady development alongr all lines; and it also witnessed a more significant thing—ther growth of a wider and more intelligent interestr in matters affecting the park, which had an inevitabler and healthy reaction upon the administration.r

r r

MAPPING THE YOSEMITE REGION

r r

r It is only in recent years that the vast alpine regionr to the north and east of Yosemite Valley has becomer generally known to tourists, though for many yearsr before that it was familiar to many mountain lovers.r The first white men who frequented this Yosemiter *hinterland* were miners and sheepherders and cattlemen.r After them came the surveyors and then ther soldiers of the republic to guard the mountain meadowsr and forests from the destructive forces at work. Andr lastly the tourists, at first in little groups at long intervals,r but now in throngs, to see the glories of ther mountains.r

r r

r The first systematic reconnaissance of the Yosemiter region was made by the California Geological Surveyr between 1863 and 1867. The first expedition, inr 1863, covered in a general way the watershed betweenr the Merced and the Tuolumne and the headwaters ofr those rivers. Their later expeditions were made directlyr as a result of the creation of the state park,r first to survey its boundaries and secondly to gatherr data or the preparation of the maps and text of ar book descriptive of the Yosemite region which wasr published by the California Geological Survey in 1868.r It was in connection with these and other expeditionsr r r r of the State Geological Survey that Clarence Kingr had the experiences so delightfully described in hisr bookr "Mountaineering in the Sierra Nevada."r Tor this survey we are indebted for the names of many ofr the peaks, and for the first accurate maps of the region.r The same area was covered in 1878-79 by a party ofr the Wheeler Survey in charge of Lieutenant M. M.r Macomb. The definitive mapping of the region has,r of course, been done by the United States Geologicalr Survey, whose fine topographic maps are familiar tor all mountain travelers.r

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THE TRAIL OF THE MINER

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r The trail of the miner is found everywhere in ther Sierra Nevada. We have already seen that the discoveryr of Yosemite was a result of the mining advancer into the foothills. Subsequently there were two wellr defined periods of mining excitement which were ofr importance in the history of the region. The firstr of these began about 1857 when placer gold wasr discovered in what are broadly referred to as ther Mono diggings. To accommodate the miners and packr trains passing to and fro across the range the Monor Trail was blazed out easterly along the ridge betweenr the Merced and the Tuolumne, following in the mainr old Indian trails, and descending into the Monor plain through the steep defile of Bloody Canyon.r For a few years this trail was much traveled and thenr fell into disuse as the placers were worked out. Whenr Joseph Le Conte passed over it first in 1870 he foundr it nearly obliterated in many places.r

r r

r The miners went elsewhere, but soon flocked backr again in even greater numbers, when gold and silverr r r r ores were discovered in the summit ridge about 1878.r In a short time claims were staked out all the wayr from Parker Pass to Virginia Creek, but the interestr centered principally at Lundy and Tioga. In 1881r a group of Eastern capitalists incorporated the Greatr Sierra Consolidated Silver Mining Company for ther purpose of exploiting the central group of claims inr the Tioga District. A post office, called Bennettviller in honor of the president of the company, was establishedr and operations were vigorously pushed. Ther writer has seen in a little paper published at Lundy ar graphic description of the way in which the first machineryr for the Tioga mine was snaked up the mountainr side to Oneida Lake on skids, hoisted with a windlassr to the summit of Tioga crest and thence dragged pastr Saddlebag Lake into Tioga in the dead of winter.r

r r

r But this was too primitive a method to be used forr bringing in all the heavy machinery and other suppliesr required. The company therefore determined tor build a road up the western slope to Bennettville;r and thus was inaugurated the building of the famousr Tioga Road. The surveys were made in 1882 andr construction work was begun in the fall of that year,r Chinese labor being employed. The road was completedr in the fall of 1883, having cost about $62,000.r In December, 1883, and January, 1884, toll franchisesr were granted by the

counties of Mariposa and Tuolumner and for a short time tolls were collected fromr travelers who used the road.r

r r

r Financial disaster overtook the company after itr had expended over $300,000 and the mine was closedr in July, 1884. Subsequently, in January, 1888, her entire property, including the road, was sold by ther Sheriff to W. C. N. Swift of New Bedford, Mass.,r r r r who had been interested in the original company. Inr 1889 operations were resumed in the mine but werer not long continued. The road, abandoned by itsr owners, year by year fell into disrepair.r

r r

r It was during this period of mining excitement thatr John L. Murphy took up his claim on the shore ofr Lake Tenaya, built a cabin, and established a stoppingr place that was sometimes distinguished with the titler of hotel. John B. Lembert took up a claim in ther Tuolumne Meadows which included the Soda Springs.r For several years a saddle train was run during ther summer between Lundy and Yosemite, and theser places were connected by telephone. There was alsor the inevitable crop of rumors regarding projectedr railroads to cross the Sierras through this region.r Finally it is to be noticed that in the summer of 1881r silver mineral was discovered near Mt. Hoffman andr the considerable excitement occasioned by it resultedr in the organization of the Mt. Hoffman Mining District.r Some months later John B. Lembert is saidr to have found a vein of silver bearing quartz in ther Tuolumne Meadows. Sufficient quantities of ore haver never been found to justify the working of theser claims.r

r r

THE RÉGIME OF THE SHEEPHERDER

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r r During all this time the Yosemite region was ther haunt of the sheepherders and their all-devouringr woolly charges. The mountain meadows are ther finest of all sheep pastures, and year by year they werer visited by countless thousands of these "hoofed locusts,"r as John Muir aptly termed them. As soon asr the early summer heat dried up the grasses of ther r r r plains and foothills the herds were headed towardr the higher mountains, and before the autumn chillr started them on their backward journey to the plainsr they had penetrated into every little grassy glade,r leaving a desert in their wake, eating up or tramplingr to death every young plant that lay in their path,r not excepting the young fir, which were for them anr especially prized tidbit.r

r r

r John Muir in his first summer in the Sierra notedr the damage and destruction that was wrought byr the sheep. The State Engineer, Wm. Ham Hall, inr a report to the State Commission in 1882, calledr attention to the disaster threatening the Valley fromr the indiscriminate grazing of sheep in the Mercedr watershed. It was not alone the fact that the sheepr ate up every green thing within their reach, or thatr their myriad trampling feet loosened the soil on ther hillsides; the shepherd, through design or carelessness,r applied the match, and "his trail to the plain wasr marked by the smoke of the burning forest."r

r r

CREATION OF NATIONAL PARK

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r The sheep may fairly be said to have been responsibler for the formation of the Yosemite National Park.r The first determined effort to protect the region surroundingr the Valley from the destruction wrought byr them was in 1881, when the State Commissionersr fathered a movement to include in the state park ar district somewhat smaller than the present nationalr park. A bill embodying this plan was introducedr into Congress but through the vigorous opposition ofr powerful local interests the success of the movementr was frustrated. The Commissioners continued forr r r r some years to urge the measure, but they were neverr able to muster sufficient influence to put it through.r

r r

r In 1889, John Muir and Robert Underwood Johnson,r one of the editors of the *Century Magazine,*r camped together in Tuolumne Meadows. Muirr pointed out to his friend the devastation that wasr being wrought by the sheep, and it was agreed, atr Johnson’s suggestion, that the way to save the regionr was to have it set aside as a national park. A planr of action was agreed upon—Muir to write for ther *Century* a series of articles designed to arouse publicr sentiment, and Johnson to secure for the movement asr much support as possible from influential men in ther East. The movement thus launched culminated successfullyr in the enactment of a law, approved Octoberr 1, 1890, to set aside this region as "reserved forestr lands." The name Yosemite National Park was somewhatr inconsistently applied to it by the Secretary ofr the Interior. The original boundaries were largerr !an the present limits of the Park, including as theyr Id a considerable area on the west and southeastr which has been eliminated by subsequent legislation.r

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THE WORK OF THE SOLDIERS

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r r The control of the Park was vested in the Secretaryr of the Interior, and the plan of administration adoptedr was to place the local authority in the hands of anr Acting Superintendent, who was a military officer inr charge of one or more troops of cavalry. The firstr Superintendent was Captain A. E. Wood, an intelligentr and energetic officer, for whom the post atr Wawona was later named. The soldiers ordinarilyr came in in April or May and took their departure inr r r r October. During the winter two forest rangersr patrolled the Park, so far as it could be patrolled.r

r r

r The difficulties confronting the first Superintendentr were rather formidable: the boundaries not havingr been surveyed were difficult or impossible to locate;r the country to be patrolled was large and extremelyr rough; there was no well-planned trail system, and nor detailed topographic map showing the location ofr such trails as did exist; it was necessary for the Superintendentr to make himself acquainted with the regionr and to organize and direct a plan for protecting it,r from the encroachments of the sheep and cattlemen,r who, having had undisturbed use of the Park for ar quarter of a century, were extremely reluctant nowr to abandon it.r

r r

r Headquarters were established at Wawona and fromr there patrols were sent out to cover the entire Parkr systematically. The principal work of these patrolsr was in fighting fires and in preventing trespassingr within the Park lines by sheep and cattle. No penaltyr had been provided by Congress for the infraction ofr rules. The army officers ingeniously adopted ther plan of driving the sheep from the Park and escortingr the herders across the mountains to the opposite boundary. This plan when vigorously followed soonr resulted in reducing this evil to a minimum. Besidesr these more general duties the soldiers frequently werer compelled to repair trails and bridges along the liner of their march. One Superintendent reports ther clearing out and repair by the troop of more than sixtyr miles of trails in one season. The protection of ther game within the Park from the depredations of predatoryr hunters was an important duty of the patrols.r

r r

r These troopers were faithful and efficient. In ther r r r discharge of their duties they not infrequently werer called upon to push their way through snow-filledr passes and to ford bowlder strewn and angry mountainr streams at flood water, sometimes in peril of theirr lives. One carries away from a perusal of the reportsr of the various Superintendents an increased respectr for the military arm of the national government.r

r r

r To the subordinate officers of the command therer were frequent opportunities for special service. Duringr the early years Lieutenants N. F. McClure, H. C.r Benson, M. F. Davis, and W. R. Smedberg made ar careful study of the topography of the region and fromr their notes and the results of previous surveys Lieutenantr McClure prepared an excellent map for the user of the troops, on which the topography and the trailsr were accurately delineated. Lieutenant Benson spentr several seasons in the Park, first as a junior officerr and later with rank of Captain and Major as Actingr Superintendent, and has always been keenly interestedr in all matters affecting it. It was upon his suggestionr that the system of permanent patrolling stations wasr instituted in 1903. This greatly facilitated the workr of the troopers. After a few years a telephone liner was built connecting these stations with headquartersr in Yosemite Valley, and thus instant communicationr could be had with all parts of the Park.r

r r

PLANTING TROUT IN YOSEMITE WATERS

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r r Lieutenant Benson was an enthusiast on the subjectr of fishing and at all times took a lively interestr in the stocking of the waters of the Park. Not onlyr did he direct the planting of trout fry sent into ther Park by the California State Fish Commissioners,r r r r but he personally netted trout in a number of lakesr and streams and placed them in unstocked waters.r

r r

r This was a work of primary importance, since fishr are not indigenous in any of the lakes or streams inr the upper Yosemite region. John L. Murphy is saidr to have planted trout in Tenaya Lake in 1878, andr about the same time the Yosemite State Commissionersr took up the question of stocking the Yosemiter streams. They proposed to have a hatchery establishedr in the Valley. This plan, renewed from timer to time, was not then carried out, but at their suggestionr the State Fish Commissioners sent in youngr trout to be planted in the Merced River and its tributaries.r After the establishment of the national parkr the planting of trout fry came to be one of the regularr duties of the soldiers. In 1895, Washburn Brothersr erected at Wawona a fish

hatchery which was operatedr by the State Fish Commission, and from here millionsr of fry have been distributed in the lakes and streamsr throughout the Park. During 1919, the State Fishr and Game Commission operated a temporary hatcheryr in Yosemite Valley under an agreement with the federalr government. This work was not continued during 1920,r but the last report of the National Park Service indicatesr that a permanent hatchery will soon be established inr accordance with the agreement referred to.r

r r

REVISING THE BOUNDARIES

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r No sooner had the national park been created thanr efforts were begun to effect a change of boundaries.r As first established, the Park included a large amountr of land which was owned by private parties underr patents and which was concentrated for the mostr r r

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r PLATE IIIr

r Liberty Cap and Nevada Falls. The buildings are the La Casar

r Nevada, a famous hostelry of the early days whichr

r has long since disappearedr

r Photo by George Fisker

r r r r r part in certain relatively small districts. This wasr largely in the form of timber and mining claims.r The owners very naturally objected to having theirr lands thrown into a national park with all of the inconveniencesr which that involved. There was also otherr supposedly valuable land of similar character within ther Park lines which was not yet taken up, and this was now,r by the terms of the law, withdrawn from entry.rr r

r From the standpoint of the administration of ther Park there were two reasons for a change: first becauser of the trouble occasioned by the presence ofr privately owned lands within the Park; and secondr because the original boundaries were laid out alongr straight lines instead of conforming to the naturalr features of the country, and thus increased greatlyr the problem of a proper patrol system. For theser reasons some of the early Superintendents advisedr reducing the size of the Park by fixing natural boundaries,r so far as possible, and eliminating the bulk ofr the mineral lands and privately owned timber. Fortunatelyr no attention seems to have been paid to theirr recommendations. Later Superintendents generallyr opposed cutting down the boundaries, but stronglyr urged the importance of extinguishing all privater holdings within the Park by purchase or otherwise.r

r r

r Within a few months after the Park came intor existence an attempt was made in Congress to reducer its size. This first attack upon the integrity of ther Park was defeated, largely through the efforts ofr the Sierra Club. As time went by it became clearr that one of two things was necessary—either to buyr up the private claims within the Park lines, or tor revise the boundaries so as to exclude the bulk ofr these lands. The national government was evidentlyr r r r unwilling to make the necessary appropriation to buyr the claims, and finally in 1904 a commission appointedr by the Secretary of the Interior visited the Park forr the purpose of ascertaining, among other things,r "what portions of said Park are not necessary forr park purposes, but can be returned to the public domain."r This commission, composed of Major Hiramr M. Chittenden of the Engineer Corps of the army,r R. B. Marshall of the Geological Survey, and Frankr Bond of the General Land Office, made a carefulr study of the situation and recommended the boundaryr changes that were incorporated in the Act of Congressr approved February 7, 1905. This act eliminatedr about twelve townships on the east and west andr added about three townships on the north, fixing ther eastern boundary at the summit of the Sierra Nevadar and the divide between the Merced and the Sanr Joaquin rivers. In 1906 another small tract on ther southwest was cut off, ostensibly to enable an electricr line to secure a right-of-way. All of these eliminatedr lands were added to the adjacent forest reserves.r

r r

r Further changes in the boundaries may be expected.r In fact the National Park Service in its recent reportsr has suggested the advisability of a further lopping offr of grazing land on the west and the addition of ar large area on the southeast (eliminated in 1905)r which includes such scenic features as the Mountr Ritter Range, Thousand Island Lake, and the Devil’sr Postpile.r

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RECESSION OF STATE PARK

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r r The establishment of the national park resulted inr bringing into existence a dual system in the Yosemiter region, the State having control of Yosemite Valleyr r r r and the Mariposa Grove, and the national governmentr having control of the surrounding territory. This wasr an awkward and inconvenient arrangement, necessitatingr much duplication of administrative machineryr and expense. Yosemite Valley was the natural locationr for the headquarters of the national park, butr could not be used for that purpose. Headquartersr were therefore maintained at Wawona and the troopsr were constantly compelled to cross the state park linesr in carrying on their patrol work. Superintendentsr repeatedly called attention in their reports to ther anomalous situation and the difficulties which it involved.r The disadvantage of dual control was sharplyr brought out in 1903 by a fire which burned for morer than a week in the Illilouette basin, resulting in

ar rather ill-tempered controversy between the state andr national park authorities over the questions as tor where the fire originated and whether the stater Guardian used due care and vigilance in its extinguishment.r This division of authority interfered withr the improvement and development of the entire region.r The national government, not having control of whatr were considered the main scenic features, did notr feel called upon to make large appropriations, and itr was never possible to induce the State Legislature tor set aside money enough to properly care for eitherr Yosemite Valley or the Mariposa Big Tree Grove.r

r r

r As time went by many citizens of California camer to feel that it would be better to hand back to ther national government the trust received from it inr 1864, and a movement was launched with that objectr in view. It was pointed out that conditions hadr greatly changed since 1864, at which time there werer no national parks; since then the federal governmentr r r r had inaugurated a policy of creating national parksr and had manifested a disposition to make adequater appropriations for their maintenance. A comparisonr of appropriations and results achieved in Yellowstoner National Park and in Yosemite State Park proved ar powerful argument. Many clubs and civic organizationsr were enlisted in support of the movement, chiefr among which in the zeal and effectiveness of its workr was the Sierra Club.r

r r

r Local state pride proved to be the greatest obstacler in the way of the recession, but this was finally overcome,r and an act passed by the State Legislature,r approved March 2, 1905, receding to the United Statesr Yosemite Valley and the Mariposa Big Tree Grove.r The adjournment of Congress prevented a formalr acceptance of the recession until 1906 and hence ther transfer could not be effected until that time. Ther Yosemite State Park finally came to an end August 1,r 1906, after an existence of forty-two years. Ther Superintendent of Yosemite National Park, Major H.r C. Benson, at once removed his headquarters fromr Wawona to the Valley and the central military campr was established on the site of the present Yosemiter Lodge. In 1920 jurisdiction in all matters civil andr judicial was transferred from the state to the nationalr government.r

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THE SIERRA CLUB

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r r One of the most important of the forces operatingr to shape the history of the Yosemite region since ther creation of the national park has been the work ofr the Sierra Club. This organization has been instantr in season and out of season in promoting all forward-lookingr movements affecting California’s great alpiner r r r heritage. The life of the Sierra Club has been almostr exactly contemporaneous with that of Yosemite Nationalr Park. The Club was organized in 1892, butr the idea from which it was evolved had its inceptionr in the mind of Professor J. H. Senger of the Universityr of California and was expressed by him as early asr 1886. The final impetus was given to the movementr by the strongly felt need of some organization to pushr forward the work that was only begun by the parkr act of October 1, 1890.r

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r The special purposes of the Sierra Club are thus expressedr in the articles of incorporation: "To explore,r enjoy, and render accessible the mountain regionsr of the Pacific Coast; to publish authentic informationr concerning them; to enlist the support and cooperationr of the people and government in preservingr the

forests and other natural features of the Sierrar Nevada Mountains." A detailed account of the doingsr of the Club would show how faithfully and eagerly itsr members have carried out these purposes. Duringr the first twenty-two years its work was carried onr under the inspiring leadership of John Muir.r

r r

r The field of the Sierra Club's work is much morer extensive than the Yosemite National Park, but fromr the beginning it has taken a special interest in thisr region. Several of its annual outings have been heldr in the Park and surrounding territory. As early asr 1898 a building in the Valley, granted by the Stater Commissioners, was equipped as local headquartersr for the Club, to be used also as a public reading roomr and bureau of information. A few years later, afterr the death of Joseph Le Conte, the beautiful Le Conter Memorial Lodge was erected just below Glacier Point.r In 1918 it was moved about a quarter mile westward tor r r r its present site. In 1913 the Club purchased the Sodar Springs property in the Tuolumne Meadows and twor years later built upon it the E. T. Parsons Memorialr Lodge.r

r r

r The work of the Sierra Club in opposing attemptsr to cut down the size of the Park and in urging ther recession of the state park has been referred to above.r In every time of crisis the Club has stood forth asr champion of the forests and the mountains againstr vandalism and commercialism. The *Sierra Clubr Bulletin,* an annual publication, contains a wealth ofr information about the entire Sierra region—descriptive,r illustrative, and scientific. The speech andr writings of its members have gone far toward makingr known to the wide public the true character of ther Yosemite region.r

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HETCH HETCHY: EARLY HISTORY

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r This interesting counterpart of Yosemite was discoveredr in 1850 by a mountaineer named Josephr Screech. Not long before that the Valley was ar disputed ground between the east and west sloper Indians, but the Piutes from across the range hadr gotten the upper hand and for years were accustomedr to spend some time in Hetch Hetchy in the fall of ther year gathering acorns. Screech blazed a trail into ther Valley and the rich meadow land became a grazingr ground for sheep and cattle. Subsequently the discovererr and two or three other parties took up preemptionr claims covering most of the Valley floor.r The State Geological Survey visited Hetch Hetchyr in 1867, and a description of it was published in ther *San Francisco Bulletin* in October of that year. Whenr r r r John Muir first visited the Valley in 1871 he found ar sheep owner named Smith in possession. This wasr doubtless the Smith who later obtained the ownershipr of a large part of the Valley and of several desirabler tracts in the vicinity, and for whom Smith's Peakr and Smith's Meadow were named. Muir records ther fact that in the seventies Hetch Hetchy was frequentlyr called Smith's Valley.r

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r The number of tourists who visited Hetch Hetchyr in the early days was very small, due to its inaccessibilityr and the superior attractions of Yosemite Valley.r John Muir and other enthusiasts did much to acquaintr the public with its beauties, but it was only afterr San Francisco started her fight to secure Hetch Hetchyr as a reservoir site that it became widely known. Evenr then it was better known by report than by actualr visitation. The Sierra Club included it in several ofr its annual outings. In 1905 some Stanford Universityr students conducted a hotel camp there, under ther auspices of the Santa Fé railroad, and that served tor bring in a

number of tourists.r

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HETCH HETCHY: THE SAN FRANCISCO WATER SUPPLY

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r The San Francisco city charter which was adoptedr in 1900 placed on the supervisors and the city engineerr the duty of conducting investigations to determiner the best available source for an adequate waterr supply for that city, this being a matter of pressingr importance. After a careful examination of somer fourteen suggested sources the Tuolumne River wasr selected as in every way the best, and there was preparedr the first draft of what came to be known as ther Hetch Hetchy project, the central feature of the planr r r r being the conversion of Hetch Hetchy Valley into ar lake-reservoir and the use of Lake Eleanor as a secondaryr storage basin. The necessary filings werer made to cover the desired water rights and an applicationr was made to the Secretary of the Interior,r under the provisions of the act of February 15, 1901,r for a permit to use the proposed reservoir and forr authorization to construct the necessary dams andr other works.r

r r

r As soon as the plans of San Francisco becamer known, a movement was put under way to preventr their consummation. This was the beginning of anr extraordinary contest, lasting for a dozen years, whichr was at times waged with considerable bitterness.r San Francisco's first application was denied in 1903r by Secretary of the Interior E. A. Hitchcock. It wasr renewed in 1905 and again denied. In 1907, afterr James R. Garfield became Secretary of the Interior,r the matter was presented to him, and a hearing was heldr in San Francisco in July of that year. Further argumentsr were presented in writing after the Secretary'sr return to Washington. Finally, on May 11, 1908,r Mr. Garfield granted to the city the rights asked for,r but upon two conditions: one that the Lake Eleanorr site should be developed to its full capacity beforer any work should be undertaken on the Hetch Hetchyr site; the other that the rights of the Modesto andr Turlock irrigation districts should be fully protected.r

r r

r Under the terms of this grant the city proceededr to buy up the private claims involved, at a cost ofr several hundred thousand dollars, and to vote a bondr issue of $45,000,000. Construction operations hadr been started when Secretary of the Interior R. A.r Ballinger, in February, 1910, after an investigation ofr r r r the question, ordered the city to show cause whyr Hetch Hetchy Valley should not be eliminated fromr the permit granted by Secretary Garfield. Thisr looked at first like a blow to San Francisco's plans,r but it turned out to be quite the reverse, for the fightr which was now inaugurated resulted finally in a completer triumph for the city and in the defeat of thoser who were trying to save Hetch Hetchy from inundation.r

r r

r A board of army engineers, consisting of Col.r John Biddle, Lieut.-Col. Harry Taylor, and Maj.r Spencer Cosby, was appointed to advise the Secretaryr of the Interior on the question. After a preliminaryr hearing in May, 1910, a continuance of one year wasr granted in order that a thorough investigation mightr be conducted. The city hired one of the best engineersr in the country and spent over a quarter of ar million dollars in an examination of every phase ofr the question and in the preparation of the reports andr plans on which its case finally rested. The finalr hearing was held November 25-30, 1912, before Secretaryr of the Interior Walter L. Fisher. The reportr of the advisory board of army engineers, presentedr February 19, 1913,

was on the whole distinctly favorabler to the city. Nevertheless Secretary Fisherr declined to act on the matter, since he was about tor retire from office and since he also felt that a questionr of such importance should be passed upon by Congress.r Franklin K. Lane, who succeeded Mr. Fisher as headr of the Interior Department, in view of his formerr connection with the case as city attorney of Sanr Francisco, likewise referred the matter to Congress,r and the fight was accordingly transferred to thatr body.r

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r In June, 1913, as an emergency measure, Congressmanr John E. Raker introduced a bill granting tor San Francisco the necessary rights and authorizationsr for carrying out the Hetch Hetchy water project substantiallyr in the form presented in the plans preparedr for the city by John R. Freeman. After extendedr hearings before the House committee this bill wasr redrafted in order better to protect the national parkr and to safeguard the interests of the government.r In this form, in spite of the strenuous opposition ofr many persons from all parts of the country, the billr passed the House by a practically unanimous vote,r passed the Senate by about two to one, and was approvedr by President Wilson, December 19, 1913.r Under this act San Francisco was granted the immediater use of both Lake Eleanor and Hetch Hetchyr Valley and the extensive engineering works called forr by the development of the project were at once putr under way. The city is required to build a scenicr road along the north side of the lake that will ber created by the flooding of Hetch Hetchy Valley, andr certain other roads and trails the effect of which willr be to make more accessible to tourists the countryr about Hetch Hetchy and the portions of the Parkr north of the Tuolumne River.r

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RECENT ADMINISTRATIVE CHANGES IN THE PARK

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r After the recession of the state park in 1906 ther administrative machinery already established wasr continued in effect for some years longer, althoughr the Acting Superintendent found himself confrontedr with much more exacting duties than formerly. Inr 1914 a new system was inaugurated. Secretary Laner r r r of the Department of the Interior, in his report forr that year, says:r

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r "The conditions in and around these reservationsr which led to the authorization of the use of the militaryr force in these parks having radically changed, ther conclusion was reached that their presence was nor longer required in the Yosemite, Sequoia, and Generalr Grant National Parks, and the Secretary of War wasr so advised. During the past year, therefore, troopsr have no longer been employed in these reservationsr and have been superseded by civilian rangers, bringingr the latter in closer touch with the actual work ofr the park management than was formerly practicabler when troops were only in the reservations for a fewr months." The general plan of the patrol system begunr under the military régime was continued by ther civilian rangers.r

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r Mark Daniels was the first Superintendent underr the new arrangement. On March 10, 1914, he wasr "commissioned as landscape engineer in the Yosemiter National Park for the purpose of preparing a comprehensiver plan for the development and improvementr of the floor of the Yosemite Valley covering the bestr locations for roads, trails, and bridges, so as to bringr into view the full scenic beauty of the surroundings,r the clearing and trimming of suitable areas of woodsr to provide attractive vistas, the proper

location andr arrangement of a village in the Yosemite Valley, etc."r An important step taken in 1915 was a change in ther method of handling concessions, placing all the hotels,r camps, and lodges (with the exception of Camp Curry)r in the hands of one company under a long term lease,r thereby providing for the building of two new hotels,r one on the floor of the Valley and one at Glacier Point.r r r r In June, 1914, Mark Daniels was appointed Generalr Superintendent and Landscape Engineer for all ther national parks under control of the Department ofr the Interior. This was as far as the executive branchr of the government could go in the reorganization ofr national park administration. The final step awaitedr the action of Congress. For some years the Secretaryr of the Interior, seconded by the President, had beenr urging the establishment of a national park service.r This was finally done by an act of Congress whichr was approved August 25, 1916. The new bureau wasr organized in the spring of 1917. As its first Directorr Mr. Lane appointed Stephen T. Mather, who hadr already, as assistant to the Secretary of the Interior,r had general oversight of national park affairs. Muchr of the recent development in this field has been duer to the clear vision, enthusiasm, and untiring energyr of Mr. Mather. The establishment of the Nationalr Park Service marks the beginning of a new era inr national park history.r

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THE NEW YOSEMITE

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r In the last decade a change has come over Yosemite—ar change that can be fully appreciated only byr those who have seen both the old Yosemite and ther new. There has come into existence a new attituder on the part of the general public, and the administrativer development just described is in part a cause andr in part an effect of this new attitude. It is now seenr that Yosemite is not simply the glorious valley ofr that name, nor the remarkable old Sequoias, but ar vast alpine wonderland containing, besides these,r many other features quite as much worth seeing.r r r r There are several factors which have an importantr bearing upon this new conception, and it is necessaryr to mention a few of them.r

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r The Park has been made accessible to a degree thatr was formerly only dreamed of or hoped for. First,r the building of the Yosemite Valley Railroad has mader it possible for the tourist to ride in comfort to ther very edge of the Park, giving a much more effectiver approach to the Valley through the wild gorge of ther Merced River. The building of this railroad was ther final outcome of many suggestions and proposals forr a wagon road or an electric road or a steam roadr designed to do away with the worst discomforts attendingr a visit to Yosemite. It follows the route whichr was pronounced the best by two different commissionsr appointed by the Secretary of the Interior. Ther right of way up the Merced River canyon was grantedr September 5, 1905, and the road was opened to travelr in the spring of 1907. Second, the admission of automobilesr has popularized the Park in a way thatr nothing else could do. This policy was inauguratedr near the close of the 1913 season. At the presentr time approximately two thirds of the visitors to ther Park enter it in private automobiles. Third, ther rehabilitation of the Tioga Road has opened the greatr upper Yosemite region to thousands who would neverr have gone there under the old hard conditions. Thisr road, the importance of which was stressed by everyr Acting Superintendent of the Park, was purchasedr and presented to the government in 1915 through ther generosity of Stephen T. Mather and a few others.r The State of California purchased the portions of ther road outside of the Park and built an extension downr Leevining Creek to connect with the highways on ther r r r eastern side of the range, thus making this old roadr an important link in a great highway system. Fourth,r the removal of the toll annoyance from the roads andr the construction of new roads and trails within ther Park have added immensely to the comfort of touristsr and the ease of getting about to points of interest.r The park road and trail system is not yet complete,r but enough has been done to

show beyond peradventurer how richly it pays in the finer sense to open upr the mountain playgrounds of the people.r

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r Since the recession of the state park in 1906 andr concurrent with the changes outlined above, travel tor Yosemite National Park has increased thirteenfoldr and national appropriations have grown from a fewr thousand to $300,000 for the season of 1920. Withr these changes the old Yosemite has become but ar memory. The long hard trip over mountain roadsr followed by a sojourn in the quiet and restful Valleyr has given place to comfortable automobile and trainr service and life in modern camps and hotels. Inr winter, in early spring, and in late fall the Valleyr still bears much of its old-time restful atmosphere,r but during the height of the season (July) the populationr numbers ten thousand or more. The policy ofr the National Park Service in making the Park "liveable"r and more and more accessible is unquestionablyr the right one. Even now the charm of the old Yosemiter can still be found by those who are willing to pursuer it, for in Tuolumne Meadows, at Tenaya Laker and at Merced Lake are delightful little mountainr chalets; and in spite of further encroachments ofr civilization there will always be the wildness of naturer for those who seek it.r

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r Next: Indians of Yosemiter •r Contentsr •r Previous: Illustrationsr

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Indians of Yosemite

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Handbook of Yosemite National Park (1921)r by A. L. Kroeber

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r Next: Ideals and Policy of the National Park Servicer •r Contentsr •r Previous: History of Yosemiter

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r r [Editor's note:r Susie McGowan with daughter Sadie,r Mono Lake Paiute.r From J. T. Boysen photo, c. 1901r —DEA]r r

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INDIANS OF YOSEMITE

r r

r By A. L. Kroeberr

r r

r *r Professor of Anthropology and Curator of the Anthropologicalr*
r Museum, University of Californiar r

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r Ther Indians of Yosemite belong to a group or familyr known as the Miwok who, before the white man came,r owned the tract from the Cosumnes River on the northr to the Fresno on the south, and from the crest of ther Sierra Nevada to the edge of the San Joaquin Valley.r The name Miwok is not strictly a tribal appellation; itr is simply the word in the language of these Indiansr which means "people." In default of any specificr designation for them, this term Miwok has beenr applied in distinction from other groups of aborigines.r Of such groups, there may be mentioned as neighbors:r the Maidu to the north in the Sierra; the Yokuts to ther south in the foothills and to the southwest in the Sanr Joaquin Valley; and the Mono to the south in the highr Sierra, and to the east in Owens Valley and aboutr Mono Lake. Excepting the Mono (who are an offshootr from the Paiutes and other Shoshoneans ofr Nevada and the Great Basin country) the otherr groups of Indians adjacent to the Miwok are veryr similar to them in physical type and customs, and evenr show a probable, although distant, relationship tor them in speech. In short, the Miwok are typical andr representative California Indians, and in this capacityr r r r form part of the large body of tribes known as "Diggers."r This is, however, a misleading name; partlyr because it carries a tinge of contempt, and still morer because it lumps together a variety of nationalitiesr that sometimes differed pretty thoroughly in theirr speech or were even unaware of one another’s existence.r For this reason the more accurate terms Miwok,r Maidu, and Yokuts are preferable.r

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ORIGIN

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r The origin of these Sierra Nevada tribes is notr definitely known. There can, however, be no seriousr doubt that they form part of the generic Americanr Indian race and that their ultimate origin must ber sought wherever the source of this division of mankindr may have lain. While no one is yet in a position tor speak dogmatically on this matter, all indicationsr point to the Indians having come at some time in ther far past from Asia, probably by the Bering Strait andr Alaska route. It is clear that in his bodily type ther Indian more nearly resembles the Mongolian of Easternr Asia than any other variety of the human species.r The long, straight, stiff hair, one of the most valuabler marks in race classification, is alone sufficient to establishr a strong presumption in this direction. As tor when this migration of the first inhabitants of Americar out of Asia took place, there is growing up a fairlyr unanimous concensus among anthropologists that thisr movement must have occurred at about the time thatr the Old Stone Age was giving place to the New inr Europe; that is to say, in the period at which chippedr stone tools were being replaced by polished ones, andr the ax, bow and arrow, textiles, agricultural implements,r r r r and domestic animals were becoming part ofr the heritage of the species. These steps in advancer are believed to have occurred about ten thousandr years ago. We may therefore say roughly that somewherer about 8000 B.C.—with an allowance of a fewr thousand years either way as a margin for error—ther American Indian became established on this continentr and began his diffusion.r

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r California was probably not very long in beingr reached; a mode of life adapted to local conditionsr was worked out, and with this the natives werer apparently content, and their development progressedr only slowly. They have left some traces of theirr occupancy in ancient village sites, shell mounds, andr the like.

Here the less perishable of their utensils,r such as mortars, pestles, pipes, knives, arrow points,r awls, beads, and other objects of stone, bone, and sor forth, have been preserved. In one of the mostr favorable localities on the shores of San Franciscor Bay careful computations have been made as to ther age of these deposits, with the result that the lowerr levels of the shell mounds there have been estimatedr to date back at least 3000 years. The implements atr these lower levels are ruder than those found near ther tops of the mounds; but they are after all of the samer type and even rather similar to those used by ther modern Indians of the State, including the Miwok.r We are therefore justified in assuming that nativer customs evolved very slowly in California, and thatr the ancestors of the Miwok and of the Yosemiter Indians for a very long time past have lived veryr much in the manner and under the conditions inr which they were discovered by the whites seventyr years ago.r

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DECREASE OF NUMBERS

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r The Miwok probably numbered at least tenr thousand, but the population decreased with terrifyingr rapidity after the advent of the white man. Somer of the nearer groups of them were taken to the Franciscanr Missions on the coast and there died off or becamer mixed with other tribes. The miner and rancherr quickly overran the Miwok habitat after 1849. Ther Indian was crowded into the less desirable nooks; hisr native food supply was preëmpted; whiskey and newr diseases against which he had no immunity werer introduced and resulted in a startling mortality; andr the general change in mode of life—new types ofr habitations, clothing, diet, labor, etc.—accentuatedr the effect of these diseases. The consequence wasr that in the sixty years between their first serious contactr with the white man until the census of 1910, ther Miwok lost more than ninety percent. of their numbers.r This census, which may not be wholly complete butr was by far the most accurate ever made as regardsr Indians, enumerates only about seven hundred ofr them, and of these a fair proportion are mixed bloods.r The number is still shrinking, but fortunately with lessr rapidity than formerly. The Indian has begun tor adapt himself to civilized life, and has acquired somer resistance to our diseases. The Miwok therefore bidr fair to maintain themselves as a diminishing remnantr for some time longer, and quite likely even a smallr fraction of them may survive permanently.r

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r The Miwok were not divided into tribes in the usualr sense of the word. They recognized very little politicalr authority. They were broken up into small localr groups, little larger than village communities, each ofr r r r r which admitted the headship of some chief and allowedr im a rather poorly defined amount of influence onr their conduct. These numerous little bodies namedr each other, generally, after the localities which theyr inhabited. Thus the Yosemite Indians as a bodyr were ordinarily known to the other Miwok as ther Awanichi, after Awani, the largest or best knownr village site in the Valley, located not far from the footr of Yosemite Falls. In the same way a group south ofr Yosemite was called the Pohonichi, because in summerr they ranged northward to the Valley in the region ofr Bridalveil Creek, the famous falls of which are knownr as Pohono.r

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FOOD: THE ACORN

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r The Yosemite Indians were in the hunting stage;r that is, they never farmed nor raised domestic animals.r Actually, however, only a small part of their diet camer from game. They probably took as many pounds ofr fish each year as of animal flesh, and a still largerr portion of their food was wild vegetable products.r Among these the acorn was preëminent, and evenr to-day the caches or bins for the storage of theser nutritious nuts can occasionally be seen in the Valley.r These are rude affairs, eight or ten feet in height, constructedr of brush much like a long and deep bird'sr nest, and set between four or five posts to keep ther receptacle and its contents off the ground. They fulfillr their function of food conservation with onlyr moderate success, since one rarely approaches one ofr these caches without seeing a squirrel run out from ar hole which it has wormed through the brush walls.r Acorns, however, are plentiful in most parts of Californiar r r r and before the American introduced hogs theyr were superabundant, so that the Indians could affordr to share part of their crop with these unbidden visitorsr and still have enough left for their own needs.r

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r Acorns contain more or less tannin. The Indianr women leached this out with hot water after the nutsr had been shelled and pounded with a pestle in a stoner mortar. The latter usually was nothing more than ar hole in the surface of some convenient outcrop ofr granite. Frequently a number of these mortar holesr were assembled in one spot; these were roofed overr with branches, and in the shade of such an arbor ther Indian women were wont to gather for hours at a timer to wield the heavy pestle and meanwhile indulge in ther gossip of which they were not less fond than theirr Caucasian sisters. After the acorns were pulverized,r the meal was sifted and then cooked in baskets into ar thin mush or gruel—the famous "acorn soup" whichr was the staff of life to most of the California Indians.r As pottery and iron vessels were unknown, cookingr had of necessity to be done in water-tight baskets. Ar basket cannot of course be set over a fire, so ther Indian woman had perforce to bring the fire into herr food, as it were. This she did by heating stones aboutr the size of her fist, picking these up with a pair ofr sticks, and dropping them into the liquid, to whichr they communicated their heat until the mass boiled,r The stones were then removed and the gruel was readyr for consumption.r

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r At least fifty to a hundred other varieties of foodr plants were utilized. Among the more important ofr these were buckeyes, which contain a narcotic poisonr that is removable by leaching like the tannin in ther acorn; *chia,* a variety of sage the seeds of which can ber r r r

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r PLATE IVr

r Francisco, a Yosemite Indian, in dance costume. The crown isr
r of magpie feathers, the headband of yellow-hammerr
r feathers, and the white ropes about the bodyr
r chiefly of eagle down. The kilt is a wildr
r cat skin with bead trimmingsr
r Photo by J. T. Boysenr

r r [Editor's note:r Francisco Georgely was Northern Yokuts from Chowchilla.r —DEA]r r

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r r r r r most palatably prepared; and brodiaeas, often calledr wild onions or lilies, whose bulbs were dug up byr means of sharp sticks.rr r

r THE BOW: HUNTING AND WARr

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r The Miwok bow was from three to four feet longr and had its back heavily covered with a layer of sinewsr to give added toughness and elasticity. It was ar rather narrow weapon, and the sinew was thickenedr at the ends and then curled back on itself in a characteristicr shape. Such at least was the bow used inr warfare and for hunting large game. For rabbits,r gophers, and birds, which can be approached closely,r a ruder weapon without the sinew backing sufficed.r For such purposes, too, the arrow was often a merer shaft, whereas the real hunting and war bow shotr arrows which were foreshafted and tipped with delicater points of flint or obsidian. The latter material, ar blackish, volcanic glass, the Miwok obtained by trader from the Mono Indians.r

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r With all its inferiority to firearms, the bow is ar powerful instrument within its effective range. Ar good weapon speeds an arrow with an initial velocityr of 120 feet per second. It has definite killing power upr to fifty yards, and at double that distance can easilyr inflict wounds that subsequently prove fatal. It tearsr the tissues more than a modern bullet, and frequentlyr produces internal hemorrhages from which the victimr bleeds to death, or which so weaken game thatr it can be followed up and overtaken. The longestr attested flight for an arrow is more than a quarter of ar mile, but this record was made with a compositer Turkish bow and especial long range arrows. Ther r r r Indians never attempted shooting over such distances.r They depended rather on knowing the habits of deerr and elk and creeping up on them. A favorite devicer was for the hunter to cover himself with a deer hider and set on his head a stuffed deer's head. In this wayr he attracted the curiosity of his quarry without alarmingr it, and was often able to approach very close to it.r

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r When the Miwok fought, which was not very often, itr most frequently took on the form of a feud for revenge.r They usually shot at each other at fairly long range;r enough, at any rate, to make possible the dodging ofr arrows. Each line of warriors therefore capered andr danced about to render it difficult for their opponentsr to take aim, and jerked forward and sidewise as theyr saw arrows coming. As might be expected, casualtiesr were rather light. It was only when one party couldr ambush another, or pounce on a settlement asleep justr before daybreak, that fatalities would run high.r

r r

r HABITATIONSr

r r

r The houses of the Yosemite and other Miwokr Indians were rude affairs, built, according to locationr and abundance of materials, either of thatch, slabs ofr bark, or with a covering of earth. In Yosemite itselfr the cedar-bark house predominated. This was a conicalr lean-to with the slabs laid on several deep, andr while not entirely wind-proof it afforded reasonabler shelter. Most of the huts were small, probably notr over ten or twelve feet in diameter. One or two ofr them may still be seen at the time of this writing,r though they present rather a sorry appearance ofr gunnysacks, worn-out quilts, and pieces of sawnr lumber mixed in with the bark slabs.r

r r r r r

r In the lower foothills, the native house was morer frequently of the wigwam type, thatched with grass,r rushes, or brush; and in parts of the San Joaquinr Valley the earth lodge was typical. This was morer or less excavated and covered with a heavy layer ofr earth laid on a roof of poles and brush supported byr stout timbers. The Miwok used the earth lodge mainlyr for their dance- and sweat-houses. The formerr were large affairs up to forty or more feet in diameter.r The latter were much smaller edifices in which the menr daily sweated themselves for their health and physicalr comfort. The Yosemite Indians were about at ther edge of the habit of building earth-covered dancer houses. The more northerly Miwok and the tribesr beyond used them regularly in every village of anyr consequence, whereas the Yokuts, to the south ofr Yosemite, did not erect earth lodges.r

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r THE NAME YOSEMITEr

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r The word "Yosemite" means Grizzly Bear in ther Miwok language. Its more exact form is "üzümati"r or"ühümati." The name became definitely attachedr to the Valley, and to the band of Indians that made itr their headquarters, from the time of their first contactr with Americans. There are several explanations. Oner story has it that an unarmed young Indian fought offr a fierce grizzly bear with only a stick, and that thisr exploit led to the adoption of the name as a sort ofr heraldic crest by his group. Somehow this legendr gives the impression of white man's imagination; itr does not have the true ring of Indian tradition.r Another account is that Tenaya (who was the chief ofr the Yosemite band at the time of the discovery andr r r r whose name is perpetuated in that of the canyonr leading into the Valley) and his people lived in ar country infested with bears. In addition, the bandr was reputed to consist of unusually fierce warriors.r Therefore the sobriquet "Grizzlies" was bestowedr upon them by the neighboring tribes. This storyr also does not seem wholly in accord with knownr principles of Indian nomenclature; although Dr. C.r Hart Merriam says that the inhabitants of Hokokwila,r the native village where the Sentinel Hotel now stands,r were called "Yohamite," that is, "Ühümati" orr Grizzly Bear. The true explanation of the name ofr the Valley is probably to be found in a peculiar socialr institution which the Yosemite Indians shared withr the other Miwok.r

r r

r This entire nation is everywhere divided into twor groups or "moieties" or halves, as we might call them,r which intermarry. The first social law of theser Indians is that a man must always take to wife ar woman from the other moiety. The children followr the father, and whether boys or girls are restrictedr in their choice of wife or husband to the secondr moiety, that of their mother. In this way the lineager is carried on uninterruptedly generation afterr generation.r

r r

r These two intermarrying halves of the Miwokr nation have the elements land and water as theirr designations or totems, and are known as Tunuka andr Kikua. The division is made more picturesque byr assigning every known species of animal and plant tor one or the other division. Thus the bear and mostr land animals and birds belong to the land side. Fishes,r water animals, and plants and a few exceptional onesr from the land—especially the deer and coyote—arer r r r associated with water. In some parts of the Miwokr country the people therefore speak of the "Blue Jay"r and "Bullfrog" instead of the land and water divisions.r In the Yosemite region it was customary to denominater the land side "Grizzly Bears" and the water sider "Coyotes." Furthermore, within Yosemite Valley, allr the villages on the north side of the Merced River werer supposed to belong to the Grizzly Bear division, andr those on the south the Coyote. It seems more thanr probable that this local name of one of these two sidesr or divisions came to be applied, through some misunderstandingr on the part of the whites, to all ther Indians of the valley, and then to the valley itself.r

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r [Editor's note:r For the correct origin of the word *Yosemite* seer r "Origin of the Word Yosemite."—DEA]r

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r VILLAGES IN YOSEMITEr

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r The points on the floor of Yosemite at which ther Indians at one time or another lived or camped arer numerous. Dr. C. Hart Merriam, the greatest livingr authority on these people, enumerates about fortyr such spots and supplies the information which her obtained about them and verified from the Indians.r The principal sites are, in order down stream on ther north side of the Merced and proceeding up streamr again on the south side: Wiskala, at the foot of Royalr Arches; Yowachki, near the mouth of Indian Canyonr (this site is still occupied by a few families); Awanir and Kumini, near Yosemite Falls, the former being ther more important, in fact recognized as the largest andr most permanent settlement in the Valley in aboriginalr days; Hakaya, near the Three Brothers; Kisi andr Chuchakala, opposite the last, on the south side of ther river; Loya, at Sentinel Rock; Hokokwila, where ther Sentinel Hotel now stands; Tuyuyuyu, near ther r r r Le Conte Memorial Lodge; and Omato, between Campr Curry and the Happy Isles.r

r r

r It should be said, however, that these villages werer preëminently summer encampments. Now and thenr a few families with an unusually favorable stock ofr supplies hoarded up, might remain in the valley fromr autumn to spring, but the majority of the inhabitantsr annually retreated to the canyon of the Merced Riverr below El Portal in order to avoid the heavy snowsr of the 4000-foot altitude of Yosemite. Down belowr they waited, no doubt impatiently, for spring to comer and permit them to resume occupation of the mostr favored of their hunting and food-gathering grounds.r It may be added that the Indians, as their legendsr clearly indicate, were pretty fully aware of the extraordinaryr scenic features of the Valley, and derivedr much satisfaction from them; although with theirr native stolidity they no doubt expressed themselvesr less extravagantly than is the Caucasian habit.r

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r The number of the band at the time of discovery isr not accurately known, but may be estimated to haver been in the vicinity of two hundred and fifty souls.r

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r ENCOUNTERS WITH THE AMERICANS: TENAYAr

r r

r It was their raids on miners, prospectors, andr scattered storekeepers, that in 1851 led to the formationr of a little volunteer army known as Savage’sr Mariposa Battalion. This company went up intor the as yet unpenetrated mountains in pursuit of ther Yosemite "Grizzlies" and to their overwhelmingr astonishment burst into the hitherto undiscoveredr valley. In the fighting that followed, the Indiansr were defeated, and part of them, including the Chiefr r r r Tenaya, captured. The prisoners were taken to ther San Joaquin Valley and put on a reservation. Herer they kept the peace, but were in great distress of mindr on account of their deprivation of the natural foodsr to which they were accustomed in their own haunts,r as well as owing to their enforced contiguity to alienr or hostile tribes. Tenaya pleaded to be let off. Her was finally released, returned to Yosemite, and withinr four years was followed by all the surviving membersr of the band. The old chief did not long survive: her was killed by the Monos. He was not only a braver warrior but an unusual personality, who maintainedr his authority over his people by his native influencer and by the respect which he commanded rather thanr by any legal position.r

r r

r MARRIAGEr

r r

r The Miwok social customs were numerous, andr many of them strangely different from our own.r The curious system of intermarrying divisions broughtr it about that a person always knew automatically tor which moiety any given blood relative belonged. Hisr father, his father's father, his brothers and sisters, hisr children (if he were a man), his son's children, and hisr uncles and aunts on the father's side, were always ofr his own "side." His mother, her father, his wife, hisr father-in-law, his daughter-in law, and his daughter'sr children, inevitably belonged to the opposite division.r His mother's mother, however, was always on hisr own side of the line-up. A woman differed from ar man in that her children always belonged to ther opposite division. Cousins were divided betweenr the two sides according to whether the connectionr r r r between them was through the male or the femaler line.r

r r

r The dual totemic division was reflected in ther personal names also. Any man, woman, or child, ifr his or her name referred to coyote or deer or beaverr or otter or crane or salmon or salamander, or evenr indirectly alluded to these animals, was therebyr designated as forming part of the water division. Onr the other hand, if his name had any reference to bearr or wildcat or squirrel or raccoon or raven or a host ofr other animals he was a "landsman."r

r r

r A curious custom was that while in general marriager with any blood relative, even of the seventh degree,r was absolutely prohibited, an exception was made inr favor of certain first cousins. Such cousins were inr fact more or less expected to marry, if there was nor satisfactory reason to the contrary. Which cousinsr were available for marriage, depended on the dualr division principle. A man could never marry hisr father's brother's daughter, because the two brothers,r and therefore their children, would belong to the samer division. Cousins sprung from two sisters were also,r ineligible, because, even though women did not transmitr descent to their children, sisters were forced tor mate with husbands of the opposite moiety; consequentlyr their offspring would also be of the same descentr and ineligible to one another. The daughter ofr one's mother's brother, however, was looked upon asr one's natural spouse. A simple calculation will showr that such a cousin must always be of the opposite,r division from oneself.r

r r

r How this curious plan of relationships, marriages,r and descent originated is unknown. The Miwoksr themselves can give no explanation but take forr r r

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r Miwok woman pounding acorns in bedrock mortar holer
r r Photo by Univ. of Calif., Department of Anthropologyr

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r r

r PLATE Vr
r Kalapine, an old Yosemite medicine woman, making a coiledr
r basket. The process of manufacture, which is one of sewing,r
r can be seen. Her hair is cut short in mourningr
r r Photo by J. T. Boysenr r

r r r r r granted that the system has existed since the beginningr of the world, and look upon us as very stranger beings for not observing the same customs. It isr probable that the psychological root of the observancesr was a desire to keep the blood mixed; althoughr if such were the case, the original purposer was certainly defeated by the system of first-cousinr marriages.rr r

r The newly wedded man was expected to showr deference to his wife's parents by avoiding them asr much as possible, especially the mother-in-law; andr his wife behaved similarly toward his mother and father.r The young people did not look their elders in the facer or speak to them. If communication was necessary,r the husband would address himself to his wife, and sher in turn would repeat the statement to her mother, whor would make the necessary answer by the same route,r even though all three might be sitting in the samer lodge. For a young man to do otherwise, would ber the grossest breach of decorum, and the old lady wouldr no doubt complain to her friends that her daughterr seemed to have married a man lacking in all proprietyr and affection. This is another custom which ther Indians assume is self-evident, and when asked for ar reason they can give none except that they would ber mortally ashamed to behave otherwise.r

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r BABIESr

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r When a child is born, both father and mother haver certain taboes imposed upon them. The man mayr not hunt nor do other than the necessary work, andr both parent’s sit as quietly as possible about the house.r After this follows a longer period during which theyr r r r are free to resume normal occupations but must notr eat certain kinds of food under penalty of injury tor the health of the child.r

r r

r The Miwok baby is put into a frame or "carrier," ar sort of flat, hooded basket woven of slender sticks.r In this it spends the greater part of the first twelver months of its life, and is easily carried about by ther mother. The baby carrier has the further advantager of seeming to keep the infant still and contented. It isr a notorious fact that Indian babies cry much less thanr white ones, and the native mothers declare that if theyr remove the children from their carriers the kickingr about of legs and arms soon induces restlessness, discontent,r and bawling. The woven hood of each ofr these tiny cradles is ornamented with a little patternr which differs according to sex. Zigzags or diagonalr stripes show that the inmate is a boy, whereas a girl isr indicated by a pattern of diamonds.r

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r DEATH AND MOURNINGr

r r

r When a Miwok died, mourning and wailing werer intense. His name must under no circumstances ber spoken. To do so might invoke the ghost, and wouldr in any event be considered as the deepest of all possibler insults by his relatives. A widow cropped or burnedr her hair very short, smeared melted pitch over it, andr also covered her face and breast with the same material.r During the whole period of mourning she wasr not allowed to wash these parts of her body. Afterr a few months of pitch and dirt, her appearance wasr a startling one: sufficiently forbidding, no doubt, tor deter any prospective suitor. For the whole of ther first year of her widowhood, also, she kept silence, orr r r r spoke only in low whispers to a female relative whenr the occasion was imperative.r

r r

r Once a year, in each region of the Miwok country,r usually in late summer or autumn, a great commemorativer mourning ceremony for the dead was held,r which lasted amid wailing and singing for severalr nights. Toward daybreak on the last morningr immense accumulations of food and property werer thrown into the fire by the mourners. Those of ther deceased who had been of special rank, or particularlyr beloved by their survivors, were represented by ruder effigies which were also consumed in the blaze. Afterr this the mourners of the land side were ceremoniallyr washed by the water people, and vice versa, to signifyr their cleansing from the period of grief and from ther restrictions which they had been under. For ther widow it was also a much needed literal cleansing.r

r r

r MEDICINE-MENr

r r

r When an Indian became sick, a shaman or mediciner man was called in. This individual had acquired hisr power from spirits. He was believed to possess ther power of clairvoyance. After dancing, singing, manipulatingr the patient, and other preliminaries, he wouldr declare that the illness was due to the infraction ofr some religious taboo, or that some evil-minded medicine-man,r a witch or wizard, had managed to lodger some foreign object or noxious little animal in the bodyr of the sufferer.r

r r

r He then proceeded to remove the poison by suckingr the part affected, and finally pretended to remove ar little mass of straw, a wisp of hair, a dead grasshopperr or lizard, or something of that sort. The patient andr r r r his relatives of course felt immeasurably relieved, and,r confidence having been regained, nature in most casesr concluded the recovery.r

r r

r If, however, the medicine-man was unfortunate andr lost several patients, especially if these died in rapidr succession, he paid dearly for his preëminence. Ther Indians were so convinced of the complete power ofr these shamans, that they gave them entire credit forr every cure that happened. Consequently they werer quite logical when they reasoned that the death of ar patient must be due to the unwillingness or evilr disposition of the practitioner. One or two fatalitiesr might be pardoned as due to mere incompetence; butr suspicion would be gathering, and after his third orr fourth loss, the medicine-man's life was worth little.r The relatives of his deceased patients were simplyr waiting for an opportunity to ambush and murderr him, and he must be a wary or powerful man indeedr to escape permanently. Even to-day an occasionalr murder among the Sierra Nevada tribes can be tracedr to a lingering of this old custom.r

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r MYTHS AND ORIGIN BELIEFSr

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r The myths and legends of the Yosemite band restedr on the same ideas as those current among the otherr Miwok. From these latter we gather that it wasr currently believed by the natives that this earthr was peopled six successive times. The first world wasr dominated by a cannibal giant Uwulin who graduallyr devoured its inhabitants until little Fly discovered ar tiny vulnerable spot in his heel—like that of Achilles—andr despatched the malefactor. The people of ther second world were not much better off, for they werer r r r stolen away by an immense bird, a sort of Roc, namedr Yelelkin, and the remainder were persecuted by antsr until they were driven away. The third world wasr peopled by beings who were half human and halfr animal, and came to an end with their transformationr into complete animals—a sort of retrograde evolution.r The fourth race was vexed by its chief, Skunk, whor kept for himself all meat, until his people succeededr in destroying him by strategy. In his death agoniesr Skunk upheaved the mountains. This race was alsor transformed into animals. As to the fifth world,r tradition is obscure, but the sixth peopling wasr accomplished by Coyote. The earth was at this timer covered with water, but Coyote had Frog dive andr bring up a bit of soil from which he created land. Her then caused vegetation to grow up and made humanr beings. He and his associates, who up to this timer had been more or less human or even superhumanr in attributes, then became changed into animals liker those which we see to-day.r

r r

r In the story of the origin of death among mankind,r Coyote also figures. His plan was to have peopler covered up for four days and then arise reborn in ther prime of manhood. For a while this arrangementr worked to the satisfaction of everyone. Once, however,r a person died just as Meadow-lark took to himselfr a wife. After a day or two, odors of decay began tor arise from the blanket-covered pile and penetratedr to the hut of the honeymoon couple. Meadow-larkr resented having his bliss disturbed in this way, andr proclaimed that a much, better plan would be to burnr up the source of the stench and leave everyone inr peace. His counsel prevailed and the first cremationr took place, which the Miwok have adhered to everr r r r since; but with it there passed away the habit ofr human lives being renewed over and over. Althoughr they believe this tale, the Miwok seem to bear nor resentment against Meadow-lark.r

r r

r The greatest hero of Miwok legends is Wekwek, ther Falcon, son of Condor or according to other versions ofr Yayil, and grandson of Coyote. Falcon fought andr overcame a destructive giant, Kilak; escaped a firer that consumed the surface of the world; and underwentr numberless other adventures. More than oncer he was killed and restored to life, and at other times her brought back among the living his father, his sister, orr some friend. The Miwok never tire of telling aboutr this character, who impersonates all that they conceiver of daring and magic and skill in the days of long ago.r

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r LEGENDS OF YOSEMITEr

r r

r About Yosemite Valley proper there are a number ofr Indian stories which have repeatedly been recordedr with but little variation, so that they may be consideredr authentic. The favorite one tells of a womanr named Tiseyak who lived far down the Merced River,r in or near the plains. Having quarreled with herr husband, she ran away eastward, creating the course ofr the present stream and causing oak trees and otherr food-bearing plants to spring up along her route. Inr Yosemite Valley her husband overtook her and beatr her soundly. In the scuffle, the hooded bady-cradler which she was carrying was thrown across to the northr wall of the canyon, where the bent hood can still ber seen in the Royal Arches. A globular basket whichr she had brought with her, landed bottom upward andr became Basket or North Dome. The husband, whor r r r r is known in the story as Nangas, "her husband,"r turned into North Dome or Washington Tower,r whereas Tiseyak herself became Half Dome, the darkr streaks on the sheer cliff of this great peak being ther tears which her pain and humiliation had caused tor stream down her face. The several versions vary inr details, but in substance the tale is told by all ther Yosemite Miwok as here outlined. It must ber remembered that oral tradition can never ber absolutely consistent in the mouths of separater individuals.r

r r

r El Capitan, it is said, was originally a small rock.r Once, long ago, a she-bear went to sleep on top withr her two cubs. When they awoke in the morning, ther rock had grown into the present tremendous cliff.r Neither they nor the people of the village below knewr how to rescue the unfortunates; until at last the Inchr or Measuring Worm succeeded in humping his way upr the cliff. By this time, however, the poor bear andr her cubs had starved to death, and he could do nor more than bring down their bones for cremation byr their mourning relatives.r

r r

r Measuring Worm was now possessed by the spiritr of adventure. He reclimbed El Capitan, stretchedr himself clear across to the opposite side of the Valley,r and drew himself over. Then he recrossed. Thisr sport, however, must have weakened the walls of ther canyon, for it was not long before they began to caver and the inhabitants were obliged to flee down ther river in order to save themselves. The Indians sayr that before this catastrophe the Valley was evenr deeper than it is at present.r

r r

r Waterfalls are dreaded by the Miwok, and bothr Yosemite and Bridalveil Falls are believed to be inhabitedr r r r by spirits, those in the former being knownr as Poloti, and in the latter as Pohono. They causer gusts of wind which are likely to whirl into the fallsr people who venture too close. Once the Polotir captured a girl. She had gone to Yosemite Creekr from Awani or a neighboring camp to bring backr a basket of water. When she dipped up, it wasr full of snakes. These the spirits had caused tor enter the vessel so that she might abandon her accustomedr spot and move farther upstream. Eachr time she dipped her basket, the unfortunate girlr found more vermin in it, and so gradually she wentr higher and higher up until she reached the pool atr the foot of the falls, when a sudden violent gust blewr her in.r

r r

r It was with such tales as this that the Yosemiter Indians used to beguile the long winter evenings whiler sitting about the fire.r

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r Next: Ideals and Policy of the National Park Servicer •r Contentsr •r Previous: History of Yosemiter

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r http://www.yosemite.ca.us/library/handbook_of_yosemite_national_park/indians.htmlr

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Ideals and Policy of the National Park Service

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Handbook of Yosemite National Park (1921)r by Stephen T. Mather

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r Next: Administration of Yosemiter •r Contentsr •r Previous: Indians of Yosemiter

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r THE IDEALS AND POLICY OF THE NATIONALr r PARK SERVICE PARTICULARLY IN RELATIONr r TO YOSEMITE NATIONAL PARKr

r r r

r By Stephen T. Matherr

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r *r Director, U. S. National Park Servicer* r

r r r

r r Ther r first national parks were set aside by Congressr with the view of conserving some of our most strikinglyr scenic natural assets. Thus, previous to 1902,r the Hot Springs, Yellowstone, Sequoia, General Grant,r Yosemite, Mount Rainier, and Crater Lake nationalr parks were reserved from public entry. These nationalr parks of early date were merely set aside forr the future; indeed, no national park policy or centralr organization which would make them available asr vacation centers for the American public was at thatr time deemed necessary. In the following years to ther time of writing Congress set aside twelve other areasr as national parks making a total of nineteen parks,r seventeen of them within the boundaries of the Unitedr States, one in Alaska, and one in the Hawaiian Islands.r

r r

r Previous to 1915 the parks were all administeredr with the aid of the War Department, and policies andr the interpretation of rules and regulations variedr greatly on the different reservations. Up to 1918 roadr work in Yellowstone and Crater Lake parks wasr handled by the engineers of the War Department, butr since that time all administrative activities in ther r r r r parks have been handled by the Interior Department,r In 1916, Congress passed a bill creating the Nationalr Park Service as a bureau of this department. Sincer its establishment much has been said about the Servicer both in compliment and criticism and it is with pleasurer that the writer hails this opportunity to explainr how the ideals and policy of the Service govern ther administration of Yosemite National Park.r

r r

r In his message to the Director of National Parks,r former Secretary of the Interior Franklin K. Laner concisely and accurately summarized the policy of ther Park Service into three broad principles: "First, thatr the national parks must be maintained in absolutelyr unimpaired form for the use of future generations asr well as those of our own time; second, that they arer set apart for the use, observation, health, and pleasurer of the people; and third, that the national interestr must dictate all decisions affecting public or privater enterprise in the parks." So much for our ideals.r Let us now consider each of the three fundamentalr principles as they are applied by the Service in Yosemiter National Park.r

r r

r The first principle, "*that the national parks must ber maintained in absolutely unimpaired form for the use ofr future generations as well as our own,*" is one that mustr be upheld by the Service. This standpoint has beenr attacked time and again by private individuals andr corporations who wish to get a foothold in the people’sr parks for their own gain—to pasture herds of sheep inr our mountain flower gardens, or to turn aside ourr streams and destroy some of our most beautiful fallsr for the sake of electric power which might easily ber developed elsewhere. There are even now, at ther time of writing, applications which, if approved, wouldr r r r r ruin the wonderful Waterwheel Falls in the Grandr Canyon of the Tuolumne and turn Nevada Falls into ar mild sedate affair instead of the wonderful torrent thatr now pours over its granite rim in the spring months.r Let the lower levels of streams like the Merced ber developed before destroying the beauty of the highr country. The Yosemite Power Plant built by ther National Park Service well below the Valley is ar practical example. If in years to come hydro-electricr development demands the destruction of beauty spotsr of the High Sierra after other sources of power haver been exhausted, it will be well to consider then, butr that time is not yet.r

r r

r The public is one of the best allies of the Service inr many of its practical problems of "preserving the parkr absolutely unimpaired." Campers realize the justicer of being allowed to use only dead wood for their fires.r It is especially gratifying to note that fewer forestr fires are caused each year by the carelessness ofr campers; indeed, many fires are discovered, reported,r and fought by them. People are coming to realizer that thousands of unafraid live deer and elk are muchr more to be preferred than a few invisible or dead ones,r and hundreds of real sportsmen get more pleasurer hunting with camera in national parks than they wouldr with gun outside.r

r r

r In this task of preserving the park one of the arch-enemiesr of the Service is *fire.* Rangers are always onr the lookout for the first sign of smoke and others arer always ready to go on duty as fire fighters, staying withr the

fight night and day until the Forest Fiend isr conquered.r

r r

r Often one sees in the Sierras dead or dying treesr which have been attacked by insects. A speciallyr r r r qualified ranger is assigned to the work of fightingr these pests in coöperation with the Bureau of Entomologyr of the U. S. Department of Agriculture—anotherr phase of the preservation of our parks.r

r r

r Some of the roads in the western part of the park,r notably the Wawona Road, traverse private timberr holdings. By negotiating with the owners of theser timberlands the government has exchanged stumpager in various out-of-the-way sections of the park andr thus preserved the scenic beauty of the roads.r

r r

r It is with the second ideal, "*that they* (the parks)r *are set apart for the use, observation, health, and pleasurer of the people,*" that so many of the activities of ther Service are concerned. The first idea of nationalr parks seems to have been that they were stupendousr natural spectacles, to be seen (or we might say *done*) inr a short time, as one might view an art exhibit or ar pageant. Then came the great out-of-doors movementr and, especially since the advent of the automobile,r people turned to the national parks as placesr to live during their vacations and to "get next tor Nature." Lastly comes the realization that our parksr are not only show places and vacation lands but alsor vast school-rooms of Americanism where people arer studying, enjoying, and learning to love more deeplyr this land in which they live.r

r r

r In the administration of the parks the greatest goodr to the greatest number is always the most importantr factor determining the policy of the Service. Duringr the assignment of army officers to administer Yosemiter National Park all motor vehicles were prohibited fromr entering, but finally, in 1914, under instructions fromr Secretary Franklin K. Lane, automobiles were admittedr under very strict regulations. Since 1915r r r r r motor restrictions have been gradually removed untilr there are now but a few rules and these for the safetyr of motorist and pedestrian alike. The advent of ther automobile with the opportunity for its use freely inr all the parks within the last five years has been ther open sesame for many thousands; indeed, during ther season of 1919 74% of the visitors of Yosemite Nationalr Park entered in their own machines.r

r r

r The road problem then is one of the most importantr issues before the Service. Outside of possibly Yellowstoner there has been but little development in ther parks to enable the motorists to have the greater user of these playgrounds which they demand and deserve.r Definite projects have been laid out by the Service inr all the larger parks calling for important road building,r but up to the present time no substantial funds haver been available to carry them out. Congress, the appropriatingr body, has been engrossed with its warr problems, but I now feel that the turning point hasr arrived. As an indication of the interest of that bodyr it might be mentioned that during the present seasonr (1920) the House Appropriations Committee visitedr seven of the largest parks and expressed themselvesr as deeply impressed with the needs of the Service.r

r r

r As regards Yosemite National Park much remainsr to be done in the way of road development. A substantialr piece of work has been accomplished in ther reconstruction of the road from Yosemite Valley tor

the El Portal Entrance, a total of seven and a halfr miles built at the cost of a quarter of a million dollars.r This is the only heavy piece of road work which hasr been done in any of the parks during or since the warr period. This will connect with the all-year-roundr highway which the State is building up the Mercedr r r r Canyon and which will make the Valley more readilyr accessible to motorists in winter than it now is inr summer. The certain great increase of travel intor Yosemite Valley by this easy grade road makes itr necessary to provide a convenient outlet into the backr country. This outlet will be the road which has beenr surveyed from the Valley by Vernal and Nevada Fallsr into the Little Yosemite Valley, thence connectingr with the Tioga Road at Lake Tenaya. The surveyr has been carefully run so as not to interfere with ther beauty of the falls.r

r r

r The other approach roads to the Valley—the Bigr Oak Flat and the Wawona—must be widened andr their grades lowered, and the Tioga Road should haver many of its bad pitches smoothed out. Perhaps ar spur road should be built up the Lyell Fork, connectingr with the Tioga Road at Tuolumne Meadows, thusr opening up additional camping country in the scenicr Mount Lyell region.r

r r

r The beautiful Tuolumne Meadows, considered byr John Muir and the Sierra Club the finest campingr ground in the High Sierra, will come into much greaterr use when the new lodge for visitors is established therer (1921). A store has been started which is provingr very useful to the campers in this section.r

r r

r While the motorist will find a great area of the parkr accessible to him under the plans indicated, therer will be a large proportion of the park preserved forr trail trips only. The rugged canyons north of ther Tuolumne River will be for many years to come devotedr to trail travel, and Superintendent Lewis hasr plans for developing the present trail system therer which will make this magnificent section of the parkr more accessible.r

r r r r r r

r Each year sees the park better developed for the user of the people. The Free Public Camps in Yosemiter Valley have become very popular, a total of twenty-threer thousand four hundred persons having beenr registered during the season of 1920. Better facilitiesr must be provided in these camps; the sanitaryr system by which they will largely benefit is alreadyr under construction, and all the camps should ber lighted by electricity. Time and again Europeanr visitors express astonishment that all this service canr be free. To them it is as incomprehensible as is ourr sense of American freedom.r

r r

r As rapidly as conditions permit, the system of lodgesr should be extended farther back into the High Sierrar so that hikers may walk from place to place on ther highland trails and be sure of food and shelter at ther end of each day’s travel.r

r r

r Yosemite National Park is already a fisherman’sr paradise, especially in the High Sierra country. Eachr year many of the lakes and streams are stocked withr trout fry, but even more should be done, and eachr body of water in the park should be made productive.r A hatchery which would supply the needs of the parkr must be built in Yosemite Valley where it will ber an object of interest and instruction to thousands ofr visitors.r

r r

r To further exemplify the principle of use tne Servicer allows the. grazing of cattle on lands which are notr used by tourists. Overstocking, a condition which inr some sections of the High Sierra has made it next tor impossible for a camper to obtain feed for his stock,r is carefully guarded against.r

r r

r Upon the principle that the parks are set apart forr di observation by the people" are based many of ther r r r most recent activities of the Service. The establishmentr of the Free Nature Guide Service during ther season of 1920 proved a great success. The quickeningr interest in Nature-study work under Dr. H. C.r Bryant and Dr. Loye Miller points the way for us tor develop this work on a far greater scale in the Yosemiter as well as other national parks in future years.r

r r

r The Yosemite Museum is the outcome of the publicr demand for authentic exhibits of natural history,r geology, ethnology, botany, and other sciences sor well exemplified by the region. The museum wasr made possible almost entirely by gifts and loans ofr private individuals and will be developed as rapidlyr as possible by the Park Service.r

r r

r The Le Conte Memorial Lectures which are givenr in Yosemite under the auspices of the Extension Divisionr of the University of California have been veryr useful in bringing to the tourist a better knowledge ofr the park and of men like Le Conte and Muir who haver told its story so well.r

r r

r In recent years there has been a movement to taker classes into national parks for instruction and it is nowr a common experience to meet university students,r troops of Boy Scouts, and other groups studying Naturer first-hand. Such use of the parks is stronglyr encouraged by the Service.r

r r

r The function of the parks as factors in increasingr our national health, vitality, and happiness is a mostr important one. To encourage clean living in God’sr great out-of-doors should be one of the primary idealsr of the Service. The European visitor whose idealr vacation so often consists in lounging about a hotelr and viewing Nature from the veranda, marvels at ther number of people he finds hiking, riding, swimming,r r r r or otherwise engaged in strenuous sports in the Yosemite.r Let us encourage this American spirit to ber up and doing. Of course there are those who requirer "artificial" amusements and there will always ber entertainments, dancing, bowling, pool, etc., at ther larger hotels, camps, and lodges. Let us not, however,r "vulgarize" the parks as has been the accusationr of some visitors.r

r r

r I hope that winter sports in the park will become ar great feature. If Glacier Point with its beautifulr hotel were available in winter time, Sentinel Domer with its heavy snowfall could be made to rival St.r Moritz. To reach this altitude in winter the suggestionr has been made for the construction of a shaftr by which the tourist would be carried directly from ther Valley to Glacier Point. If this plan is carried out itr must be done without marring the beauty of the canyonr walls. Anything in the nature of an outsider structure could not be

considered.r

r r

r The third ideal of the Service, "*that the nationalr interest must dictate all decisions affecting public orr private enterprise in the parks,*" is one phase of ther parks policy which is least understood by the public.r When the Department of the Interior assumed completer administration of the parks each public utilityr was handled by a separate individual or company.r Under these conditions results were not always satisfactoryr and prices were sometimes abnormally high.r Finally a large corporation, the Yosemite Nationalr Park Company, made up of hundreds of stockholders,r principally public-spirited citizens of Los Angeles andr San Francisco, was organized and all concessions exceptingr the photographic studios, a bakery, the Yosemiter Hospital, and Camp Curry were turned overr r r r to it. This organization has been doubly necessaryr during the past few seasons because of the greatlyr increased travel and the corresponding increase inr investments necessary to allow for unlimited and immediater expansion. The government regulates pricesr and this very easily by dealing with one central office.r Furthermore of all of the profits made by this larger company, over and above six per cent. for physicalr investment, the United States Government receives,r 22 1/2 per cent. While much criticism was at firstr expressed on the part of local concessionaires over ther concentration of all public utilities, it is now generallyr realized that this is the only system of managementr which could have kept pace with the park development,r and being a problem of national interest it wasr decided by the Service with a view to the greatest goodr to the greatest number.r

r r

r In conclusion let me say that the development ofr the Park Service has been more than gratifying,r especially as regards the *esprit de corps* which has notr only made the organization efficient but is daily exemplifyingr the true meaning of *service*. The ideal ofr each individual member of the Service and of ther Service itself is to give to the public not merely whatr they pay for, but everything within power.r

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"Administration of Yosemite National Park"

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r *Handbook of Yosemite National Park* (1921)r by W. B. Lewis

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ADMINISTRATION OF YOSEMITE NATIONAL PARK

r r

r By W. B. Lewisr

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r *Superintendent, Yosemite National Park*r

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r Yosemite National Park,r which covers 1125r square miles, an area nearly as extensive as the Stater of Rhode Island, is a national reservation. It is completelyr subject to federal administration and is governedr by rules and regulations prescribed by ther Secretary of the Interior under authority of the law.r The enforcement of the laws and regulations is entrustedr to a Superintendent who resides and maintainsr headquarters in Yosemite Valley and who is directlyr responsible to the Director of the National Park Service,r the chief administrative officer of the entirer National Parks system.r

r r

r The duties of the Superintendent are multifarious.r He must supervise the many governmental activities,r some of which are the task of building and maintainingr roads and trails; the building of telephone and

telegraphr lines and the operation of telephone and telegraphr service within the park, and to the connectionr of these lines with the outside commercial lines; ther building of power transmission lines and the operationr of the government-owned and -built 2000 kilowattr hydro-electric power plant; the building, maintenance,r and operation of the park shops and barns; the constructionr r r r and maintenance of living quarters for ther employees of the government; the operation of constructionr camps for the working men; the installation,r maintenance, and operation of water and sewager systems; the care of public grounds; the policing andr maintenance of the public camping grounds, etc.; andr the administration of the park ranger force. The dutiesr of this last branch of the service include the generalr policing of the park for the protection of fish and game,r the prevention and extinguishing of forest fires, ther regulation of traffic, and the general preservation ofr order, the checking of automobiles, and the maintenancer of an Information Bureau for the disseminationr of accurate, reliable, and impartial information on allr matters of interest to park visitors.r

r r

r The Superintendent must also hear complaints,r arbitrate differences between individuals or parties,r supervise the activities of those individuals or corporationsr who operate hotels, camps, transportationr services, etc., under government franchise, aridr adjust differences between such individuals andr corporations themselves or between them and ther public.r

r r

r The Superintendent further has supervision over ther cutting of timber on private lands within the park andr on government lands where, through exchanges withr private owners to preserve privately owned timberr of scenic importance, such cutting is permitted. Her must also see that the government’s interests are notr impaired under the operation of power and waterr supply projects where they are authorized by law as,r for instance, in the case with the City and County ofr San Francisco in the development of its power andr water supply project in Hetch Hetchy Valley.r

r r r r r

r With this diversity of governmental activities ther administrative organization is divided into variousr departments, each with its supervising officer andr each with clearly specified activities and duties. Theser various administrative and operative units togetherr with their general duties are enumerated below.r

r r

r *Department of General Administration.* The Assistantr Superintendent is in charge of this departmentr and the activities are as follows: general office management;r purchase of supplies and equipment; disbursingr of pay rolls and accounts; timekeeping; accounting;r collections of revenues from sales, franchise fees, andr fees from all other sources; appointments; employees’r compensation; preparation of contracts and vouchers;r sales; and the numerous details of local routiner matters.r

r r

r *Department of Maintenance and Operation.* Ther activities of this department, which is administeredr by a Park Supervisor who is assisted by an Assistantr Supervisor, are the most varied of any of the parkr administrative units. They consist principally ofr the maintenance of the 138 miles of park roads andr 600 miles of trails, of some 200 government buildings,r and of approximately 5 miles of water lines; the maintenancer and repair of all buildings, fences, and bridges;r the care and distribution of stock and transportationr facilities; upkeep and repair of tools and equipment;r care of public grounds and camps; disposal of garbager and waste; and the production of wood, ice, hay, etc.r

r r

r *Department of Engineering.* A Resident Engineerr has direct charge of this unit and his duties consistr mainly of the advisory supervision of all outside maintenancer work; the making of surveys for roads, trails,r pipe lines, etc.; the preparation of plans, designs, andr r r r specifications for construction; and the inspectionr contract work.r

r r

r *Ranger Service.* It is with this phase of the parkr administration that the public comes most in contact.r The Ranger Service consists of a force of from ten tor thirty rangers (depending upon the season of the year)r under a Chief Ranger.r

r r

r The park is divided into a number of districts and,r during the summer months, in each is stationed ar mounted ranger who is responsible for the properr patrol of his district. It is his duty to inform, assist,r and instruct the park visitor, to prevent and extinguishr forest fires, to protect fish and game in accordancer with the park rules and regulations, to inspectr camping grounds, and to enforce the rules and regulations,r making arrests when necessary.r

r r

r Traffic rangers, mounted on horses and motorcycles,r are stationed on the floor of Yosemite Valley. Whiler their principal duty is to regulate traffic, they mustr also be informative to the public, patrol for fire, policer camping grounds, and, in general, preserve law andr order around the village, camps, and hotels.r

r r

r A specially qualified ranger is also in charge of ther Information Bureau which is maintained at the Parkr Headquarters. Here information concerning roadsr and trails and all other matters of public interest concerningr the park is given out; campers are registered;r park publications and maps are distributed and sold;r and bulletins concerning roads, trails, and generalr park conditions are prepared from time to time forr distribution to newspapers, automobile clubs, andr other organizations interested.r

r r

r Checking or automobile rangers are stationed atr all of the road entrances to the park, and at the topr r

r r r r

r NATIONAL PARK SERVICE INSIGNIAr

1.—Director of National Parks (Gold Star)r
Assistant Director of National Parks (Silver Star)r
2.—Park Superintendentr
3.—Assistant Park Superintendentr
4.—Park Engineerr
5.—Assistant Park Engineerr
6.—Chief Park Rangerr
7.—Assistant Chief Park Rangerr
8.—Park Rangerr
9.—Temporary Park Rangerr
10.—Ranger's Badger
11.—Collar Insigniar

r r r r r and bottom of the steep grades entering Yosemiter Valley. They issue permits, collect automobile fees,r distribute park information, and collect and seal firearms.r Records are kept of every automobile or otherr vehicle passing the stations, together with the numberr of persons carried and the exact time of leaving ther stations. Checking rangers are also called upon to dor their share towards the effective operation of the parkr by observing for fires, reporting violations of regulations,r etc.rr r

r *Electrical Department.* Under this department fallsr the maintenance and operation of the park telephone,r telegraph, power, and lighting systems. A Chief Electricianr is in direct charge.r

r r

r The telephone and telegraph system of the parkr consists of approximately 210 miles of telephone lines,r to which are attached from 100 to 175 telephones.r These lines radiate from Yosemite Valley to variousr parts of the park, and fifteen miles of telegraph liner links Yosemite with El Portal where connection isr made with the lines of the Pacific Telephone andr Telegraph Company.r

r r

r A 150-line switchboard is operated continuously onr a 24-hour basis throughout the year, and local andr long distance service may be had from all hotels,r camps, or ranger stations throughout the park.r The main telegraph office is located at the Parkr Headquarters Building in Yosemite Village, butr messages may be filed and received at all hotels andr camps. A messenger service is also provided duringr the summer months but this is of necessity limitedr to Yosemite Valley.r

r r

r The electrical system consists of a hydro-electric,r power plant of 2000 kilowatt capacity, located on ther r r r Merced River a short distance below the western endr of Yosemite Valley. This plant was completed inr June, 1919, at a cost of $212,000.00 and serves sevenr miles of high power transmission line and approximatelyr nine miles of distributing lines. The energyr here developed is used for power, lighting, heating,r and cooking purposes in the hotels and camps, and inr the residences of park employees and other governmentr buildings.r

r r

r *Department of Forests and Timber.* Under ther supervision of a Park Forester this unit of park administrationr is charged with the supervision of timberr operations in the park and the immediate representationr of the federal government on the Hetch Hetchyr project in course of development by the City andr County of San Francisco.r

r r

r Special work having to do with the forests of ther park is also assigned to this department.r

r r

r *Mechanical Department.* This department is presidedr over by a Master Mechanic who has charge ofr the operation of the machine shop and the maintenancer and upkeep of all motor-driven vehicles. Tor him is also assigned the task of advisory supervisionr of the upkeep and operation of all power-drivenr machinery and plants.r

r r

r In addition to the more or less specific activitiesr enumerated above, numerous problems of a specialr nature are from time to time taken up in connectionr with other bureaus or departments of the State andr National governments. Control of the mosquito nuisancer is carried on in coöperation with and underr the advice of the United States Public Health Servicer of the Treasury Department; the study of forest insectsr and application of the findings of the Bureau ofr r r r Entomology of the Department of Agriculture in ther elimination of insect depredations on the park forestsr are effected by the park force in coöperation withr that bureau; the planting of fish in the park waters isr done in coöperation with the California State Fishr and Game Commission; methods for the exterminationr of rodents in Yosemite Valley are applied underr the advice of the Biological Department of the Departmentr of Agriculture; and in coöperation with ther Forest Service the problem of the preservation ofr timber along the roads leading to the park is beingr worked out.r

r r

r Hence the administration of the park, in its positionr as a separate and independent nationally governedr unit which compares with the District of Columbiar so far as form and application of government isr concerned, places, on the small scale, upon its administrativer organization many of the same complex problemsr of administration and operation that confrontr the local government of that reservation—problemsr and difficulties that are, however, little realized by ther casual visitor to the park whose soul and mind arer occupied in absorbing scenery and with getting ther fullest enjoyment out of his holiday.r

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Geology of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Andrew C. Lawson

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GEOLOGY OF YOSEMITE NATIONAL PARK

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r By Andrew C. Lawsonr

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r *r Professor of Geology and Mineralogy, University ofr r Californiar* r

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r Fromr a geological and physiographic point of viewr the Sierra Nevada is, as its Spanish name implies, ar single range built on very simple structural lines. Itr belongs to the class of mountains of the Basin Ranger type, so called because it is best exemplified in ther Great Basin, that great region of no drainage to the sear which lies between the Sierra Nevada and the Wasatch.r In this region the earth's crust has been broken intor blocks, elongated in a general north-south direction.r Some of these have been depressed and lie beneath ther broad valleys of the desert, while others have beenr uplifted and constitute its linear mountain ranges.r The uplift has, however, not been uniform in mostr cases, but has been effected by a rotation of the blockr On an axis parallel to the range. It results from thisr that the block as a whole has been tilted so as tor Present a steep front, or scarp, on one side and ar gentle slope on the other. The simplicity of ther Profile thus produced has of course been greatly modifiedr by the erosion of the block which has taken placer irl the long period of time

that has elapsed since itsr uplift.r

r r r r

r The Sierra Nevada is one of these uplifted and tiltedr blocks, presenting a very steep, bold front to the eastr and a slope of only about 2° to the west. The edge ofr the tilted block is the crest of the range; its easternr front is the surface of the break whereby it wasr dislocated from the relatively depressed region of ther desert; and its western slope represents the old, lowr surface of the region before it was elevated. Bothr the eastern front and the western slope have sufferedr greatly from erosion since the range came into beingr by this process of uplift and tilting. On the east ther fault scarp has been battered to a slope much lessr steep than it was originally, and the crest of the ranger has thereby migrated westward. On the west the tiltingr of the surface determined a drainage by streamsr running transverse to the axis of the range; and these,r by reason of their velocity, cut sharp trenches, whichr in the course of time have been deepened and widenedr into the great cañons of the Sierra Nevada. On ther divides between the cañons, in cases where their slopesr have not yet intersected, there are still remnants of ther old surface much in the same condition as it was beforer the uplift. From these flat-topped divides, anr observer may get such extended views in all directionsr that he forgets he is in the mountains, and, overlookingr the deep cañons, gets the sensation of being on a vastr sloping plain with occasional low hills rising above ther general surface. It is this plain which has a slope ofr 2° from the edge of the Great Valley to the regionr of the summit peaks and crests. Its remarkabler evenness on many of the divides, particularly in ther northern part of the range, is due to the fact that ther region before its uplift was extensively covered byr deposits of meandering streams, and these in turnr r r r covered by layers of volcanic ash, agglomerate, andr lava, thus smoothing out and obscuring the inequalitiesr of an erosional surface of comparatively low relief.r Considered in the light of these observations andr viewed in its entirety, the Sierra Nevada is recognizedr not only as one of the Basin Ranges, but as ther most perfect and most magnificent example of ther type.r

r r

r The uplift of the Sierra Nevada was not, however, ar simple sudden event, nor even a continuous process ofr earth deformation. The uplift proceeded by stagesr of which two are strongly pronounced, particularly inr the southern part of the range. Between these stagesr the process of tilting stopped for a long time, and in ther interval the cañons, which had been deepened to ther limit for the first stage, were widened into broad flat-flooredr valleys. As a consequence of the second stager of uplift, the streams flowing through these wider valleys were rejuvenated and resumed the work ofr cañon cutting, leaving large remnants of the oldr valley floors as benches or terraces above the brink ofr the cañon walls. The high valleys that border ther cañon of the Kern are perhaps the best records of thisr Period of stability in the Sierra Nevada between twor stages of uplift. The wide, level, rock floor of Tuolumner Meadows, by its contrast with the gorges ofr Tenaya Creek and Tuolumne River below the Meadows,r suggests that it, also, may have been developedr in its preglacial outlines, during this same period ofr stability.r

r r

r The uplifting process of the second stage is not yetr completed. In 1872, at the time of the heavy earthquaker of that year, a movement occurred on the greatr fault which bounds the Sierra Nevada on the east.r r r r By this movement the elevation of the southern partr of the range, in relation to Owens Valley, was increasedr by about twenty feet; and a fresh scarp was formed,r causing a sharp step in the profile of the lower flank ofr the range.r

r r

r Having now acquired an understanding of ther general configuration of the Sierra Nevada as a singler mountain of the Basin Range type, formed by ther tilting of an elongated block of the earth's crust, wer may proceed to consider the cañons which haver been cut into the rising mass, and particularly ther cañon of the Merced with its famous Yosemite Valley.r With one notable exception the great cañons of ther Sierra Nevada are transverse to the range. Ther dominant drainage still follows the lines imposedr upon it consequent upon the tilting of the crustalr block. In this respect the drainage pattern differsr in a marked degree from that of many other mountainr ranges. The main valleys and stream courses of ther Appalachian Range, for example, are parallel to ther length of the elevated mass, with only short transverser outlets for the extended longitudinal system.r Similarly the main drainage of the Coast Ranges isr parallel to their elongation. The reason for this isr that in these and similar mountain ranges the belts ofr rock conform in direction to the elongation of ther range, and belts of soft rock generally alternate withr belts of hard rock; so that, although the drainage mayr have been originally transverse, consequent upon ther uplift, the tributaries of these consequent streams thatr happened to be on belts of soft rock eroded cañon'sr very much faster than those which drained belts ofr hard rock, and faster than the consequent streams,r which traversed both hard and soft belts. The resultr r r r of this has been that, in the course of time, the greatr valleys of old mountains become located in the softr belts, and so become the dominant features of ther drainage systems. Such longitudinal drainage isr technically designated *subsequent* to distinguish it fromr the earlier transverse or *consequent* drainage.r

r r

r The reason that no notable subsequent drainager has been developed in the Sierra Nevada is twofold:r 1. The time that has elapsed since the uplift of ther range has been so short that, even in the northern partr of the range where the contrast of hard and soft beltsr is pronounced, the tributary streams have as yetr made but little headway in establishing their domination.r Geologists and geographers regard a wellr developed subsequent drainage as characteristic of ar relatively old mountain range. So we may classifyr the Sierra Nevada, on the basis of the meagerness ofr subsequent streams, as a young mountain range. 2.r In the southern part of the Sierra Nevada there are butr few contrasts in the hardness of the rocks, the mass ofr the mountain being almost wholly granite, so that ther condition favorable for the development of subsequentr streams, on a well-marked longitudinal pattern,r is lacking.r

r r

r The notable exception to this transverse dispositionr of the Sierran streams is the Kern River. Thisr stream, however, had its position determined for it byr a remarkable rift in the earth's crust, parallel to ther great fault which marks the eastern boundary of ther range.r

r r

r Long after the uplift of the Sierra Nevada to practicallyr its present altitude, after the cañons had beenr eroded down to very nearly their present depth belowr the flat-topped divides, the climate changed for ther r r r worse. In the summit region the ablation of summerr failed to remove the snows of winter. The snows ofr many years accumulated and became packed downr of their own weight into ice, so that glaciers werer formed. At first these were small and situated on ther north side of the great peaks where ablation wasr feeble; but later they expanded into great névésr from which tongues of ice extended down into ther cañons. These tongues were veritable streams of icer many hundreds, and even thousands, of feet deep,r which flowed slowly through the cañons for ages.r They extended far below the line of perennial snows,r and in each case reached a limit, at the time of maximumr severity of climate, at a point in the cañon wherer the ablation of summer just balanced the forward flowr of the ice. At this point the glacier dumped the loadr of rock débris which had been shed upon it from ther cañon walls above. Thus a great lunate ridge ofr fragments, ranging in size from grains of sand to spaulsr the size of a house, was formed, spanning the cañonr from wall to wall.

This ridge is called a terminalr moraine; and there are many such moraines in ther great cañons. Besides the terminal moraine, therer are others farther up the cañons, called moraines ofr retreat, which mark stages in the waning of the glaciersr when the climate again became more genial. Tor these moraines were delivered not only the rock,r fragments which had ridden on the back of the glacierr to its end, but also similar fragments carried in ther body of ice, which had either fallen into crevasses orr had been plucked out of the floor of the cañon in placesr where the rock was so intersected by joint cracks as tor be divided into blocks, and so easily dislodged by the icer stream. Many rock fragments were also carriedr r r

r r

r PLATE VIr

r Two Yosemite domes. Mount Star King (left) and Half Dome (right) from the summitr

r of Mount Watkinsr

r r Photo by A. D. Lockwoodr r

r r r r along in the bottom of the ice, and these scratched,r abraded, and polished the rock surfaces over which ther ice flowed, and were themselves scratched, abraded,r and polished by the same action. By carefullyr examining the material of some moraines one may findr an abundance of bowlders showing such evidence ofr abrasion; while in other moraines they are veryr scarce or absent.rr r

r Besides the terminal moraines and moraines ofr various stages of retreat, the upper slopes of ther cañons formerly occupied by glaciers are in manyr cases, particularly near their headwaters, modified byr great ridges of glacial débris, known as lateral moraines.r These accumulations were formed in the samer way as the terminal moraines due to a sideways movementr of the ice to balance the ablation along itsr margin.r

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r The effect of the long continued flow of these icer streams upon the configuration and aspect of ther cañons is very notable, and may be observed in ther upper reaches of all the great Sierran cañons. In theirr lower stretches, the cañons are all V-shaped in transverser profile, the slopes are uneven and generallyr encumbered with a mantle of rock débris and soilr arising from the disintegration and decay of the rockr tinder the weather. Where rock surfaces are exposedr these present the appearance of fractures, or arer bounded by joint planes, and the rock is usuallyr somewhat decomposed for a short distance below ther surface. As we pass up the cañons, within the limitsr of former glaciation, the whole aspect of the landscaper changes. The cañons are no longer V-shaped inr profile, but more nearly U-shaped. All of the rockr débris and soil has been swept out of the cañon, andr r r r bare rock surfaces are seen on every hand. Theser surfaces are, moreover, not commonly fractures orr joint planes, but are clearly surfaces due to abrasionr since they show abundant evidence of scoring, striation,r fluting, and polishing. Many surfaces are sor highly polished that they reflect the sun’s rays

like ar mirror. Where the polish is lacking it is generallyr evident that this is due to exfoliation, the scaling off ofr the rock in thin slabs, and that the polish once extendedr over the areas thus denuded. The bare rockr surfaces have acquired rounded or hummocky formsr which, from a distance and in the aggregate, look liker the backs of sheep in a flock. They are thereforer known technically as *roches moutonnées.* Ther hummocks are characteristically elongated in ther direction of the cañon and have a symmetricalr transverser profile but an asymmetrical longitudinal profile,r with a steep front facing down stream. This asymmetryr is due to the fact that the upstream side of ther hummock received the full force of the abrasive impactr of the ice current, whereas the tendency on the downstreamr side was to pull out or pluck fragments fromr the rock mass and so leave a steep front. Ther abrasion thus so apparent on the *roches moutonnées*r affected all surfaces over which the ice passed. Itr was not done by the ice itself, however, but by ther rock fragments imbedded in it. The passage of the icer stream through the cañons not only swept away allr loose rock and soil on the slopes, but by this processr of abrasion removed all the decomposed material, sor that the rocks so generally exposed in the glaciatedr Portions of the cañons are in a wholly sound and freshr condition. It is evident also that the abrasive processr was competent to reduce even the fresh hard rock afterr r r r the superficially decomposed material had beenr removed. The long continued abrasion and ther plucking together have deepened the cañons, at ther same time giving them their characteristic U-shapedr profile. One of the finest examples of the effect of icer upon the configuration of a cañon, once merely ar stream gorge, is afforded by Tenaya Cañon, a goodr general view of which may be had from Mirrorr Lake.r

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r The power of glaciers to deepen the cañons in whichr they flow is perhaps best exemplified in their upperr reaches where the general grade is steeper. Herer the characteristic longitudinal profile of the cañonsr is a series of steps, the present streams cascading fromr one level to another. On each step is a rock-rimmedr basin, or tam. In some cases there may be severalr such steps and tarns in the course of a mile, while inr others the steps may be much broader and morer widely spaced. No other agency is known wherebyr these tarn basins could have been formed except byr the abrasive power of rock-laden ice. Seizing uponr the inequalities of the original stream profile the icer has accentuated these into a series of giant steps,r the treads of which suffered heavy local abrasion byr the impact of the ice descending from above, while ther risers were developed into cliffs by exceptionally activer Plucking. One of the lowest of the tarns in ther vicinity of Yosemite is Tenaya Lake which lies in ar rock-rimmed basin 140 feet deep.r

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r Another extremely interesting feature of mostr glaciated cañons, to be found at their very head,r where the ice stream has its origin, is the cirque.r This is a vast amphitheatre of bare rock enclosed byr nearly vertical cliffs, generally hundreds of feet high,r r r r in the floor of which is a tam. In some of the largerr cirques there are several tarns at slightly differentr levels. These cirques appear as great bites in ther mass of the mountain and are clustered around ther high peaks of the summit that divide the drainage.r They have been formed by that peculiarly vigorousr process of ice erosion which, on a smaller scale, hasr given us the steep faces of the *roches moutonnées* hummocks,r and the risers on the steps of the glaciatedr cañons. The glaciers at their heads ate their way intor the mountain mass, by nibbling at the base of the cliffsr and so undermining them. The blocks of rockr plucked out from the cliffs were incorporated intor the ice and carried away by the glacier to be deliveredr chiefly on its sides, to make the great lateral morainesr which are now found below the cirques. As ther process proceeded, and the cirques were enlarged atr the expense of the peaks and ridges, the dividesr between opposing cirques were in many cases reducedr to thin partitions with sharp knife-like crests. Asr still further enlargement proceeded, these dividesr were rapidly lowered. We have thus presented to usr in this encroachment of cirques, one on the other, ar process whereby lofty mountain crests and summitsr are first gradually narrowed and then rapidly reduced.r This glacial destruction of mountain crests mayr eventually so lower the elevation that the conditionsr favoring the accumulation of ice may be done awayr with. Alpine glaciers may therefore be said to ber self-destructive. The glaciation of the high Sierra,r however, occupied

but a brief time from a geologicalr point of view and before the destruction of ther high peaks and summits had proceeded far the climater changed and the glaciers almost wholly meltedr r r away, leaving only remnants in a few of the higherr cirques.r

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r Of these lingering glaciers within the limits of ther National Park the most notable, as well as the mostr accessible, are those on the east side of Mt. Dana, onr the north side of Mt. Lyell, and on the northeast sider of Mt. McClure. These glaciers are very smallr compared with the great ice stream that once filledr the whole of Tuolumne Meadows, and sent oner tongue down the cañon. of the Tuolumne River farr below Hetch Hetchy and another down Tenaya Cañonr into Yosemite. They are, however, interesting featuresr of the high Sierra and well worth a visit.r Although they are very small, they have all ther essential features and functions of their great ancestorsr except that they are in some cases broader than long.r Here at the lower edge of the ice one may see a morainer in actual process of accumulation; and on searchingr among the bowlders one may find some that have beenr abraded and scratched. The ice is traversed byr crevasses just as in the case of the great glaciers andr riding on the ice may be seen the débris shed fromr the cliffs above. If we cross the glacier to its upperr edge where it appears to adhere to the base of ther cirque walls, we find that the appearance is deceptive,r for the ice, instead of hugging closely the base of ther cliffs, is separated from them by a space of several feet.r The space extends down for a long distance betweenr the wall of rock and the wall of ice as a great chasm.r This detachment of the glacier from the cliffs isr known as the *bergschrund.* At the bottom of ther chasm goes on the plucking and sapping action whichr gives the cirque walls their verticality, as seen whenr the ice eventually vanishes.r

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r Among the glaciated cañons of the Yosemiter National Park those of the Merced and the Tuolumner are the most impressive and the most interesting.r just as at present these two streams gather up andr carry forward to the San Joaquin Valley practicallyr all the drainage of the park, so, in glacial time, ther great bodies of ice which covered the summit regionr within the limits of the park, excepting the highestr peaks, converged on the same two cañons, and flowedr down them to the limit where ablation balanced ther forward movement. Some of the ice, however, flowedr through the passes on the crest of the range towardr the east and gave rise to glacier tongues on that sider which were much shorter than those on the west;r because then, just as now, the climate was much drierr and the summers hotter than on the west side of ther summit. Most of these short glaciers on the easternr flank of the range have left splendidly developedr lateral moraines. Some of these, particularly thoser of Bloody Cañon, Leevining Cañon, and Parker Creek,r in the vicinity of Mono Lake are easily accessible tor visitors in the park. It is interesting to note that, atr the maximum extension of these east flank glaciers, ther level of Mono Lake was about 675 feet higher than atr present. At this high level the glaciers reached ther lake. But even under these conditions the greatlyr increased influx of water from the melting glaciersr was balanced by evaporation, for at its highest stager Mono Lake had no outlet. Thus we have ther apparent anomaly of glaciation combined with aridity.r The explanation of course is that the glacialr streams flowed from a humid region west of ther crest of the Sierra Nevada into an and region tor the east of the crest. The line between two stronglyr r r r contrasted climatic provinces was, however, veryr sharp.r

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r In the drainage system of Merced River Tenaya isr perhaps the most typical illustration of a thoroughlyr glaciated stream gorge. It is at the same time ther most easily accessible to visitors in the Yosemiter Valley. Everybody who goes to Yosemite gets ar glimpse of Tenaya Cañon from Mirror Lake. Yosemiter is also a glaciated cañon. There is a larger moraine spanning the Valley just below El Capitanr and the ice must have extended that far at least.r Yet the contrast between Tenaya Cañon and Yosemiter Valley is very great. If Tenaya be the typer of a glaciated cañon, Yosemite must be abnormal.r In what does the departure from the

type consist?r Evidently in the width of the Valley floor, its levelr character, and the entire absence of bare rock surfaces.r The floor of Yosemite is everywhere sandy and therer is reason to believe that the deposits of sand are severalr hundred feet thick. If we imagine this sand removedr and the talus at the base of the great cliffs nonexistent,r we would see the Valley as it actually was immediatelyr on the retreat of the glacier. The picture before ther mind's eye would then differ in no essential respectr from the view we get of Tenaya Cañon. The Valleyr would then be true to type. It would be larger andr deeper, but there are good reasons for this. Ther glacier entering Yosemite from Tenaya was not ther Only one that filled the Valley with ice. An equallyr important one flowed in from the Upper Merced andr Little Yosemite; and another moved down ther Illilouette. These three great glaciers converged onr Yosemite and the cross section of the confluent glacierr in the Valley was probably not less than the sum of ther r r r cross sections of the three tributaries. This greatr increase in the volume of the ice, particularly asr expressed in its depth, together with the steepness ofr approach of the tributaries to the Valley, wouldr greatly increase the abrasive action of the glacier onr its floor. Just below the confluence, that is in Yosemite,r the cañon would be over-deepened and we wouldr have a rock-rimmed basin formed, like that of Tenayar Lake but larger and deeper. Thus, in our mentalr picture of the restoration of Yosemite as it was at ther immediate retreat of the glacier, we must introduce ar beautiful lake, in which were mirrored the majesticr walls encircling it. At the lower end of this lake, justr below El Capitan, had been left a moraine whichr helped to accentuate the depression caused by ther scour of the ice. Into this lake poured the sandy andr milky waters of the three glaciers, now separater during the long period of their retreat. These streamsr built out a delta into the lake which eventually filledr it, giving us the present floor of the Valley, sevenr miles long and one mile wide. On this floor has accumulatedr the talus of rock spauls shed from the cliffs;r and across the floor in a shallow sandy trench flowsr the Merced River, cascading over the moraine belowr El Capitan, giving us the Valley as we know itr to-day.r

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r Hetch Hetchy Valley is generally recognized asr being analogous to Yosemite though on a smallr scale. The profound gorge of the Tuolumne, with itr stepped profile of bare, glaciated rock emerges suddenlyr on a wide, flat-floored, sandy valley, justr Tenaya Cañon opens on Yosemite. Both valleysr have had the same history. Glacial abrasion andr plucking over-deepened the cañon, so that, when ther r r r

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r PLATE VIIr

r The Lyell Canyon with Mount Lyell and its glacier several miles distantr

r r Photo by Wm. E. Colbyr r

r r r r ice retreated, a tarn occupied the basin. This tarnr served as a trap for sediments brought down from ther melting ice above, and the filling of the basin built outr the level floor of Hetch Hetchy. The lake which willr soon be created in Hetch Hetchy Valley by the damr at its outlet, now being built by the City of Sanr Francisco, will be but a restoration on a larger scaler of the lake which once existed there. The new laker will seem very natural in its mountain setting, a gemr of great beauty and a delight to all who may have ther good fortune to see it.rr r

r Little Yosemite Valley owes its flat, sandy floor andr its breadth between walls to the same process. Ther valley is but a tread on the great stepped profile ofr the Merced; and on this tread there had been scouredr out a rock-rimmed basin which, on the final retreat ofr the ice, contained a tarn about three miles long.r Several meadows in Tenaya Cañon above Tenayar Lake are similarly filled tarns, as are also manyr meadows of the higher altitudes.r

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r The contrast between the typical glaciated cañon ofr Tenaya Creek, and the aberrant Yosemite and Hetchr Hetchy valleys is not, however, due wholly to the factr that they once held lake basins now filled with sand.r The contours and the profiles of the walls of bothr Yosemite and Hetch Hetchy differ from those ofr Tenaya Cañon. The contours of Yosemite are inr general zig-zag, expressive of salients and reëntrantsr which are full of surprises and suggest some mysteriouslyr intentional process of sculpture. In the profilesr the vertical element dominates and gives the Valleyr its atmosphere of solemnity and majesty, the samer atmosphere which the great architects of the Middler Ages gave to their splendid Gothic cathedrals. Theser r r r features are in striking contrast with the smoothlyr flowing, though undulatory, contours and profilesr of Tenaya Cañon below Clouds Rest as seen fromr Mirror Lake. When we try by close observation tor ascertain the cause of this contrast we discover, asr Matthes has so well told us, that in the sculpturalr modification of the Valley by glacial erosion there hasr been a large element of control inherent in ther structure of the granite, which is the prevailing rock.r The granite originally solidified from a molten conditionr under a cover of immense thickness. This coverr was removed by erosion ages before the uplift whichr gave the Sierra Nevada its present configuration.r The relief of load, as erosion proceeded, and the loweringr of the temperature of the mass as the graniter was brought nearer the surface and eventually into ther zone of erosion, greatly changed the condition ofr compressive strain which the force of gravity imposesr upon the rock. This redistribution of strain causedr certain portions of the mass to be overstrained, andr relief was obtained by the development of systems ofr cracks or fissures which we call joints. These jointsr are in some cases straight and parallel so as to divider the rock into thick slabs, as on the face of Sentinelr Rock. In other cases there are two or three intersectingr systems which divide the rock into prisms, orr cuboidal, or rhomboidal blocks. In still other casesr the joints are curved and roughly concentric as at ther Royal Arches. Many portions of the granite are, however,r almost free from joints, or, if they be present,r they are so widely spaced that they only slightlyr affect the integrity of the rock, as at El Capitan.r

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r Now, nearly all of the vagaries of erosion, ar particularly of ice sculpture, in Yosemite Nationr r r r Park are referable to the erratic distribution of theser systems of joints and to the disposition of the jointr planes in each system. The ice, in passing over orr past jointed granite, plucked out the blocks one by oner and incorporated them within its body, carrying themr forward with the glacial flow. In the course of timer a vast quantity of rock was thus removed. In ther unjointed portions of the granite in contact with ther ice, on the other hand, erosion was limited to abrasionr and comparatively little rock was removed by thisr process. In this way there were large differences inr the rate of glacial erosion in near-by localities; andr the same influence had also affected ordinary atmosphericr and stream erosion in the ages that precededr the glacial period. The great salients like El Capitanr are composed of granite in which the joint structurer is but feebly developed and were, therefore, resistantr to erosion by the dislodgment of blocks. The troughr in which Bridalveil Creek

flows above the falls isr clearly conditioned by the intersection of inclinedr joints. The great steps over which Vernal Falls andr Nevada Falls tumble are equally clearly determinedr by the disposition of the joint planes there. In ther exfoliation of the curved slabs, so well exemplifiedr in the Royal Arches, we have an excellent illustrationr of the control exercised by curved joints in the developmentr of the great domes of the park, such as Northr Dome, Half Dome, and many others. The curiousr spires which are so common about Tuolumne Meadows,r and which characterize the landscape in ther wonderful view from the summit of Mt. Conness, ower their configuration to the same control of erosion byr internal structure. It is well to note, however, thatr the curved joints which determined the configurationr r r r of the domes and spires presented a structure whichr was not so favorable to dislodgment of spauls, whetherr by atmospheric agencies or by glacial plucking as wasr the structure formed by intersecting straight jointsr The domes and spires represent portions of the graniter which were, like the unjointed rock, relatively resistantr to mechanical disintegration, so that, when ther rest of the region was reduced in level, they remainedr as eminences. The higher domes and spires probablyr rose well above the surface of the great névé and ther ice streams flowing from it, so that the exfoliationr which gave them their present configuration is referabler not to ice plucking, but to the heaving action ofr freezing water in the joint cracks, and to the slow,r recurrent movements due to dilatation and contractionr under varying temperature. Half Dome,r the asymmetry of which, no less than its isolation andr height, makes it so conspicuous a feature of Yosemiter Valley, owes its peculiar configuration to the intersectionr of two systems of joints: a system of straight,r vertical joints parallel to the flat west face, probablyr disposed in a narrow zone, and a system of curvedr joints concentric with the rounded east side.r

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r Many of the lower domes have, however, been overr ridden by the ice and so have had a glacial modelling,r by abrasion, imposed upon surfaces originally whollyr determined by curved joints. In this process ar glacial modelling great thick slabs of granite whichr had become loosened from the parent mass werer plucked out by the ice, leaving vertical walls from ar few inches to twenty feet or more high facing downr stream. The ice immediately flowed into ther reëntrants thus formed and abraded the new surfacer exposed to its attack by the removal of the slab. Inr r r r r cases where this happened during the retreat of ther ice front we find abundant manifestations of glacialr scouring at sharply different levels on the bare roundedr surfaces. Some extreme cases of this sort have suggestedr to Mr. Matthes that there may have been twor glaciations of the region, and he has adduced otherr evidence in favor of this view. In this he is supportedr by the earlier interpretation of the moraines nearr Mono Lake by Russell; by the observations of Turnerr and Ransome in the Big Trees quadrangle; and byr the later observations of Knopf on the eastern flank ofr the Southern Sierra Nevada. But the doctrine of twor distinct glaciations of the Sierra Nevada is one whichr must be subjected to much more critical study beforer it can be accepted by geologists as an established fact.r There is, of course, in this doubt as to the realityr of two distinct glacial periods no objection to ther recognition of frequent retreats and advances of ther glacier front in one and the same glacial period; for wer are familiar with such oscillations in the existingr glaciers of Alaska, Norway, and the Alps.r

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r Yosemite Valley differs from Tenaya Cañon in stillr other important features which excite not only geologicalr interest, but also the wonder and admiration ofr all who come to the Valley. These are the waterfalls,r the grace and beauty of which, no less than their greatr height, have made them famous the world over.r Streams which flow with gentle gradients in comparativelyr shallow channels on the uplands correspondingr to the old surface before it was uplifted,r reach the brink of the Valley and plunge headlongr into the abyss, clearing all contact with the cliffsr for hundreds of feet. These upland channels whichr thus appear at the brink of Yosemite Valley asr r r r small notches in its walls belong to the class of so-calledr "hanging valleys," which are rather characteristicr of glaciated regions in general. They mayr have one of two different origins: 1. The relativelyr shallow upland channels may have been nonexistentr prior to the glaciation of the region, the drainager having then taken some other path. In this caser the present position of

the streams was determined byr the configuration of the surface vacated by the ice, andr their channels, in so far as these have been cut byr water erosion and not by glacial scouring, is wholly ar post-glacial effect. If this be the explanation ofr Yosemite and Bridalveil creeks then there is nothingr surprising in the fact that, in the short time since ther ice vanished, they have eroded but shallow trenchesr in the glaciated upland, and so appear as hangingr valleys on the brink of the Valley. 2. The uplandr creeks that now cascade into the Valley at Yosemiter Falls and Bridalveil Falls may have been preglacialr drainage lines which were temporarily occupied by ther ice with the rest of the country, and which againr became functional when their channels were vacate,r by the ice. In this case these two tributaries of ther Merced must have been engaged in the work of streamr erosion as long as the main stream and there shouldr have been, just prior to glaciation, no glaring discordancer in the depth of their trenches. If this be so, thenr the main cañon of the Merced at Yosemite Valleyr must have been very shallow just prior to glaciation,r and nearly the whole depth of the Valley would haver to be ascribed to glacial erosion. But we cannotr accept this latter explanation because the cañon of ther Merced below the limit of glaciation affords us ther measure. of preglacial. erosion and tells us that Yosemiter r r r has been only modified and over-deepened byr ice work, but not, in its larger features, created byr the glacier.r

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r It would seem, therefore, that both Yosemite Creekr and Bridalveil Creek are post-glacial drainage features;r although the argument applies with greaterr force to the former than to the latter. The samer interpretation can scarcely, however, be placed onr Illilouette Falls, and much less can it be applied tor Vernal and Nevada falls on the main flow of ther Merced. These three magnificent cascades clearlyr are on lines of pre-glacial drainage, and their relationr to Yosemite Valley is not the same as that of Yosemiter and Bridalveil falls. The drop from Little Yosemiter and that from the upland valley of the Illilouette tor the floor of Yosemite are nearly the same, and ther gorge into which the waters tumble in both cases is ar glacially modified inheritance of a pre-glacial condition.r Attention has been called to the fact that ther uplift of the Sierra Nevada took place by two mainr elevatory movements, with a long period of restr between during which the high valleys of the Kernr region were evolved to their present notable width.r It may well be that on the drainage system of ther Merced there were also similar high valleys carvedr out of the mountain mass, and that Little Yosemiter and upper Illilouette are remnants of this old topography.r Such valleys after the second uplift would,r of course, be subject to vigorous dissection by reasonr of the accentuation of the stream grades. Thisr dissection, however, probably proceeded as it doesr In plateaus underlain by flat lying strata; that is, byr the recession of falls so well exemplified at Niagarar and by the falls of the Yellowstone. At Niagara ther r r r rocks are hard limestones resting on soft shales, whiler in the Yellowstone the strata are sheets of volcanicr rock. But in both cases the gorge has been formed byr the slow upstream recession of the falls. Horizontalr jointing in the granite, such as is so well displayedr near the top of Lower Yosemite Falls, and one thirdr of the way up the walls of Hetch Hetchy, wouldr have the same effect as planes of stratification in promotingr this process of gorge cutting, particularly ifr combined with transverse vertical jointage, whichr would determine the verticality of the head of ther gorge. Both horizontal and vertical jointage are wellr displayed in the gorge between Nevada Falls and ther floor of the Valley.r

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r We may thus picture to ourselves a pre-glacierr Yosemite Valley, not as deep, nor as wide, nor asr sheer-walled as the present Valley, but neverthelessr profound erosional gorge ending in spray filledr *culs-de-sac*r below both Little Yosemite and the high valley ofr the Illilouette, with great cascades in them not essentiallyr different from those we see to-day with so muchr pleasure and interest. Nevada,Vernal, and Illilouetter are, therefore, from this point of view, falls whichr handed over their work of extending the cañon of ther Merced into the High Sierra to the Merced Glacierr for a geologically brief time, and have since resumedr operations at nearly the old stand. The amount ofr recession effected by the glacier was probably notr great, since the work must have been done chiefly,r not wholly, by the process of plucking, and the

paucityr of the moraines below Yosemite indicates but a smallr product.r

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r Pre-glacial Tenaya Cañon, in contrast to that of ther Merced, was not extended upstream by a sappingr r r r process, but by stream corrasion through graniter traversed by a zone of vertical joints parallel to itsr length, and deficient in horizontal and in transverser vertical joints. The gorge was narrow and steep,r and although it doubtless had its cascades, these didr not have the sheer drop displayed by the Nevada andr Vernal Fails. The deepening of the cañon by streamr corrasion was more uniformly distributed throughoutr the length of the cañon.r

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r Next: Life Zones of Yosemiter •r Contentsr •r Previous: Administration of Yosemiter

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Life Zones of the Yosemite Region

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Handbook of Yosemite National Park (1921)r by Joseph Grinnell and Tracy Irwin Storer

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r Next: Birds of Yosemiter •r Contentsr •r Previous: Geology of Yosemiter

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LIFE ZONES OF THE YOSEMITE REGION

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r By Joseph Grinnell,r *Director,*r and Tracy Irwinr
r Storer,r *Field Naturalist, Museum of Vertebrater*
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r (Contribution of the Museum of Vertebrate Zoölogy of ther
r University of California[1])r

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r [1]For several years past the natural history of the Yosemiter region has been the subject of special study by staff members ofr the California Museum of Vertebrate Zoölogy. This and ther following three chapters are based upon the results of that study.r Attention has been concentrated upon the mammals, birds,r reptiles, and amphibians occurring within the section across ther Sierra Nevada extending from Snelling in the San Joaquinr Valley to Mono Lake, east of the mountains. This cross-sectionr is at right angles to the main axis of the Sierras and is approximatelyr ninety miles long and seventeen miles wide. It embracesr Yosemite Valley and its environs, the lower canyon of the Mercedr River, and the country traversed by the Tioga Road; but neitherr Hetch Hetchy Valley nor the Mariposa Grove of Big Trees isr included.r

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r r Ther r "Yosemite section," embracing in that termr the territory included between the eastern side of ther San Joaquin Valley and the basin in which Monor Lake lies, may be considered to afford a fair sampler of the fauna and flora of the entire Sierra Nevada.r The following brief accounts of the life zones and ofr some of the vertebrate animals belonging to them mayr thus prove useful beyond the immediate limits of ther Yosemite Park itself.r

r r r r

r A total of 226 kinds of birds is now authenticallyr known from the Yosemite section; there are 97 kinds ofr mammals, ranging in size from bats to bears, 20 kindr of snakes and lizards, and 11 kinds of frogs, toads, andr salamanders. This makes, all told, a vertebrate fauna,r outside of fishes, of 353 forms. This richness in numberr of kinds is due to the wide range of climatic conditions,r with the depending vegetational features,r covered in the Yosemite section. Only a small proportionr of the total number of species occur together atr any one level. The curious and interesting thing isr that the changes in faunal constitution across ther Sierras are not perfectly gradual but take place atr intervals, abruptly. Several belts or "zones" of lifer result, in each of which conditions are relatively uniform.r These belts have been described and named.r and it is useful to know their names so as to be able tor state the distribution of species in more exact termsr than would otherwise be possible. These life zonesr are correlated roughly with altitude, and from bottomr to top are called **Lower Sonoran, Upper Sonoran,r Transition, Canadian, Hudsonian, and Arctic-Alpine.**r As will be recognized at once, these zones are in ther nature of temperature belts, the warmest at the baser of the mountains, the coldest at the crest, on the highestr peaks. It will be further seen that they correspondr roughly to the transcontinental belts of climate, andr that they bear names significant of their location—Sonorar (in northern Mexico), Canada, Hudson Bay,r etc. To outline very briefly the condition of affairsr in the Yosemite section, let us begin at the west.r

r r

r In following the Yosemite Valley railroad out ofr Merced, one traverses for the first hour the level floorr of the San Joaquin Valley. From the train one seesr r r r along the Merced River bottom numerous Fremontr cottonwoods and valley oaks, and planted orchards ofr fig, orange, and olive, all indicative of the **Lower Sonoran Life Zone.**r A day put in at a representative point,r such as Snelling, would show the presence there ofr Mockingbirds, Texas Nighthawks, Blue Grosbeaks,r Dwarf Cowbirds, Fresno Pocket Gophers, Mercedr Kangaroo Rats, Golden Beavers, and other exclusivelyr warm-belt types of animals as well as of plants.r

r r

r At Merced Falls the railroad enters the first foot-hillsr of the Sierra Nevada, and concurrently there appearsr with remarkable abruptness an entirely new setr of trees and lesser plants, accompanied by as distinctr a set of birds and mammals. The **Upper Sonoran Zone**r has been entered and may always be recognizedr in distant view by the presence of digger pines,r buckeyes, blue oaks, and interior live oaks, and by ar host of bushy plants which constitutes the "Californiar chaparral." This zone continues some fifty miles,r all the way to El Portal, and up to an altitude of 4000r feet on south-facing slopes. Some of its distinctiver species of animals are: California Jay, Northern Brownr Towhee, Pallid Wren-tit, Plain Titmouse, Californiar Thrasher, California Bush-tit, San Joaquin Wren,r Hutton Vireo, Anna Hummingbird, Western Gnat-catcher,r Bell Sparrow, Rufous-crowned Sparrow,r Dusky Poor-will, Nuttall Woodpecker, Mariposar Brush Rabbit, Gilbert White-footed Mouse, Parasiticr White-footed Mouse, Mariposa Meadow Mouse,r Digger Pine Pocket Gopher, Heermann Kangaroor Rat, San Diego Alligator Lizard, and Californiar Striped Racer.r

r r

r At El Portal, on shaded, north-facing slopes, ther visitor for the first time encounters the **Transition Zone,**r r r r which is characterized by the yellow pine.r Douglas spruce, golden oak, black oak, and incenser cedar. This zone continues east throughout ther Yosemite Valley, and rises on the walls of the Valleyr to about the 6000-foot level. A few Upper Sonoranr birds and mammals reach up into the Transition, butr for the most part an entirely new set predominates.r But few of these are absolutely restricted to this zone;r the greater number range farther upward, through ther next one or two zones above. The more distinctivelyr Transition vertebrates are: Band-tailed Pigeon, Californiar Purple Finch, Black-throated Gray Warbler,r Calaveras Warbler, Western Flycatcher, Black Swiftr Pigmy Owl, Northern Spotted Owl, Northwesternr Long-legged Bat, Boyle White-footed Mouse, Yosemiter Pocket Gopher, and Coral King Snake. Somer well-known species which range down into Transitionr from the zones above are: Blue-fronted Jay, Westernr Robin, Sierra Junco, Sierra Creeper, Short-tailedr Mountain Chickadee, American Dipper, Sierra Hermitr Thrush, Mountain Weasel, Yosemite Meadow Mouse,r and Sierra Nevada Flying Squirrel.r

r r

r At about the 6000-foot contour on any of the trailsr leading up out of the Valley, a rather impressive changer is to be noted; the golden oak becomes replaced byr the dwarf huckleberry oak, the California laurel andr maple and black oak disappear, the Jeffrey pine replacesr the yellow pine, and red firs and aspens appear.r These mark the **Canadian Zone.** Birds encounteredr here are: Yosemite Fox Sparrow, Williamson Sapsucker,r Sierra Grouse, Townsend Solitaire, Westernr Ruby-crowned Kinglet, Red-breasted Nuthatch, Casinr Purple Finch, California Evening Grosbeak, Lincoln Sparrow,r Hammond Flycatcher, and Westernr r r r Goshawk. Among the mammals are: Navigatorr Shrew, Pacific Fisher, Allen jumping Mouse, Yellow-hairedr Porcupine, Sierra Mountain Beaver, Sierrar Golden-mantled Ground Squirrel, Tahoe Chipmunk,r Allen Chipmunk, Sierra Chickaree, Tenaya Blue-belliedr Lizard, Mountain Lizard, and Sierra Alligatorr Lizard.r

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r Life zones on cross-sectional profile of Yosemite National Parkr

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r The **Hudsonian Zone** is the belt of forest just belowr timberline. It contains the lodgepole pine, whichr occurs commonly in the Canadian Zone, and has alsor trees of its own, namely alpine hemlock, silver pine,r and white-bark pine. Birds become scarcer in thisr zone though mammals remain plentiful; some of ther species extend up from the zone below. The Californiar Pine Grosbeak, Mountain Bluebird, White-crownedr Sparrow, Alpine Chipmunk, Belding Ground Squirrel,r Sierra Marmot, Mountain Lemming Mouse, Grayr Bushy-tailed Wood Rat, Yosemite Cony, Sierrar White-tailed Jack-rabbit, Pine Marten, Wolverine,r and Sierra Least Weasel are rather closely restrictedr to it.r

r r

r The **Arctic-Alpine** is the highest of all the zones andr Covers the treeless area from about the 10,500-footr contour to the summits of the loftiest peaks. Onlyr r r r one species of bird is confined to it, the Sierra Nevadar Rosy Finch. Some of the Hudsonian mammals enterr it locally; for example, Gray Bushy-tailed Wood Rat,r Yosemite Cony, and Alpine Chipmunk.r

r r

r It must be kept in mind that many of the vertebrater animals of the Yosemite section are not so closely restrictedr as the ones named in the preceding paragraphs.r Certain species range regularly through twor zones, for example, the Blue-fronted Jay; a few throughr three zones, as with the Sierra Junco, and in exceptionalr cases as many as five out of the six zones namer are covered, as is done by the Red-shafted Flicker,r Sparrow Hawk, and Western Chipping Sparrow. Ther last named was found by us summering in the oranger groves at Snelling and also among the timberline treesr in Mono Pass. It was, perhaps, more numerous onr the floor of Yosemite Valley than anywhere else.r

r r

r Other zonal contacts than those just given may ber mentioned for the use of persons coming into the Yosemiter National Park along the roadways or who mayr go on foot, on horseback, or by vehicle to other portionsr of the park. On the Big Oak Flat Road, ther Transition Zone is reached in the vicinity of Groveland;r Canadian is entered at Tuolumne Grove Bigr Trees and is left again near Tamarack Flat. On ther Coulterville road, Transition is reached at the top ofr the grade three miles east of Coulterville, and thisr zone is traversed practically all the way thence intor Yosemite. The Tioga Road begins in Transition,r reaches Canadian just below Aspen Valley, touchesr Hudsonian on Snow Flat and enters it again atr Lake Tenaya and continues in that zone until reachingr Warren Fork of Leevining Creek. Tuolumner Meadows, Lyell Canyon, and Tioga Pass are all in ther r r r Hudsonian Zone. The Wawona Road lies just at ther upper margin of the Transition Zone for most of itsr course between Fort Monroe and Mariposa Grove ofr Big Trees.r

r r

r The restriction of animals by "zones" applies particularlyr to the breeding season. Migratory speciesr of both birds and mammals range more or less widelyr at other times of the year according to food requirements.r Close adaptation of a species to a kind ofr food supply which disappears at the close of the summerr season makes necessary search elsewhere for it inr the winter time.r

r r

r The study of the distribution of the animal life onr the slopes of the Sierras is a fascinating one, especiallyr when the student attempts to ascertain what ther limiting factors may be; for it is certainly not in everyr instance temperature alone, up or down, which formsr the barrier to the species. The intricate interrelationsr which we seek to understand are to be worked outr only by patient and thoughtful study of the animalsr in their many and diverse environments.r

r r

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r Merriam, C. H., 1898.r "Life Zones and Crop Zones of ther United States." U. S. Department of Agriculture, Divisionr of Biological Survey, Bulletin No. 10, 79 pp., 1 plate.r

r r

r For further information on life zones and also on the birds,r mammals, reptiles, and amphibians, consult, in addition to ther titles given, articles in the following series:r

r r

r University of California Publications in Zoölogy, 1908-1920.r Volumes v., vii., x., xii., xvii., xxi. Many references to ther vertebrates of the Yosemite region.r

r r r r

r United States Department of Agriculture, Bureau of Biologicalr Survey, 1889-1920. Bulletins, Circulars, and other seriesr contain articles relating to vertebrates found in the Yosemiter region.r

r r

r *The Condor,* 1889-1920. A magazine of western ornithology.r Published by the Cooper Ornithological Club at Berkeley,r Calif. Contains much information relating to bird species,r which occur in the Yosemite region.r

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r Next: Birds of Yosemiter •r Contentsr •r Previous: Geology of Yosemiter

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r http://www.yosemite.ca.us/library/handbook_of_yosemite_national_park/life_zones.htmlr

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Some Birds of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Joseph Grinnell and Tracy Irwin Storer

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r Next: Mammals of Yosemiter •r Contentsr •r Previous: Life Zones of Yosemiter

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SOME BIRDS OF YOSEMITE NATIONAL PARK

r r

r By Joseph Grinnell,r *Director,*r and Tracy Irwinr
r Storer,r *Field Naturalist, Museum of Vertebrater*
r Zoölogy, University of Californiar

r

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r r

r (Contribution of the Museum of Vertebrate Zoölogy of ther
r University of California)r

r r r

r Ther West is often commented upon as a regionr scant in bird life, yet the "Yosemite section" alone,r comprising an area of about fifteen hundred squarer miles, a little greater than that of the State of Rhoder Island, has been found to harbor no less than 226r different varieties of birds. Of these, 199 are "fullr species." Nor are restricted localities within thisr area lacking in their quotas; Yosemite Valley, far offr the general routes of bird migration, can already ber credited with a hundred different kinds. Dailyr censuses checked by us hour by hour prove birdsr abundant there in early summer as to both species andr individuals. A four-hour tally in Yosemite Valley onr May 31, 1915, revealed 32 species and 220 individuals;r a five hour walk in the western foothills near Pleasantr Valley a week previously showed 48 species and 490r individuals.r

r r

r Of all the birds in the Yosemite National Park ther **Western Robin** least needs introduction. Soon afterr leaving El Portal on the stage, or upon entering ther yellow pine belt along the Wawona, Big Oak Flat orr r r Coulterville Road, the visitor will catch sight of ther familiar Robin as it forages in some open glade orr sings from a perch in some roadside tree. It occursr throughout the mountain forest belt, in the Transition,r Canadian, and Hudsonian zones, chiefly about grassyr meadows and clearings. The mud-cemented nestsr are built for the most part in early May, and ther spotted young appear by June. In fall And winterr the Robins gather in flocks and wander widely as theyr seek out the then ripening berry crops. They desertr the higher mountains at this season going to the foothillsr and lower valleys; after the first snow fall of ther season, only a few remain in Yosemite Valley.r

r r

r An associate of the Robin is the **Sierra Junco** orr Snow-bird which does its foraging likewise aroundr openings in the forest or along the banks of open flowingr streams. The Junco has a black "cowl" coveringr head, neck and breast, a white-appearing bill, a darkr back and wings, and white belly. As it hops about,r the tail is opened momentarily and when the birdr flies this member is spread widely, showing a conspicuousr white margin which forms with the otherr features a ready recognition mark for the bird. Ther male Juncos sing from perches in the trees. Nests arer built upon the ground where the birds seem not lessr successful in bringing off their young than the Robinsr which place their nests in trees. The juncos stay inr pairs during the summer, but they band together atr the coming of fall and go to the foothills in flocks ofr twenty-five or more.r

r r

r The Robin about ten inches long, and the Junco sixr inches from bill to end of tail, may be taken as standardsr of size comparison for other birds of the region.r Both of these species are common in Yosemite Valley,r r r r

r r

r PLATE VIIIr

r Male Western Warbling Vireo on the nest, singing whiler
r performing the duty of incubation. This is one of ther
r common summer visitant birds of the Parkr
r r Photo by Henry J. Rustr r

r r r r and both range in fair numbers through the higherr country nearly or quite to timberline.rr r

r A small Finch found numerously in summer inr Yosemite Valley is the **Western Chipping Sparrow**.r Smaller than a Junco, with a bright chestnut cap, ar whitish line over the eye and streaked back but plainr under surface, it is sure to come early to attention, andr in May and June its nests will be found in the piner saplings and deer-bushes on the Valley floor. Ther "chippies," like the Juncos, form into flocks beforer they depart westward and southward for the winter.r

r r

r The small birds of bright and contrasted colorationr known as **wood warblers** are important members of ther Sierran avifauna. The **Audubon Warbler**, of variedr body plumage but always exhibiting a yellow rumpr and white spots on the outer tail feathers, is the mostr widely distributed species of the group. It occursr in the coniferous trees of the Transition, Canadian, andr Hudsonian zones during the summer, and winters inr large numbers in the foothills west of the park boundary.r This species both nests and forages twenty tor fifty feet above ground in evergreen trees. A somewhatr rarer species not occurring much above ther Transition Zone is the **Hermit Warbler**, which has ar dark body and rump, yellow head and black chin andr throat. It forages amid the same sort of surroundingsr as the Audubon Warbler. When once learned,r their songs, alone, distinguish them. The **Black-throatedr Gray Warbler** is a species practicallyr restricted to the golden oaks which grow in profusionr on the talus heaps and ledges along the north andr south walls of Yosemite Valley. It is a bird ofr deliberate mien and drawling song and its colorationr shows no obvious yellow. The other warblers of ther r r r park are yellow-bodied in the main. In the willowsr and cottonwoods lining the Merced River fromr Snelling up into Yosemite Valley is the **Californiar Yellow Warbler**. The black oaks of the Valley floorr harbor the grayish-headed **Calaveras Warbler**, whichr seeks a site upon the ground for nesting, while in ther moist thickets in the Yosemite is to be found the dark-r "cowled" **Macgillivray** or **Tolmie Warbler**. In ther Canadian Zone above the rim of the Yosemite gorge isr the **Golden Pileolated Warbler**, a

brilliantly yellowr bird with a shining black crown patch. It stays in ther creek dogwood and willows which grow in the wetr meadows and along rushing streams. All of theser warblers are absent from the mountains during ther winter months; their food being almost exclusively ofr insects is available here in adequate quantity for theirr sustenance only during the summer season. Each ofr our Warblers has a set song delivered persistently inr the spring months. But despite their cognomen ofr "Warbler" they do not compare as musicians withr many of the other forest songsters in either quality,r extent, or variety of song.r

r r

r It is to be expected that "birds of prey" aboundr in a region so well stocked with the smaller birds andr animals as is the Yosemite section. A dozen kinds ofr hawks and nine different species of owls have, indeed,r been found here. Space limits us to detailed mentionr now of only a f ew of these. The **Golden Eagle** isr supreme in size and in majesty of bearing among allr the Sierran land birds. It is most common in ther western foothills but is fairly well represented up intor the highest passes of the Sierra Nevada. The Goldenr Eagle measures thirty to thirty-five inches in length,r with a wing spread of six to seven feet. The leastr r r r glint of sunlight on the bird's head and neck reflectsr a golden brown tint, and this feature accounts for itsr name. The **Red-tailed Hawk** is found throughoutr the mountain country, and in summer the misnamedr **Sparrow Hawk** visits the higher meadows and ridgesr even above timberline to search for grasshoppers.r

r r

r The clear cool mountain air lulls so many Yosemiter visitors to an early sleep that only the exceptionalr person will note the flitting forms or measured hoots ofr any of the owls in the region. The smallest of theser birds, the **California Pigmy Owl**, is perhaps the mostr likely one to be heard, because it begins calling atr early dusk and often continues in voice long afterr daybreak. It is only about seven inches long, has ar rounded head without ear tufts, yellow eyes, and ar dark brown back. It inhabits sparse woods and is ther commonest owl in Yosemite Valley. Its call is quiter distinctive, a trilled tooting which lasts several seconds,r a pause, then a single note, another pause and then ar second note, *too-too-too-too-too-too-too-too-too; whoot;r whoot.* Sometimes a deep reverberant *whoo, whoo,r who-hoo* comes from the taller trees, indicating ther presence of the big **Horned Owl**; and on occasion oner may hear, in Yosemite Valley, the dog-like yelpingr and barking of the rarer **Spotted Owl**.r

r r

r The Yosemite visitor who has readr John Muir's sr splendid and appreciative description of the **Waterr Ouzel** or **Dipper** in his bookr *The Mountains of Californiar* will be keen for a personal acquaintance withr this singular inhabitant of the Sierran creeks and rivers.r A morning along any of the streams in the park isr likely to reveal a chunkily built bird of slaty grayr coloration which is jouncing about this way and thatr on some rock in midstream or flying from one suchr r r r perch to another. Suddenly, the bird disappearsr beneath the stream, and one wonders with apprehensionr at its fate in that rushing torrent; butr speculation is dispelled when the Dipper reappears inr a few seconds up or down stream and resumes itsr "dipping" on another rock. This one-time land bird,r relative of the wrens and thrushes, has taken to livingr about, *in* and *under* the water. Its nest is placedr along the stream, usually in a niche of the rock wherer touched by light spray, so that the mossy exterior ofr the structure is kept wet and growing while the birds arer rearing their brood. The Dipper's song is among ther most striking of all mountain bird voices, and while givenr through much of the year, it appeals best when otherr songsters are gone or quiet, during the snowy winter.r

r r

r The swift flowing waters of the Merced and Tuolumner rivers offer attraction to but few water birds,r but wherever the banks are low and covered withr sand or gravel there may be expected the **Spottedr Sandpiper**.

Lagrange, Yosemite Valley, and Tuolumner Meadows are but three of its several knownr haunts within the Yosemite section. In summer ther pairs are busy with their nesting duties, and their clearr calls ring out at all times of the day as the birds trotr along the strand or fly in semicircular course fromr place to place along the shores in search of food.r These are typical "shore-birds" and their nest consistsr of little more than a depression in the gravelr large enough to shelter the four good-sized eggs.r

r r

r The mountain forests furnish the homes of manyr different kinds of **Woodpeckers**. The Yosemite sectionr has thus far revealed no less than twelve species,r some in the foothills, some in the high mountains,r others encompassing both these habitats. At middler r r altitudes, in Yosemite Valley and the Canadian Zoner above, is the **White-headed Woodpecker** which isr solidly black except for a pure white head and smallr patch of white on each wing. It might be thought thatr a bird of such coloration would be conspicuous, butr the very reverse is true; these colors blend exceedinglyr well with the background whether this be formed byr the bleached or blackened stumps, or the high lightsr and shadows on the living trees. The Whiteheadr nests usually within twelve feet of the ground, byr preference in a shattered stump or in an upstandingr branch of a prostrate trunk. During the late springr and early summer months its domestic program is thusr capable of easy study.r

r r

r "Cock-of-the-Woods" is an appropriate name givenr to the **Pileated Woodpecker**, the giant among all ther local Woodpeckers. It measures over seventeen inchesr in length as compared with the twelve inches of ther well-known Red-shafted Flicker. A bird of blackr body, it shows white in large patches on both outerr and inner surfaces of the wings and a stripe of white onr its neck, while the head bears a flaming red crest.r This Woodpecker occurs at times in Yosemite Valley,r but his kind is more abundant in places of greaterr altitude where there are numerous dead stubs of red orr white fir to be prospected for grubs or, in spring, to ber excavated for nesting places. When at work the noiser produced by the Pileated's big chisel-like beak soundsr like the strokes of a distant woodchopper or the blowsr struck by a telephone repair man. When on the wingr the Pileated Woodpecker pursues a nearly level course,r flashing the white wing patches regularly, and oftenr uttering a sustained and far-carrying *kuk-kuk-kuk-kuk-kuk.*r

r r r r

r The **California Woodpecker**, so common in ther California valleys and foothills, reaches the oak-dottedr floor of Yosemite Valley in fair numbers, andr its work may be seen in many places there. This isr "el carpintero" of the Spanish explorers, the birdr which stores for itself a supply of acorns, wedgingr each into a newly dug pit in the bark of some convenientr oak or pine tree. Certain big trees in Yosemiter Valley are studded with acorns for many feet from ther ground. With golden oaks on the talus slopes andr black oaks on the Valley floor the birds should neverr be at a loss for their favorite nuts. Yet another typer of food is needed, for in summer they are regularly tor be seen flying out from exposed perches to capturer passing insects.r

r r

r Over the open gorge of the Yosemite and from mostr of the "inspiration" points about the rim, may ber seen every day of the summer season, the "policemenr of the upper air," the **Swifts** and **Swallows**. The dark-bodiedr form, of crossbow outline, which cuts the airr at lightning speed is the **White-throated Swift**, andr its more leisurely associate, which displays a pure whiter under surface, is the **Violet-green Swallow**. The Swiftr is of about twice the bulk of the Swallow, its proportionatelyr narrower wings are concave instead ofr straight-margined behind, and it is much more swiftr and daring than the Violet-green; when flying it oftenr utters a torrential series of notes. louder and morer hurried in delivery than any calls given by

swallows.r

r r

r The **Band-tailed Pigeon**, western counterpart. ofr the now extinct Passenger Pigeon, is found in fairr numbers in the Yosemite region practically throughoutr the year. Yosemite Valley harbors one or morer flocks of these birds, and while acorns constitute theirr r r r main source of food, toyon and coffee-berries, andr scattered grain in the poultry yards of indulgent residentsr of the Valley afford the birds forage when ther first named staple is scarce or wanting. The bluishr gray back, pinkish breast, and dusky-banded tail arer color features to be looked for. The big birds arer often unnoticed amid the oak foliage until they flushr with a loud clapping of wings and make off in swiftr course to some other retreat.r

r r

r At the lower limit in scale of size among Sierranr and indeed all Californian birds is the **Calliope Hummingbird**,r the little green and violet-feathered jewel,r which flits lightly about the flowers of the mountainr meadows. This midget, weighing about one-tenth ofr an ounce (3 grams), is but a summer visitant here andr winters in Mexico. The thickets of Sierran currantr break into blossom in the Canadian Zone during Mayr or early June. The Calliopes at the same time appearr in numbers, the males foraging and battling with oner another on the upper slopes while the females stayr down toward the canyon bottoms preparing to rearr their broods. The "gorget" of iridescent hues on ther throat of the male consists of long lance-shaped feathersr which in display are held out apart from the snowyr white color of the neck. This is the only Hummingbirdr which, so far as we know definitely, nests in ther park; the **Anna** and **Black-chinned** occur in the westernr foothill country as far up as El Portal, and ther **Rufous Hummingbird** passes south along the Sierrasr in July and August.r

r r

r From early morning until late dusk, throughout ther mountain forest belt, is to be heard the droningr *zuweez* of the **Western Wood Pewee**. This is ther commonest and most widely distributed member ofr r r r the flycatcher family although other species of ther group occur in numbers in appropriate places in ther Yosemite section. The Pewee is a bird of open forest,r usually perching fifteen to forty feet above the groundr in a place where it has a clear view of its surroundings.r The bird sits quietly, but its head turns this way andr that as it watches for passing insects. These arer captured by short quick sorties, the Pewee returningr to the same or a nearby perch after each pursuit. Ther Pewee is plain dark brown above and on the sides ofr the body, with yellowish white on the middle of ther lower surface. The larger **Olive-sided Flycatcher**r which chooses the lofty tree-tops as lookouts hasr whitish flank patches and a loud three-syllabled call;r and the small weak-voiced flycatchers have light ever rings and light bars on the wings.r

r r

r About the same time that the newly arrived visitorr sees his first Robin, another, even bolder member ofr the mountain avifauna will likely force itself uponr the attention. This is the **Blue-fronted Jay**, localr representative of the crested or Steller Jays of westernr North American generally. It is a common residentr of the Transition and Canadian zones of the park.r The bird spends most of its time in the trees; a favoriter perch is near the top of a tall conifer from where itr can see all that goes on in the forest. When ascendingr to such a station the bird will keep close to the trunk,r hopping up and around from one branch to anotherr as if following a spiral staircase. In nesting time ther two members of a pair keep close together. Whiler ordinarily noisy, a "zone of quiet" is maintainedr about their own nest. At this season they are wont tor raid the nests of smaller birds carrying off the eggs orr young to serve for their own food; the small parentsr r r

r r

r PLATE IXr
r The Water Ouzelr
r r Photo by Gertrude Metcalfe Sholesr r
r

r r r r r know this, for whenever a piratical jay approachesr they at once set up a remonstrant calling that attractsr sympathizers from far and near.rr r

r The "high Sierra" has its component of bird life,r smaller to be sure in both species and numbers thanr the lower, more thickly wooded areas, but containing ar number of distinctive types worth a long hike to getr acquainted with. The **Clark Nutcracker**, a memberr of the Crow Family, and the local "camp robber," is ar denizen of the Hudsonian Zone, sometimes rangingr down to the upper limits of the Transition, and againr and more often up above timberline. It wears a piedr plumage, gray on the body with black flight feathers,r while each wing shows a white spot, and the tail ar broad white margin when the bird takes to flight.r The daily round of foraging after pine seeds either inr the trees or on the ground beneath soon results in ther plumage acquiring a brownish overtone due to pitch,r and after the birds have gone through with the dutiesr of the nesting season (March to May) some individualsr present a bedraggled appearance indeed.r

r r

r Early summer visitors to the Canadian Zone arer likely to hear a song of exquisite beauty coming fromr the top of some lofty fir or pine. Interspersedr between the warbling strains are numerous metallicr clinking notes resembling a ground squirrel’s whistle.r All of these are from the repertoire of the **Townsendr Solitaire**, in

several respects an unique member of ther Thrush Family. The Solitaire is a grayish bird ofr slender form and long tail. When it takes to flightr one sees a light margin to the outer tail feathers and ar broad yellowish bar upon each open wing. One wouldr search the trees in vain for this bird's nest; the tree-topsr are used only for singing and foraging. At nestingr r r r time a sheltered spot on the ground is selected,r such as the base of some uprooted tree or a niche in ar roadside bank, and here a nest of loose construction,r with many pine needles and twig-ends stragglingr below it, is placed. In the fall the Solitaires ranger over the country widely, going here and there afterr berries of juniper, toyon, and mistletoe, which furnishr their sustenance in the colder months of the year.r

r r

r Two **Thrushes** occur in the region during summer,r the larger and more plainly garbed **Russet-backed**,r rather sparingly and chiefly in the Transition Zone,r and the **Sierra Hermit Thrush**, vesper songster in ther wooded glades, which is found in Yosemite Valley butr more commonly in the zones above. The latter, toldr at once by its rather bright "rufous" rump and tail,r has a peculiar habit of twitching or refolding its wingsr at short intervals and slowly depressing the tail at ther same instant. It keeps close to the stands of smallr dense conifers in canyon bottoms whence its song ofr set theme but much varying key comes at short intervals,r especially in the morning and evening hours ofr twilight.r

r r

r The Sierras possess three distinct **Grosbeaks**, twor of which are resident at high altitudes practicallyr throughout the year. In the Hudsonian Zone is ther rather rare **California Pine Grosbeak**, a gray bird ofr slender appearing body and long tail. The femalesr and young are "washed" with yellow on the head andr breast while the adult males are brilliant red overr nearly the entire body. In the Canadian and Transitionr zones one is likely to see the more chunkily builtr and vari-colored **California Evening Grosbeak**. Thisr bird has a huge greenish yellow bill. The bodyr plumage of the male is yellow, the tail and wings blackr r r r with a large patch of white along the inner margin ofr each wing. The female is gray with scattered whiter markings on the dark flight feathers. Neither of theser Grosbeaks is an elaborate singer; their best efforts arer little-more than a repetition of the high-pitched callr notes.r

r r

r The **Black-headed Grosbeak**, one of the largest andr most strikingly colored of the finch and sparrow tribe,r has gained a special reputation in Yosemite Valley byr reason of i ts habit of appropriating butter and otherr viands from tables set beneath the trees. The plumager of the male is varied with black, brown, and white,r while the female is much streaked, especially aboutr the head. In May and June these Grosbeaks are inr full voice in Yosemite Valley. Novices confuse ther song of this Grosbeak with that of the Robin, but ther former is fuller and quicker, with many little trillsr and warbles not heard in the Robin's rather monotonousr carol. The Black-headed Grosbeak builds ar simple nest, little more than a cupped platform of finer interlacing twigs, and. often so thin that an observerr standing on the ground can look through the bottomr and see at least the outline of whatever it contains.r

r r

r The brush belt of the Canadian Zone with its manzanita,r snow bush, chinquapin, and huckleberry oak isr the home of a big, ground-dwelling type of Finch, ther **Fox Sparrow**. Winter or summer, birds of this sortr are there, though the race represented, and of courser the individuals, change with the season. In summerr there is the grayish toned race called **Yosemite Foxr Sparrow** while winter sees this variety replaced byr brown backed birds from the Alaska coast. All arer alike in being ground foragers, who kick and dig withr their stout feet in the leafy waste, sending up littler r r r jets of débris with an accompanying noise out of allr proportion

to the size of the bird, and such as sometimesr frightens timid walkers along the trails whor suspect some lurking wild beast. Passing theser thickets in summer one is apt to hear the clear ringingr lay of the bird, and if one camps near a ridge topr touched early by the morning sun, he will likely ber awakened by the songs of the Fox Sparrows who haver moved upslope to catch these first warming rays afterr a chilly night.r

r r

r Often while traversing trails through open forest,r there comes from the tree tops a quaint, nasal *weh,r weh, weh*—syllables which sound like the blasts of anr elfin horn. Search as he may, the traveler will atr best locate a small form moving about the trunk andr limbs near the tiptop of the tree. If luck and patiencer favor, the bird may come low enough so that itsr grayish back, black head with light stripe over eye,r reddish under surface, and very short squared tailr show it to be a **Red-breasted Nuthatch**. The birdr forages exclusively on the bark, hunting out insectsr which have secluded themselves in crevices. Inr moving about, the Nuthatch goes either up or down,r with seemingly equal facility. The **Slender-billedr Nuthatch**, western relative of the White-breasted ofr the East, occurs at lower altitudes, and occasionally, inr the yellow pine belt, a troop of the **Pygmy Nuthatches**r may be encountered.r

r r

r Each part of the tree receives attention from somer particular type of bird. Kinglets and Warblers searchr the foliage, Vireos the smaller twigs, Woodpeckers seekr grubs buried within the wood, while Nuthatches andr Creepers scrutinize the bark of trunk and limbs. Ther **Sierra Creeper**, the local variety of an almost world-rangingr r r r species, is found on the forest trees of ther Transition and higher zones. The Creeper wears ar streaked brown pattern of color on the back and ther under surface is white; its tail feathers are long-pointedr and stiffened so as to give the bird support as it clingsr to the side of a tree. Unlike the Nuthatch, ther Creeper moves only upward on the trunk; it ascendsr from the base, often spiralling around the trunk, andr when it arrives at the top of one tree it flies off to ther base of another. Its call is fine and wiry and the songr is but little more than several of these faint high-pitchedr notes in quick succession.r

r r

r **Chickadees** are associated in the mind with forests,r and in the Yosemite region is to be found the **Mountainr Chickadee**, inhabitant of the woods, throughoutr the Transition and Canadian zones. Memories of ther plainly pronounced *chick-a-dee-dee* and of the clearr whistled song remain long in the minds of travelersr who visit the California Sierras. In fall and winterr the birds go about in companies but in spring theser companies break up into pairs, and by early May ther nesting duties are begun. First comes selection of ar nest site, usually an old hole of the White-headedr Woodpecker. This chosen, it may be remodelled orr cleaned out somewhat, when it is lined with feathersr and hair, and then five to eight eggs are laid. Whenr the brood is hatched and grown they fairly fill ther cavity, and anyone who has taken out a family ofr Chickadees to make their portraits will attest to ther impossibility of being quite able to fit them back intor the nest hole again. The Mountain Chickadeer remains in the Sierras through the winter, and itsr familiar call is one of the few bird notes to be heardr when the Yosemite Valley is blanketed with snow.r

r r r r

r Along the streams at middle altitudes in the Transitionr and Canadian zones one is sure to hear, duringr the early summer months, the pleasing song of ther **Western Warbling Vireo**. Many birds sing only atr morning and evening, a few chiefly during midday,r and some of those who keep up their songs and callsr throughout the day soon weary the human hearer;r but all this does not apply to the Western Warblingr Vireo. Even during afternoons of drowsy heat wer have heard these birds in almost continuous song.r Singing does not hinder the birds in the performancer of their regular duties, for we have seen one carryingr material and

building its nest while it sang, and it isr commonly known among bird students that this Vireor sings regularly while sitting upon its eggs.r

r r

r The open grassy areas of the Hudsonian Zone, suchr as those which constitute Tuolumne Meadows, affordr an abundant supply of insect food for a brief periodr during the summer months, and several birds migrater to these high mountain locations to take advantage ofr this ephemeral food supply. The **Mountain Bluebird**r is one of these summer visitants to the high Sierras.r Paler in tone of blue than either its relative of ther California foothills or the Eastern Bluebird, thisr species in its coloration reflects the intense lightsr and pallid tones of the high mountains. When ther first mountaineers of the season reach the alpiner meadows, pairs of Mountain Bluebirds are preparingr to nest, seeking old woodpecker holes or similar cavitiesr of dead trees. By July the young are hatchedr and then the parent birds busy themselves huntingr insects in the fast growing grasses of the meadows.r A favorite method with this bird is to hover in oner place with rapidly beating wings ten to twenty feetr r r r above the ground and intently scan the turf belowr for prey. When an insect is spied the bird dropsr rapidly to the surface, captures the object and thenr makes off with it to a perch or to the nest.r

r r

r From well up in the forest trees there comes duringr the spring and early summer a clear song of considerabler volume which seems to say, *0, Oh-Oh, Cheerily,r Cheerily, Cheerily.* One would be tempted to look forr a bird of considerable size, but the songster is actuallyr one of the smallest in the mountains, the **Ruby-crownedr Kinglet**. There are two species of ther diminutive Kinglets with bright crown markings, inr our mountains. The Ruby-crown has a red crownr patch present only in the male. This is normallyr concealed by the other feathers of the head but can ber flashed forth with startling effect when the bird isr excited. The **Golden-crowned Kinglet** on the otherr hand wears a yellowish crown patch bounded by black.r It is present in both sexes and in both is held permanentlyr in view. In addition to its pleasing song, ther Ruby-crown gives a loud sputtering note or "ratchet-call"r which it utters when excited over any unusualr event such as the appearance on the scene of a Bluejayr or Owl.r

r r

r Surely the visitor who really looks for birds in ther Yosemite region will not be disappointed. For ther experience of those who have already made fair trialr has proven the richness of the possibilities here. Andr these possibilities are far from exhausted; new discoveriesr are sure to reward careful search for manyr seasons to come.r

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r Next: Mammals of Yosemiter •r Contentsr •r Previous: Life Zones of Yosemiter

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r http://www.yosemite.ca.us/library/handbook_of_yosemite_national_park/birds.htmlr

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Some Mammals of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Joseph Grinnell and Tracy Irwin Storer

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r Next: Reptiles and Amphibians of Yosemiter •r Contentsr •r Previous: Birds of Yosemiter

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SOME MAMMALS OF YOSEMITE NATIONAL PARK

r r

r By Joseph Grinnell,r *Director,*r and Tracy Irwinr
r Storer,r *Field Naturalist, Museum of Vertebrater*
r Zoölogy, University of Californiar

r r

r (Contribution of the Museum of Vertebrate Zoölogy of ther
r University of California)r

r r r r r

r Ther Yosemite region possesses an abundant populationr of mammals both as to species and individuals.r A total of ninety-seven different kinds is definitelyr credited to the region. Subtracting three speciesr known to be extinct, and eight varietal forms, we haver record of eighty-six "full species" now to be foundr between Snelling and Mono Lake. The determinationr of the population as to individuals is more difficultr with

mammals than with birds, and has beenr attempted in only a few places. In so far as datar have been assembled it is estimated that mammalsr exist throughout the country at large in the ratio tor birds of ten to one.r

r r

r The average visitor, nevertheless, sees much less ofr mammals than of birds. Squirrels and Chipmunksr are out during the daylight hours, and occasionally ar Bear or Coyote or a group of Deer is observed, but ther presence of most other mammals must be ascertainedr by noting their "sign," tracks, and workings. Footprintsr of Badgers, Wolverines, and Mountain Lions mayr be seen in trails and roadways, or on snow; gnawedr r r r tree trunks give evidence of Porcupines; and earthr mounds of different sorts indicate the presence ofr Moles and Gophers; but the host of small species ofr Mice and Shrews leave less evidence of their presencer than any of the above, and only assiduous trappingr (which can be done in the park only under specialr permit for scientific purposes) will reveal the abundancer and variety of mammalian life which is activer during the hours of darkness.r

r r

r Among all this multitude of mammals there is notr one species which need be feared by visitors on ther ground of personal violence. Bears in search of foodr will sometimes raid camps at night, especially whenr the occupants are away, and Mice and Chipmunks willr gnaw into stores of provisions, but these temporaryr inconveniences, if they are experienced at all, arer certainly far more than offset by the pleasure to ber gained in observing the ways in which these diverser types of animals carry out their several existences.r

r r

r The **California Gray Squirrel** will be one of ther first mammals to attract the attention of the visitorr to Yosemite, for it is fairly well represented in ther Transition Zone forests which are traversed by ther several roadways leading into the mountains fromr the west, and it is common among the trees on ther floor of Yosemite Valley. The Gray Squirrel isr typical of the tree dwelling members of the squirrelr family. Its lithe body, strong legs, and long, heavilyr bushed tail all enable it to jump readily from branchr to branch, while the sharp curved claws enable it tor cling securely to the bark of trunk or branches. Ther Gray Squirrel is active practically throughout ther year, so that visitors at whatever season will seer the species; however, more individuals are out in goodr r r

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r r PLATE Xr r

r Rocky Mountain Mule Deer, the only species of hoofed big game now to be found in Yosemiter National Park.r

r r Photo from habitat group, California Academy of Sciences, San Franciscor r

r r r r r weather than during times of heavy snow. Theser animals find their usual forage in the acorns of severalr kinds of oaks and in the cones of the pines, particularlyr those of the yellow pine. From the time that the firstr cones reach full size, in early summer, until the lastr seeds are matured in late fall or early winter, the Grayr Squirrel pays devoted attention to the cone crop asr long as this holds out. The squirrels ascend the treesr and cut the cones loose from the branches. No effortr is made to hold onto them at this time, and the heavyr green cones come hurtling down and strike the groundr with a force that is, to say the least, disconcerting tor persons who may be walking near or under the trees.r After cutting off one or more cones, a squirrel willr descend to the ground and proceed to open up a cone.r Sitting up on its haunches and steadying the cone inr its forefeet, the animal gnaws off the scales whichr protect the seeds, beginning at the base of the cone.r Like other rodents or "gnawing" animals, the Grayr Squirrel is provided with two opposed pairs of stoutr chisel-like teeth in the forepart of its jaws, and theser serve to cut quickly through the tough bases of ther scales. In a surprisingly short time the cone isr reduced to a core and a heap of scales while ther squirrel has consumed the stock of seeds or nuts orr stored them in part within its cheeks. The groundr beneath "fruiting" pines is often strewn thickly withr piles of these "table scraps" from numerous feasts.rr r

r At other times of the year the Gray Squirrel livesr on a variety of vegetable materials, especially uponr acorns, many of which are buried in the ground in ther fall. In the spring it sometimes turns its attention tor the eggs and nestlings of birds which nest in trees.r The birds recognize the squirrel as a possible enemyr r r r and are quick to set up a disturbance whenever a Grayr Squirrel appears in the near vicinity of their nestingr precincts.r

r r

r The Gray Squirrel population in Yosemite Valleyr seems somewhat larger than in like territory elsewhere.r This may be due to the additional food availabler about houses and camps as well as to the abundancer of oaks and yellow pines there. An estimate made inr Yosemite Valley during October, 1914, placed ther numbers of the Gray Squirrel at one per acre. Ther Valley, below the 4250-foot contour, and from "Ther Gateway" below Cascades eastward, contains aboutr seven and a half square miles. This would give ar total Gray Squirrel population, in the fall, of 4800,r which is believed to be considerably in excess of ther numbers to be found in any equal area in the openr woods of the Transition Zone elsewhere.r

r r

r In the forests of the Canadian and Hudsonianr zones lives the **Sierra Chickaree**, a "red" squirrelr similar in general habits to the Gray Squirrel but ofr smaller size and different coloration. The Chickareer is dark brown tinged with reddish on the upper surface,r has a black line along each side of the body, andr the lower surface of the body is white or buffy white.r Its body is about eight inches long and the moderatelyr bushy tail five or six inches. The mode of life of ther Chickaree is similar to that of the Gray Squirrel.r It is a dweller in the trees and comes to the groundr only when necessary to retrieve a fallen cone or tor cross an opening not bridged by overhead branches.r Where trees are close together as in many parts of ther lodgepole pine forest the Chickaree literally lives inr the trees.r

r r

r The food of this species is similar to that of the Grayr r r r Squirrel but not so varied; there are no large oaksr and but few nut producing plants within the Chickaree'sr domain. It must perforce live more extensivelyr on the seeds of cone-bearing trees. The Chickareesr which dwell in the Canadian Zone where firs are abundantr may be seen in the fall assiduously gathering ther thin-scaled cones of the red and white firs. Theser are "cachéd" by being buried along the sides of somer large log near the squirrels' home tree. When ther snow comes the cones gain further protection, in coldr storage as it were, whence they are drawn upon andr used by the Chickaree, as need be throughout ther winter. In the spring observant travelers will findr the logs strewn with the scales and cone-cores discardedr by the squirrels during their meals. Ther voice of the Chickaree is decidedly different fromr that of the Gray Squirrel and is also much morer varied. One common call is a prolonged trill of highr pitch; and there is a striking single note which is givenr from time to time with an insistent delivery.r

r r

r There are seven species of small striped **Chipmunks**r in the Yosemite section, and five of these occur withinr the Park boundaries. All agree in general patternr of markings, having the head and back marked withr alternate stripes of dark and light color and with morer or less bright brown along the sides, but there arer decided differences in tone of coloration. There arer also considerable differences in size, habits, and localr distribution of the several species.r

r r

r Chipmunks in general are nimble creatures, to ber seen scurrying about in their eager search for food, atr frequent intervals playing with one another or fleeingr from supposed or real enemies. There is a distinctiver sort of quick intermittent or "jerky" movement on ther r r r part of a chipmunk, in which the animal will move ar few steps and then be absolutely still for severalr seconds, save perhaps for a sideward switching of ther bushy tail. In these short intervals of quiet ther streaked pattern fairly melts into the animal's surroundingsr so that the eye may lose the creature for ther moment altogether. Sudden changes of position arer often each accompanied by a single exclamatory note.r If a Chipmunk becomes thoroughly frightened itr makes off pell-mell and in direct course toward itsr retreat, scarcely looking behind, and uttering a torrentr of excited chippings as it goes.r

r r

r The usual note with all of the species is a highr pitched *psst* which is often repeated to form a sputteringr series. The larger species have also a hollow low-tonedr *pook* which may be likened to the bark of a dog,r as it is given with rather long rests between successiver notes.r

r r

r Each species of Chipmunk has a definite generalr range and a particular "niche" within this range; nor two species are found in exactly the same surroundings.r On the west slope of the mountains in portions of ther Upper Sonoran and Transition zones containing mixedr chaparral and trees there is the **Mariposa Chipmunk**r (*Eutamias merriami mariposae*) a large dark grayishr species. It is found in small numbers in thicketsr along the north and south walls of Yosemite Valley.r The most widely distributed and commonest speciesr of the Yosemite region is the **Tahoe Chipmunk**r (*Eutamias speciosus frater*) which occurs throughoutr the Canadian and Hudsonian Zones. It may ber known at once by its small size (total length aboutr eight inches), bright highly contrasted pattern ofr coloration, extremely lively manner, and especially byr r r

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r PLATE XIr

r Mountain Lion or Cougarr

r r Photo from habitat group, California Academy of Sciences, San Franciscor r

r r r r r its habit of seeking safety high in the trees, ratherr than in logs, thickets, or rock heaps. Tahoe Chipmunksr have been seen fifty feet or more above ther ground, while none of the other species in the highr mountains goes much if any over five feet from ther ground.rr r

r The Canadian Zone possesses also a rather larger species of predominantly grayish coloration, the **Allenr Chipmunk** (*Eutamias senex*). This one lives aboutr boulders, fallen logs, and brush patches. In the upperr part of the Transition Zone and the lower portion ofr the Canadian there is a species of about the -same sizer and practically the same habits as the preceding, butr with much taller ears and a conspicuous white spot atr the hinder base of each ear. This is the **Long-earedr Chipmunk** (*Eutamias quadrimaculatus*), almost asr brightly colored as the Tahoe Chipmunk. Ther smallest and palest-colored species within the park isr the **Alpine Chipmunk** (*Eutamias alpinus*) which dwellsr among rocks and fallen trees in the Hudsonian Zone.r It is the timberline chipmunk, the last to be seenr during an ascent of Mount Lyell or any of the otherr loftier summits.r

r r

r All of the chipmunks living above the snow-liner (about 3300 feet) in the Yosemite section hibernater for longer or shorter periods of time in winter, althoughr their larger relatives, the Gray Squirrel and Chickaree,r are active throughout this season, retiring only onr very stormy days.r

r r

r There is one member of the squirrel tribe which isr observed by very few Yosemite visitors. This is ther strictly nocturnal **Sierra Nevada Flying Squirrel**, ther only local mammal except the bats which is able tor travel through the air. The word "flying" is herer r r r used inaccurately, as this squirrel is only able to volplaner from a high perch to a lower one. Its body isr flattened, and between the fore and hind leg on eachr side there stretches a furred double layer of skin whichr adds to the animal's spread and makes feasible itsr oblique passage through the air. Its dense silky hairr seems to be an adaptation in this direction and alsor contributes to the quietness of its "flight." Ther Flying Squirrel lives in the Transition and Canadianr Zones, being fairly common in the black oaks in Yosemiter Valley and in the red firs above the Valley rim.r

r r

r All of the members of the squirrel kind mentioned inr the preceding paragraphs are species which live andr find shelter chiefly or entirely in trees or logs; but therer are also important members of the group which dwellr upon and beneath the ground. These are the Groundr Squirrels and the Marmot. The **California Groundr Squirrel**, of brown tone of coloration with whitishr shoulders, is in habits the western counterpart of ther Prairie Dog and is found, in the Yosemite region, fromr the San Joaquin Valley up to an altitude of 8200 feetr in the mountains. In the Canadian and Hudsonianr zones is the **Sierra Golden-mantled Ground Squirrel**,r locally called "copperhead." This species has ther head and shoulders golden yellow while the body isr marked along each side with two jet black stripesr enclosing one of pure white. The "niche" of thisr species is in the open forest about bases of large treesr and rocks. The Hudsonian Zone supports anotherr burrowing species, the **Belding Ground Squirrel** orr "picket-pin," a rather plainly garbed animal ofr yellowish brown coloration and with a reddish washr along the back. It lives altogether in the meadowsr where it finds abundant forage during the summerr r r r months and where it may often be seen sitting up inr characteristically erect posture on the lookout forr danger.r

r r

r The Golden-mantled and Belding Ground Squirrelsr hibernate regularly and so do those representatives ofr the California Ground Squirrel which live in the Transitionr and Canadian zones where snow lies on ther ground during the winter months. All of these rodentsr feed to repletion during the summer and by fall theirr bodies are heavily stocked with fat which then servesr to warm and nourish them during the long winterr sleep.r

r r

r The **Sierra Marmot** (*Marmota flaviventer sierra*),r often called "Woodchuck," is the largest local representativer of the squirrel family in the Yosemite region.r In bodily configuration the Marmot is stouter than ther other members of the family, with proportionatelyr shorter legs and tail. It is not infrequently mistakenr for the badger, a totally different animal which, however,r often lives in the same sort of country. Adultr Marmots measure 15 to 18 inches (head and body),r with the tail 5 to 8 inches long, while the weight rangesr from 4 to 6 3/4 pounds with different individuals. Herer in the Sierras the Marmot is a high mountain animal,r dwelling chiefly in the Hudsonian Zone. The winterr months (from about October until May) are spent inr hibernation. Each Marmot has a burrow in ther ground, usually beneath some huge granite bowlder atr the edge of a meadow or at the base of a tree at ther margin of the forest. On all pleasant days the Marmotsr are out during the warmer hours, either foragingr in the grass of the meadows or resting near theirr burrows. During the summer months the Marmotsr must eat not only to supply their daily needs but alsor r r r to take on fat to carry them through the long winter.r It is not an uncommon experience during this seasonr to come upon one of the animals out some distancer from its burrow and busily engaged in cropping ther new grasses. If frightened while so engaged ther Marmot will make off with a lumbering gallop towardr its

burrow. When not feeding, the animals spendr much time sunning themselves on the tops of bowldersr or at the mouths of their burrows. In any situation,r when alarmed, the Marmot utters a shrill bark orr whistle. Sometimes it stands up on its hind legs tor get a better view of the object which it is keepingr under surveillance.r

r r

r The **Rocky Mountain Mule Deer** (*Odocoileus hemionusr hemionus*) is the large mammal most likely to ber seen by the Yosemite visitor. In early days, whenr white pen first thronged the Sierran foothills in searchr of gold, no less than four species of homed or antleredr big game animals inhabited the Yosemite region.r The San Joaquin Valley marshes supported the Tuler or **Dwarf Elk**; the plains both east and west of ther Sierras were the ranges of the **American Antelope**; ther high Sierran crest was the habitat of the **Sierra Mountainr Sheep**, while on the intervening slopes of ther mountains there lived the **Mule Deer.** The firstr three have vanished from the Yosemite section, probablyr never to return, but the Deer are still present inr goodly numbers. Deer are present in the parkr throughout the year, though their local distributionr changes with the season. In the summer time theyr are more common in the higher zones and many arer to be seen at Chinquapin, above Yosemite Falls andr in the vicinity of Merced Lake, and a few wanderr above timberline along the Sierran crest. With ther r r r

r r

r PLATE XIIr

r American Black Bear amid the yellow pines in Yosemite Valleyr

r r Photo by J. T .Boysenr r

r

r r r r coming of winter they are forced to lower levels andr concentrate in that season in the upper foothills alongr the western boundary of the park. At all times ofr year they find their forage chiefly among the bushyr plants, most especially the various species of deerr brush or mountain lilac (*Ceanothus*). Our Deer dor not habitually graze in meadows.rr r

r The Mule Deer gains its name from the large sizer of its ears, which are about eight inches long and fourr inches across. The tail lends further character to ther suggested comparison, for this member is slender andr nearly devoid of hairs . toward the base beneath. Inr the summer months the Deer wear a thin reddishr colored coat, which is acquired in June and carried untilr October; then the thick gray pelage of winter isr assumed.r

r r

r The fawns of the Mule Deer are born about ther first of July, but the does keep their charges hiddenr until a month or so later, after which time the young inr the spotted reddish coats are seen rather commonly.r The usual number at a birth is two, though singler fawns are often seen and rarely there are three young.r The young run with the mother until the followingr spring or until they are "yearlings." Then sher deserts them to prepare for the new litter.r The Deer in the park have responded favorably tor protection from hunting, and large bands are seenr there during the winter months. Some pass throughr Yosemite Valley but the larger migratory movementsr are along the ridges above.r

r r

r Discussion of Deer leads logically to mention of theirr principal enemy, excepting man, the **Mountain Lionr or Cougar**. Save for the **Wild Cat** or "Lynx Cat"r (two names for one and the same species) there is nor r r r other member of the cat tribe here; there are nor Canada Lynxes in the Sierra Nevada. The Mountainr Lion when fully adult measures about 6 1/2 feet fromr tip to tip, of which about thirty inches is the tail.r The body coloration is usually reddish brown, sometimesr gray. The only difference between males andr females is in size, the former being the larger. Mountainr Lions are so wary that but few are seen underr ordinary circumstances. Many persons have livedr in the mountains for years without seeing one of ther animals. Only when trailed and treed by dogs arer they to be seen readily. However, evidences of theirr presence and activity are relatively common. Theirr tracks are seen in summer along dusty trails or crossingr roads, and rather commonly after the snows of winterr come. The footprints are catlike, and measure fromr three to four inches in each surface dimension. Ther depredations of the Mountain Lion among the Deerr are most evident during the winter. In that seasonr the deer are concentrated in the foothills at the marginr of the heavy snow, and then the Cougars have ar relatively easy time to obtain prey.r

r r

r Another "predatory" mammal, common in ther high Sierras and likely to be seen by visitors to ther park, is the **Mountain Coyote** (*Canis latrans lestes*).r Standing about 20 inches high at the shoulder with ar body length of 30 to 33 inches, with ears about 4 inchesr tall, and weighing as much as 25 pounds, some particularlyr long-haired and gray colored individualr Coyotes are designated as "gray wolves" by localr trappers. All efforts, however, to obtain actualr specimens of the real wolf have been unavailing. Ther Mountain Coyte is less restricted in diet than ther Cougar. It feeds upon a variety of small game suchr r r r as ground squirrels and gophers, and even at timesr captures insects; manzanita berries are also eatenr in season. Coyotes sometimes feed upon deer, butr their "venison" comes mostly from carcasses left byr the Mountain Lion. The barking of the Coyote isr often heard in the mountains and the combination ofr yelps, squeals, and howls in the voice of an individualr often gives the impression that there are several ratherr than a single

animal.r

r r

r **Bears** there are in the Yosemite, even close aboutr the floor of the Valley. Indeed, the word Yosemite,r of Indian origin, means big bear or grizzly bear. Ifr ever there were grizzlies in Yosemite Valley, as therer were certainly at other points in the region such asr Wawona, none are left to-day. The famous grizzlyr with its huge size, long front claws, and "silver-tipped"r fur is extinct here now, but its smaller tree-climbingr relative, the **Black Bear**, is still thriving in goodlyr numbers. These smaller bears exhibit two colorr phases, some individuals being black, others cinnamon;r and litters of cubs have been seen in which oner individual of the two was black and the other cinnamonr colored. The name "brown bear" properlyr applies to a species not found here. The Black Bearr is found throughout the Transition and Canadianr zones of the park and is likely to be seen, from Juner until October, by visitors to the Yosemite Valley andr adjacent points. The various garbage dumps whichr have been established in the Valley attract the bearsr regularly in the night time. Several bears have hadr their headquarters in the rock slides near El Capitanr from where they can fare forth and hunt for food inr the table and kitchen débris. Under native conditionsr they eat berries and seeds, beetles, ants, and otherr r r r insects, and small mammals; the wide variety of theirr likes in the matter of food places much material withinr easy reach. In October or early November the Bearsr seek some secluded cavern or hollow tree and curl upr there for a sleep which lasts until early the followingr spring. Persons camping out in the mountains arer sometimes disturbed by having their provisions raided-r by bears, but there are no instances known to us inr which anyone has been injured by a bear when ther start of the trouble did not lie with the personr concerned.r

r r

r There are numerous species of smaller carnivores inr the Sierras of the Yosemite region. Many of theser will be recognized at once as among the importantr "fur-bearing" species. About the rock slides of ther Hudsonian Zone is the brownish colored **Sierra Piner Marten** (*Martes caurina sierrae*); in the forests of ther Canadian and Hudsonian zones is found the **Pacificr Fisher** (*Martes pennand pacifica*), a much largerr animal of generally similar build with a long bushyr tail and much black in its pelage. In the highestr parts of the mountains there is the **Sierra Nevadar Wolverine** (*Gulo luscus luteus*), a heavy-bodied animalr of yellow and brown coloration, now rare. About ther buildings in Yosemite Valley and around rock slidesr in the higher mountains the **Mountain Weasel** (*Mustelar arizonensis*) occurs in considerable numbers. Ther Weasel has a slender body, scarcely two inches throughr but nine or ten inches in length. The body color isr yellowish brown in summer, but this changes to whiter in the winter season. The end of the long and slenderr tail remains black at all seasons so that in winterr pelage our Weasel is an "ermine" in generalr appearance.r

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r r

r PLATE XIIIr

r Three notable animals of Yosemite National Parkr

r The California Grey Squirrel (upper), Tahoe Chipmunkr

r (middle), and Pacific Rattlesnake (lower)r

r r Photos of squirrel and snake by J. T. Boysen, Yosemite;r

r Chipmunk by J. Dixon, California Museum ofr

r Vertebrate Zoölogyr r

r r r r r

r The predacious mammals considered thus far arer all of considerable size, but there are "hunters" ofr smaller bulk though no less daring or active in theirr pursuit of prey.r

r r

r The rocky shores of the streams and crevicesr beneath logs and brush constitute the forage ground ofr several small species of animals called **Shrews**. Theser are related to the moles, and may be known as a groupr by their long slender noses, long tails, and their shortr smooth fur. These small predators, most of whichr are less than two inches in length of body, are voraciousr feeders, to judge from their habits in captivity;r their presence in a region suffices to explain whyr bodies of small birds or mammals disappear so quicklyr When trapping in localities where Shrews abound itr is not an- uncommon experience to have specimensr caught during the early hours of the night, halfr devoured by morning.r

r r

r **Bats** are present in most of the region, whence atr least eight species are now known. Certain speciesr are restricted to the warmer valleys and foothills,r others occur over the floor of the Yosemite gorge, andr one species, the **High Sierra Bat**, has been taken atr 10,350 feet altitude near Vogelsang Lake, almost ther highest altitudinal record for any species of bat in thisr country.r

r r

r Many of the larger accomplishments in nature suchr as the felling of large trees by storms, the scouring ofr valleys by freshets, or the results of earthquakes, arer spectacular in the extreme; but other highly importantr operations are carried on in such an unobtrusiver manner that they excite no popular interest or comment.r The actions of **Gophers** and **Moles** and otherr burrowing animals as agents of erosion and soil manufacturer r r r are examples in this latter category. In cultivatedr districts the **Pocket Gophers** are looked upon asr unmitigated nuisances, but their rôle in the mountainsr is totally different. The numerous earth mounds andr tunnels made by Gophers play an important part inr pulverizing and aerating the granitic soil and permittingr water to permeate below the surface. The finer surface material is washed down by the melting snowsr and the summer rains to add to the fertile plains of ther great valleys. During the summer the Gophers pushr the loosened soil from below ground out on the surface;r but in winter this material is packed into tunnels inr the snow and these "earth cores" are to be seen everywherer in the higher mountains in early summer.r

r r

r **Moles** likewise live most of their time beneath ther surface of the ground, but their structure, and habits,r and their mode of life, are quite different from thoser of Gophers. The Moles never appear above the surfacer and their earth mounds are erupted from beneath,r being split with many cracks and having a rough andr irregular outline. The Gopher comes to the surfacer with each lot of earth he has loosened and pushes itr out so that eventually his mound has a crescenticr rim with a low spot at one side indicating the site ofr the exit after closure. Moles often run along justr an inch or two beneath the surface of the ground andr the resulting "ridges" are plainly evident in placesr where the animals have been hunting actively forr insects. The Mole is chiefly if not wholly dependentr upon insects, worms, and other low forms of animalr life, while the Gopher feeds entirely upon roots andr other parts of plants.r

r r

r As stated in the opening paragraph there is a surprisinglyr large population of small mammals, ther r r r presence of which can hardly be surmised by ther casual observer. Intensive trapping shows that rockr crevices, old logs, brush heaps, and the like arer tenanted by large numbers of **White-footed Mice** ofr several species, all agile long-tailed rodents; the grassyr meadows everywhere are the homes of chunkily builtr **Meadow Mice** with short legs and soft furry coats; andr the higher meadows support many of the long-tailedr long-legged **Jumping Mice**. In the rock slides of ther higher mountains there lives the much larger **Bushy-tailedr Wood Rat**. This animal, like its smooth-tailedr house-building relative in the foothills, is commonlyr called "pack rat" or "trade rat" because of its habitr of carrying away articles of camp equipment and oftenr leaving in their places chips of wood, or other similarr tokens. The Bushy-tail lives in the rock slides of ther Hudsonian Zone, along with the Yosemite Cony andr the Sierra Pine Marten. The Wood Rats exhibit somer tendency toward house-building as is shown by ther accumulations of twigs and sticks in some of the rockr crevices, but the animals rarely do as much in thisr direction as the **Streator Wood Rats** in the Upperr Sonoran and low Transition zones.r

r r

r In the lodgepole pines of the Canadian Zone ther work of the **Yellow-haired Porcupine** is to be seen inr many places; more rarely the animal itself is discovered.r The Porcupine scarcely needs description. Itr is a rodent, or gnawing mammal, of large size, weighingr when adult fifteen pounds or more. The wholer upper surface of the body is provided with long quillsr which grow out beyond the warmth-giving under-fur.r These quills have very sharp points, provided withr slight barbs which adhere readily to any rough or softr substance into which they are thrust, while the quillsr r r r are readily released from their attachment to the skin.r The Porcupine cannot "shoot" its quills as is supposedr by some persons, but for defense it curls its body up sor as to be surrounded by its spiny covering and its tail isr lashed from side to side. Any person or carnivorer incautious enough to come in contact with the quillsr speedily receives a number of these in its flesh. Ther Porcupine has one particular item of forage which itr seeks at all times of year, namely the inner growingr layers of the bark of the pine. A recently-fallen treer is likely to have all of its branches stripped of bark andr graven with the paired markings left by the incisorr teeth of the animal. But downed trees are not ar necessity, for the Porcupine climbs well and often itsr forage is obtained well up in some large tree. Ther lodgepole pine with its thin outer bark seems to affordr the animal the most suitable kind of forage, and wherer common it is eaten to the exclusion of other coniferousr trees.r

r r

r This brief account of the more noteworthy mammalsr of the Yosemite section may well close with mentionr of that interesting resident of the large heaps of slider rock in the Hudsonian Zone, the **Yosemite Cony**r (*Ochotona schisticeps muiri*), variously called "pika,"r "little chief hare" and "rock rabbit." The latter twor names have reference to the relationship of the Conyr with the rabbits, a kinship evinced more by internalr structure than external features. The Cony measuresr less than seven inches in length and has nor obvious tail, both pairs of legs are short, and the earsr are rounded. The covering of hair everywhere isr dense. Its habits are unique; it runs on all foursr with a hobbling gait, and does not sit up on itsr haunches like a rabbit. Instead of migrating to ar r r r milder climate, or else hibernating, during the winterr season, the Cony keeps active even though its rockr slide home is covered by many feet of snow. Inr summer it is busy with food-getting, and cuts, dries,r and piles up in airy, yet protected places, large heapsr of "hay." This includes stems and leaves from mostr of the common plants in the vicinity. The animalsr rarely forage beyond the margins of the rock slides,r seeming to feel that within these heaps of tumbledr granite they are afforded their only reliable protection.r When not engaged in foraging the Cony is accustomedr to perch on some one of its observation posts in ther rock slide and there keep watch of the neighborhood.r The nasal "bleating" notes are given at this time.r Thus the Cony, unlike the rabbits, makes regular user of its voice.r

r r

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Reptiles and Amphibians of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Joseph Grinnell and Tracy Irwin Storer

r r

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REPTILES AND AMPHIBIANS OF YOSEMITE NATIONAL PARK

r r

r By Joseph Grinnell,r *Director,*r and Tracy Irwinr
r Storer,r *Field Naturalist, Museum of Vertebrater*
r Zoölogy, University of Californiar

r r

r (Contribution of the Museum of Vertebrate Zoölogy of ther
r University of California)r

r r r

r Nextr lower in the evolutionary scale below the birdsr and mammals stand the reptiles, including ther turtles, lizards, and snakes, and next below them ther group known as amphibians or batrachians comprisingr the salamanders, toads and frogs. The Yosemiter region contains twenty-one species in the first namedr group and eleven in the second. Among all theser "cold-blooded" vertebrates there is but one poisonousr species, the Pacific Rattlesnake; none of the othersr need be feared at all. All the snakes, even the Rattler,r will slip away

quietly unless cornered and provokedr into fighting. As normal parts of the protectedr animal life in Yosemite National Park no personr should kill any of these reptiles or amphibians, saver the Rattlesnake.r

r r

r As a rule, the numbers of both species and individualsr decrease with altitude. Above the Transitionr Zone there are but few reptiles, though amphibiansr are well represented as to individuals. One speciesr in the latter group, the **Pacific Tree-toad** (*Hylar regilla*), may be heard in spring at almost all altitudes.r r r r Although scarcely an inch in length, it is notablyr hardy and ranges up even to timberline. In the highr mountain meadows will be found a toad peculiar tor the region, the **Yosemite Toad** (*Bufo canorus*), andr its mellow notes are pleasing additions to the chorusr of bird songs just after the snow leaves. **Yellow-legged Frogs**r throng all the stream sides and lake marginsr up to timberline. The salamanders are less inr evidence, and careful search is required to locate them.r One species, the **Lyell Salamander**, is known only fromr the Yosemite Park, the two known specimens havingr been taken in the head of Lyell Canyon at an altituder of 10,800 feet.r

r r

r The **Pacific Mud Turtle** is the only representativer of its tribe found in the region; it has not yet been discoveredr higher than the 3000-foot level in the westernr foothills. Of the nine kinds of lizards the most commonr and most widely distributed group comprises ther "Swifts" (*Sceloporus*) which live about trees and onr rocks and logs. These are dark bodied, with more orr less blue on the under surface. The **Alligator Lizards**r (*Gerrhonotus*) which have long slender bodies, smallr legs and large diamond-shaped heads are found inr grass and under brush piles and chaparral. Theser are reputed to be poisonous, but their only defenser when handled is to give their captor a sharp pinch inr their relatively heavy jaws. They have no poisonr glands. In the leafy débris beneath the golden oaksr along the walls of Yosemite Valley there is the larger **Red-headed Skink** (*Plestiodon skiltonianum*) whichr has a pinkish-red head and olive-green body. It hasr exceedingly smooth scales so that it can slip throughr one’s fingers as if oiled.r

r r

r The snakes of the region comprise eleven species.r r r r In the Yosemite Valley is found the **Rubber Snake**r (*Charina bottae*), a smooth scaled "double-ended" relativer of the pythons and boas of the tropics but notr known to exceed thirty inches in length. There arer numerous **Garter Snakes** (*Thamnophis*) in the region.r These are often called Water Snakes, in recognition ofr their preference for moist meadows and the marginsr of pools. They may usually be identified at once byr the three light yellow stripes along the body, one onr each side and the third along the middle of the back.r

r r

r The most beautiful of the local snakes is the **Coral King Snake**,r a small, smooth scaled, perfectly harmlessr species which lives along the golden-oak . talus slopesr and is frequently met with on the lower trails. Itsr banded coloration is of black, red, and yellow, all ofr bright tone. **Gopher Snakes** have been found in ther western foothill country but have not yet beenr recorded within the park itself.r

r r

r The **Pacific Rattlesnake** is likely to be found anywherer in the Yosemite National Park below aboutr 8500 feet altitude, but in Yosemite Valley, and alongr the well-traveled trails so many of the snakes haver been killed that the species is becoming rare in mostr of these places. The Rattler has many distinctiver features, and in consequence will be recognized at once,r even by persons who know it only by reputation. Ther head is

bluntly triangular, the neck constricted; ther stout body is covered with ridged or keeled scales,r and the short tail has at the end a short segmentedr rattle which the animal can vibrate to produce the well-knownr warning sound. The Rattlesnake is essentially ar ground dweller and seeks refuge at night and duringr the winter in a crevice in the rocks or a hole in ther ground. Occasionally a number collect together in ar r r r favourable location, forming one of the rattlesnaker "dens" really more common in folklore than fact.r The rattlers subsist largely upon small rodents—ground squirrels,r chipmunks, meadow mice, andr pocket gophers.r

r r

r From time to time the Rattlesnake, like otherr snakes, sheds the outer layer of the skin, and eachr time this occurs a new segment is added to the rattler at the end of the tail; for the substance of the rattler grows in continuation with this outer "epidermis."r These molts do not occur at any regular time, andr some individuals probably molt much oftener thanr others so that the number of rattles cannot be takenr as an index of the age of the snake, only of the numberr of molts it has undergone. The "button" at the endr of the rattle and several of the terminal segments arer sometimes lost through accident and so a very larger snake may have only a few rattles. The largest numberr known to us to have been found in one series wasr twenty-two; eight to ten is near the average. At ther time of molt the skin covering the eye is cast off andr just previous to this operation the eye may be slightlyr clouded over. This has given rise to a belief thatr Rattlesnakes become "blind" (especially in late summerr when many individuals molt), and it is currentlyr believed that the snakes are then more likely to striker without rattling than at other times of the year.r

r r

r When excited the Rattlesnake vibrates the tip ofr the tail rapidly, causing the horny rattle to give forthr a cicada-like, buzz that is unmistakable. If dangerr threatens, the snake places its body in a series ofr S-shaped curves, the tip of the tail being held vertically.r To "strike," the reptile straightens out suddenly,r lunging at its prey or enemy, dropping ther r r r lower jaw and erecting the hollow teeth or "fangs"r in the roof of the mouth so that they point almostr straight forward. At best the Rattler cannot striker more than two-thirds its total length. Stories ofr snakes "jumping" at their enemies are without foundation.r If the snake hits the object of its attack ther two hollow fangs are buried in the flesh, the lower jawr is brought up and poison is forced into the wounds.r Leather tramping boots or puttees usually afford fullr protection against the Rattlesnake, as the animals arer not known to strike much if any over twelve inchesr above ground.r

r r

r If a person chances to be struck by a Rattler certainr things should be done, promptly but with as littler flurry as possible.r

r r

r (1) If bitten on the leg or arm, apply a tourniquetr above the wound, that is, toward the heart from ther bite. This is done in order to stop the flow of bloodr toward the heart. A bandana handkerchief twistedr tight by means of a stick makes a good tourniquet.r

r r

r (2) Cut the wound open with a pocket-knife, orr cauterize with a red hot iron. If possible, inject ar solution of potassium permanganate into the surfacer immediately surrounding the bite. If the solution cannotr be made, apply crystals of permanganate directlyr at the place of the bite.r

r r

r (3) After about one hour loosen the tourniquetr slightly for a fraction of a minute, then tighten downr again; after this, loosening and tightening should ber done every fifteen minutes or so.r

r r

r (4) The patient should be placed in a comfortabler position. A mild stimulant, such as coffee, may ber given. Do *not* give whiskey. A doctor should ber summoned as soon as possible.r

r r

r [Editor's note:r the above information for snakebite first aid is obsoleter and should not be followed. In particular, do notr use a tourniquet, do not cut the wound open, do not apply heat,r and do not apply ice.—DEA]r

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The Fishes of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Barton Warren Evermann

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THE FISHES OF YOSEMITE NATIONAL PARK

r r

r By Barton Warren Evermannr

r

r *r Director, Museum, California Academy of Sciencesr* r

r r r

r Ther fish fauna of Yosemite National Park is not ar rich one. Of native species there are two Suckers,r three Minnows, and one Trout; and of these only ther Trout is at all common. If we include the fishes notr native to the region but which have been introducedr into its lakes and streams, the number will be increasedr by nine additional species of Trout. The ten kinds ofr Trout in the park about in order of their relativer abundance are:r
r

r Rainbow Trout; *Salmo irideus* Gibbonsr
r Eastern Brook Trout; *Salvelinus fontinalis* (Mitchill)r

r Shasta Trout; *Salmo shasta* (Jordan)r
r Loch Leven Trout; *Salmo trutta levenensis* (Walker)r
r Cutthroat Trout; *Salmo clarkii* Richardsonr
r Steelhead Trout; *Salmo gairdneri* Richardsonr
r Brown Trout; *Salmo fario* Linnaeusr
r Tahoe Trout; *Salmo henshawi* Gill & Jordanr
r Dolly Varden Trout; *Salvelinus parkei* (Suckley)r
r Golden Trout; *Salmo roosevelti* Evermannr
r

r r This list includes most of the trout known fromr California waters.r

r r

r The limited space available will permit only a veryr brief treatment of each species. It is hoped, however,r at anyone interested can, with these short descriptions,r r r r identify with reasonable certainty the fishesr he may find within the limits of Yosemite Nationalr Park.r

r r

r In the first place, let it be said that all *real* trout ofr whatever kind, belong to the Salmonidae or Salmonr Family. This family includes not only the true Troutr but also the Salmons and the Charrs. Some of ther species, usually the larger ones, are marine and anadromous,r living most of their lives in the sea and Corningr into freshwater streams only for spawning purposes.r Others live habitually and continuously in the colderr streams and lakes.r

r r

r Of all the families of fishes there is none more interestingr than the Salmonidae, from whatever point ofr view they may be considered. To the biologist, ther family is of surpassing interest because of the remarkabler life histories and habits of the many species; tor the angler, no fish has appealed more strongly thanr the Salmon and Trout because of their game qualitiesr and their beauty; to the epicure, there is none morer delicious; to the lover of the beautiful as exhibited inr animate forms, there is perhaps nothing that appealsr more strongly than the silvery sheen, roseate orr golden hugs, and the beautiful form of the Salmon,r the Brook Trout, or the Golden Trout; to the fish culturist,r the Salmonidae are of the greatest interest andr importance, more species of this family being propagatedr artificially than of all other species combined;r and to the commercial fisherman, this family of fishesr is the most important in all the world.r

r r

r The true Trout all belong to the genus *Salmo* andr are found only in the northern parts of Asia, Europe,r and North America; in Europe they extend as farr south as the Pyrenees; and in America to Lower Californiar r

r r

r PLATE XIVr

r Some Trout of Yosemite National Parkr

r Top to bottom—Rainbow Trout, Steelhead Trout, Easternr

r Brook Trout, Golden (or Roosevelt) Troutr

r r Pictures from California Fish and Game Commissionr r

r r r r r and Durango, and eastward as far as the Blackr Hills and Colorado.rr r

r California is richer in Trout than any other countryr in the world, the number of species or kinds nowr known from her lakes and streams being about ar dozen.r

r r

r It has been a more or less common practice to speakr of the Trout of California as falling naturally into threer series, popularly known as the Steelhead, Rainbow,r and Cutthroat groups. This grouping is no longerr accepted without reservations by ichthyologists. Itr has been shown that the Steelheads of Californiar streams are simply Rainbows that have gone out tor sea, and, after growing to considerable size and becomingr silvery in color, have returned to fresh water,r and that the Rainbows are simply the individualsr that never went to sea. For present purposes, however,r it seems best to treat them separately.r

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CUTTHROAT TROUT

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r *Salmo clarkii* Richardsonr

r r

r **Other names.**—Red-throated Trout; Clark Trout;r Black-spotted Trout; Clark Cutthroat Trout.r **Description.**—The Cutthroat Trout can be readilyr known from all other trout by the red blotches on ther membranes of the lower jaw. This mark is usuallyr diagnostic of all the various species of so-called Cutthroatr Trout, of which there are in western Americar not fewer than a dozen recognizable forms. Theser different forms may be distinguished from each otherr by proportional measurements, size of scales, andr coloration. The Clark Trout is characterized by itsr r r fine scales and the presence of small teeth on ther hyoid bone.r

r r

r **Distribution.**—This species occurs in streams andr lakes from the Columbia River south to northwesternr California. It probably did not occur originallyr anywhere in the southern High Sierra, but it has beenr introduced into many streams and lakes. In Yosemiter National Park it is most abundant in ther Tuolumne River from Hetch Hetchy to its source, inr the South Fork of the Merced, and in Gaylor andr Peeler lakes.r

r r

TAHOE TROUT

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r *Salmo henshawi* Gill & Jordanr

r r

r **Other names.**—Henshaw Trout; Black-spottedr Trout; Truckee Trout; Silver Trout; Redfish; Tommy;r Black Trout; *Salmo tahoensis; Salmo purpuratus henshawi;*r *Salmo mykiss henshawi; Salmo clarkii henshawi.*r

r r

r **Description.**—Color, dark olive-green above, bodyr everywhere with rather widely scattered black spots,r red darker on membranes of lower jaw; body stout,r the greatest depth about one-fourth the total length;r scales small.r

r r

r **Distribution.**—This is the common trout of Laker Tahoe and its connecting waters; also of Donner,r Webber, and Independence lakes and the upper part ofr Truckee River. It is not common in the park, butr was introduced into the Tuolumne River at Hetchr Hetchy Valley, Soda Springs, and in the Lyell Canyonr in 1896.r r **Habits.**—During a portion of the year the Tahoer Trout lives in deep water, and can be caught, if at all,r only on long lines. Early in the spring and in ther r r r summer, they are to be found in relatively shallowr water. It may be that food supply accounts for, thisr migration, as spawning minnows seem to be the

attractiver food when the trout is in shallow water.r The greatest number of this species are taken byr trolling with a spoon. (Snyder.)r

r r

r The Tahoe Trout appears to feed largely on minnows,r but black ants and other insects are taken in quantity.r

r r

STEELHEAD

r

r *Salmo gairdneri* Richardsonr

r r

r **Other names.**—Steelhead Trout; Steelhead Salmon;r Salmon Trout; Hardhead.r

r r

r **Marks for field identification.**—Large size; smallr head; large scales; bright silvery color; absence ofr red on lower jaw.r

r r

r **Distribution.**—The Steelhead enters coastwiser streams from Ventura northward, ascending to theirr headwaters for spawning purposes and then returningr to the sea. Since 1917 the species has been introducedr into Yosemite National Park in the Mercedr River and in Babcock, Emeric, Grant, Tenaya, andr Ten lakes.r

r r

r **Habits.**—The Steelhead is more or less anadromousr in its habits, being migratory like the salmon andr spending much of its time in salt water, and ascendingr freshwater streams at spawning time.r

r r

r As a game-fish, the steelhead is a favorite withr anglers. Its game qualities, together with its larger size, make this one of the fishes most sought after byr the followers of good old Isaak Walton. When inr fresh water it will not only take the trolling spoon,r but will rise readily to the fly.r r r r Ar The Steelhead is an excellent food-fish, and its larger size and abundance make it of considerable commercialr value. It is an important fish in the fish culturalr operations of California and of other Pacific Coastr states and of the Federal government. It has been introducedr into Lake Superior and is now an abundantr and much prized game-fish in that lake and its tributaryr streams.r

r r

r The fact that most ichthyologists and many anglersr regard Steelheads simply as sea-run individuals ofr Rainbow Trout has not escaped the writer’s attention,r and he himself is inclined to accept the view. Neverthelessr it is known that in some places, they are entirelyr distinct and easily distinguishable. At anyr

rate, it is deemed best for present purposes to treatr the Steelhead as a distinct species.r

r r

RAINBOW TROUT

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r *Salmo irideus* Gibbonsr

r r

r **Other names.**—Mountain Trout; Speckled Trout;r Brook Trout; California Trout; Sea-run form;r Steelhead; Steelhead Trout; Steelhead Salmon; Salmonr Trout; *Salmo rivularis,* in part; *Salmo gairdneri,*r in part.r

r r

r **Description.**—Body usually profusely covered withr small roundish or star-shaped black spots, mostr numerous on back and upper part of side; middle ofr side with a rich rosy band; ground-color of back darkr olive-green; fins all more or less spotted the dorsal, anal,r and ventrals not usually tipped with white.r

r r

r **Distribution.**—This is, as far as is known, the onlyr native Trout in the Merced and Tuolumne rivers andr their tributaries. It is very abundant in the park,r r r r having been introduced or transplanted into mostr streams and lakes in the Yosemite region. Locallyr the species is confused with its close relative, ther Shasta Trout, which has been widely planted in ther waters of the park under the name of Rainbowr Trout.r

r r

r **Habits.**—As a game fish the Rainbow Trout is oner of the best. It runs upstream in early spring tor spawn, leaping over waterfalls and entering the smallr streams forming the headwaters. Here the eggs arer deposited in the sand and the young hatched out.r

r r

r By far the largest output of the state hatcheries isr composed of Rainbow Trout, and there is a goodr reason, for this is considered the best game-fish of all,r and it is most highly prized by anglers. The Rainbowr often leaves the water in its eagerness to take ar fly. So readily does it take a fly, in fact, that therer is seldom need to resort to bait or other lures.r

r r

r The Rainbow varies in coloring according to age,r sex, and location. Those individuals which are abler to reach the sea spend part of each year there, returnr to the freshwater stream a larger and more silvery-coloredr fish commonly called Steelhead. Spawningr fish travel far up the coastal streams and spawn highr up in the small tributaries. Their habits in this regardr are more like those of the salmon than those ofr the trout. Unlike the salmon, however, the Steelheadr does not, as a rule, die after spawning.r

r r

r In beauty of color, gracefulness of form and movement,r sprightliness when in the water, reckless dashr with which it springs from the water to meet ther descending fly ere it strikes the surface, and the madr and repeated leaps from the water when hooked, ther Rainbow Trout must ever hold a very high rank.r

r r r r

r The gamest fish we have ever seen was a sixteen-inchr Rainbow taken on a fly in a small tributary of ther Williamson River in southern Oregon. It was in ar broad and deep pool of exceedingly cool water. Asr the angler from behind a clump of willows made ther first cast, the trout bounded from the water and metr the fly in the air a foot or more above the surface;r missing it, he dropped upon the water only to turnr about and strike viciously a second time at the flyr just as it touched the surface; though he again missedr the fly, the hook caught him in the jaw from the outside,r and then began a fight which would delight ther heart of any angler. His first effort was to reach ther bottom of the pool, then, doubling upon the line, her made three jumps from the water in quick succession,r clearing the surface in each instance from one to fourr feet, and every time doing his utmost to free himselfr from the hook by shaking his head vigorously as ar dog shakes a rat. Then he would rush wildly aboutr in the large pool, now attempting to go down ther riffle below the pool, now trying the opposite direction,r and often striving to hide under one or the otherr of the banks. It was easy to handle the fish when ther dash was made up or down stream or for the oppositer side, but when he turned about and made a rush forr the protection of the overhanging bank upon whichr the angler stood, it was not easy to keep the line taut.r Movements such as these were frequently repeatedr and two more leaps were made. But finally he wasr worn out after as honest a fight as trout ever made.r

r r

r The Rainbow takes the fly so readily that there isr no reason for resorting to grasshoppers, salmon eggs,r or other bait. It is a fish whose gameness will satisfyr the most exacting of expert anglers and whose readinessr r r r

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r PLATE XVr

r Some Trout of Yosemite National Parkr

r Top to bottom—Lake Tahoe Trout, Brown Trout, Cutthroatr

r (or Black spotted) Trout, Loch Leven Troutr

r r Pictures from California Fish and Game Commissionr r

r r r r r to take any proper lure will please the mostr impatient of amateurs.rr r

r Spawning takes place in winter and early spring,r varying with the temperature and locality. Ther bulk of the eggs are usually taken in February, March,r and April, although spawning continues through Mayr in the mountain districts.r

r r

r The Rainbow feeds on worms, insect larvae, andr salmon eggs. In streams in which the Salmon andr Rainbow exist together, the Rainbow is more destructiver to the salmon eggs than is any other species exceptr the Dolly Varden.r

r r

SHASTA TROUT

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r *Salmo shasta* (Jordan)r

r r

r **Other names.**—McCloud River Trout; McCloudr River Rainbow; Shasta Rainbow; Rainbow Troutr (of fish culturists); *Salmo gairdneri shasta; Salmor irideus shasta.*r

r r

r **Marks for field identification.**—Differs from otherr Rainbow Trout, with the exception of that of ther Klamath River, in its larger size, smaller mouth, andr larger eyes; scales intermediate in size between Cutthroatr and sea-run Rainbow, caudal fin more deeplyr incised than in typical Cutthroat.r

r r

r **Distribution.**—McCloud River and streams of ther Sierra Nevada from Mount Shasta southward at leastr to Calaveras County. This species has been widelyr introduced into the streams and lakes of Yosemiter National Park where it is not officially distinguishedr from the true Rainbow.r

r r

r **Habits.**—This Rainbow lives in water with a comparativelyr high temperature if it is plentiful and runningr r r r with a strong current; but in sluggish waterr even when the temperature is considerably lower, nor other species will do as well. This species appears tor inhabit the rapids more largely than the slow-movingr water. The spawning season in California extendsr from early February to May. Males are good breedersr at two years of age, but the females rarely producer eggs until the third season. The Shasta Trout mayr lack a little of the wild gameness of the typical Rainbow,r but that is made good by its larger size. It isr largely an insect feeder and, therefore, a favorite ofr the fly fisherman.r

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r This is the Rainbow which has been most widelyr used in fish cultural operations and has been morer widely distributed than any other species.r

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r THE GOLDEN TROUT OF THE SOUTHERNr r HIGH SIERRAr

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r The Golden Trout of California are, so far asr known, found only in the headwaters of the Kernr River, all in the vicinity of Mount Whitney. Throughr the activities of the California Fish and Game Commissionr and other agencies, their original distributionr has been somewhat extended by transplanting.r

r r

r Four species of trout are now recognized as nativer to the upper Kern River Basin, namely: The Kernr River Trout or Gilbert Trout (*Salmo gilberti*), ther Soda Creek or White's Golden Trout (*Salmo whitei*),r the South Fork of the Kern Golden Trout (*Salmor agua-bonita*), and the Roosevelt Trout or Goldenr Trout of Volcano

Creek (*Salmo roosevelti*). All exceptr the Gilbert Trout are of the Golden Trout type.r

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r All four of these species belong to the Rainbowr r r r series, the species of which as a whole may be distinguished,r with greater or less difficulty, from those ofr the Steelhead series or sea-run Rainbows on the oner hand by the usually brighter colors, and on the otherr hand from the Cutthroat series, by the absence of ar red or scarlet dash on the throat, and the entirer absence of hyoid teeth.r

r r

GOLDEN TROUT

r

r *Salmo roosevelti* Evermannr

r r

r **Other names.**—Roosevelt Trout; Golden Trout ofr Volcano Creek; Golden Trout of Golden Trout Creek;r Volcano Creek Golden Trout; Mount Whitneyr Golden Trout.r

r r

r **Marks for field identification.**—Color, delicater golden olive on the head, back, and upper part of ther sides; clear golden yellow along and below the lateralr line, overlaid by a delicate rosy lateral band; underr parts rich cadmium yellow; body without black spotsr except on the caudal peduncle; scales extremely small.r

r r

r **Distribution.**—The Golden or Roosevelt Trout isr native only to Volcano Creek in the Mount Whitneyr region. It is a creek fish and appears to keep withinr the peculiar environment of this small stream. Ther species has been transplanted to and thrives in severalr near-by streams. In 1919 it was introduced into oner of the unstocked lakes of Yosemite National Park.r

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r **Habits.**—As a game-fish the Golden Trout is one ofr the best. It will rise to any kind of lure, includingr the artificial fly, at any time of day. In the morningr and again in the evening, it will take the fly with ar rush and make a good fight, jumping when permittedr to do so; during the middle of the day it rises morer r r r deliberately and may sometimes be tempted only withr grasshoppers. It is a fish that does not give up soonr but continues the fight. Its unusual breadth of finsr and strength of caudal peduncle, together with ther turbulent water in which it dwells, enable it to maker a fight equaling that offered by many larger trout.r

r r

r The scales are smaller than in any other knownr species of trout. They are so small, indeed, as tor have caused so good an observer as Stewart Edwardr White to declare that this trout had no scales at all.r

r r

r Although now abundant in Volcano Creek, ther Golden Trout cannot long remain so unless affordedr some protection. The great beauty of the Rooseveltr Trout lies in the richness of its colors and in the trimnessr of its form—characteristics which fully entitler the species to be known above all others as ther Golden Trout.r

r r

BROWN TROUT

r

r *Salmo fario* Linnaeusr

r r

r **Other names.**—European Brown Trout; Germanr Brown Trout; von Behr Trout.r

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r **Marks for field identification.**—This Trout can ber distinguished from all other species by the decidedlyr brown color of the back and sides, the black spotsr on the back, and red spots on the sides; the belly isr silvery or brownish.r

r r

r **Distribution.**—The Brown Trout was introducedr into the United States in 1895, and since then a numberr of streams in California have been stocked. Inr Yosemite National Park it may be taken in the Mercedr River, in the south Fork of the Merced River, and inr Merced and Edna lakes.r

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r **Habits.**—The Brown Trout lives in clear, cold,r rapid streams and at the mouths of streams tributaryr to lakes. It grows to be of large size, but matures atr about eight inches in length. In its movements it isr swift, and it leaps over obstructions like the salmon.r It usually feeds in the morning and evening, is morer active during evening and night, and often lies quietlyr in deep pools or in the shadow of overhanging bushesr and trees for hours at a time during the day. Itsr food is formed of insects and their larvae, worms, mollusks,r and small fishes, and, like the Rainbow Trout,r it is fond of the eggs of fishes. Spawning begins inr October and continues until January. Eggs are depositedr in crevices, between stones, under projectingr roots of trees, and sometimes in nests excavated byr the spawning fishes. The parents cover the eggs tor some extent with gravel.r

r r

LOCH LEVEN TROUT

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r *Salmo trutta levenensis* (Walker)r

r r

r **Other names.**—Scotch Trout; *Salmo levenensis.*r

r r

r **Marks for field identification.**—The true Lochr Leven Trout is a slimmer fish than the Brown Trout,r and the adipose fin is smaller. Furthermore, it isr fully spotted and lacks the brown color of the Brownr Trout. The sides are silvery, with a varying numberr of X-shaped black spots or rounded brown or blackr spots.r

r r

r **Distribution.**—This trout, a native of the lakes ofr Scotland, was introduced into California in 1894, andr has since been placed in many streams and lakes ofr the State. Seventeen lakes of Yosemite National Park—amongr them the noted Benson, May, Merced,r r r r Washburn, and Ten lakes—have been stocked withr this species. Fry have also been planted in ther Merced and Tuolumne rivers.r

r r

r **Habits.**—The spawning season may begin in Octoberr and continues until January. This trout is largelyr non-migratory in its native habitat. It takes ther artificial fly readily. The food of this species includesr freshwater mollusks, crustaceans, worms, and smallr fish. Hybridization between this species and ther Brown Trout is common.r

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EASTERN BROOK TROUT

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r *r Salvelinus fontinalis* (Mitchill)r

r r

r **Other names.**—Brook Trout; Speckled Trout; Fontinalis;r *Salmo fontinalis;* American Charr.r

r r

r **Marks for field identification.**—This beautiful andr best-known trout is easily distinguished from all otherr trout of our waters by the red spots on the sides butr not on the back, and the mottled or marbled color ofr the upper parts.r

r r

r **Distribution.**—This trout is native only to ther eastern part of North America westward to Minnesotar and Iowa. It has been introduced very widely allr over the world. It has been placed in many Californiar streams and lakes and is one of the most abundantr species in most streams and lakes of Yosemiter National Park.r

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r **Habits.**—Eastern Brook, Trout abound chiefly inr cold, slow-running meadow brooks; but they thriver in all pure cold waters whether of stream, lake, orr pond. The fish is wary and great skill is required tor catch it. The

outstanding peculiarity of its habitsr is evidenced by the fact that a person acquainted withr r r its haunts can go out and catch a string of Easternr Brook in a comparatively short time, while others,r with better tackle and equal skill, will fish a wholer day for them in vain. The largest Brook Trout arer found in the deep, wide pools in the warmer rivuletsr near their source. Eastern Brook Trout do not keepr well nor ship well, probably on account of the fat.r They spawn high up in tributary streams and so earlyr (October to January) that eggs for hatchery purposesr are almost impossible to obtain.r

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DOLLY VARDEN TROUT

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r *Salvelinus parkei* (Suckley)r

r r

r **Other names.**—Malma; Salmon Trout (Alaska andr Montana); Bull Trout (Idaho); Western Charr; Oregonr Charr; *Salvelinus malma* (in part).r

r r

r **Marks for field identification.**—This fish may ber readily distinguished from all other species of Salmonidaer native to western America by the presence ofr small red or orange spots on the body. From ther Eastern Brook Trout (introduced into many Californiar waters) which also has red spots on the body,r the Dolly Varden Trout may be known by the absencer of blackish marblings or reticulations on ther back, and by the presence of red spots on the back.r

r r

r **Distribution.**—The Dolly Varden Trout is of wider distribution. It is found from western Montana andr Idaho to Oregon and Washington, and northwardr through British Columbia and Alaska to the Arctic.r In California it is native only to the McCloud River,r but has been introduced into other streams. Inr Yosemite National Park the species is found only inr one of the Chain o' Lakes at the source of the Southr r r r Fork of the Merced River and very rarely in ther Merced River in Yosemite Valley.r

r r

r **Habits.**—The Dolly Varden is the poorest of allr trouts. It does not rank high as a game-fish, and, asr a food-fish, it is inferior to any other species. Inr Alaska it is very destructive to the eggs and fry of ther salmon. It attains a weight of two to twelve pounds.r

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r This completes the list of Trout, both native andr introduced, that are found in Yosemite Nationalr Park. There remain but two suckers and threer minnows that might be found within the park limits.r The

Sacramento or Western Sucker (*Calostomus occidentalis*)r is common in the lower reaches of all streamsr of the State, but the Hardhead Sucker (*Pantosteusr araeopus*) is a very rare species. Of the three speciesr of Minnows, the first is the Kaweah Chub, Lake Fish,r or Hardhead (*Mylopharodon conocephalus*), one of ther largest of Minnows. It reaches a length of two orr three feet and a weight of several pounds. The nextr Minnow is the Sacramento Pike or Squawfishr (*Ptychocheilus grandis*). This fish, which reaches ar length of two or three feet, is abundant in the lowerr portions of all the larger tributaries of the San Joaquin.r Still another minnow is the Chub (*Siphatelesr formosus*), a small species, usually not exceeding fourr or five inches in length. So far as the writer knowsr none of these minnows or suckers has been recordedr from any locality within the limits of Yosemiter National Park.r

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Insects of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Edwin C. Van Dyke

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r Next: Trees of Yosemiter •r Contentsr •r Previous: Fishes of Yosemiter

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INSECTS OF YOSEMITE NATIONAL PARK

r r

r By Edwin C. Van Dyker

r

r *r Assistant Professor of Entomology, University ofr*
r Californiar r

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r r Tor r the uninitiated the word "insect" conjurs allr kinds of creepy crawly "bugs"—yet to those who arer at all interested in Nature, the study of entomology isr a most fascinating one. The insect fauna of Yosemiter National Park is especially rich and offers an excellentr field to collectors.r r [Editor's note:r collecting is not allowed within Yosemite National Park.—DEA]r r Indeed, so numerous are ther species that many will be noticed by even the mostr casual observer. The Nature-lover will be most atr tracted by the multi-colored butterflies, the dayr flying moths, the bronze and gold timber beetles, andr such other insects as are beautiful in form and haver interesting habits. To the naturalist all of the insectr life will be attractive and he will be kept busy, for ther region possesses a most wonderful assemblage of forms.r Even the most prosaic individual must needs taker notice, for the thirsty mosquito or deer fly will soonerr or later tax him for a meal and the sociable ant willr always be ready to welcome him.r

r r

r The butterflies and moths, which belong to the orderr *Lepidoptera,* are generally the first to claim attention.r Some of the former will be seen in the park nor matter where one wanders. In the meadows therer will be the ever present **sulphur butterfly** (*Coliasr r r r eurytheme* Boisd.) and numerous busy **skippers**, asr well as an occasional large orange-red **fritellary** orr **silver spot**, so named from the numerous silveryr patches on the under side of the wings. The largestr of our mountain fritellaries is **leto** (*Argynnis leto* Behr.r Plate xvi, 9), a noble insect with a wing expanse ofr about three inches, but the commonest is **Behr's fritellary**r (*Argynnis monticola* Behr.), a somewhat smallerr species. About damp patches along the roadside orr at the sandy

margins of streams great congregationsr of butterflies may often be seen, all eagerly quenchingr their thirst. The dominant species here will generallyr be the **California tortoise shell** (*Vanessa californica*r Behr.) which is of a rich red color above andr dark, almost black, beneath. This insect is alwaysr abundant in the mountains. Some years its larvaer have been so numerous that they have become seriousr pests, defoliating the deer brush and other species ofr wild lilac over extensive areas. Other butterfliesr often found drinking are numerous species of **blues**r and a sprinkling of **white admirals** (*Basilarchia lorquini*r Boisd.). The latter is a moderate-sized, blackr butterfly with red tips to the wings. A somewhatr larger butterfly which simulates it in color patternr is *Adelpha bredowii* var. **californica** But. (Plate xvi, 4).r Of the several swallowtails the commonest is the darkr yellow **tiger swallowtail** (*Papilio rutulus* Boisd.).r Less common is its creamy colored cousin, *Papilior eurymedon* Boisd., and the prize of all is the **two-tailedr swallowtail**. (*Papilio daunus* Boisd. Plater xvi, 1) which is a rare visitor.r

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r As one leaves the Valley and enters the high countryr other butterflies will be noticed. One of these,r *Parnassius clodius* Menetr. (Plate xvi, 11), is truly ar r r r butterfly of the high mountains. It is of fair size,r white, with several short black bars on the forewingsr and a few pink spots on the hind, and with much ofr the wing membrane uncovered by scales. One mostr often sees it flying about the higher mountain meadowsr or beneath such scattered trees as occur in the alpiner forests. One may at times notice flying about ther yellow pines numbers of the **pine white** (*Neophasiar menapia* Feld. Plate xvi, 8). Its distinguishing characteristicr is the pinkish outlining to the veins onr the underside of the wings. The caterpillars of thisr species often greatly injure the pines through defoliation.r At the tops of the various domes and atr other exposed lookout places two more **whites**r (*Pieris sisymbri* Boisd. and *Pieris occidentalis* Reak.)r may generally be seen on sunny days. These prominentr places are, in fact, favorite congregating spots forr many types of insects besides the butterflies. Lazilyr sailing across the valleys we are almost sure to seer our well-known friend from the lowlands, the **monarch**r or **milkweed butterfly** (*Anosia plexippus* Linn.).r This large red butterfly wanders far and wide duringr the summer months in search of the food plant for itsr young, the various species of milkweed, but in later autumn it migrates to the coast to one or the other ofr its numerous assembling grounds where it spends ther winter. The highly prized black **alpine swallowtail**r (*Papilio indra* Reakirt. Plate xvi, 6) may also greetr one's vision as it soars away from its rocky heights.r

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r Mountaineers will probably be familiar with ourr three most common high-mountain species. Ther brilliant little **copper** (*Chrysophanus cupreus* Edw.r Plate xvi, 3) may often be seen basking in sunny spotsr in Tuolumne Meadows. **Behr's sulphur** (*Colaisr r r r behri* Edw. Plate xvi, 5), a rather small greenishr yellow butterfly, which haunts the most alpiner meadows and grassy slopes, is a southern remnant orr relict of an arctic race left stranded and isolated inr our southern Sierra. That hardy gray satyr of ther heights, (*Aeneis ivallda* Mead. (Plate xvi, 7), can onlyr be found about the crags and high rocky slopes wherer it flies freely from place to place when the weather isr pleasant but instantly settles when it is otherwise, andr because of the harmony of its colors with the surroundingsr disappears from view. Even this habitr does not always protect it, for many a specimen hasr been caught up by a mountain storm and left tor perish high up on the snowfields and glaciers.r

r r

r Of the moths there are even more species to ber found than there are of the butterflies, but the mostr are of somber appearance or so small that they willr rarely attract the notice of any but the expert. ofr the more conspicuous several are day-flying like ther showy orange and black **"sheep moth"** (*Pseudohazisr eglanterina* Boisd. Plate xvi, 10). This flies throughoutr the chaparral areas of the Sierra and as a resultr may often be seen about the lower ridges and lesserr peaks. Its larvae when fully grown are several inchesr long

and black, armed with prickly yellow spines.r They feed on the willow and several of the chaparralr shrubs. Another day-flying moth is the **wild forget-me-not moth**r (*Gnophaela latipennis* Boisd. Plater xvi, 2), a beautiful black species maculated withr yellow. Whenever one can locate a patch of its foodr plant at higher levels it can generally be found. Ther most conspicuous of the night-flying moths is ther large **California silk moth** (*Samia rubra* Behr.), a mothr with a wing expanse of several inches and with a brickr r r r

r r

r PLATE XVIr

r Some Butterflies and Moths of Yosemite Nationalr

r Parkr

r r r r red color. This species in its earlier stage feeds onr various shrubs, chiefly the pigeon berry or cascara,r and as an adult may often be attracted to light. Ther most important moth in the park, however, from ther standpoint of destructiveness is a very diminutiver one. It is the **lodgepole pine** or "tamarack" **needler miner** (*Recurvaria milleri* Busck.), so called from ther fact that its larvae tunnel the terminals. of the needlesr of this common pine of the higher altitudes. Thisr kills the needles, thus weakening the trees so that theyr fall an easy prey to the attacks of the destructiver bark beetles. The great areas of dead "tamaracks"r or lodgepole pines which one sees in the mid-Sierranr region bear mute testimony to the destructiveness ofr this insect.rr r

r After the moths and butterflies, the beetles or Coleopterar provide us with the greatest number of showyr representatives. Among the conspicuous species ofr this order in the park are a number of the long-hornedr wood boring beetles of the family *Cerambycidae*.r One of these, the **elderberry beetle** (*Desmocerus auripennis*r Chev. Plate xvii, 4), is often to be seen restingr on the leaves of its food plant. It is a large

bluish-blackr beetle with wing cases entirely red if a male orr blue bordered with red if a female. Another is ther **maculated timberman** (*Monohammus maculosus* Lec.r Plate xvii, 7), a large black and white clouded beetler which may often be found resting on the sticks ofr corded pine wood or stretched out along the protectedr portion of an old log. When isolated from its environmentr this is a very conspicuous insect, but whenr at rest on the side of an old log, it so thoroughly blendsr with its surroundings that it is hard to detect. Ar most interesting and peculiar long-horned beetle isr r r r *Ulochaetes leoninus* Lec. (Plate xvii, 8), a good-sizedr and somewhat hairy black and yellow barred beetler which has its wing causes so very much abbreviatedr that the greater portion of the wings are exposed to viewr even when folded. This species haunts the deadr yellow and Jeffrey pines. On milkweed plants anotherr very conspicuous member of the family may ber seen. It is the so-called **milkweed beetle** (*Tetraopesr femoratus* var. *basalis* Lec.) which is of a bright redr color spotted with black. Many of the beetles ofr this family are pollen feeders, and such flowers as ther wild lilac and wild hellebore are especially attractiver to them. Here many of the wasplike members ofr the great genus *Leptura* (Plate xvii, 18) may be found.r Even at night one may collect some of these beetlesr for many are nocturnal and often fly to lights. Twor of the largest are *Ergates spiculatus* Lec. (Plate xvii,r 17) and *Prionus Californicus* Mots. (Plate xvii, 15),r the former over two inches in length and the latterr an inch and a half and both of a reddish-brown color.r

r r

r Another group of timber beetles are the so-calledr **jewel beetles**, the family Buprestidae. Within ther park a good collector might find twenty species. Ther best known is the **golden-lined Buprestid** (*Buprestisr aurulenta* Linn. Plate xvii, 6), a beautiful greenishr or bronze-green beetle margined with gold. Thisr species, which is about one inch in length, breeds inr both pines and firs. Another species is *Buprestisr fasciata* Fab., the male of which is green blotched withr yellow and the female entirely green. These generallyr rest on green willow or poplar leaves, but duringr their young lives live in the Douglas fir. Two of ther smaller members of this family sometimes do considerabler damage through the work of their larvae.r r r r The first of these (*Melanophila drummondi* Kirdy) is ar flat bronze beetle generally spotted with yellow whichr normally breeds in the dead Douglas and true firs.r The other (*Melanophila gentilis* Lec.) is a rich blue-greenr or greenish-blue species which is restricted tor the pines. Most of the members of. this family confiner themselves to their food trees, but a few frequentr flowers.r

r r

r A third group of timber beetles are the so-calledr bark borers or engraver beetles of the family *Scolytidae.*r The members of this family are generallyr small and of somber color, but they are at times veryr abundant and often tremendously destructive. Ther females bore tunnels beneath the bark where theyr deposit their eggs. The young, upon hatching, alsor bore tunnels, but generally in the opposite direction.r As a result of the work of adult and larvae the tree isr soon girdled. Though these beetles normally attackr only the dead and dying trees, they at times turn theirr attention to the living ones. As a result there is anr enormous loss of some of our very best timber everyr year. In the park itself one may notice many treesr which are gradually dying as indicated by the yellowingr of their tops, or trees with brown needles which arer already dead. If one strips off the bark of any ofr these trees he will find the insects at work or if theyr have emerged he will find the results of their labors,r the peculiar adult and larval tunnels which generallyr engrave both bark and sapwood.r

r r

r Among the host of other beetles which are to ber found on the herbage, on the ground, or in the water,r but a few can here be mentioned. One of these isr the true **milkweed beetle** (*Chrysochus cobaltinus* Lec.r Plate xvii, 20), a chunky beetle of brilliant metallicr r r r blue color. It feeds upon the roots of the milkweedr during the larval stage and on the foliage as an adult.r In spite of its conspicuousness it is rarely molested byr birds, no doubt because like the lady beetles it is veryr distasteful to them. Another interesting night-flyingr beetle is

the large white striped **June beetle** (*Polyphyllar decemlineata* Say. Plate xvii, 19), which is perhapsr the largest of its family in the mountains. Itr often comes tumbling about one's house or camp fire.r A smaller and somewhat distant relative of the latterr is the little **"tumble bug"** (*Canthon simplex* var. *militaris*r Horn). This bluish-black beetle with redr shoulders is a close relative of the sacred scarabeus ofr Egypt and has similar habits. If one watches ther less frequented roads and trails he may be rewardedr by finding some of these beetles at work hauling andr pulling their precious pellets to a safe retreat. Inr the flower of the azalia another species of scarabidr may be found. This is a very pretty pollen- andr petal-feeding species (*Hoplia dispar* Lee.) which mayr appear in a dress of various colors-orange, brown,r or green.r

r r

r Among the ground beetles most species are ofr somber appearance, but there are a few exceptions.r Two of these are the brilliant green **tiger beetles**r (*Cicindela perveridis* Schaupp. Plate xvii, 1, andr *Cicindela depressula* Casey). These are generally tor be found only at the higher altitudes and generallyr on the grassy slopes just below the snow fields. Herer their larvae sink their shafts into the earth and lie inr wait for their prey while the active and long-leggedr adults seek theirs in the open chase.r

r r

r In the water there are also many beetles both greatr and small. Some, like the **water scavengers** (*Hydrophilidae*),r r r r prefer warm and stagnant waters; others,r like the **whirligigs** (*Gyrinidae*), most enjoy skatingr over the surface of the water; and still others, liker the predaceous **diving beetles** (*Dytiscidae*), will liver and thrive in even the coldest streams and lakes. Ther most interesting aquatic beetle in the mountains isr *Ampizoa insolens* Lee. (Plate xvii, 3). It is a flattenedr beetle a little less than a half inch in length andr in color an opaque black. It may be found crawlingr over the rocks and in the cold mountain streams. Althoughr it lives in the water it looks more like a landr dweller and is, in fact, equally related to both landr and water beetles. It may be well to state that notr one beetle in our country is poisonous, and that all mayr be handled with perfect safety. A very interestingr beetle collection may easily be made by carrying ar small vial of alcohol. Specimens should be removedr and mounted on pins at the end of each day'sr collecting.r

r r

r There are in the park a goodly number of species ofr wasps, bees, ants, and other insects of the great orderr Hymenoptera. Most of these are small, but a fewr such as the **horn tails** or **wood wasps** are of fair size.r The females of these insects are provided each withr along, stout drill which enables them to bore straightr into solid wood where they deposit their eggs. Oner of these, a large black species with orange wingsr (*Urocerus Californicus* Nort. Plate xvii, 2), has anr appearance not unlike some of the large so-calledr tarantula hawks of the Southwest. It is harmless,r however, for it cannot sting. The larvae often do considerabler damage to timber and would do even morer were it not for the fact that they are heavily parasitizedr by a large wasp of the family *Ichneumonidae*.r r r r One of these is a black and yellow insect (*Megarissar nortoni* Cress. Plate xvii, 5) which has a threadliker ovipositor longer than its body—so long, in fact, thatr it cannot be used in the usual way but must be curledr over the back and brought down in front of the headr before it can be used. With this wonderful instrumentr a hole is soon sunk in the timber where the woodr wasp larvae are boring, and an egg is laid in theirr neighborhood.r

r r

r Among the larger bees the **carpenter bees** of ther genus *Xylocopa* are perhaps as notable as any. Theser black or bluish-black bees are fully as large as bumbler bees and every bit as energetic. They have a habitr of selecting well-seasoned wood such as an old cedarr fence post or a portion of a building, and of excavatingr out a long chamber for their young much in the samer way that a woodpecker does. If one approachesr their

home they circle about in a threatening mannerr but rarely do they attack one.r

r r

r Other wood workers of this order which might ber ment ioned are the large **timber ants** of the genusr *Camponotus.* These are either black or red and black,r and are the largest ants we have. Their nests arer made in old logs and stumps and even in the hearts ofr growing trees when they have the opportunity to enterr through an old scar. At times they do some damager but on the whole they are beneficial, for the workersr destroy great numbers of destructive forest beetles;r furthermore their wood work is, as a rule, only in oldr logs which are useless and should be removed. Ther winged adults of these ants often congregate in greatr numbers, like the lady beetles, about the summitsr of the lesser peaks.r

r r

r Of the two-winged flies or *Diptera* there are also ar r r r great number, some of recognizable size and of peculiarr interest. About the meadows and in the neighborhoodr of watercourses **mosquitoes** are often quiter abundant. At higher altitudes, however, there isr nothing to fear from these insects other than the annoyancer of a few bites, for there are no malaria carriersr or *Anopheles* much above five thousand feet. Ar small vial of oil of citronella will generally provider the means of repelling the meadow species. **Horser flies** and **deer flies** (*Tabanidae*) are also annoying atr times, but the selection of proper camp sites awayr from marshy places, their normal breeding grounds,r will generally give ample protection. Among ther flies that will catch one's eye during his rambles arer the **sun** and **hover flies** (*Syrphidae.* Plate xvii, 12 andr 14), many members of which, in their early stages,r prey upon plant lice and which, in the adult stage,r often mimic bees and wasps with which they oftenr associate. One will also see many **bee flies** (*Bombylidae.*r Plate xvii, 9 and 11), some hovering aboutr the flowers like humming birds and others skimmingr over the ground to alight here and there in sunnyr spots. Often the **robber flies** (*Asilidae.* Plate xvii,r 16) may be noticed. These hawks of the fly worldr are parasitic in their larval state and predaceous inr the adult stage. The more gayly colored speciesr haunt the forests where they may be seen sunningr themselves on old logs, but the more somber colored,r the grays and browns, frequent sandy areas.r

r r

r Among the other orders of insects the **grasshoppers**r will, of course, claim a certain degree of attention.r Of these we have a few meadow species which, liker the **devastating grasshopper** (*Melanoplus devastator*r Scudd.), may at times destroy much of the uplandr r r r feed but are generally not numerous enough to greatlyr exceed their demand as fish bait. Many species, however,r are quite interesting to those who will take timer to observe them. Some of these have beautiful under-wingsr of yellow, orange, red, blue, or black and somer clap their wings together in flight and hover hawk-liker as they rise, giving out such a strident sound that theyr can be heard for some distance. One of the latter, ar blue-winged species (*Cireottix thallassinus* Saus.), isr more common farther north, but a second, a black-wingedr species (*Cireottix maculatus* Scudd.), is fairlyr abundant at high altitudes in the middle Sierra.r Many of the grasshoppers also show marked degreesr of color protection, an example being the whiter and black species which chooses only granite slopesr for a resting place.r

r r

r Nests of **termites** or **white ants** may often be foundr in the woods beneath the bark of old fallen trees. Wer have but few species of these insects outside of ther tropics, but one of our species is exceedingly large.r This is a brown species (*Termopsis nevadensis Hagen.*r Plate xvii, 13) which is found widely distributedr throughout California but which is especially abundantr in the mountains. The insects are very industriousr creatures and will in a short time completelyr honeycomb a large log. Upon opening one of theser nests one

finds not only a host of their light coloredr workers and big-headed soldiers but also many wingedr adults. Many hours might be spent interestinglyr and profitably investigating the habits of these remarkabler social insects. Even the bears are fond ofr the termites and the Indians likewise dig out theirr nests and use the eggs and larvae for food.r

r r

r In the water one may find the interesting **caddice fly** larvae,r r r

r r

r PLATE XVIIr
r Some Beetles, Wasps, and Flies of Yosemiter
r National Parkr
r

r r r r each enclosed in its own peculiar case, andr also the flat bodied larvae of the **rock flies** crouchingr close against the rocks. The adults of both insectsr will be found in the immediate neighborhood, ther moth-like caddice flies dancing over the waters andr the rock flies resting along the banks. A somewhatr distant relative of the above flies is the night-flyingr brown **lace-winged fly** (*Polystoechotes punctulatus* Fab.r Plate xvii, 10). It is the largest of its race andr peculiar in that its larvae have never been discovered.rr r

r In this short article it is possible to mention brieflyr only a few representative species of the differentr types of insects found in Yosemite National Park.r The following list of references will aid those whor wish to investigate more thoroughly the fascinatingr science of Entomology.r

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Trees of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Ansel F. Hall

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r Next: The Giant Sequoiar •r Contentsr •r Previous: Insects of Yosemiter

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TREES OF YOSEMITE NATIONAL PARK

r r

r By Ansel F. Hallr

r

r *r U. S. National Park Service, Formerly Instructor inr*
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r r r r

r r Ther r forests of the West, although the grandestr in the world, are not at all complex, for where oner might find two hundred and fifty varieties of trees inr some of the eastern hardwood forests, he would findr but thirty-five species within the 1125 square miles ofr Yosemite National Park. Of these few species ther conifers (cone-bearing trees) are by far the mostr important. They may easily be identified by ther aid of the *Key to the Trees*r in the appendix of thisr volume.r

r r

r In the Sierra Nevada Mountains the abrupt riser from almost sea level to twelve or thirteen thousandr feet causes within a few miles as great a diversity ofr climates as one would encounter in traveling fromr Mexico to Alaska. Each tree species has its ownr climatic requirements. We therefore find the treesr Occurring in definite belts, one above the other. Thoser hardy pioneers which can withstand the long andr intense cold of arctic winters have been driven tor timberline, while the most drought-resistant speciesr have claimed the dry foothill regions. So definite isr this balance in Nature that, by observing the trees,r r r r one can estimate quite definitely the altitude at whichr he stands.r

r r

r Entering the park from the west, one first passesr through the treeless or oak-dotted San Joaquin Valleyr and lower foothills. In the upper foothills and lowerr mountains (1000 to 3000 feet altitude) is the **Foothillr Forest** (Upper Sonoran Zone). Only a few speciesr can withstand the severe drought of the long aridr summers and these grow in open park-like stands.r The one characteristic conifer of the region is ther silvery gray, many-branched **digger pine** (*Pinus sabiniana*).r The small **knobcone pine** (*Pinus attenuata*)r occurs but infrequently. Of the hardwoods, the oaksr are predominant. Among these are the **valley oak**r (*Quercus lobata*), the **California black oak** (*Q. californica*),r the **interior live oak** (*Q. wislizeni*), and ther **canyon live oak** (*Q. chrysolepis*). Along the streams.r may be found several species of **willow** (*Salix sp.*),r **black cottonwood** (*Populus trichocarpa*),r **Californiar buckeye** (*Aesculus californica*), **mountain laurel**r (*Umbellularia californica*), and **California nutmeg**r (*Tumion californicum*). The brush or chaparral which coversr many of the hillsides is often interspersed with scatteredr specimens of **mountain mahogany** (*Cercocarpisr parvifolius*).r

r r

r At about three thousand feet elevation one entersr the **Main Timber Belt** (Transition Zone) of the Sierrar Nevada. This forest, which extends from threer thousand to seven thousand feet altitude, is one of ther finest in the world both as regards size and value ofr timber and perfection of its charming landscapes. Atr the lower elevations the first trees to greet one are ther brilliantly green **western yellow pine** (*Pinus ponderosa*),r the fragrant **incense cedar** (*Libocedrus decurrens*), andr r r

r r

r PLATE XVIIIr
r A Yosemite forest of Pine, Fir, Incense Cedar, and Sequoiar
r r Photo by A. C. Pillsburyr r

r r r r r the rugged **Douglas fir** (*Pseudotsuga taxifolia*). At anr altitude of about five thousand feet we find the giantr **sugar pine** (*Pinus lambertiana*) and the beautifulr **white fir** (*Abies concolor*) forming an important part ofr the forest family. Here and there are groves of ther monarch of all trees, the **giant sequoia** (*Sequoia gigantea*).r At higher elevations the **Jeffrey pine** (*Pinusr jeffreyi*) replaces its close relative the western yellowr pine. In the lower part of the Main Timber Belt andr generally on the fertile bottomlands are a few hardwoods.r Most beautiful of all these is the **floweringr dogwood** (*Cornus nuttallii*). Others are the **broadleafr maple** (*Acer macrophyllum*), its close relative, ther **dwarf maple** (*Acer glabrum*), the **black cottonwood**r (*Populus trichocarpa*), the **quaking aspen** (*Populusr tremuloides*), **California black oak** (*Quercus californica*),r **canyon live oak** (*Quercus chrysolepis*), **California laurel**r (*Umbellularia californica*), **alder** (*Alnus rhombifolia*),r and various species of **willow** (*Salix sp.*).rr r

r Above the Main Timber Belt between the altitudesr of seven thousand and nine thousand feet is ther **Sub-alpine Forest** (Canadian Zone), a region characterizedr by dense forests of small or medium-sizer trees. The typical trees of the region are the **red fir**r (*Abies magnifica*), **white fir** (*Abies concolor*), **lodgepoler pine** or "tamarack" (*Pinus contorta*), and **Jeffrey pine**r *Pinus jeffreyi*). On open rocky sites the **westernr juniper** (*Juniperus occidentalis*) is conspicuous, andr near the upper limit of the belt the **western white pine**r (*Pinus monticola*) occurs scattered throughout ther forest. The only hardwood of the region is the **quakingr aspen** (*Populus tremuloides*) which forms beautifulr groves in some of the high mountain garden-spots.r

r r

r In the **Alpine** or **Timberline Forest** (Hudsonian Zone),r r r r which extends from approximately nine thousand feetr elevation to timberline, only the hardiest species canr exist. The two principal trees are the gracefulr **mountain hemlock** (*Tsuga mertensiana*) and ther storm-resistant **white bark pine** (*Pinus albicaulis*). At ther lower edge of the belt these merge with **red fir** (*Abiesr magnifica*), **western white pine** (*Pinus monticola*) andr **lodgepole pine** (*Pinus contorta*).r

r r

r Yosemite Valley might be called the meeting placer of the trees. Although at an altitude of but fourr thousand feet, several species which are normallyr found at twice that elevation thrive in the shade ofr the

great south wall. The opposite side of the Valleyr is so warm that we find many patches of vegetationr typical of the foothill region. For the tree-lover andr botanist the Valley is therefore an ideal vacationr land, both because of the great variety of plant lifer within its walls and the accessibility to the highr country beyond.r

r r

r So much for the trees as they live together inr communities—but let us now seek to know then, asr individuals. Botanists have grouped all plantsr according to their relationship into divisions, classes,r orders, families, genera, and finally species. Sincer some trees have as many as twenty different names,r each of which is used exclusively in a differentr locality, it is important to state also the botanicalr (or universal) name. This is a combination of ther names of the genus and species to which the plantr belongs.r

r r

r Everyone is familiar with the two broad classes ofr trees—the broadleaf trees or hardwoods, and ther evergreen trees or conifers. The former group,r although abundantly represented in Yosemite Valley,r r r

r r

r PLATE XIXr

r Red Fir—White Fir forest on the Pohono Trail which passesr

r through miles of most exquisite wild flower gardensr

r r Photo by Ansel F. Hallr r

r r r r probably forms less than one per cent. of the forestsr of the park. The conifers will therefore be describedr more in detail.rr r

r Cone-bearing trees are classified by dendrologistsr into three families: the **Pine Family** (*Pinaceae*), ther **Redwood Family** (*Taxodiaceae,*), and the **Cypressr Family** (*Cupressaceae*). Their leaves are retainedr from two to ten years, which causes them to be calledr evergreens.r

r r

r The **Pine Family** is by far the most important in ther park—for that matter, in all the world. It containsr all the pines, firs, hemlocks, and the Douglas fir andr also the spruces, larches, and true cedars. The latterr do not occur in the Sierra. All these trees have needle-liker leaves and bear but two seeds beneath each scaler of their cones.r

r r

r The **pines** (Genus *Pinus*) are represented in ther park by eight species, some of which may be foundr at any altitude. The characteristic distinguishingr this from all other genera is the occurrence of ther needles in bundles of five, four, three, or two (and inr one species singly), the base of each bundle beingr surrounded by a paper-like sheath. The five-needler Pines are called the **white pines** and those with threer needles the **yellow pines**.r

r r

r Of the three five-needle pines of the Park, the **sugarr pine** (*Pinus lambertiana*) is by far the most important.r It is not only the largest pine in the world but alsor One of the most majestically beautiful. It may easilyr be recognized (a) by its carmine-brown flaky barkr which is generally divided into long plates by longitudinalr fissures, (b) by its five-needle bundles aboutr three inches in length, and (c) by the immense conesr (twelve to twenty-four inches long) which hang pendentr r r r r from the tips of the long straight horizontalr branches, or which may be found on the forest floorr beneath. A white sugar which exudes from ther heartwood when the tree is wounded gives it itsr common name. On the floor of the Valley are butr few specimens, but a short distance up the slopes ther species enters into the forest composition and growsr abundantly up to about seven thousand feet elevation.r

r r

r The **western white pine** (*Pinus monticola*) whichr forms an important part of the forests of Idaho andr Montana, occurs in California—the southern part ofr its range—only on the higher mountain slopes, rangingr in the park from 6500 to 10,000 feet elevation. Ther young trees with their bluish-green foliage and silveryr gray bark are exceedingly symmetrical. Trees overr two feet in diameter take on a more rugged appearancer and their bark, which then continuously flakes off,r checks into very distinctive five-sided grayish-purpler plates. The tree is one of the largest in the sub-alpiner forests and may be distinguished (a) by its five-needler bundles which range from two to four inches inr length, (b) by its long feathery cones (length five tor eight inches) which are borne in clusters at the endsr of the long straight branches, and (c) by the veryr characteristic five-sided small plates in the bark of ther older trees.r

r r

r Hardiest of all Yosemite trees is the five-needledr **white bark pine** (*Pinus albicaulis*). A few large specimensr 2 1/2 feet in diameter and up to 30 feet in heightr are sometimes encountered between 9000 and 10,000r feet elevation, but the species is most evident atr timberline where it forms a scattered forest of dwarfr or prostrate trees. These trees, always in keepingr with their bleak surroundings, are the delight of ther r r r mountaineer. In early spring the raspberry-red ofr the fragrant flowers, the chocolate brown or purpler of the immature cones, the yellowish-green of the shortr leaf-tufts, and the silvery white bark of the branchesr and

trunk contrast most harmoniously. Specimensr may be identified (a) by having five short leaves perr bundle (length 1 1/2 to 2 1/2 inches) which are tufted atr the ends of the flexible branchlets, (b) by the smallr hard cones (about the size of a hen's egg), and (c) byr the smooth white bark.r

r r

r Least important of the park's three yellow pines isr the **digger pine** (*Pinus sabiniana*) of the low dry foot-hillr country. Its wide-branching habit and sparser silvery gray foliage set it apart from all other species.r Most important of its distinguishing characteristicsr are (a) the gray-green clusters of long flexible leavesr (length 8 1/2 to 12 inches) which occur three in ar bundle, (b) the low-branching habit, and (c) the larger heavily armed cones which generally remain on ther trees.r

r r

r The **western yellow pine** (*Pinus ponderosa*) and ther **Jeffrey pine** (*Pinus jeffreyi*) are so closely related thatr even botanists differ as to their separation. Bothr trees reach a large size (maximum diameter 8 to 10r feet) and are tall and symmetrical. They are exceedinglyr abundant within the park and form the greaterr part of the forests of Yosemite Valley. The richr green foliage is made up of three-needle bundles whichr range from 5 to 11 inches in length. The flaky barkr of all older trees is distinctively divided into larger Yellow plates by deep fissures. The two species growr abundantly from 3000 to 7500 feet elevation, ther Western yellow pine preferring the lower altitudes andr the Jeffrey pine the heights. The chief contrastsr r r r between the two species are (a) in the cones, which arer 2 1/2 to 5 1/2 inches in length in the western yellow Piner and 5 1/2 to 11 1/2 inches in the Jeffrey pine, (b) in ther bark which is yellowish-brown in the former and reddish-brownr in the latter, and (c) in the foliage which isr a deep yellow-green in the former and a dark blue-greenr in the latter.r

r r

r The only two-needle pine of the park, the **lodgepoler pine** or "tamarack" (*Pinus contorta*), forms extensiver forests at elevations of 7000 to 9500 feet—indeed, it isr so abundant as to be the one plebian tree of the Highr Sierra. In general the tree is not more than 2 feet inr diameter and 50 feet in height, but much larger specimensr may be found. The species may be distinguishedr (a) by its two-needle bundles which range in lengthr from 1 to 2 1/2 inches and are generally curved, (b)r by its small cones (length 3/4 to 2 1/2 inches), and (c)r by its thin, flaky, purplish bark.r

r r

r The only known specimen of the **one leaf pinyon** ofr **nut pine** (*Pinus monophylla*) in the park grows inr Pate Valley in the gorge of the Grand Canyon of ther Tuolumne. It probably sprang from a seed carriedr over the mountains by the Indians from the Monor Lake region where the nuts of this small tree form anr important part of the food of the natives.r

r r

r Of the four American hemlocks but one speciesr occurs in the Sierra Nevada. The **mountain hemlock**r (*Tsuga mertensiana*) ventures southward from Alaskar along the mountain sides, ascending higher andr higher until, in Yosemite National Park, it is foundr only in alpine forests above 9000 feet elevation. Itr is universally proclaimed the most graceful tree of ther mountains. The beautiful drooping tip and branchesr set it aside from all other conifers, and its customaryr r r

r r

r PLATE XXr
r Western Juniper Trees at Benson Laker
r r Photo by A. C. Pillsburyr r

r r r r r bleak surroundings only enhance its graceful charm.r The tree may easily be distinguished (a) by its droopingr habit, (b) by the short, petioled leaves 1/2 to 1/4r inches in length which clothe the branchlets all around,r but sometimes have the appearance of being groupedr in star-shaped clusters, and (c) by the small pendulousr papery cones (length 1/2 to 3 inches) which adorn ther ends of the branches.rr r

r The **Douglas fir** (*Pseudotsuga taxifolia*) is the mostr important timber tree in the world. In Oregon andr Washington it forms great forests, but here near ther southern limit of its range we find it sparsely mixedr with other species of the middle altitudes. There arer some splendid old specimens in the cool shade ofr Yosemite's great south wall and on the talus slopes upr to 6500 feet elevation. The tree is most easilyr recognized (a) by its medium sized pendulous conesr which are two to four inches in length and have trident-shapedr bracts sticking from between the scales, (b)r by its drooping lower branchlets which are clothed allr around with petioled leaves from 3/4 to 1 1/4 inches inr length, and (c) by the thick, deeply furrowed ashyr brown bark.r

r r

r The true **firs** (genus *Abies*) differ from all theirr American relatives of the Pine Family by bearing erectr cones. These generally occur at the very tips of ther trees, and since the scales and seeds are shed one byr one and blown away by the winds, they are almostr never found beneath the trees. Of our nine Americanr firs two species inhabit the Sierra Nevada. Ther **white fir** (*Abies concolor*) is common at middle altitudes,r ranging from 3500 to 8000 feet, while the **redr fir** (*Abies magnifica*) claims the higher slopes. Bothr Species are beautifully symmetrical with erect, narrow,r r r r r dense, spire-like crowns and delicate regularly whorledr branches. All firs are lovers of shade and thereforer grow in dense stands crowding out the less tolerantr species. The **white fir** may be identified (a) by ther leaves, which are 1 to 2 inches long, without leafr stalks, and flattened or two-ranked on the lowerr branchlets, (b) by the bark which in the younger treesr is white and bears balsam blisters and in the olderr trees is deeply furrowed, corky, and ashy gray inr color, (c) by the cones which are 3 to 5 inches inr length and borne erect near the tops of the trees,r and (d) by the habitat, the tree generally occurring atr middle altitudes as an associate of yellow and sugarr pines. The **red fir** (*Abies magnifica*) may be identifiedr (a) by its short needles 3/4 to 1 inch in length whichr generally curl upward on the branchlets, (b) by ther bark which in the young trees is silvery gray but inr middle aged and older trees is a deep carmine-red andr divided into small plates, (c) by the large cones 6 tor 8 inches in length, which are borne near the tipsr of the trees and generally have bracts sticking fromr between the scales, and (d) by the

altitude, the treer generally occurring between 7500 and 9500 feetr elevation.r

r r

r The **Redwood Family** (*Taxodiaceae*) is representedr in the United States by only three species and inr Yosemite National Park by a single species, the **giantr sequoia** (*Sequoia gigantea*). This tree, widely famedr as the oldest and largest living thing, occurs in butr twenty-six groves which are all found in the middler elevations of the Sierra Nevada from the vicinityr of Lake Tahoe on the north to the region aboutr Kings River Canyon on the south. There are threer groves in the park, the nearest to Yosemite being 17.2r r r r r wiles distant. The following chapter is entirelyr devoted to the habits and history of this most wonderfulr tree. In its natural habitat the tree is seldomr confused with any of its associates. Among its distinguishingr characteristics are (a) the massive clearr trunks with their cinnamon- or chocolate-brown fibrousr bark, (b) the closely overlapped leaves whichr are awl-like on the lower part of the tree and scale-liker near the top, and (e) the brilliant brown cones whichr vary in length from 1 1/2 to 3 inches.r

r r

r The members of the Cypress Family (*Cupressaceae*),r in which are the many so-called American cedars, allr have scale-like leaves and stringy fibrous bark. Twor Yosemite trees belong to this family. The **incenser cedar** (*Libocedrus decurrens*) is one of the most abundantr trees in the Valley and on the talus slopes above.r The vivid green of its perfectly formed crown contrastedr with its fluted brown trunk make it a constantr object of admiration. Chief among the distinguishingr characteristics are (a) the flat sprays which are mader up of scalelike leaves, the bases of which are closelyr adherent to the branchlets, (b) the small cones whichr range from 3/4 to 1 1/4 inches in length and are made upr of five (apparently three) scales, and (c) the golden-r or cinnamon-brown fibrous bark.r

r r

r The **western juniper** (*Juniperus occidentalis*) is anr inhabitant of the upper slopes and is generally foundr above the Valley rim on exposed rocky sites where itsr gnarled form picturesquely decorates the bare graniter pavements. Scattered specimens may be foundr struggling upward in most unhospitable places almostr to timberline. The characteristics which easily identifyr the species are (a) its gnarled form, (b) its thin,r stringy, light cinnamon-brown bark, (c) its tiny scale-liker r r r leaves which are arranged in whorls of three aroundr the branchlets and are closely pressed to the twigs, andr (d) its fruit which is a small blue berry with a sweetish,r pungent, aromatic taste. The berries are really modifiedr cones.r

r r

r A most interesting little evergreen is the **Californiar nutmeg** (*Tumion californicum*), a close relative to ther conifers. A few specimens may be found in the canyonr of the Merced below Cascade Falls. The sharp-pointedr needle-like leaves which range in length fromr 1 to 2 inches are flattened in two ranks along ther branchlets and omit a very characteristic pungent odorr when bruised. The fleshy fruits average about 1 1/2r inches in length and have a hard-shelled kernel which,r when dried, looks much like the nutmeg of commerce.r

r r

r The broad-leaved trees of the park are of comparativelyr little importance—far less so than wouldr appear from a casual inspection of the oak-dotted floorr of Yosemite Valley. These deciduous trees grow atr the lower elevations and prefer the rich bottomlandsr and moist stream margins. The oaks are predominant.r In the hot foothills is the **valley white oak**r (*Quercus lobata*) which, in the region about El Portalr is replaced by

the Caldomia black oak (*Quercus californica*),r gigantic specimens of which may be seenr throughout the canyon of the Merced and in Yosemiter Valley. The latter may be distinguished by its larger leaves, the deep lobes of which are sharply pointed, andr by the dark bark which is deeply checked into smallr plates. The talus slopes above the Valley floor arer the favorite habitat of the canyon live oak (*Quercusr chrysolepis*) which may be distinguished by its whitishr bark and by its small entire and toothed leaves on ther same twigs, the old leaves being lead color beneath,r r r

r r

r PLATE XXIr
r Mountain Hemlocks on the rim of Matterhorn Canyonr
r r Photo by Walter L. Huberr r

r r r r r arid the young leaves yellow powdery beneath. Abover 5000 feet one commonly finds the dwarf **huckleberry oak**r (*Quercus vaccinifolia*), a shrub 4 to 8 feetr high which much resembles the canyon live oak.rr r

r Another common tree of the talus slopes is the **California laurel** or "**bay**"r (*Umbellularia californica*). Ther evergreen, smooth, shiny leaves have a most agreeabler camphoric-pungent odor when crushed, and are driedr and used for spice. The yellow flowers of early springr develop into olive-like fruits which mature in autumn.r

r r

r Along the streams, especially within the Valley, arer a number of moisture-loving species. Of these ther tree which excites the most admiration is the **floweringr dogwood** (*Cornus nuttallii*). In early spring ther showy white flowers (really modified flower-bud scales)r appear even before the leaves and often completelyr cover the crown. In autumn the clusters of brightr red fruit and brilliant red, orange, and yellow foliager make it the most beautifully colored of all Yosemiter trees. The **broadleaf maple** (*Acer macrophyllum*) isr abundant in moist shady spots, especially in ther shadow of the great south wall of the Valley and in ther deep canyon of the Merced at its head. The **dwarfr maple** (*Acer glabrum*) has been reported fromr Yosemite but is very rare. The **alder** (*Alnus rhombifolia*)r is never found far from water. It may easilyr be identified by its rather coarsely veined, toothedr leaves and by the peculiar little cones which arer retained on the trees after the seeds are shed. Twelver species of willow occur within the park but all exceptr the **yellow** and **black willows** (*Salix lasiandra* and *S.r nigra*) are shrubs. The **black cottonwood** (*Populusr trichocarpa*) is the largest of our poplars. It is ar common tree of the moist bottomlands of middler r r r elevations and may be distinguished by its yellowishr white bark and by its thick leathery leaves whichr are deep shiny green above and silvery white beneath.r

r r

r The little **quaking aspen** (*Populus tremuloides*) isr one of the most lovable of all mountain trees. Whenr unexpectedly found in meadows and garden spots ofr the High Sierra it is always an object of delight. Ther small delta-shaped leaves which are yellow-green abover and silvery beneath are so fastened to their twigs thatr they tremble with the least breeze. This characteristic,r together with the smooth, white bark make itr impossible to confuse the tree with any other species.r

r r

r The **mountain mahogany** (*Cercocarpis parvifolius*)r is a small tree of the foothill region. Being generallyr found in the chaparral areas it enters the park onlyr in the lower reaches of the great canyons. Specimensr may be taken in the region about El Portal.r

r r

r By using ther *Key to the Conifers*r presented in the Appendixr of this volume one may easily identify anyr evergreen in the park.r

r r

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The Giant Sequoia

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Handbook of Yosemite National Park (1921)r by Willis Linn Jepson

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THE GIANT SEQUOIA

r r

r By Willis Linn Jepsonr

r

r *r Professor of Botany, University of Californiar* r

r r r

r r Ther r Big Tree or *Sequoia gigantea* is one of the mostr charmingly attractive features of Yosemite Nationalr Park. This most wonderful and most lovable of allr tree species occurs in scattered communities orr "groves" on the western slopes of the Sierra Nevadar Mountains between the elevations of 4600 and 8000r feet.r

r r

r Of the twenty-six groves, the northernmost, nearr Lake Tahoe, contains but six trees. Further southwardr the species becomes more and more abundantr until, in the region near the Kings and Kern Rivers,r great forests are formed. The largest and mostr famous of these is the Giant Forest of Sequoiar National Park.r

r r

r Within Yosemite National Park are three groves.r The Tuolumne Grove, about 1 1/2 miles west of Craner Flat on the Big Oak Flat Road, contains 40 treesr Which occur at about 5800 feet elevation. The Mercedr Grove, about 3 miles east of Hazel Green, containsr 33 trees and is traversed by the Coulterville Road tor Yosemite at an altitude of 5500 feet. The Mariposar Grove 4 miles southeast of Wawona on the mountainr heights above the South Fork of the Merced Riverr contains 490 mature trees.r

r r r r

r This latter grove is in a number of respects the mostr remarkable of all clusters of the Big Trees which occurr in the society called the "grove." It really consistsr of two almost distinct groups of trees, the upper grover of 364 trees at an altitude of 7000 feet, and the lowerr grove of 126 trees at an elevation of 5400 feet. Ther road first enters the lower grove, passing between ther Four Sentinel trees, with the fifth, the Sergeant ofr the Guard, standing a little apart. Soon a cluster ofr large Sequoias comes into view. Among these,r prostrate, lies the Father of the Forest along whoser trunk a six-horse stage has been driven and at oner time a whole troop of cavalry lined up in formation.r

r r

r The road winds upward and tunnels directlyr beneath the base of the Wawona Tree through ar passage sufficiently large for the largest of old-timer stage coaches and modern auto-busses. Beyond thisr point is the Alabama Tree which is considered ther most perfect and symmetrical tree in the grove. Afterr passing many individuals which ennoble the forest byr their commanding size, the roads of the grove finallyr center at the Big Tree Cabin which is set amid ar cluster of truly magnificent specimens of this wonderfulr race of forest giants. All of these trees have beenr individualized with favorite names, such as Ohio,r Massachusetts, General Lafayette, St. Louis, Philadelphia,r Galen Clark, and many more. The Oldr Guard consists of four very fine trees in a row. Ther four trees of the Diamond Group are so disposed thatr they form the corners of a diamond. About ninety-eightr trees of the upper grove and thirteen of thoser in the lower grove have received names.r

r r

r The dimensions in feet of a number of the morer remarkable trees of the Mariposa Grove as given byr r r r

r r

r PLATE XXIIr

r Big Tree Cabin in the Mariposa Grove. The cabin was built around 1860 by Galen Clarkr

r r Photo by A. C. Pillsburyr r

r r r r r the Department of the Interior "Circular of Generalr Information regarding Yosemite National Park" forr 1919 are shown in the following table:rr r

Tree	*Height*	*Diam. at 10 ft.*	*Diam. at Base*
Mark Twain	331	13.0	16.9
Capt. A. E. Wood	310	12.7	16.5
Columbia	294	16.5	25.6
South Carolina	264	17.3	23.5
Washington	235	20.7	29.3
Forest Queen	219	12.1	17.0
Grizzly Giant	204	20.5	29.6

r r r

r The height of the Big Tree commonly averages fromr 125 to 225 feet, but trees in excess of these figures arer well known. The best authenticated of recent figuresr of the extreme heights of known trees are those forr the General Sherman Tree in Sequoia National Parkr which is 279.9 feet high and for the Dalton Tree in ther Muir Grove which is 292 feet high. These appear tor be extreme figures for trees in the forests of the southernr Sierra Nevada. The Columbia Tree in ther Mariposa Grove is 294 feet high and the Mark Twainr Tree is said to be 331 feet high, a figure in excess of anyr measurements hitherto given which have been mader by presumably accurate methods.r

r r

r Height is a matter which can be determined withr fair degree of accuracy and when determined is notr variable. Diameter, on the other hand, is not sor definitely determinable. Diameters at the ground dor not, in many cases, give significant or proportionater values to the trunks for the reason that the Big Treesr Often swell excessively at the base. The writer hasr found by actual measurement that the diameter at ther base in certain cases is twice that at ten feet abover r r r the ground. The only figures valid for purposes ofr comparison must therefore be taken sufficiently abover the ground to minimize the error due to this factor.r As so many people have a natural interest in ther largest known diameters there are here given ther diameters

of the four most famous trees:r

r r

Name of Tree	*Diameter at 12 ft.*	*Diameter at ground*
General Sherman (Sequoia Park)	27 1/2 ft.	34 1/3 ft.
General Grant (General Grant Park)	23 "	35 1/4 "
Grizzly Giant (Mariposa Grove)	20 (at 11 ft.)	31 1/4 "
Boole Tree (Converse Basin, King's River)	25 3/4 (at 10 ft.)	36 "

r r

r It must here be emphasized, however, that characteristicallyr the taper is very slight. Indeed, allr observers unite in agreeing that the outstanding featurer of the Big Tree, more remarkable and impressiver than any other, is the columnar character of its trunk.r The great height of the clear column and the mannerr in which it maintains its diameter upward from ther ground to the crown are most extraordinary.r

r r

r In the matter of longevity the Big Tree is undoubtedlyr edly the oldest living thing on the planet. Its ager varies from 900 to 2100 years and in not a few casesr it probably attains to an age of 3000 years. The ager of one tree logged in the Converse Basin has beenr determined with closely approximate accuracy asr 3148 years. This is the oldest tree of which we haver any definite record.r

r r

r Standing in rhapsodical admiration before ar *Sequoia gigantea* one can easily imagine it to ber r r r 5000 or 10,000 years of age. The figure eightr thousand years has been placed on the Grizzly Giantr at the instance of a distinguished authority on fishes.r As a matter of fact no one knows the age of ther Grizzly Giant as there is no satisfactory way ofr determining its age except by cutting it down. Ar small core could be taken from its trunk by a specialr tool, but this means might not prove satisfactory, andr such mutilation is not likely to be permitted. Therer is no way of determining the age of a particularr individual merely by means of the diameter. Fromr various age studies I have found, on the average,r about 20 years to the inch. The Father of the Forestr in the Calaveras Grove has a diameter of 27 feet insider the bark at about 8 feet above the ground. Itsr calculated age would therefore be 6480 years. Whenr cut down its age was determined to be about 1300r years. In the Converse basin the writer determinedr the age of a tree 11 feet 7 1/2 inches in diameterr to be 2019 years. The ring count was accurate withinr a possible error of only 10 or 15 years in either direction.r Another tree 24 feet in diameter, twice the diameterr of the first, was only 1346 years old—a littler over half the age of the first. Trees of various speciesr often take on an appearance of great age when comparativelyr young, due to storm, wind, disease, orr under-nutrition. Senility or its appearance is notr always a matter of years, and attempts to assign ar longevity of four thousand years or more to the Bigr Tree rest on no substantial basis.r

r r

r The age of individual Big Trees, however imposingr their life, should not be confused with the age of ther Sequoia race. The Big Tree is *descended from* pine-liker ancestors, and the Pine Family itself and its alliesr r r r are very much older racially than the Redwood Familyr to which the Big Tree belongs. The morphology ofr the flowers and cones of a pine, not to speak of ther presence of resin, indicate a family very much olderr than the Redwood Family. Measured in terms ofr history of life upon this earth, the species of Sequoiar are recent; they are relatively modem compared withr the pines, firs, and spruces, and their allies—indeed,r they are the merest parvenues.r

r r

r In another sense they have a highly dignified ancestryr and represent a race of trees which were once morer numerous upon the surface of the earth than atr present. During the Miocene age of the Tertiaryr period many species of Sequoia were distributed overr the northern hemisphere and perhaps also occurredr in the southern hemisphere. At any rate the remainsr of Sequoia species have been observed in the rocks ofr Austria, France, England, western Asia, Spitzbergen,r at the mouth of the Mackenzie River, British Columbia,r Yellowstone Park, Oregon, and many otherr stations. They undoubtedly formed very extensiver forests during the Miocene period. It is supposedr that during one of the glacial ages all the speciesr became extinct excepting the two which are now livingr in California, viz., the Big Tree of the Sierras (*Sequoiar gigantea*) and the Redwood of the Californian Coastr Ranges (*Sequoia sempervirens*).r

r r

r Of these two species the Big Tree grows to a muchr more colossal size. It begins as a young tree withr the pyramidal outline of an arbor-vitae, its trunkr clothed with branches to the ground and its crownr tapering to a cone-like apex. After it attains to ther age of two or three hundred years it becomes a treer 75 to 125 feet high, and begins to prune its trunk ofr r r r branches from the ground upwards. As it goes intor the adult period, the crown continues to move upwardr and a clear shaft results which is 100 to 150 feet orr more up to the first limb and clothed with a deeplyr furrowed fibrous red bark which is very non-inflammable.r

r r

r The Sierran forest is typically a fire forest; that is tor say, all the tree species have shown reaction in structurer or life history to long continued fires which haver undoubtedly run over California woodlands for manyr thousands of years and perhaps for a longer period.r The trunks of the pines, firs, and cedars have becomer encased in exceedingly thickened bark which isr undoubtedly a very effective protection to the vitalr cambium layer which lays between the bark and ther wood and provides for the tree’s increase in thickness.r The bark of these trees, on the other hand, containsr more or less resin which increases the fire hazard.r

r r

r In the case of the Big Tree, however, there isr practically no resin in the whole trunk. Resin isr found not at all in the tree except in microscopicr quantities in the first annual layer of wood, in ther leaves, and in the staminate catkins. The bark isr quite free from resin except for its possible occurrencer in case of mutilation, and by its peculiar fibrous naturer forms an almost asbestos-like covering to the trunk.r This bark is a beautiful red-brown or cinnamon colorr six to twelve inches thick. It often attains a greaterr thickness, and bark two feet through is actuallyr known. Fires burn through this heavy layer of barkr very slowly, and it is only after repeated conflagrationsr that the Forest Fiend obtains entrance to the woodyr layers. Even then progress is slow because the woodr is non-resinous and burns slowly. Nearly all maturer r r trees or trees past maturity show signs of fire ravage,r although in many cases the attack has beenr negligible.r

r r

r As the tree grows on past maturity it eventuallyr begins to die in the top. This may be the result ofr the gradual exhaustion of its food supply or it may ber due to years of deficient seasonal rainfall. It isr possible that the tops of Sequoias *may* be killed byr lightning, but we know of no direct evidence to thisr effect. We certainly have no record of a Sequoia treer ever having been killed by lightning, although pines,r firs, and other trees of the Sierran forests are frequentlyr killed or completely shattered. Probably allr old trees of *Sequoia gigantea* have been *struck* byr lightning; certainly very many of them within ther period of the white man's observation.r

r r

r One of the most remarkable of forest experiences isr to see at night a fire burning 150 or 200 feet in the airr in the very tip-top of a great Sequoia tree. Suchr fires are set by lightning. On account of their inaccessibilityr and their tendency to throw off live sparks,r they are a great source of worry to the forest rangerr who can do nothing but camp in the neighborhoodr until the fire burns itself out or is extinguished by ar propitious rainfall.r

r r

r The cone of the Big Tree is two to three inches longr and bears two hundred to three hundred seeds, aboutr twenty-five per cent. of which are viable. It is quiter common to hear tourists marvel at the ridiculouslyr small size of the cone borne by so gigantic a tree, butr the complacent tourist may well be thankful that ther size of the cone does not correspond to the size of ther tree beneath which he stands with admiring gaze.r

r r

r In some of the rhapsodies which have been spokenr r r r

r r

r PLATE XXIIIr
r Typical forest in the Mariposa Grove. Left to right, Sugarr
r Pine, Red Fir, Incense Cedar, Sequoia, young Sugarr
r Pine, group of Firs, and Sequoia. The groundr
r is covered with Sugar Pine Conesr
r r Photo by A. C. Pillsburyr r
r

r r r r or written about the *Sequoia gigantea,* it is the habit tor speak of this tree as passing out, as a relic, as makingr its last stand upon the western flanks of the Sierrar Nevada, and as being a decadent survival. In ar sense it is a survival but it is a most lusty and vigorousr survival. No other tree grows to so great a size; nor other tree has such longevity; and no other coniferousr tree has such resistance to disease except its cousin ther Redwood of the Coast. In open spaces in the forest,r seedlings appear in great numbers, especially in ther southern part of the range of the species. Here theyr often form weedy thickets through which it is impossibler to force one's way. In the southern Sierra Nevadar the Big Tree forms extensive forests, and is often ther dominant tree in its areas of best development. Ther species is so abundant that it has been lumbered onr an extensive scale and many millions of board feetr of lumber from the Big Tree have been put on ther market and sold as Redwood.rr r

r The appearance of the wood does not differ veryr much from that of the well-known Coast Redwood.r It is much the same color, texture, and weight. Ther difference in strength can well be illustrated by observationr that in Tulare County vineyards, grapevine stakesr made from Big Tree wood are two inches square, whiler in Napa Valley vineyards, similar stakes made fromr Redwood are about one inch square. Redwood resistsr a far greater lateral strain than the Big Tree wood.r The latter has a tendency to fracture transverselyr When split, whereas the Redwood splits cleanlyr throughout. One sometimes sees in the beds ofr Sierran rivers huge but short logs which are brokenr off squarely at the ends. These great leviathansr have been weathered by successive floods and arer r r r often smoothed by rolling from side to side of ther canyon wall. They are

fractured segments of ther trunks of the great giants of the Sierra.r In the Big Tree, the Sugar Pine, the Yellow Pine.r the Red and White Firs, and the Incense Cedar wer have in this Yosemite region the finest and mostr remarkable group of conifers in the world. Theyr serve to give the park an interest and charm whichr highly gratifies our aesthetic sense and stirs deeplyr our imagination regarding this earth upon which wer live. The Big Tree and the Yellow Pine would be fitr tenants for Paradise, and this region is Paradise enow.r

r r

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Flowers of Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Willis Linn Jepson

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FLOWERS OF YOSEMITE NATIONAL PARK[1]

r r

r By Willis Linn Jepsonr

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r *r Professor of Botany, University of Californiar* r

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r [1]Based upon the botany series of the LeConte Memorial Lecturesr delivered by Dr. Jepson in Yosemite, June, 1918.r
r Pages 253, 258,r 259, and 260r were, under Dr. Jepson's direction,r either written or expanded by me. This paper was also used byr me for reference in preparing my article in ther *Sierra Club Bulletin*r for January, 1921, but credit for the portions on the Snowr Plant and one or two other species was inadvertently omitted.r

r

r Elizabeth Van E. Ferguson, r
r *Research Assistant*.r

r r r

r r Yosemite National Parkr r offers a remarkably richr field for the botanist. The same factors which determiner the great diversity of animal life influence to ar much greater degree the species and forms of plant life.r Some plants have become highly specialized to endurer the many months of drought in the semi-arid foothills,r while others have developed a hardiness which enablesr them to exist in the bleak reaches above timberline.r Even in the middle regions where optimum conditionsr attain, the exhuberant abundance of wild blossomsr changes in character with each change of site; eachr species seems to have its own niche, whether it be inr swamp, on fertile hillside, or on desiccated graniter barrens. Indeed, so great is the range of naturalr conditions to be encountered in the park between ther foothills and the mountain glaciers that there are nor r r r less than twelve hundred species and varieties ofr flowering plants and ferns native to this area. Whiler most of these are typical of the entire Sierra Nevada,r many are exceedingly rare, and a few species are onlyr known from small areas within the park.r

r r

r By whichever route the traveler enters Yosemite,r he will pass through the shrub formation known by ther Spanish name **chaparral**. So densely does this society,r clothe its area in the Upper Sonoran or Foothill Zoner that it is often impossible to force one’s way throughr it. The various shrubs which go to form this closer cover are of much the same stature and aspect, andr form a remarkably uniform population on exceedinglyr dry and well-drained slopes. The excessive drought,r the high summer temperature, and the rocky orr gravelly nature of the soil are the chief factors whichr have caused these various chaparral shrubs to developr many characteristics in common; of these the mostr striking are their dwarf habit, reduced leaf surface,r small flowers, hard close-grained wood, and rigidr thorny branchlets. It is only superficially, however,r that these shrubs are alike. They are derived notr from one family, nor two, nor three, but represent ther pioneer spirit in many different stocks which haver successfully met the conditions imposed by Naturer in the chaparral area.r

r r

r One of the most important and abundant of theser shrubs is **Buck Brush** (*Ceanothus cuneatus*), a grayr bush five to eight feet high with tough thorny branchlets,r opposite leaves, and hard close-grained wood. Itr is everywhere abundant, and its short blunt spursr make it a terror of the cattlemen riding the range.r The small white flowers are in themselves insignificantr but a profuse production of small honey-scented clustersr r r

r r

r PLATE XXIVr
r Washington Lily (*Lilium Washingtonianum*)r
r A fine species which fills the Yellow Pine forest with ar
r delightful fragrancer
r r Photo by A. C. Pillsburyr r

r r r r causes the shrubs for a time to take on a delicater hue. An allied species is the **Jack Brush** (*Ceanothusr divaricatus*), with longer flower clusters and alternater leaves, which occurs in the canyon of the Mercedr nearer the Valley. All species of Ceanothus are commonlyr though incorrectly known as "California Lilac."rr r

r In approaching the Valley from El Portal, if earlyr enough in the year, one will be rewarded with the sightr of that unusual glory, the **Redbud** (*Cercis occidentalis*).r Before the foliage even hints at showing its tenderr green leaves the tree is shrouded in a cloud of redr blossoms. It belongs to the Pea Family and in summerr its branches are heavily hung with purplish pods.r Along the streams at the same altitudes is the **Winer Bush** or **Sweet Shrub** (*Calycanthus occidentalis*), a bushr with large opposite leaves, aromatic flowers, and red-brownr sepals and petals which are borne on a cupliker base. Farther up the canyon of the Merced one of ther most pleasing sights in early summer is the **Philadelphus**r (*P. lewisii* var. *californicus*) which is similar tor the Syringa of Eastern gardens. It forms fragrantr thickets along the stream banks and because of itsr somewhat orange-like flowers is often called **Mockr Orange**. It is perhaps rivaled by its associate, ther **Bladdernut** (*Staphylea Bolanderi*) which grows in ther canyons of the foothills, especially above El Portalr near Pulpit Rock. The Bladdernut has its leafletsr in threes and covers itself with white drooping flowerr clusters which later develop into curious bladder-liker three-horned seed pods. It was first collected in 1874r by Dr. Henry N. Bolander, one of the early botanicalr explorers of the Yosemite region.r

r r

r Everywhere the shrubs lend interest and charm tor the Mountain sides and the open forest floors or valleyr r r r levels. Foremost among these stands the **Deer Brush**r (*Ceanothus integerrimus*) with its tall slender stems,r scattered foliage, thin leaves, and abundant masses ofr delicate white blossoms. The foliage of this bush isr eaten by the deer and it is also an important browser for cattle. Chemical analysis indicates that its leavesr have a higher nutritive value than those of any otherr native shrub. It is when the Deer Brush is in bloom,r however, that it most attracts the eye of the traveler.r The thickets with their dainty plumelike flower-clustersr borne aloft on slender branchlets form ar billowy mass of white over considerable forest areas.r A less common species is a close relative, the **Sweetr Birch** (*Ceanothus parvifolius*), which is found in ther Mariposa Grove, about Chinquapin, in the vicinity ofr Grouse Creek, and at similar altitudes. It inhabitsr open spots in the forest where its stems spread out andr form the root crown in a somewhat wheel-like fashion.r Its diminutive shiny leaves and small clusters ofr flowers in delicate shades of blue make it an attractiver asset of the forest floor.r

r r

r As the traveler enters the Valley his views of ther Merced River will often be enhanced by the abundantr bloom of the **Western Azalea** (*Rhododendron occidentale*)r as it contests for a place among the willowr thickets. In June or July its sweet fragrance charmsr one to follow the stream and see its beauties. oftenr the great flower-clusters nod to the stream and almostr dip their delicate orange and white petals into ther swiftly running water.r

r r

r But it is the Valley floor with its riotous wealth, ofr color which in favorable seasons shows best ther variety of the native vegetation. In late spring or earlyr summer the meadows are carpeted with great massesr r r r of bright flowering annuals and taller brilliant perennials.r The delicate **Canchalangua** (*Erythraea venusta*)r with its showy clusters of bright pink flowers; ther taller **Collomia** (*Gilia grandiflora*) with its denser heads of dainty funnelform flowers, cream to almostr salmon in colour; many patches of golden **Mimulus** orr **Monkey Flower**; countless blue flowers, such as ther light blue **Pentstemon** (*P. confertus*) with its flowers inr whorls on tall stems; tall blue **"Forget-me-nots"**r (*Lappula velutina*); tiny dark blue **Collinsia** (*C. parviflora*)r and the larger almost white Collinsia, tinctoria; ther red **Indian Paint Brush** (*Castilleia miniata*); the brilliantr scarlet Pentstemon (*P. bridgesii*) with lance-shapedr leaves and funnelform corolla about one inch long; andr quantities of golden **Buttercups** (*Ranunculus occidentalis*r var. *eisenii*), all go to form the brilliant mosaicr of large sheets and pools of color on the Valleyr levels.r

r r

r At altitudes of 3600 to 5000 feet, after the shallowr springtime pools have evaporated, these areas becomer midsummer beauty spots with a thick growth ofr *Downingia montana.* This is a little **Lobelia** withr delicate jewel-like blossoms, the upper lip very smallr with two minute lavender lobes, the lower lip of threer broad-spreading lobes, white at the throat, and with ar bright blue border. A mass of these dainty bluer flowers is the loveliest sight imaginable and may ber seen in Hetch Hetchy Valley and on the Hog Ranchr Road to Crocker’s Station.r

r r

r One of the plants found in Yosemite Valley and atr similar altitudes which receives especial attentionr from the traveler is the **Bleeding Heart** (*Dicentra,r formosa*) Its leaves are finely cut and its flowersr are pendulous in clusters from the summit of the stem.r r r r The flower itself is flattened, of a rose-purple color,r and about three fourths of an inch long.r

r r

r Another striking plant of moist or swampy placesr is the **Scarlet Monkey Flower** (*Mimulus cardinalis*).r The rich green foliage, soft with hairs, makes a beautifulr setting for the large brilliant flowers. Theser gorgeous plants may be seen in several places in ther Valley, usually by streams or near the bases of ther waterfalls.r

r r

r One of the remarkable sights of the upper reachesr of the Valley in midsummer are the fields of tall yellowr **Evening Primroses** (*Oenothera biennis*). They haver very handsome large golden flowers which open at twilightr and close again in the middle of the following day.r In favorable seasons the dry open fields about Yosemiter are often yellow with these stately plants. Manyr of the finest groups, however, are now a thing of ther past, due to the mowing of the meadows for wild hay.r

r r

r In the edges of brushy thickets one finds the **Wildr Ginger** (*Asarum Hartwegi*) with its broad mottledr leaves and its curious purple flowers close againstr the ground. It is one of the most singular plantr inhabitants of the Valley floor and is always worthr searching for in May and June.r

r r

r In dry spots near the Yosemite Black Oaks, ther **Sierra Milkweed** (*Asclepias speciosa*) develops itsr bunches of highly specialized pink or reddish-purpler flowers above its white hoary leaves and is a mostr interesting plant on account of its habit of catchingr and imprisoning flies.r

r r

r Along the roads one may see in May or June ther **White Mariposa Lily** (*Calochortus venustus*). This isr one of the handsomest of all Mariposas and is remarkabler for its range of color. Along the Wawona Roadr r r r one form has deep wine-red petals which are darkerr toward the middle and are crossed below by a broadr yellow band; still other plants, the more usual form,r are nearly white with a dark brown eye surroundedr by yellowish shadings.r

r r

r The Lily Family is well represented by many otherr interesting species. The **Tiger** or **Leopard Lily**r (*Lilium pardalinum*) occurs in such places as Bridalveilr Meadows where as many as twenty-eight flowersr have been counted on a single plant. The **Little Tigerr Lily** (*Lilium parvum*) has flowers about half as larger and grows in moist meadows at higher elevations.r

r r

r On the walls of the Valley are several rarities, oner of them being the **Cliff Buttercup** (*Ranunculus hystriculus*).r Its sepals are white and petal-like and ther petals, which are small and inconspicuous, are developedr as spoon-shaped nectaries. The whole flowerr looks more like an anemone than a buttercup and hasr a great historical interest as it is in reality one of ther most ancient of flowering plants. It grows on cliffs andr ledges where it is reached by the spray from Yosemiter Falls, Vernal Falls, Nevada Falls, and other cataractsr about the Valley. It is as delicately beautiful as it isr rare.r

r r

r Leaving the Valley and passing into the main piner belt (Transition Zone) one finds many interestingr plants. Here the **Deer Brush** and **Manzanitas** coverr great areas. A very abundant plant is the **Mountainr Misery** (*Chambaetia foliolosa*). There is no mistakingr it. The strawberry-like flowers (which it comes byr honestly since it is a member of the Rose Family)r and the fernlike foliage mark it distinctively. Ther woody stems grow six inches to two feet high andr colonize, almost to the exclusion of other herbs, milesr r r and miles of the open slopes and flats beneath the Pinesr in the Yellow Pine belt. It is sometimes called Bearr Clover or Tar Brush, but the true folk name, Mountain Misery,r is a better term, for it comes right fromr the soil and is born of the daily work and experience ofr the mountain rancher. He cannot trail his animalsr through it, for they leave little or no track in thisr growth; the foliage has a tarry secretion which gumsr up his clothing; and the herbage is offensive to hisr cattle and so it is useless as a fodder plant. To ther mountain rancher, then, this herb is the last word inr expression of the day's discontent and inadequacy.r To many a mountain-lover, however, its spicy odorr suggests the many drowsy sunny days spent beneathr the pines.r

r r

r Beneath the Yellow Pines on the road fromr Yosemite to Wawona the Tuolumne and Merced Bigr Tree Groves the ground is often covered with the greenr carpet of the **Mahala Mats**, a species of Ceanothus.r It has small clusters of blue flowers, leaves spiny atr the tips, and distinct horns on the seed pods. Ther mats are closely grown and, while irregular in shape,r often become five to fifteen feet broad.r

r r

r Of all rarities in the park no other plant excites sor much popular interest, perhaps, as the **Snow Plant**r (*Sarcodes sanguinea*). It is a very Mephistophelesr amongst plants, and its dazzling red color has exercisedr a strange and almost weird fascination upon ther popular mind. The whole plant—flowers, bracts, andr stems alike—is of a bloody red hue. It springs upr from the leafy mold of the forest floor, and (as ther police judge would say) is without obvious means ofr support, since it has no chlorophyll, no green leaves, tor manufacture its own food as most other plants mustr r r

r r PLATE XXVr r

Red Heather (*Bryanthus Breweri*)

Evening Primrose (*Oenothera biennis*)

Indian Paint Brush (*Castilleia miniata*)

r

r r Photos by A. C. Pillsburyr r

r r r r do. While called a parasite *it is not such* and does notr draw its sustenance from the living tissues of anotherr plant. It is a saprophyte—that is, it lives on deadr and decaying vegetable matter. Its stems rise fromr an underground, very much involved, interlaced, andr compact mass of coralline roots which gather up itsr food materials. One, two, three, or four stems riser from this root mass, or sometimes a cluster of a dozen.r The writer has even found as many as sixteen. Ther Snow Plant ha's not anything to do with snow anyr more than many other Sierra plants which come upr after the snow or snow banks have disappeared. Probablyr the Snow Plant has never been seen rising fromr *winter snow.* After the stems start up through ther layer of pine needles or forest mold and after ther stem is once above the ground, a light snowfall mayr come and the blood-red stems may thus appear tor have risen through this virgin snowfall. In this way,r most likely, the name Snow Plant originated. A near relativer is the **Pine Drops** (*Pterospora andromedea*), a red-brownr plant with a slender stem one to two feet highr which is commonly found beneath the Yellow Pines.rr r

r One of the great rarities of this region is a species ofr **Lewisia** (*Lewisia yosemitiana*) which grows in ther granite sand on top of the domes about Yosemiter and nowhere else in the world. The white flowers riser from underground roots and open out on the sandr like stars set in the very crowns of the domes. Theser plants are very delicate as well as very rare and shouldr never be disturbed, since they will fall to pieces in one'sr hand if dug up from the place where they grow, as if inr resentment at man's interference with them. They,r however, are well worth seeking for field study byr lovers of rare plant life.r

r r r r

r In dry open swales of the great Yellow Pine Forestr one comes upon the tall stalks (four to six feet high) ofr a great white lily bearing sometimes ten or fifteenr flowers, which now is called the **Washington Lily**r (*Lilium Washingtonianum*) although that pioneerr botanist, Dr. Kellogg, distinctly named it the Ladyr Washington Lily, after Martha Washington, the firstr lady of the land, as he said.r

r r

r On sandy pine barrens great areas may be crimsonedr with little **Mimulus** (*M. torreyi* and *M. bolanderi*).r Here also **Pussy's Paws** (*Calyptridium umbellatum*)r often add to the pink or red carpet of the forest floor.r The stems radiate from a central rosette of leavesr which lie flat on the ground and bear at the ends anr involved soft mass of flowers, forming a cluster whichr whitens with age and suggests the common name byr which the plant is known. In sunny spots the tallr scarlet **Gilia** (*G. aggregata*) form brilliant patches whichr greatly attract the humming-birds in their search forr hidden sweets. Its corollas are tubular and about anr inch and a half long, the exserted stamens inserted inr the notches between the lanceolate lobes. Still otherr areas are blue with other Gilias such as *G. leptalea,* ther flowers of Which are about one half inch long.r

r r

r On granite sand spaces one may find many acresr covered with **Golden Stars** (*Brodiaea aurea*), a speciesr of Brodiaea which is related to the blue Grass Nuts ofr the foothills. In the forest one meets the **Nuttall Mariposar Lily** (*Calochortus Nuttallii*), its almost white,r flowers bearing an inky spot about the gland at ther base of the petals. At slightly higher altitudes mayr be found the tiny **Sierra Pussy's Ears** (*Calochortusr nudus*) with its small white hairy petals.r

r r

r Sandy areas will often be clouded by the delicater r r r little white flowered **Eriogonum** (*E. spergulinum*). Itr

is a dainty little annual with small white flowers borner on hairlike stalks which give it a very airy and fragiler appearance. It has somewhat the appearance of ther Baby's Breath of our gardens and is in places so abundantr that it forms a great Milky Way through ther forest which is as beautiful by moonlight as byr day. Another delicate white flowering herb with ar diffusely branching flower cluster is the **Silver Tails**r (*Potentilla santolinoides*). This may be easily recognizedr by its peculiar caterpillar-like leaves which formr a silvery rosette at the base.r

r r

r Rocky or gravelly slopes are often resplendent withr lovely hanging gardens of **Pride of the Mountains**r (*Pentstemon menziesii*). This brave plant grows inr the most unhospitable places but developes into a tallr and bushy plant with ovate finely toothed leaves andr beautiful trumpet-shaped flowers which are reddish inr color. Wherever this Pentstemon appears it is indeedr the Pride of the Mountains, blooming profusely as itr does in the midst of rocky barrens.r

r r

r The high mountain meadows above Yosemite arer frequently wonderful wild gardens. In one of thoser meadows it was once the author's good fortune to seer fully twenty thousand plants of the **Jeffrey Shootingr Stars** (*Dodecatheon Jeffreyi*) in full bloom. This is ar Plant which resembles the Cyclamen of our gardens.r Among the Shooting Stars one often finds the featheryr White flowers of **Polygonum** (*P. bistortoides*); the slenderr stems are very erect and bear at the summit a closer Mass of small white flowers which at a distance lookr like neat white flags. A meadow full of Shooting Starsr and this white Polygonum has the appearance of ar fresh and orderly mountain garden. The streamr r r r which usually meanders through these rich meadowsr is often lined with clumps of the **Labrador Tea** (*Ledumr glandulosum*). This is an evergreen shrub withr shiny oval leaves which, due to the resin which theyr contain, are peculiarly fragrant when crushed. Ther white flowers are grouped at the ends of the branchesr in flat-topped clusters. By the stream bed oner may often find lovely robust plants of the large **Pinkr Monkey Flower** (*Mimulus Lewisii*) which replacesr the scarlet species of the Yosemite and lower valleys.r The flowers are showy light pink, and plainly two-lippedr but the two lips are similar. In these swampsr grow the quaint **Elephant Heads** (*Pedicularis attollens*)r with its slender rose-pink spikes. The name Elephantr Heads arises from the peculiar corolla with its hoodedr upper lip prolonged into a curved beak or proboscis.r Associated with the foregoing one finds the blue **Pentstemon**r (*P. confertus*) which is not so tall nor sor many flowered as that at lower altitudes. Often ar marshy stretch may be covered with the pale creamyr cups of the **Marsh Matigold** (*Caltha biflora*).r

r r

r The different meadows often vary greatly in theirr plant composition. On the one hand one may seer meadows filled with flowers which grow higher thanr the waist and so thickly that it is impossible to stepr without-treading down many plants. There are **Reinr Orchis** (*Habenaria unalaschensis*) with long tresses ofr small white flowers; many species of Lupins, the largestr and most attractive of which bears great massesr of showy blue spikes (*Lupinus longipes*); the greatr yellow **Cone flower** (*Rudbeckia californica*) standingr shoulder high and ending in a single conical head;r the purple **Fireweed** (*Epilobium angustifolium*) whichr raises its long wands to the breeze; and the curiousr r r

r r

r PLATE XXVIr
r The Snow Plant (*Sarcodes sanguines*)r
r This remarkable plant, which is entirely fire-red, is one of ther
r most curious species in the Parkr
r r Photo by A. C. Pillsburyr r

r r r r **Corn Lily** (*Veratrum californicum*) which adds itsr characteristic large-leafed clumps and stout cornliker stems to the meadow population, recalling in itsr appearance the Eastern False Hellebore. Instead ofr these rank growing meadows one may see a closer carpet of green painted here and there with brilliantr patches of crimson, gold, and pale lavender. Ther crimson on closer observation proves to be the brightr crimson **Paint Brush** (*Castilleja Culbertsonii*), the goldr a **Potentilla** (*P. gordoni*), and the lavender the **Mountainr Daisy** (*Erigeron compositus*).rr r

r A common shrub at altitudes of five thousand tor eight thousand feet is the **Green Manzanita** (*Arctostaphylusr patula*). The stems of this manzanita arer three to six feet high and much branched so as to maker a spreading shrub. The leaves are very green andr fresh looking and the bell-shaped flowers deep pinkr and in compact terminal clusters. More or less associatedr with it at the higher altitudes one finds the **Bitterr Cherry** (*Prunus emarginata*), its crimson cherries mostr attractive to the eye in August but shocking to ther taste. It forms dense thickets on moist slopes and isr often quite abundant.r

r r

r Throughout the Yosemite region one is impressedr with the number of species of **Eriogonum**. One ofr these which is not uncommon between five thousandr arid seven thousand feet is the **Sulphur Flower** (*Eriogonumr umbellatum*), noticeable for the spots of yellowr which it lays upon many a stony slope or rocky crag.r 0n Lambert's Dome one will find another kind,r **Lobb's Eriogonum** (*E. Lobbii*) whose white flowersr are Much larger and, since the stem reclines uponr the granite rock upon which the plant grows, it seemsr as if they

weighed down the stalk which bears them.r r r r At the high altitudes, generally from 7500 to 9000r feet, there appears the **Snow Brush** (*Ceanothus cordulatus*).r This is a low flat-topped shrub which formsr circular mounds five to ten or fifteen feet broad andr commonly one to three feet high with olive or grayishr branches and rigid or often spinelike twigs. Its lowr compact growth is the result of the heavy burden ofr snow that it must carry for several months of the year.r In the summer it also carries a white burden, but thisr time it is light and fragrant instead of heavy and cold.r Whether it is the abundance of white bloom in ther summer or the snow of the winter which causes thisr species to be called Snow Brush is disputed, but itsr distinct habit and abundant occurrence at higherr altitudes always focuses the attention of ther mountaineer.r

r r

r The swampy, alpine meadows of the Hudsonianr Zone (at about 9000 to 10,000 feet) often possess anr interesting inhabitant of the Heath Family. Ther little **Kalmia** (*K. Polifolia* var. *microphylla*) with itsr curious pink bloom carrying the anthers in pockets ofr the corolla, is always a quest with the climbers whor know rare plants. If one watch these meadows carefullyr he will see the tiny pink or white bells of ther **Dwarf Bilberry** (*Vaccinium caesspitosum*) close againstr the ground. On gentle slopes moist with seepager water from the snow banks above, one finds the **Snowr Fairies** (*Lewisia Pygmaea*), tiny plants with a fewr white star flowers. Two other diminutive shrubs of ther Heath Family also grow at these high altitudes. Ther **Red Heather** (*Bryanthus Breweri*) has stems denselyr clothed with linear leaves and ending in a cluster of redr flowers with conspicuous darker red stamens; it has ther greater altitudinal range of the two heathers and isr r r r often quite abundant. The **White Heather Bell** (*Cassioper Mertensiana*) is usually found with the Redr Heather at the higher altitudes; it grows in heavyr masses along the Lyell Fork of the Tuolumne andr picturesquely decorates the margins of most highr mountain lakes.r

r r

r As the traveler climbs the high ridges and peaksr and passes upward beyond the limit of trees he isr conscious that he is approaching the limits of life forr both plants and animals. In consequence, his interestr is intensified in those plants which occupy ther frontiers of the earth’s vegetation and typify ther Boreal Zone. Due to the high actinic quality ofr the light, most of these plants possess intensely pure orr delicate colors and tell the climber that he has reachedr a world different from that at lower altitudes. Inr their reproductive season these flowers appear veryr fragile and seem in strange contrast to their harshr and wild surroundings. If closely examined, however,r it will be found that the permanent portion of ther plant body is extremely condensed at or below ther surface of the ground and is well fitted for the longr arctic winter and the daily changes in temperaturer from freezing to summer mildness which occur even inr July and August at 9500 to 13,000 feet.r

r r

r Those alpine plants which are extremely condensedr and developed laterally are technically characterizedr as "Cushion plants." In this form of plant body ther stems branch and rebranch, forming with the leavesr a closely interlaced cushion-like vegetative body restingr on the ground. From this surface the flowerr stalks arise. The **Alpine Eriogonum** (*E. incanum*)r illustrates this high montane vegetative habit as doesr also the little golden **Draba** (*D. Lemmoni*), its leavesr r r r forming close rosettes at the base and its bright yellowr flowers with the petals in fours. One of the mostr handsome of these plants is the **Alpine Phlox** (*P.r Douglasii*), its cushion covered with white flowers,r long to be remembered as a thing of beauty. Twor alpine **Erigerons**, dwarfs with daisy-like flowers,r inhabit the highest peaks. *E. compositus* has leavesr toothed or lobed at the apex, while those of *E. ursinus*r are entire.r

r r

r The second type of alpine plant is frequently muchr dwarfed but does not develop the body laterally intor a distinct smooth cushion. Like the cushion plantsr they often have, however, most delicate or showyr flowers. One of the most glorious of these highr mountain species is the **Yellow Columbine** (*Aquilegiar pubescens*), a lovely graceful plant to which the wildr grandeur of its rocky surroundings is an almostr dramatic foil. It grows on high ridges at about eightr thousand to ten thousand feet and has large andr handsome flowers which run through a considerabler gamut of colors from yellow, white, or cream to pinkr or lavender. It is a very aristocrat among ther Columbines, quite different from the modest red-floweredr sort which grows in the Valley. This latterr is the same as the common **Columbine** (*Aquilegiar truncata*) of the Coast Ranges.r

r r

r Between eleven thousand and thirteen thousandr feet one finds the **Alpine Buttercup** (*Ranunculusr oxynotus*) which, in a modified form, extends northwardr through Oregon, Washington, and Britishr Columbia to Alaska and as far as the Bering Sea wherer it is found almost at sea-level. It is a characteristicr Buttercup with deep golden yellow corolla, the onlyr one of its genus in the alpine Sierra. Another truer r r

r r

r PLATE XXVIIr

r

Shooting Star (*Dodecatheon Jeffreyi*) Bleeding Heart (*Dicentra formosa*) Elephant Heads (*Pedicularis attollens*)

r

r r Photos by A. C. Pillsburyr r

r r r r alpine inhabitant is the **Sierra Hulsea** (*H. algida*), ar sturdy but small sunflower-like plant three to sixr inches high with more or less white woolly leaves andr stems. The bright blue trumpets of *Pentstemonr menziesii* var. *davidsonii* are truly remarkable for ther pure tone of the intensely blue corollas. A Stone-crop,r the **Alpine Sedum** (*S. roseum*) inhabits the alpine rocksr and forms matlike clusters of fleshy leaves and pinkishr flowers.rr r

r Much sought by mountaineers is the **Sierra Primrose**r (*Primula suffrutescens*), a handsome but smallr red-flowered plant with very shiny, toothed leavesr which grows on the rockiest and highest peaks.r Equaling it in interest are the sky-blue **Polemoniums**r (*P. eximium*) which are sometimes called **Sky Pilots**,r their petioles crowded with tiny leaf segments and ther stems ending in dense clusters of lovely blue flowersr which defy the barrenness of their surroundings.r Little **Alpine Willow** trees an inch high (*Salix tenera*)r further testify to the arctic character of the highestr Sierran peaks. On these same peaks grows the **Alpiner Sorrel** (*Oxyria digyna*), an interesting little plant ofr rock crevices with pinkish insignificant flowers andr

roundish cordate leaves.r

r r

r The **Steer's Head** (*Dicentra uniflora*) is anotherr reward to the alpine climber to such high places asr Mount Dana, Macomb Ridge, and Tower Peak. Itsr delicate blossoms borne on slender naked stems two orr three inches high, come up at the edge of snow banksr and sometimes in crevasses of snow near the marginsr of bowlders. The flowers are of very singular construction,r the lateral sepals spread out in such a wayr as to answer to the horns of a steer; the two innerr Petals are so constructed as to form the snout, and ther r r r inner sepals or forelocks point to the eyes, which arer furnished by the shoulders of the petals. Theser flowers hang on their stems in such a manner asr to suggest drowsy cattle, their heads cocked a bitr as if half disturbed by an intruder and mildly surprised.r Its singular appearance and its rarity giver this plant a unique interest, to which may be addedr the observation that perhaps no other species ofr our alpine flora is so typically a relic of preglacialr times.r

r r

r The flora of the Sierra Nevada comprises one ofr most marked and distinct units of vegetation of ther earth's surface. The Yosemite area is thoroughlyr typical of it, and not elsewhere on the Sierra chain canr a transection of it be studied to better advantage thanr here. All the flowering formations are remarkable,r and each in its best seasons has its own peculiar interests.r This fact is singularly true because primitiver conditions prevail over most of the area, and even inr the foothills undisturbed plant societies may still ber found by the explorer; while within the park limitsr the native plant life still reflects the old-time glory ofr the natural gardens of the Sierras.r

r r

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r Next: Camping and Mountaineering in Yosemiter •r Contentsr •r Previous: The Giant Sequoiar

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r http://www.yosemite.ca.us/library/handbook_of_yosemite_national_park/flowers.htmlr

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Camping and Mountaineering in Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Raymond H. Bailey

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r Next: Motoring in Yosemiter •r Contentsr •r Previous: Flowers of Yosemiter

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CAMPING AND MOUNTAINEERING INr r YOSEMITE NATIONAL PARK

r r

r By Raymond H. Baileyr

r

r *r Manager of the Camping Tours Department, Yosemiter r National Park Co.r* r

r r

r r Fewr r of us indeed are so well adapted to modernr conditions of living that Nature’s call to play Gypsyr a while finds no response. There comes a longing tor revert to the natural ways of living our early ancestorsr enjoyed, and to throw off for a time some of the shacklesr with which civilization has bound us.r

r r

r Pure, cold, sparkling water, not from a pipe, butr from a mountain spring; the murmur and fragrance ofr the breeze among the pines and fir trees; and the songr of birds and the call of the wild creatures of the forest,r grip the imagination and are woven in with a desirer for recreation and relaxation. Thus a wish is born forr a taste of simple living out in the open, away from ther haunts of man and free from cares and responsibility.r

r r

r This wish is quite universal. It finds expression inr "Weary Willie" with his tomato can boiling over ar cheery fire beside the railroad track, living off the landr as he goes. But it also exists in high places. Whiler the rest of the Belgian royal party stopped at ther hotel but a few miles distant, Prince Leopold chose tor camp out beside Bridalveil Creek, spending the nightr in a sleeping-bag beneath the pines, gathering firewood,r and eating flap-jacks in such numbers as only a growingr r r r boy can encompass. Even the apartment dweller,r bored with the daily drudgery of the compact andr convenient kitchenette, finds delight in her culinaryr duties as she cooks such delectable dainties as fish,r bacon, and browned pancakes over an open fire; andr one unaccustomed to the simplest duties at homer discovers pleasure in service and the self-reliancer which comes with each new task learned whiler camping.r

r r

r It is doubtful if there can be found another spotr on earth with so many conditions favorable to campingr out in the open as are found in the Yosemite Nationalr Park and other near-by regions in the Sierra Nevadar Mountains. This is where John Muir spent so muchr of his time, and of which he wrote so beautifully, andr after all his world-wide travel he declared that he stillr loved it the best.r

r r

r The weather is ideal for camping in the summer andr fall—pleasantly warm during the day without beingr hot, the nights ranging from cool to cold according tor the altitude. Day after day is clear, without a cloudr in the sky, and the heavens are marvelously bright atr night. The freedom from rain is one of the mostr delightful features, there being no storms for weeksr at a time. When they do occur they are usuallyr brief afternoon thunder showers, recurring perhapsr for two or three days. Except for a large piece ofr waterproof canvas for an emergency, little or no provisionr need be made by the camper against rain; ther use of tents for shelter in this region are the exceptionr rather than the rule.r

r r

r Annoying flies, insects, and other pests are practicallyr unknown with the exception of mosquitoes,r which are troublesome in some places only for a shortr r r r time after the snow has melted from the ground,r leaving temporary pools of water in hollows. Butr even mosquitoes are usually lacking or can be avoidedr in choosing a camp site.r

r r

r The air is invigorating, and water, abundant everywhere,r is crystal clear and icy cold. The manyr mountain streams and lakes throughout the park,r teeming with trout, make a fisherman’s paradise.r

r r

r Virgin forests of pine, fir, cedar, and scores of otherr species, dotted with flower carpeted meadows, extendr to the slopes of the rugged snow-capped peaks whichr beckon to those below to come upward and enjoy ther magnificence of the views they command.r

r r

r Only a very small portion of the park is accessibler to the tourist stopping at the hotels and lodges in ther Yosemite Valley and its immediate vicinity. Butr the whole park is open to the camper, inviting him tor leave the beaten paths and to explore regions seldomr visited, to view beauty and grandeur in solitude, tor fish where no other fisherman has just preceded him,r and to enjoy the pleasures of camping in lovely spotsr at will, without schedule, and without a thought of ther outside world which seems so far removed.r

r r

r The Camping Seasonr

r r

r The season well suited to camping on the floor of ther Yosemite Valley, which is at an elevation of about fourr thousand feet, usually extends from May to October,r inclusive. April and November are often delightful,r but provision should be made for occasional stormsr and cold weather. In other portions of the park ther camping period is shorter, depending upon the amountr of snow on the ground, which, in turn, is dependentr r r r largely upon the altitude—July, August, and Septemberr being the best months.r

r r

r During the first of the season there is the greaterr volume of water which is advantageous for its scenicr value but sometimes undesirable for the best travelingr and fishing in the higher sections. Wild flowers are inr their prime somewhere during all the season, atr increasing elevations as the months progress. Inr fall the coloring is beautiful, the air is crisp andr invigorating, and the number of visitors is small.r July is the month of greatest travel.r

r r

r Where to Campr

r r

r The Yosemite National Park is one large campingr ground. Wherever there is wood and water, and feedr if there is stock, there is a potential camp. Trailsr lead to all parts of the park, and it is a poor trail indeedr which does not pass at least one good camping spotr every hour or two. Auto roads are fewer but affordr many camp sites, especially the Tioga Road, whichr passes Lake Tenaya, through Tuolumne Meadows,r and over Tioga Pass, connecting with the roads tor Lake Tahoe on the north and to Los Angeles by wayr of Owen’s Lake to the south.r

r r

r The choice of a camping place or camping itineraryr is largely a matter of the objectives sought and ther time at one's disposal. If mountain climbing andr high alpine scenery is desired, the crest of the Highr Sierra forming the easterly boundary of the park willr afford the best in this line. There is hardly a sectionr where excellent trout fishing is not to be had, but ther best near-by points are to the east and northeast ofr Yosemite Valley, and it is still better farther northr where it is less frequented.r

r r r r

r As a fixed camp or auto camp, Tuolumne Meadowsr is unusually well located, there being innumerablr lakes, streams, waterfalls, peaks, and varied pointsr of interest within a day's walking distance. Rodgersr Lake is probably the gem of the park, and is notedr for its splendid fishing as are also Benson Lake andr Matterhorn Creek, near by.r

r r

r The Northerly portion of the park is least frequentedr because farthest from the Valley, but it isr rugged and interesting, and well worth while for ther one who has three or four weeks to spend.r

r r

r How to Gor

r r

r There are about as many gradations in the mannerr of camping as there are campers. At one extreme arer those who would go light like John Muir, for days withr but some tea and a few crusts of bread, or like anotherr mountaineer whose only excess clothing was a singler sock, that each of his hard-worked feet might have ar change of raiment on alternate days. Then there is ther "Tin Lizzie," with parents in the front seat and bulgingr with progeny in the rear, the back and sides packedr and draped with every conceivable household article,r *Lares et Penates* and all, until the identity of ther conveyance is completely concealed except for ther rattle. The student with a month's growth towardr his first beard, traveling with a donkey, Stevensonr fashion, and the luxurious limousine parked besider the Tuolumne River are equally in keeping as typesr of camping to be found.r

r r

r The stationary or fixed camp appeals to those whoser desire is to be settled in some beautiful spot, to rest, orr use the camp as a base for excursions to near-by pointsr of interest. As the transportation of equipment andr r r r supplies is simplest on this kind of an outing, ther amount of comfort and luxury which may be indulgedr in is a matter of personal taste. In the Yosemiter Valley, beside the Merced River, are a number ofr camping places, some for autoists, and others for thoser without machines, prepared by the Government withr piped water and sanitation provisions, and assignedr to campers at the office of the Park Superintendent.r The Tuolumne Meadows are also particularly wellr suited to camping in a fixed spot for those who wish tor loaf or fish or to make side trips to the many near-byr points of interest.r

r r

r But in order to see much of the park it is necessaryr to move camp from place to place. The mostr independent and least expensive means of travel isr afoot, carrying the total camping equipment andr provisions on the back. This is enjoyable for goodr walkers with strong backs, but should not ber attempted by

any not wishing strenuous, hard work.r Those carrying their own loads should observe ther Rule of I. 0. U.—Inches, Ounces, and Utility—discardingr all but the real necessities, for a pack whichr feels light in the morning grows very heavy before ther day's tramp is done, and robs such a trip of much ofr its pleasurer

r r

r Many enjoy walking on the trails who do not wishr to be burdened with carrying their outfits. Burrosr and pack mules may be used for this purpose. Onlyr animals accustomed to mountain trails and brokenr to packing should be taken, as other animals are likelyr to prove useless, if not dangerous, on the trails. Ifr there are but one or two pack animals it is usuallyr advisable to tether them out with long ropes so as tor keep them from wandering away from camp. The bestr r r stand of grass should be selected, as free from treesr and snags as possible, and the animals shifted to newr locations at frequent intervals, as it takes considerabler green feed to keep a working animal in condition. Ifr there are several animals, it is customary to hobbler a mare, or one or more of the more adventuresomer animals, and place bells on others to help locate ther band. Grain need not be taken for the animals if carer be exercised in selecting camps where the food is good,r but a little grain fed the first morning or two is oftenr helpful in keeping the stock near camp.r

r r

r About every second or third year the park is visitedr for its annual outing by the Sierra Club, a conservationr and mountaineering organization which has taken ar leading part in the preservation of the forests andr other natural features of the Sierra Nevada Mountainsr and in the development of National Parks. Approximatelyr for the whole month of July, about twor hundred of its members and friends walk from campr to camp, some ten to fifteen miles a day, the commissaryr and transportation of the entire outfit beingr provided by the organization. This is a delightfulr way of camping in the park, inexpensively andr relieved of all cooking and packing.r

r r

r Riding horseback, with pack animals to transportr the outfit over the trails, is still another way of campingr out, and a most delightful way of getting aboutr the park with the greatest amount of comfort. Carer should be exercised to take only saddle animals andr pack animals which are accustomed to mountainr trails, and double cinch saddles are advisable. If it isr desired to lighten the work of such a trip, this can ber done by engaging a guide, packer, or cook, or ther whole trip may be arranged, outfitted, and conductedr r r by the Camping Tours Department of the Yosemiter National Park Co., which also conducts certainr definitely scheduled camping trips which anyone mayr join.r

r

r Automobile camping is becoming very popular, andr when the new highway is completed into Yosemiter Valley will undoubtedly increase very greatly. Butr as yet it should be understood that although ther roads are very good of their kind, still they are mountainr roads, steep and rough in places. They are safer for careful driving and for machines which are in goodr running order. Brakes should be in first class condition,r and two spare tires are advisable. The motorr trip from Yosemite to Lake Tahoe by way of ther Tioga Road and the Leevining Creek Grade is particularlyr fine, and there are good camping places alongr the route.r

r r

r What to Taker

r r

r The question of what to take and what not to taker on a camping trip is a most important one. To ber without real necessities can prove very annoying butr to be burdened with a lot of unnecessary things veryr often mars the comfort and pleasure of a trip. It isr well to take just as little as is consistent with comfort,r but that little just right, keeping in mind that it is ther general tendency to take entirely too much in a desirer to play safe. If the means of transportation ber knapsacking, the load of necessity must be cut to ar minimum, whereas it can be materially increased ifr carried by pack-train or automobile.r

r

r There are a number of good books on the subject ofr camping which deal in minute detail with such subjectsr as clothing, personal effects, camping equipment,r r r r packing-outfits, cooking utensils, provisions, cooking,r selection of camp sites, etc., which will prove quiter helpful to a camper. No attempt will be made herer to cover these subjects in detail, but a few suggestionsr as to some items, particularly as related to conditionsr in this park, may be of service. Since there are sor many types of camping, and as no two experiencedr campers will agree on many details regarding camping,r each prospective camper will have to judge of ther applicability of the following suggestions to the particularr conditions of the trip contemplated.r

r r

r Clothing should be durable, of medium warmth, andr comfortably large. The following list is suggestedr as suitable for a month’s outing:r

r r

r 2 suits medium weight underwearr
r 2 woolen and 1 cotton shirt (or waists)r
r 6 prs. socks or stockings (medium to heavy)r
r 1 outing suit or old business suitr
r 1 extra pair trousers, riding breeches, or skirt ofr khaki, corduroy, or whipcordr
r 1 sweaterr
r 1 pair stout walking shoes with puttees or leggingsr (or light boots, if preferred)r
r 1 pr. comfortable light shoes for campr
r 1 pr. gloves or gauntletsr
r 1 soft felt or cloth hat with fairly wide brimr
r 2 bandannas and 3 khaki handkerchiefsr
r 1 pr. flannelette pajamasr

r r

r For riding or hiking, riding breeches are most commonlyr worn by women, or riding habits if muchr time is to be spent in the saddle. Short skirts, however,r but a few inches below the knee, and worn withr shorter knickerbockers of the same color, are suitabler for general wear if preferred.r

r r r r

r Special care should be taken to have comfortable,r good-fitting shoes, and it is well if possible to breakr

them in before starting on a trip. Shoes with broadr toes and low, flat heels, of the Munson type of last,r with soles heavy enough for cone-headed Hungarianr nails, are good for trail work and mountain climbingr But avoid crowding the soles with nails, as too manyr result in a poorer grip than none at all; and there shouldr be no nails in the shoes for riding. If shoes a half sizer larger than usual are worn with two pairs of socks,r one medium cotton and one heavy woolen pair, frictionr is reduced, and there is less danger of blisters. Whenr the feet become toughened, if two pairs of socks prover uncomfortably warm, one may be discarded by usingr cork inner soles.r

r r

r Heavy, high boots are to be avoided if much walkingr or climbing is to be done, but stout-soled, light-topped,r ten- or twelve-inch boots, just high enough tor hold the trouser legs, are particularly good. Appearancer is sacrificed, but greater freedom of movementr is obtained than with high boots or with ridingr breeches, shoes, and puttees.r

r r

r Basket-ball or similar shoes with heavy rubber solesr are good for smooth rock surfaces, comfortable forr camp use, and are used almost exclusively by somer hikers for all-around service.r

r r

r As ordinary shoe laces wear out quickly on walkingr trips, it is well to take an extra pair, or better still,r some buckskin laces. If ice work is to be encountered,r a set of baseball cleats screwed to the soles of walkingr shoes is good, but unless this kind of climbing isr particularly sought on some of the glaciers, there isr no need of them in this park.r

r r

r Although generally there is very little use for a rain-coat,r r r r a very light weight one is occasionally handy inr the event of a storm, and a bathing-suit is also convenientr on occasion.r

r r

r Personal effects are likely to become burdensomer unless care is taken to eliminate all but the truly usefulr ones. A very few toilet articles will suffice. Watch,r knife, and compass are very useful, and one shouldr never be out in the mountains without a map andr matches. With the one there is very little likelihoodr of becoming lost, and with the other comparativer comfort may be enjoyed even if caught out over night.r Many a person has experienced inconvenience, anxietyr and discomfort, if not danger, because of trusting tor someone else to carry these very necessary articles.r

r r

r An excellent Topographic Map of Yosemite Nationalr Park is published by the U. S. Geological Survey,r and may be obtained by remitting 25 cents by moneyr order or cash to the Director of the United Statesr Geological Survey, Washington, D. C. The map isr 28 1/2 by 27 inches; the scale approximately 2 miles tor the inch; and the roads, trails, and names are printedr in black, the streams and lakes in blue, and the reliefr in brown, indicated by contour lines representing 100-footr intervals. This same map, folded and boundr between paper covers, may be obtained by remittingr cents. It will not stand a great deal of usager without tearing along the creases, but the flat mapr selling for 25 cents may be mounted in durable formr convenient for carrying in the pocket by cutting itr into sections along the lines indicating each io minutesr in latitude and

longitude, and pasting these sectionsr 1/4 inch apart on muslin of a little closer weave thanr cheesecloth.r

r r

r The U. S. Geological Survey also publishes a Map ofr r r r Yosemite Valley, 35 x 15 1/2 inches, scale 2000 feet tor the inch, with 50-foot contour intervals, which willr be mailed upon remittance of 10 cents in coin. Thisr is a splendid large-scale map of Yosemite Valley andr its immediate vicinity, but does not cover the rest ofr the park.r

r r

r These maps may also be purchased in Yosemite (byr personal application, but not by mail) at the officer of the Superintendent of the park or at the generalr merchandise store.r

r r

r Tinted glasses are often useful for relieving the eyesr from the glare of the sun on the rocks, and quiter indispensable on glaciers or large snow fields. Ar pedometer, adjusted to the length of one’s step, is goodr for approximating the distance traveled in walking.r A small electric flashlight or the smallest size acetelener camp light or some type of folding candle lanternr comes in very handy at times. If mosquitoes shouldr be encountered, a bar of mosquito netting or a smallr vial of oil of citronella (repellent) might not comer amiss. Stout twine is often in demand.r

r r

r Adhesive tape rivals the safety-pin as "handy man"r about camp. By applying it to the portion of ther foot where soreness first begins to manifest itself, ar blister usually can be avoided, and it is good forr holding gauze or wrappings in place. Tape may ber used to secure the cover on an opened can, seal ther holes in a can of milk, patch a cracked watch crystal,r effect hasty repairs to clothing, and accomplish manyr original acts which readily suggest themselves.r

r r

r Take no fire-arms, as hunting is prohibited in thisr park, but be prepared with finishing tackle, for troutr are plentiful. California Royal Coachman, and Grayr and Brown Hackle flies with peacock body, are universallyr r r r good, and many others do well according to ther local conditions. Numbers eight and ten are the sizesr generally used. The necessary State Fishing Licenser may be secured in Yosemite. The daily catch of troutr is limited to twenty fish, providing, however, that in nor event may more be caught than are to be used.r It is hardly necessary to suggest a camera and andr ample supply of films for a trip into a region of suchr beauty and magnificence.r

r r

r Sleeping equipment is a most important consideration,r since about a third of one’s time is spent in bed.r The type of bedding is largely a matter of choice, butr as experienced campers differ materially as to the best,r more than one will be mentioned. All bedding materialr is best if dark in color, so as not to show the dirt.r Three wool blankets of about five pounds each arer ample for cold nights in the higher altitudes, and twor are sufficient for usual needs. A 10-ounce canvasr about seven feet square when folded will serve as ar ground cloth and also an extra covering. If the blanketsr are folded lengthwise and sewed along the bottomr and side, or fastened with large safety pins or smallr blanket pins, this sleeping-bag will give greaterr warmth and comfort. The canvas may also be mader into a bag.r

r r

r The following quotation from an Outing Announcementr of the Sierra Club describes a lighter weightr sleeping outfit recommended for use in this region:r "This should consist of a sleeping-bag made by doublingr two wool comforts, so as to give the bag the greatestr length, and sewing securely across the bottom andr two thirds of the way up the side. This bag shouldr be lined and covered with gingham or sateen, whichr should project a foot or two beyond the top as a looser r r r flap. The wool comforters may be sewed up intor separate bags as indicated, and one lined and the otherr covered. One bag can then be slipped inside the otherr for ordinary, use and removed easily for knapsackr trips where economy of weight is desirable. A tallr person will require extra length comforters. Blanketsr are too heavy and cotton comforts are not desirable.r A waterproof sheet or covering at least six by six feetr should be taken. Canvas and the ordinary rubberr blanket are entirely too heavy for this purpose. Ther most serviceable and satisfactory material is waterproofr silk (balloon silk). It is strong, durable, perfectlyr waterproof, and very light. A piece five yardsr in length, cut in half and sewed together along one side,r will make a large sheet that will protect the sleepingr bag from the ground and form a covering as well."r

r r

r One thick lamb’s wool batting comforter is lighterr and has about the same warmth as two ordinary woolr comforters, and an eiderdown quilt is still lighter forr the same amount of warmth but not so serviceable.r If a sleeping-bag is used it should be so made that itr is capable of being aired easily. Should the beddingr prove inadequate for the coldest nights, a hot-waterr bottle, heated rock, a pair of soft woolen bed socks willr probably solve the difficulty by keeping the feet warm.r A small down cushion makes a very light but comfortabler pillow. Air cushions are less comfortable butr more convenient.r

r r

r Suitable packing equipment adds to the comfort andr convenience of a camping trip. A hiker’s whole outfitr may be rolled up inside sleeping-blankets andr carried over one shoulder, but it is preferable to use ar pack-sack or pack-harness for greater convenience andr comfort, and in order to secure a better distributionr r r r of the load; this permits of the use of a light-weightr sleeping-bag which is much warmer for its weight thanr blankets. Even for carrying lunch and other lightr articles on the trail, a small knapsack or rucksack withr straps over both shoulders is much more comfortabler and permits greater freedom in walking than a bagr carried on but one shoulder.r

r r

r In packing animals, the use of coal-oil boxes (ther cases in which two five-gallon cans are shipped) slippedr into kyacks or strapped in canvas slings, greatlyr facilitates the packing of provisions or equipmentr without danger of injury from pressure of the packr ropes. Dunnage bags of stout canvas three feet longr and eighteen inches in diameter (when packed) arer very convenient for packing sleeping equipment andr personal effects.r

r r

r A pocket roll is most useful in packing and carryingr one’s effects. Again quoting from the Sierra Club’sr Outing Announcement, a description for a pocket rollr follows: "It should be made of denim or drilling, asr follows: A piece three feet square is first taken as ar back, and three box-plaited pockets, each of a footr deep, and one above the other and extending the entirer width, are securely sewed to the back and bound withr tape. The upper pocket can be divided into threer divisions to hold small articles. All these pockets canr be closed with flaps or tied with tapes. Into this rollr all one’s belongings except bedding can be packed, andr it can be arranged with eyelet and cord, and hungr to a tree when in camp."r

r r

r As cooking utensils are bulky and hard to pack atr best, care should be taken to have them of convenientr shape and size, and nesting one inside the other as farr as possible. Some of the kettles at least, should be ofr r r granite or enamel ware, so as to render them safer against acid while cooking or holding certain fruits.r or vegetables. Tight-clamped covers for these kettlesr will make it possible to carry such foods from one campr to another. Nesting ten- or twelve-inch galvanizedr buckets are handy for cold water, hot water, andr dishpan. Be sure there is an extra can opener.r

r r

r Fireless cooker, Dutch oven or folding reflectingr oven, shovel, and axe, are all good if consistent withr the means of transportation, but none are necessities.r Some type of folding stove, grate, or fire irons is veryr convenient, and a great time-saver when shifting campr often. Two iron bars 1/4 inch by 1 inch by 3 feet long,r having riveted to each end folding legs of the samer material 15 inches long, pointed at the ends, make ar very good set of fire irons when driven into the groundr about 5 inches apart at one end to hold the smallerr cooking utensils, and about 8 inches at the other endr for the larger ones.r

r r

r Provisions should not as a rule include many cannedr goods containing a large percentage of water unlessr the transportation is a minor consideration. Driedr fruits and vegetables go much farther for their weightr and bulk. It is well to plan for variety in the diet, asr this can be done with a little thought without increasingr the weight or expense. Small cloth bags are goodr for packing broken package- or bulk-goods, for paperr sacks will soon go to pieces.r

r r

r On a camping trip one craves sweets and fats muchr more than normally. One quarter pound per day perr person is about the average amount of sugar used.r Jams and jellies and an abundance of dried fruits gor well. Bacon is the regular stand-by, and ham comesr next. An average use of bacon and ham (principallyr r r r r bacon) is about one fourth to one third pound per dayr per person if used freely. If the grease is saved forr frying fish and hot cakes, making gravies, etc., littler lard or other fats need be taken for shortening andr cooking. Hot cereals for breakfast and tea as a beverager are generally liked, even by those who seldomr care for them at home. Beef extract, bouillon cubes,r and powdered soup are convenient as soup stocks.r

r r

r Butter as now packed in convenient one-poundr tins cannot be distinguished from the fresh, and therer is now some very successful powdered milk in gradesr from skimmed milk to cream. While not quite sor instantaneously available for use as canned milk, it isr much lighter and less bulky, and is generally preferredr to canned milk because of a more natural flavor.r

r r

r About five pounds per day per person is consideredr a normal allowance of provisions if they include thoser which are watery and bulky, while just about half thatr amount is sufficient if the foods are all concentratedr such as would be suitable for a knapsack trip.r

r r

r What can be Supplied in Yosemiter

r r

r A tourist or "dude," as more frequently designatedr by the guides and packers, may come to Yosemite withr never a thought of camping out and, if the notionr suddenly appeals to him, either purchase or rent everythingr essential for a comfortable camping trip. Ther Yosemite National Park Co., operating under concessionr from the Government, conducts several departmentsr which will be of service to a camper, and all rates andr prices will be found reasonable, being controlled andr authorized by the Government.r

r r

r The General Merchandise Store carries a good liner r r r of outing clothes and shoes suitable for camping, cookingr utensils, supplies, and a large stock of provisions.r It has on sale the folded map of Yosemite Nationalr Park previously mentioned, fishing tackle, And ther necessary State Fishing License. A limited stock ofr provisions may be obtained from some of the lodger,r in the park outside of the Valley.r

r r

r The Housekeeping Department can supply a partr of any number of persons with a full camping outfitr including tent, bedding, furniture, cooking utensils,r etc., for a fixed camp in Yosemite Valley, set up readyr for housekeeping.r

r r

r The Camping Tours Department serves those whor wish to move from place to place while camping out.r Guides, packers, cooks, saddle-animals, pack-animals,r and packing and camping equipment can be furnishedr those wishing to manage their own camping trips.r All-Expense Camping Tours at a fixed daily rate perr person are planned, arranged, and conducted for partiesr desiring exclusive service for saddle trips independentr of schedules, but wishing to be relieved of allr personal responsibility of management and to be abler to start on the trail carefree and without loss of time.r All riding and packing stock, attendants, sleeping andr cooking equipment, and provisions, are included inr the charge—in fact everything necessary for a completer and comfortable camping trip except one’sr clothing and personal belongings. A number ofr definitely scheduled All-Expense Camping Tours ofr from two days to two or three weeks are organized andr conducted during the summer for any individuals whor may wish to join such parties. A booklet telling ofr the trips and various activities of the Campingr Tours Department may be secured from the Yosemiter r r r National Park Company. Photographic suppliesr may be obtained at the numerous studios in ther Valley. Yosemite is well able to equip an unpreparedr camper with all the necessities for a trip, but shouldr there still remain some articles he may desire, they canr be secured quickly and conveniently by parcels post.r

r r

r There are a number of places in the park wherer one may secure information regarding camping. Ther National Park Service has an Information Bureau atr the office of the Park Superintendent. The rangers inr charge are well informed, maps of the park and Valleyr are on display and for sale, and the official booklet ofr General Information Regarding Yosemite Nationalr Park issued by the Department of the Interior is therer for distribution. The Park Service also maintains ar free Nature Guide Service with headquarters in ther Government Administration Building in Yosemite.r The transportation offices in the various hotels, lodges,r and camps, are also prepared to impart information.r

r r

r The Sierra Club maintains the LeConte Memorialr Lodge in Yosemite Valley, and the Parsons Memorialr Lodge in the Tuolumne Meadows, where maps andr books pertaining to the park are available, and informationr may be obtained from those in charge. Rangersr stationed at various points throughout the parkr can also be of assistance to campers, and their ’phonesr are available in case of need.r

r r

r On the Trailr

r r

r Before starting on the trail be sure that all fires haver been carefully extinguished, and that the camp siter has been left clean and inviting for the next camper.r The value of an early start to get the most pleasurer r r r out of a day’s travel can hardly be overstated; if a longr day’s journey is to be made it is quite essential. Butr even for a short trip, traveling is at its best in the coolr of the morning, stopping along the trail may then ber indulged in without a sense of hurry, and an early campr can be made in time to fish, swim, loaf, or explorer around camp during a part of the afternoon.r

r r

r Whether walking or riding it is well to start out at anr easy pace, increasing it gradually until muscles arer limbered and breathing comes easily. Many have ar tendency to tire themselves or their animals out duringr the first hour of travel by exhausting too much of theirr energy at the start. Endurance at a moderate gaitr throughout the day is what counts, rather than a speedr which cannot be maintained. As a rule it will ber found that it does not pay to take steep shortcuts on anr up-grade; while saving a trifle in time at the momentr as against the longer but easier grade, the additionalr effort and resulting exhaustion usually more than offsetr the temporary gain. Excessive drinking of the icyr cold water of the mountain streams and lakes is to ber avoided when one is hot, as it often brings on illness.r Drinking small amounts at frequent intervals can ber done with safety.r

r r

r Most of the trails in the immediate vicinity of ther Valley are very well made, and junction points arer usually marked by sign boards. Farther into ther mountains of the park, where there is less travel, notr so much attention has been paid to easy grades orr marking of junctions, but with the aid of the topographicr map little difficulty is experienced in followingr any of them.r

r r

r Except in occasional obscure places, trails in commonr use are clearly evident by the slight depressionr r r r worn in the ground. But sometimes in rocky places,r meadows, or forests where the ground is thickly strewnr with litter, or when the ground is covered with snow,r the path underfoot is not distinguishable. To providder against such contingencies, trails are generallyr indicated by a continuous series of easily recognizedr marks within sight of each other.r

r r

r In the forest, the marks are blazes on trees close tor the trail, a blaze being a cut through the bark exposingr a

surface of the lighter colored sapwood. Blazesr are cut in various shapes, many trails being marked byr those having the form of the letter "T." In rockyr places trails are usually indicated by several rocksr piled one on top of the other, commonly known asr "ducs," "monuments," or "cairns." In meadows,r stakes or ducs are sometimes set along the trail if ther trail is not marked where it leaves the meadow.r

r r

r By referring occasionally to the Topographic Map ofr Yosemite National Park, which no camper should ber without, the proper trails at junction points are easilyr ascertained; and if doubt exists at any time regardingr a trail, it may be dispelled by checking its course withr that of the trail indicated on the map. In this connectionr it may be well to make a few suggestions as tor how to read this map, for those not accustomed to ther use of a topographic map.r

r r

r Names, roads, trails, boundary lines, etc., are shownr in black, and lakes, rivers, creeks, etc., in blue, as onr ordinary maps; but the brown figures and linesr indicate elevations. Each brown line shows ther contour of the land at its particular elevation abover sea level, and the space between lines represents anr interval of one hundred feet in elevation. At intervalsr of each five hundred feet above sea level is a heavyr r r r brown line with figures every now and then showingr its altitude. The elevation of any point may thus ber determined by following the contour line passingr through it, back to the nearest figures in the heavyr brown line next below it in elevation, and then addingr one hundred feet for each space separating these lines.r The exact elevations of principal peaks, lakes, andr other points of interest are also indicated by brownr figures.r

r r

r The spacing, position, and form of these brown linesr tell at a glance the story of the topography of ther country. If they are spaced far apart, the landr between them slopes gently, while if they are close,r together a steep slope is indicated. The form ther lines take and their relation to each other indicate ther form and nature of the landscape. The size and shaper of a mountain, ridge, spur, etc., are indicated, and ther position shown as related to other features of ther landscape and to the points of the compass. It willr be noticed that a contour line in crossing a canyonr forms an angle which invariably points upstream, thusr indicating at a glance the direction in which ther stream flows. A little study will reveal many suchr short-cuts for reading the features of the map rapidly,r so that with a little use, the map will picture ther country in relief at a glance.r

r r

r Trails may then be left if one wishes to cut acrossr country, as it is known in advance what will ber encountered in the way of canyons, ridges, passes, etc.r But it must be remembered that the map does notr show the surface characteristics of the country. Ar steep mountain side which may be easy traveling ifr it affords good footing in a forest, may present difficultiesr ties if it proves to be a mass of broken rock, or may ber r r r impassable if it is a smooth granite slope. For thisr reason it is usually inadvisable to attempt to taker horses off the trail into unknown territory, but afootr one can usually find some way around mostr obstructions.r

r r

r But before leaving a trail be sure that you have ther points of the compass well in mind in relation to ther direction in which you are to travel, so that if your should have any difficulty in retracing your steps, ther map and compass may be brought to the rescue. Inr order to square the map accurately with the compassr it must be borne in mind that the magnetic north isr about sixteen degrees east of the true north in thisr park, so that

while the north and south line of ther compass should be parallel with the north and southr line of the map, the magnetic needle should be pointingr sixteen degrees east of north. With the map spreadr out horizontally and the top thus pointing accuratelyr to the north, it is usually easy to find one's location atr any time providing a view of some known object canr be obtained. By sighting across the position of anr object on the map to the object itself, a line is foundr passing through one's location, and the intersectionr of two such lines will definitely establish one's positionr on the map.r

r r

r In Campr

r r

r If a comfortable trip is sought, try to make campr early enough to permit of some leisure without havingr to rush to prepare camp and get dinner before dark.r In selecting a camp site a number of considerationsr enter in. Convenience to a sufficient supply of goodr Wood and water perhaps come first. As no standingr r r r timber, living branches, or shrubbery are allowed tor be cut in the Park, dead wood must be depended uponr entirely for fuel. For cooking purposes, limbs fromr one to two inches in diameter usually give best results,r with smaller branches for kindling of quick, smallr fires. If such wood is not found on the ground it isr often obtained by breaking the lower dead branchesr from living trees. This wood is dry even when thatr laying on the ground may be damp, and being usuallyr brittle, it breaks readily into lengths by striking itr against a rock, so that an axe is seldom necessary.r An abundance of good feed should be near by for ther animals.r

r r

r Seek level, dry spots for sleeping quarters. Ther edge of a meadow, although apparently dry in the daytime,r is likely to prove damp and cold at night, whiler a few steps distance into the forest or an elevationr a few feet higher will generally secure a dry spot whichr will be many degrees warmer. Where pine needlesr are available, a pile of them spread out and used as ar mattress will add greatly to the warmth and comfortr of the bed. Should mosquitoes be encountered near ar meadow, lake, or other spot where there is standingr water, they can often be avoided by pitching camp ar short distance away on higher ground or on a runningr stream. It is seldom necessary to seek shelter fromr wind unless camping in a draw or near a high mountainr pass, but it is well to determine the prevailing directionr of even a slight breeze so that the fire may be builtr where the smoke will blow away from camp ratherr than toward it. The location of the camp withr relation to the fishing, view, mountain climbing, conveniencer for side trips, or such other objectives asr may be sought, will readily suggest itself. A tent isr r r r not often needed as shelter against storms, but isr desired by some for convenience as a dressing roomr and place for storage. However, it is advisable to haver a waterproof fly or canvas of some sort for use in caser of rain, and each individual should have a waterproofr covering of some-kind for his bedding.r

r r

r Too much emphasis cannot be laid on the necessityr of selecting safe places for cooking fires or camp fires.r The danger of causing a disastrous forest fire is constantlyr present unless every possible precaution forr prevention is taken. Usually a sandy or gravelly spotr is conveniently at hand, and if not, it often can be mader by scraping away the surface covering of pine needlesr or leaves from an area several feet in diameter. Butr if the forest floor is thick and does not expose a surfacer free from roots or leaf-mold, it is unsafe, as a fire willr often smolder in such material for hours or even daysr under the surface before coming to a blaze. A firer just large enough for one's wants requires the leastr fuel, is least likely to spread, and is the easiest tor extinguish upon departure. If no camp stove or fire-ironsr are brought, flat rocks with straight edges oftenr can be found,

and quite a satisfactory fireplace may ber built with parallel sides about six or eight inches apartr and three or four feet long. A little piece of candle isr often helpful in lighting a fire if small kindling isr scarce or the wood is damp.r

r r

r In frying trout more can be cooked in the pan ifr the heads are removed, and severing the backbone inr several places will prevent a newly caught trout fromr curling up while cooking. As the heat necessary tor boil water is approximately two degrees less for eachr one thousand feet above sea-level, boiled foods requirer considerably longer cooking at the higher altitudes.r r r r Many canned foods being unsafe when allowed tor stand in their tins after opening, it is a good rule tor empty all tins of their contents as soon as opened.r

r r

r It is advisable to make up one’s bed before dark, andr to gather enough wood for dinner and breakfast, puttingr a little kindling in some covered place if dampnessr during the night seems likely. Covering the food-stuffsr will protect them from possible moisture andr various small night-prowling animals as well as thoser which arise with the break of day. Occasionallyr leather goods such as shoes, straps, and saddles arer damaged by small animals at night, unless they arer hung up or otherwise put out of reach.r

r r

r Before leaving camp a little house-cleaning is inr order. Make sure that all tin cans, paper, and refuser have been buried or burned, that the water supply hasr been left clean and free from waste of any kind, thatr the fires have been extinguished thoroughly, and thatr no articles have been left behind.r

r r

r Mountaineeringr

r r

r As a rule, mountain climbing in the park isr incidental to a camping trip rather than its mainr objective, for the reason that there are so manyr splendid peaks which are easily and safely climbedr from comfortable base camps. In many of the goodr camping places well below timberline, visited in ther course of an outing, the camper will find himself atr such an elevation, and so close to the base of some peak,r that it is a simple matter to make the ascent andr return to the camp in a single day’s trip. Althoughr many peaks rise to an altitude of about thirteenr thousand feet above sea-level, no one mountain of ther r r r park stands out in isolation, towering preëminentlyr above its fellows and thus inviting the special attentionr of the mountaineer. By this it is not to ber inferred that the peaks do not stand out from oner another sufficiently to command splendid views, forr many of them offer magnificent panoramas of forests,r lakes, and snow-clad peaks as far as the eye can reach,r and are more than worthy of the slight effort usuallyr required to reach them. But instead of rising aloner and from a low altitude they are usually found inr groups or in a chain, and commence to rise as individualr peaks from a high base altitude.r

r r

r Sierra Characteristicsr

r r

r The Sierra Nevada Range is a huge block of ther earth's crust tipped so that it rises very abruptlyr along its eastern edge, but sloping gently toward ther west. The apex of this block forms the crest of ther High Sierra which serves as the eastern boundary liner of the park. The predominating rock is granite,r varied now and then by some other formation suchr as the metamorphic rock of Mt. Dana and Mt. Gibbs.r It is generally characteristic of the peaks that-theirr east and north faces are precipitous, while they sloper more gently toward the south and west. Glacialr action is strongly in evidence in polished surfaces,r carved domes, scoured canyons, and moraines. Ar few small residual glaciers still remain on the protectedr northern slopes of some of the higher peaks,r where they have cut precipitously walled cirquesr or amphitheaters well into the mountain sides almostr to the very summits.r

r r

r True alpine conditions of climbing are not oftenr r r r encountered in the High Sierra unless deliberatelyr sought, and alpen-stocks and ropes are very seldomr required. Forests extend well up the slopes of manyr of the peaks, the timberline generally being aboutr ten thousand or eleven thousand feet. Usually butr few large snow fields are found after the middle ofr July, even at the highest altitudes, but there are oftenr patches in sheltered places or where the drifts haver been heavy. Practically all of the principal peaks.r of the park can be climbed, many of them calling forr no special requirements except an early start, endurance,r and care to avoid dislodging loose rocks. Somer present an element of danger toward the top if ther summits are shattered into large blocks difficultr to get over or around, and require a steady nerve,r and a little skillful and careful rock work.r

r r

r Near-by Yosemite Peaksr

r r

r Climbing to the points and peaks about the rim ofr the Valley may hardly be considered mountaineering,r since many of them may be reached by well-builtr trails all or most of the way, but as some of themr command excellent views of the Valley or its surroundingsr they are worthy of mention in this connection.r Glacier Point is probably the finest viewpoint of thisr kind, affording a good bird's-eye view of the easternr end of the floor of the Valley and a splendid panoramar of the High Sierra peaks. It is connected with Yosemite Valleyr by a steep footpath, two horse trails, andr an automobile road. Sentinel Dome, about a mile andr a half to the southwest, permits of a wider outlookr on the high mountain country, while Taft Point,r Crocker Point, Stanford Point, and other points alongr r r r the beautiful Pohono Trail present intimate views ofr Yosemite Valley from various angles along its southernr rim.r

r r

r From the north and west the Valley may be viewedr to advantage from North Dome, Yosemite Point,r Eagle Peak, and El Capitan, the most sweepingr panorama being that obtained from Eagle Peak. Ther most varied view to be had from such a low elevationr is that from Sierra Point, a climb of about a thousandr feet on a footpath starting from the Vernal Fallsr Trail opposite the Happy Isles. The Vernal, Nevada,r Illilouette, and Upper and Lower Yosemite falls mayr all be seen from. this one spot.r

r r

r Clouds Rest (9924 feet) and Half Dome (8937 feet)r command excellent views of Yosemite Valley from ther east, and magnificent panoramas of the High Sierra.r There is a horse trail almost to the very summit ofr Clouds Rest and to within about 1000 feet in elevationr of the top of Half Dome. The last four or five hundredr feet of this latter climb is quite unique, requiringr the use of the arms as well as the legs, there being twor parallel steel cable handrails where the surface of ther rock is so steep that it is impossible to climb afootr unaided.r

r r

r High Sierra Peaksr

r r

r There are dozens of mountains in the Yosemiter National Park twelve thousand or thirteen thousandr feet in height, and a hundred or two above ten thousandr feet, from which wonderful views of the surroundingr country are to be had. Only a few of the betterr known or more accessible ones will be mentioned.r

r r

r The highest of them, which is also one of the veryr r r r finest viewpoints and perhaps the most interestingr peak to climb, is Mt. Lyell (13,090 feet). It is usuallyr climbed from a base camp nine thousand feet inr elevation, where the Lyell Fork of. the Tuolumner River emerges into the long meadow of Lyell Canyon.r Making an early start, equipped with tinted glasses tor protect the eyes against the snow's glare, and with ther face blackened or covered with grease paint to preventr snow-burn, the climb of five and a half miles to ther summit is usually made in four or five hours. Followingr up the west bank of the stream for a little more,r than two miles, the McClure Fork is crossed at ther head of a Cascade at the 10,600-foot level. Generallyr after the middle of July it is quite free from snow up tor this point. Then the rock spurs separating ther McClure Fork and Lyell Fork, with stretches of ar large snow field in between, are followed for a littler over two miles more, veering a little to the southeastr to the foot of the Lyell Glacier. This small residualr glacier, nestling in an amphitheater which it has cutr into the northern face of the peak, is about threer quarters of a mile long and twice that in width, and isr usually almost entirely covered with deeply pittedr snow, making rather laborious climbing. At the headr of the glacier, where the moving ice has separated fromr that clinging to the head wall, is a bergschrund,r usually open to a considerable depth for the greaterr part of the width of the glacier. But it is generallyr filled with snow directly below Lyell's summit, so thatr it may be crossed where a long, narrow snow tonguer extends well up in between the rugged cliffs. Leavingr the snow tongue where it becomes too steep for travel,r and climbing up the right hand cliff, the summit isr reached after fifteen to thirty minutes of steep rockr r r r climbing where care must be taken not to dislodger loose rocks. At times when there is very little snowr covering the glacier, the bergschrund is so wide openr that it cannot be crossed at the base of the snow tongue.r The ascent can then be made up the rock wall fromr the extreme easterly end of the glacier. A splendidr panorama of snow-clad peaks, innumerable lakes, ther sources of several rivers, and broad expanses of forestr may be seen in every direction—a glorious spectacler never to be forgotten, and a lesson in the geographyr of the surrounding country which cannot be equalledr in any other way.r

r r

r The customary base camp for climbing Mt. Danar (13,050 feet) is about four miles below the summit,r at the 9700-foot level on the little branch of the Danar Fork of the Tuolumne River which originates in ther canyon between Mt. Dana and Mt. Gibbs. Theser two colorful peaks of metamorphic rock stand out inr contrast with

the neighboring gray granite peaks.r This canyon is followed up to within a few hundredr yards of the saddle between these two mountains, atr an elevation of 11,500 feet. Although it is ratherr rough traveling in some places, horses may be riddenr to this point. There is then something over a mile ofr simple, but rather arduous, climbing to the northwest,r over heaps of roughly piled and often loosely balancedr rocks. To the usually fine scenery witnessed from ar mountain top there is here added a view of ther interesting Mono Craters and the beautiful blues ofr Mono Lake to the east, and a display of the extensiver Tuolumne Meadows to the west.r

r r

r Another mountain in the main crest of the ranger from which a wide outlook may be obtained is Mt.r Conness (12,556 feet), a rugged and imposing peak,r r r r but very easily climbed. A horse trail leads nearlyr to the top from a lovely base camp at Young Laker about four miles to the southwest.r

r r

r Mt. Hoffmann (10,921 feet) generally climbed fromr the south, is comparatively isolated and affords ar view very well worth while. Cathedral Peak, Unicorn Peak,r Echo Peak, and Columbia Finger, a groupr of peaks to the south of Tuolumne Meadows allr approaching eleven thousand feet in elevation, arer interesting ascents for experienced climbers. Inr each case the climb is simple to within a short distancer of the top, where the fractured rocks of the summitr require a steady nerve and some very careful rockr work to avoid a misstep which would be fraught withr danger.r

r r

r Colby Mountain (9700 feet), near the Ten Lakesr Basin, commands a view of the Grand Canyon of ther Tuolumne, a magnificent gorge which affords a veryr interesting but strenuous four or five day knapsackr trip from Tuolumne Meadows to Hetch Hetchyr Valley.r

r r

r To the south of Merced Lake is Mt. Clark (11,506r feet), presenting a very clear-cut and regular profile.r against the skyline. It stands out at the end of ar long spur, commanding a good view of the south-easterlyr portion of the park, but it is not very oftenr climbed because rather difficult and far from a convenientr base camp. The ascent may be made fromr the northeast with the final climb along the southeastr knife edge.r

r r

r The highest peak in the Yosemite region, Mt.r Ritter (13,156 feet), is just outside of the park boundary,r about five miles in a direct line southeast of Mt.r Lyell. The climb is made up a steep rock chimney onr r r r r the west side, or across the head of the glacier from ther southeast if approached from the Shadow Lake side.r It is considered one of the more difficult mountainr climbs, but has its reward in a wonderful view of ther watersheds of the North Fork and Middle Fork of ther San Joaquin River.r

r r

r There are scores of other high mountains, wellr worthy of the effort of the climber because of ther splendid view they afford, and there is hardly a campingr place in the park but has at least a little peakr near by to tempt the one who has the spirit of ther ditty: "The bear went over the mountain to see whatr he could see."r

r r

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Motoring in Yosemite National Park

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MOTORING IN YOSEMITE NATIONAL PARK

r r

r By Wallace B. Curtisr

r r

r *r Associate Manager, Curry Camping Companyr* r

r r

r Yosemite National Parkr was first opened to Motorr travel late in the 1914 season. At that time the parkr as under the local government of the War Department,r and for the first few months conditions were farr from satisfactory. The next year, park controlr passed to the Department of the Interior and ther National Park Service was established, and since thenr there has been a steady improvement of conditions,r until now the motorist enjoys all the freedom thatr is practicable to allow.r

r r

r There are three well-established roads into ther valley, known as the Wawona Road, the Big Oakr Flat Road, and the Coulterville Road; and, in addition,r the famous Tioga Road cuts directly across ther park from Mono Lake westward over the summit ofr the Sierras. Still another road is in course of construction,r and upon its completion it will undoubtedlyr be the most popular of them all. Starting from Mercedr it will follow the State Highway to Mariposa, thenr across the mountains to the Merced River Canyon,r and thence to El Portal. From there into Yosemiter Valley a splendid highway is already constructed. Onr entire road there will be no elevation greater thanr r r r three thousand feet until one enters the park, so allr year round travel will be an easy possibility.r

r r

r Rules and road maps can be obtained from eitherr the National Park Service Headquarters in Yosemiter or at any of the hotels, camps, or lodges, and inasmuchr as there are minor changes in these from time to timer they will not be taken up here.r

r r

r Driving over mountain roads is not so dangerous,r as many people would have one believe, provided thatr one or two simple rules are always followed. Ther first, of these is, “Always keep your car under fullr control.” Many drivers have the habit of coastingr with their gears out of mesh; the risk of such a practicer is apparent, so whenever a car is on a down-grade,r the gears should be thrown into second or low andr compression used as a brake.r

r r

r The second rule is, “Don’t be afraid to shift gears.”r You may hear a driver boast that he made suchr and such a grade on “high,” but that is merely anr admission of poor judgment, for such practice putsr an undue strain upon the motor and transmission.r Before you start up a grade, decide what gear you arer going to use, get up good engine speed, and shift intor gear. Shifting gears on any grade is dangerous practicer and especially so in mountain driving.r

r r

r The driver of the car has one thing to keep in mindr and that is, that he must keep his eyes on the road andr let the rest of the passengers look at the scenery. Hisr car should be equipped with a good loud horn and itr should be used frequently.r

r r

r The principal requisite for good mountain drivingr is good common sense, and if this is coupled with ther following suggestions, no one need have any hesitancyr about attempting the trip.r

r r r r r

r *Carburetor Adjustment.* While it is true that withr higher altitudes the air mixture changes because of ther increasing thinness of the air, still it is advisable forr the average motorist to leave his carburetor untouchedr throughout the trip to the Valley. Carburetor adjustmentr to meet constantly changing air conditions is ar matter of expert judgment, and the layman is expectedr to know nothing about such adjustments. Ther only place where a carburetor adjustment mightr prove really necessary is at the summit of the Tiogar Road, while motoring to or from the low country. Inr case of trouble on this road, which seems to ber caused by an improper carburetor adjustment, simplyr give a little more air to the mixture.r

r r

r *Use of Brakes.* Come down hill as much as possibler on compression, in order to save brakes. Never letr your car gather more momentum than can be overcomer with the known strength of the brakes. Alternater the use of the brakes, first using the foot braker and then the hand brake, so that one set will notr become overheated and wear out.r

r r

r *Use of Gears.* Always decide when approaching ar hill what gear will carry the car over the grade and thenr shift into that gear before starting up the hill. Inr mountain country it is often dangerous to shift gearsr On a steep hill, and it is always an unnecessary strainr on the car.r

r r

r Always keep the gears in mesh—it insures controlr of the car. It is now a State and National Park lawr to keep gears always in mesh on Sierra roads. Neverr run on high over a steep grade just to test out ther power of the motor—it is the worst and most uselessr strain on the machine on mountain roads.r

r r

r *Tires.* Always keep tires up to guaranteed pressurer r r r on a Yosemite trip. Poor brake use, such as slidingr the wheels, or slowing up very suddenly just before ar rut, will wear out tires prematurely.r

r r

r The State and National Park law requires that atr least one spare tire be carried on the roads of Yosemiter National Park.r

r r

r *Radiators.* Never try to make a record for snallr consumption of water on a trip over any of the roadsr into Yosemite. Such a practice unnecessarily heatsr up the engine, and thus increases the consumption ofr gas and oil. Keep the radiator full of water at allr times. The water of mountain creeks is usable, butr it should be strained through a cloth before using.r

r r

r *Supplies to Carry.* Carry an extra supply of oil:r it is more essential than gasoline.r

r r

r Carry a supply of extra bolts and nuts forr specific make of car.r

r r

r Carry a spare fan belt.r

r r

r Carry a can of grease and use it freely.r

r r

r *Seeing the Country.* Take down the top when your get into the mountains if you want to see some of ther most beautiful scenery along the route.r

r r

r *Road Rules to Remember.* Always stay on the rightr side of the road.r

r r

r Up-hill traffic has the right-of-way,—accordingr tor State and National Park law.r

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Photography in Yosemite National Park

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Handbook of Yosemite National Park (1921)r by Arthur C. Pillsbury

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PHOTOGRAPHY IN YOSEMITE NATIONAL PARK

r r

r By Arthur C. Pillsbury,r Yosemite Californiar

r r

r Nor souvenir of a vacation can compare with one'sr pictures. They are more than mere records of ther scenery; each has its own associations, and each bringsr back memories outside the photo itself. We shouldr strive, however, to produce photographs which haver an intrinsic worth as pictures—likenesses whichr express our own impressions to others. In Yosemiter Valley attractive views disclose themselves to everyr side and even the amateur will have no trouble inr securing beautiful pictures if he but give a littler thought to composition and correct exposures.r

r r

r Few people realize what an important part lightr and shade play in the composition of photographs.r Under the high noonday sun most pictures are "flat"r and lifeless, and it is during the morning and afternoonr hours that the photographer gets his best exposures.r The Yosemite features change rapidly in this respectr from hour to hour during the day, and the followingr suggestions are offered with the hope that they willr help to solve some of the visitor’s problems.r

r r

r From within the Valley itself the surroundingr mountains and cliffs appear high and near—consequentlyr you would better point the camera *up* to taker their tops. Do not be afraid of distoring them asr r you would a tall building if you did the same thing, forr in Nature there are no parallel lines so marked as tor offend in a picturer

r r

r As to lighting, one should remember that no matterr how beautiful a subject is at a given time, it is *most*r beautiful at some certain hours during the day.r Yosemite Falls is a good example. At nine o’clock ther sun is casting shadows across its cliffs, and the Falls arer very beautiful, but the foreground is more or less in ther shadow. By ten the sun is on the foreground and fullr on the cliffs, but the light is a little "flat" and stays sor until about one or half past. After this time the Fallsr are casting their shadows, and every rocket as itr shoots out casts *its* shadow, so they seem to stand outr clear cut from the wall. This latter effect increasesr until two or half past, when the lower half of the Lowerr Fall is in the shadow. These light and shade effects,r in the writer’s opinion, make the best picture. Afterr two thirty the change is very rapid and by threer o’clock the Falls are almost entirely shaded.r

r r

r Bridalveil Falls are in the shadow all the morningr hours, so close views are not good until one o’clockr when the upper half of the Falls is touched by sunshiner and veiled by wonderfully luminous mist. This,r their best time and condition for posing, continuesr until two thirty.r

r r

r El Capitan from "River View" has several lightingr effects that are pleasing. From seven to eight in ther morning the shadow cast by the granite wall makes ar bold picture which is particularly good in enlargements.r During the late morning hours the sun beatsr down on its smooth face without shadows until oner o’clock, when the profile begins to stand out, andr ridges, quite unnoticed half an hour before, begin tor r r r assume shape and substance; these, the best effects,r are of short duration.r

r r

r At Happy Isles, the Meeting of the Waters, the bestr time for photographs is from ten to twelve o’clock.r Going on up the trail one will find a triangle of sunshiner on the lovely Vernal Falls at ten, which continuesr to light their wonderful outpouring of jewels and colorr until about eleven; later they are apt to be but a broadr white streak in one’s picture.r

r r

r Nevada Falls seems a thing of life between elevenr and twelve thirty when its great rockets cast shadowsr upon the face of the Fall, but when fully lit by the sunr it does not picture as well.r

r r

r Mirror Lake is at its best until, at about eightr o'clock, its surface is struck by the sun, and it losesr its reflective power. After this time it is disappointingr unless the sky holds floating clouds which producer the most beautiful effect of all.r

r r

r The foregoing remarks are but a few of the manyr which might be included if space permitted. Ther writer will be pleased to make further such suggestionsr to those who will see him personally in Yosemite.r

r r

r A word about the time of one's exposures. Comparedr with the smoke-laden atmosphere of cities, ther light in Yosemite is much faster and clearer, givingr strong negatives and good prints and enlargements.r The normal exposure within the Valley should be 1/25r second at U. S. stop 8. Mirror Lake before sunriser requires about 1/5 second exposure at U. S. aperature 8,r and pictures taken beneath the Big Trees should ber given about 1/2 second with the same opening.r

r r

r At higher altitudes the atmosphere becomes thinner,r with the effect that the sky appears more intenselyr blue but at the same time becomes darker, the sun'sr r r r rays become brighter and hotter, and the shadowsr become deeper and colder. As we ascend we get lessr diffused illumination from the atmosphere itself, andr less protection from the direct rays of the sun. Wer will therefore get more contract in our negativesr which are exposed at the higher elevations, and onr account of the more intense light the camera should ber stopped down to 16 for 1/25 second exposure.r

r r

r Distant views require only half as much exposure asr near-by subjects. Instead of reducing the exposurer the better plan is to diminish the opening so as tor admit less light.r

r r

r If the above suggestions are borne in mind ther amateur will find no difficulty in obtaining really goodr pictures during hs Yosemite vacation.r

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APPENDIX

r r r

THE WEATHER CONDITIONS OF YOSEMITEr r VALLEY

r r

By Ansel F. Hall

r r

r Oner often reads praises and generalities aboutr Yosemite climate and weather but, so far as the writerr knows, no concise statement as to exactly what mightr be expected at any given time of year has ever beenr published. The accompanying table has been compiledr from the U. S. Weather Bureau daily records forr the past eleven years and the data summarized forr each month. By examining this table one may determiner with fair accuracy the conditions which willr be encountered at the time of his visit. The followingr remarks, however, should be borne in mind.r

r r

r *Temperature.* The **Mean Maximum** is the averager of the hottest temperatures for each day during ther month (generally about 2 p.m.).r The **Mean Minimum**r is the average of the coldest temperatures for eachr night during the month (generally about 3 a.m.).r The **Mean Temperature** is the average temperaturer for the entire month. The **Maximum Temperature**r is the hottest recorded temperature during the monthr and the **Minimum** the coldest recorded during ther same period. The **Greatest Daily Range** is ther greatest temperature change for any twenty-four-hourr period during the month. The Mean Maximumr and the Mean Temperature show very little variationr r r r between the different years, but the Mean Minimumr varies considerably, especially in the late spring andr summer months. The Greatest Daily Ranges for ther different months fluctuate greatly in different years,r sometimes as much as fifteen degrees, so this factorr in the table is not as reliable for forecasting temperaturesr as are the other averages.r

r r

r *Precipitation.* Rainfall is a factor which variesr extremely in different years in both amount and frequency.r The frequency is indicated in the horizontalr column headed "Number of Days with .01 inch orr more Precipitation"; it must be remembered in thisr connection that from May to October on days uponr which rain *does* fall it is generally as short thunderr showers.r

r r

r *Snowfall.* Snowfall is the one climatic factor whichr shows the most variation from year to year. A lightr snowfall sometimes occurs in October and may ber rather definitely expected in November, the first snowr in five of the past eleven years having occurred duringr the latter month; during these two months the snowr generally melts quickly. In December, however, oner may reasonably expect permanent snow, for ther records show that in all but three of the past elevenr years Yosemite Valley has had a "white Christmas."r The melting of the permanent snow is more definiter and may be expected quite regularly between Marchr 15th and 30th.r

r r

r *Clear Days.* The number of clear, partly cloudy,r and cloudy days per month is surprisingly the samer from year to year and these figures in the table willr closely approximate actual conditions for any month.r

r r r r

r WEATHER REPORT SUMMARY, YOSEMITE, CALIFORNIA—AVERAGE FOR ELEVEN YEARS (1909r TO 1919 INCLUSIVE)r

r r

MONTHLY SUMMARY		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
Temperature														
Mean Maximum	Degrees F.	44.2	52.0	60.8	69.8	74.3	85.5	91.5	93.2	84.6	71.1	58.2	45.8	69.2
Mean Minimum	"	21.2	23.8	27.4	32.7	36.7	42.9	48.5	47.2	41.2	28.7	25.4	21.0	33.1
Mean	"	32.7	37.4	44.2	51.2	55.5	64.2	69.6	70. 1	63.6	53.2	41.8	33.4	51.4
Maximum	"	56.7	64.2	77.2	83.0	90.3	95.0	99.6	100.5	94.9	87.8	73.3	59.2	81.0
Minimum	"	6.8	11.3	18.6	22.6	26.7	33.2	37.4	36.9	32.1	23.4	16.9	8.4	22.9
Greatest Daily Range	"	36.0	42.3	48.3	51.3	51.4	52.2	53.7	56.0	55.6	56.4	46.5	39.0	49.1
Precipitation														Totals
Total	Inches	8.96	6.00	4.53	1.56	2.39	.40	.23	.28	1.06	1.54	2.94	3.90	33.88
Greatest in 24 hours	"	1.94	1.43	1.18	.70	1.18	.16	.12	.17	.58	.72	1.11	1.57	
Snow														
Total snowfall	Inches	33.1	58.5	18.7	3.6	Trace	.0	.0	.0	.0	Trace	3.5	16.9	134.3
On ground 15th	"	11.6	9.3	7.6	Trace	.0	.0	.0	.0	.0	.0	Trace	1.9	
On ground 30th	"	10.4	13.2	Trace	Trace	.0	.0	.0	.0	.0	.0	Trace	7.4	

Number of Days per Month													
With .01 in. or more precip.	10.8	9.5	8.4	5.5	4.9	2.0	1.1	1.4	2.4	3.6	5.4	5.9	61.
Clear	11.3	11.4	13.8	13.2	18.6	24.8	26.6	25.2	21.8	19.9	16.3	14.2	217.
Partly cloudy	8.1	7.3	8.7	8.9	6.6	2.8	3.0	2.9	4.3	5.4	6.7	6.7	71.
Cloudy	11.6	9.6	8.4	8.8	5.2	2.5	1.4	2.8	4.0	5.7	7.0	10.7	77.

r r r r r

r TABLE OF LAKES IN YOSEMITE NATIONAL PARK WITHr FISHING NOTESr

r r

Lake.	Species of Trout.	Fishing.
Adair Lake	Golden Trout, 1919	?
Arndt Lake	None	No fish
Babcock Lake	Rainbow (Date unknown), Steelhead, 1919	Good
Bearup Lake	Loch Leven (Date unknown)	Fair
Benson Lake	Species unknown, 1897 Loch Leven, 1905 Rainbow, 1905	Good
Bernice Lake	Eastern Brook, 1917 Loch Leven, 1913	Good
Branigan Lake	Rainbow (Date unknown)	Good
Breeze Lake	Loch Leven, 1905 Eastern Brook, 1917 Rainbow, 1917	Poor
Buena Vista Lake	Eastern Brook, 1892, 1908, 1918, 1919 Rainbow, 1892	Excellent
Cathedral Lake	Eastern Brook, 1897, 1915	Poor
Chain o' Lakes (near Fernandez Pass) (3)	Dolly Varden, (Date unknown)	Good
Chiquito Lake[1]	None	No fish
Crescent Lake	Eastern Brook, 1891, 1909, 1911	Poor
Doe Lake	No fish	No fish
Dog Lake	Eastern Brook, 1907, 1915, 1917, 1918, 1919 Rainbow, 1920 Loch Leven, 1920	Good
Dorothy Lake	Rainbow, 1911, 1913	Fair
Echo Lake	Eastern Brook, 1913	Fair
Edith Lake	None	No fish
Edna Lake	Brown Trout, 1905	?
Eleanor Lake	Rainbow, 1878, 1880 Eastern Brook, 1908	Excellent

Elizabeth Lake	Eastern Brook, 1907	Good
Ellery Lake[1]	?	Good
Emeric Lake	Steelhead, 1919	Good
Emigrant Lake[1]	Loch Leven (Date unknown)	Good
Evelyn Lake	Loch Leven, 1913 Rainbow, 1878, 1880 Eastern Brook, 1913	Poor
Fletcher Lake	Eastern Brook, 1897 Loch Leven, 1913	Poor
Flora Lake	None	No fish
Gabriel Lake	Eastern Brook (Date unknown)	No fish
Gaylor Lakes (5)	Rainbow, 1906 Cutthroat (Date unknown)	Good
Givens Lake	Eastern Brook (Date unknown)	No fish
Grant Lakes (2)	Easter Brook, 1918 Steelhead, 1918	Good
Grouse Lake	Rainbow, 1917	Good
Harden Lake	None	No fish
Harriet Lake	None	No fish
Helen Lake (Near Mt. Starr King)	None	No fish
Helen Lake (Near Kuna Crest	None	No fish
Hidden Lake	None	No fish
Huckleberry Lake[1]	Loch Leven (Date unknown)	Good
Ireland Lake	Eastern Brook, 1897	Excellent
Irwin Lake	Rainbow, 1912	Fair
Johnson Lake	Rainbow, 1897 Eastern Brook, 1891, 1911, 1917, 1919	Excellent
Kibbie Lake	Rainbow, 1878, 1880	Good
Laurel Lake	Eastern Brook (Date unknown) Rainbow (Date unknown)	Good
Lillian Lake	Rainbow (Date unknown)	Fair
Lost Lake	None	No fish
Lukens Lake	None	No fish
Mary Lake	Rainbow, 1911	Fair
Mattie Lake	None	No fish
May Lake	Eastern Brook, 1908, 1917 Loch Leven, 1908 Rainbow, 1908, 1913	Good
McCabe Lakes (5)	Loch Leven, 1920	?
McGee Lake	Rainbow, 1913 Eastern Brook, 1916, 1917	Poor
Merced Lake		Good

	Brown Trout, 1905 Loch Leven, 1905, 1918 Species unknown, 1908	
Mildred Lake	Species and date unknown	Good
Miller Lake	Species unknown, 1911	?
Minnow Lake	Eastern Brook, 1897	Good
Murdock Lake	None	No fish
Neall Lake	Species and date unknown	Good
Onion Lake	None	No fish
Ostrander Lake	Rainbow, 1892, 1893, 1899, 1911 Eastern Brook, 1893, 1899 Cutthroat (Date unknown)	Good
Peeler Lake[1]	Cutthroat	Excellent
Rock Island Lake	None	No fish
Rodgers Lake	Rainbow, 1907 Loch Leven, 1907	Excellent
Royal Arch Lake	Eastern Brook, 1897	Excellent
Rutherford Lake[1]	Rainbow (Date unknown) Eastern Brook, 1905	Excellent
Saddlebag Lake[1]	Species and date unknown	Good
Shamrock Lake	None	No fish
Sister Lake	None	No fish
Smedberg Lake	No record	Poor
Snow Lake	None	No fish
Soldier Lake	None	No fish
Spiller Lake	Species unknown, 1875	Poor
Summit Lake[1]	Species and date unknown	Poor
Surprise Lake	None	No fish
Swamp Lake (Near McGill Meadow)	None	No fish
Swamp Lake (Near Gravelly Ford	None	No fish
Table Lake	None	No fish
Tallulah Lake	None	No fish
Tenaya Lake	Eastern Brook, 1909, 1917, 1918, 1919, 1920 Rainbow, 1911, 1915, 1917, 1918, 1919, 1920 Loch Leven, 1911, 1920 Cutthroat, 1918, 1919 Steelhead, 1919	Fair
Ten Lakes (10)	Eastern Brook, 1908, 1913, 1915, 1918 Loch Leven, 1908 Steelhead, 1918	Good
Tilden Lake	Species unknown, 1905, 1911 Rainbow, 1912	Good

Tioga Lake[1]	Species and date unknown	Good
Twin Lakes	Species and date unknown	?
Vernon Lake	Rainbow, 1878, 1880 Eastern Brook (Date unknown)	Good
Virginia Lake	Rainbow (Date unknown)	Fair
Virginia Lakes[1]	Species and date unknown	Good
Vogelsang Lake	Loch Leven, 1913 Eastern Brook, 1918	None
Washburn Lake	Eastern Brook, 1905 Loch Leven, 1905 Species unknown, 1908	Good
Wilmer Lake	Rainbow (Date unknown) Eastern Brook (Date unknown)	Good
Young Lake	Eastern Brook, 1914 Rainbow, 1914	Good
Unnamed chain of Lakes near Lake Eleanor (4)	Loch Leven, 1911	?
Unnamed lake 1 mi. west of Parsons Peak	Loch Leven, 1913	?
Unnamed lake at the source of Emeric Creek	Cutthroat, 1919 Golden, 1920	?
Unnamed lakes just west of Schofield Peak	Rainbow. 1912	?
Unnamed lake near Vogelsang Pass	Eastern Brook, 1918	No fishing
Unnamed lakes (2) near Bernice Lake	Eastern Brook, 1917	Good

r r

r [1] = Outside park boundaries.r

r r

r Besides the lakes listed above (112 in the Park and 10 just outside) ther U. S. G. S. "Topographic Map of Yosemite National Park" shows 317 otherr unnamed lakes—mostly small—within the Park.r The total number of lakesr within the Park is 429.r

r r r r

r TABLE OF STREAMS IN YOSEMITE NATIONAL PARK WITHr FISHING NOTESr

r r

Stream.	Species of Trout.	Fishing.
Alder Creek	Eastern Brook, 1891	Fish plentiful

	Loch Leven, 1897 Rainbow (Date unknown)	but small
Alkali Creek	None	No fishing
Avalanche Creek	None	No fishing
Babcock Creek	Rainbow, 1896 Eastern Brook, 1905	Fair
Big Creek	Species unknown, 1905	?
Big Meadow Creek	None	No fishing
Bishop Creek	Rainbow, 1896	Poor
Bluejay Creek	None	No fishing
Breeze Creek	Rainbow, 1896	Good
Bridalveil Creek	Rainbow, 1892, 1899, 1905 Eastern Brook, 1893, 1899	Good
Buck Creek	None	No fishing
Budd Creek	None	No fishing
Buena Vista Creek	Rainbow (Date unknown)	Good
Camp Creek	None	No fishing
Cascade Creek	Eastern Brook, 1897	Fish all small
Cathedral Creek	Eastern Brook, 1917 Rainbow, 1920	Plentiful but small
Cherry Creek[1]	Species and date unknown	Good
Chilnualna Creek	Eastern Brook, 1892, 1899 Rainbow, 1892, 1899	Fish plentiful but small
Conness Creek	Rainbow (Date unknown)	Fair
Crane Creek	Rainbow, 1915, 1916, 1917	Fish all small
Dana Fork Tuolumne R	Rainbow (Date unknown)	Good
Delaney Creek	Rainbow (Date unknown)	Poor
Dingley Creek	Rainbow (Date unknown)	Poor
Eagle Peak Creek	None	No fish
Echo Creek	Eastern Brook, 1905	---
Eleanor Creek	Species and date unknown	Good
Falls Creek	Rainbow, 1913	Good
Fletcher Creek	E. Brook (Date unknown)	Good
Florence Creek	?	?
Foerster Creek	None	No fish
Frog Creek	Rainbow, 1905	Good
Givens Creek	None	No fish
Gray Creek	None	No fish
Grouse Creek	Rainbow (Date unknown)	Good
Illilouette Creek, near mouth	Cutthroat, 1918	Good
Illilouette Creek, above Valley rim	Eastern Brook, 1893 Rainbow, 1893, 1905	Good
Illilouette Creek, Clark Fork	Rainbow, 1905	Good

Indian Creek, near Chinquapin	Rainbow (Date unknown)	Fair
Indian Creek, Indian Canyon	None	No fish
Ireland Creek	None	No fish
Jack Main Creek	Rainbow, 11905	Good
Kerrick Creek	Species unknown, 1905 Rainbow, 1906	Good
Kibbie Creek	None	No fishing
Leevining Creek[1]	Species and date unknown	Good
Lilly Creek	None	No fishing
Little Crane Creek	Species and date unknown	Fair
Little Yosemite	Eastern Brook, 1891, 1905 Rainbow, 1891, 1896, 1911, 1912, 1913, 1917	Good
Lyell Fork, Merced R.	Eastern Brook, 1908 Rainbow, 1908	Good
Lyell Fork, Tuolumne River	Eastern Brook, 1879, 1919 Rainbow, 1896, 1915 Cutthroat, 1896 Tahoe Trout, 1896	Good
Matterhorn Creek	Eastern Brook, 1905	Good
Merced River, at El Portal	Eastern Brook, 1918, 1919	Good
at Yosemite Valley	Rainbow, 1909, 1912, 1917 Brown Trout, 1905, 11920 Loch Leven, 1912 Dolly Varden (Date unknown) Steelhead, 1917 Cutthroat, 1918, 1919 Eastern Brook, 1917, 1918, 1919, 1920	Fair
at Little Yosemite	Eastern Brook, 1891, 1905 Rainbow, 1891, 1896, 1911, 1912, 1913, 1917	Good
Merced River, McClure Fork	Eastern Brook, 1905	Good
Merced River, Lyell Fork	Rainbow, 1908 Eastern Brook, 1908	Good
Merced River, South Fork	Rainbow (Date unknown) Brown Trout (Date unknown) Eastern Brook, 1899	Good
at Gravelly Ford	Cutthroat, 1895	Good
near Buck Camp	Eastern Brook, 1899 Rainbow, 1899	Good
Miller Creek	Eastern Brook, 1916	Good
Moss Creek	Rainbow, 1915 Eastern Brook (Date unknown)	Fish plentiful but small
Murphy Creek	Species and date unknown	Fair
North Crane Creek	Species and date unknown	Fish all small
Ottoway Creek	None	No fish

Pigeon Creek	None	No fish
Piute Creek	Rainbow, 1896 Eastern Brook, 1903, 1905	Good
Porcupine Creek	Species unknown, 1897	Fish all small
Rafferty Creek	None	No fishing
Rancheria Creek	Eastern Brook, 1905	Good
Red Creek	None	No fish
Register Creek	None	No fish
Return Creek	Eastern Brook, 1896, 1913	Poor
Ribbon Creek	None	No fish
Rodgers Canyon Cr.	Rainbow (Date unknown)	Good
Rush Creek (Merced)	Rainbow, 1892, 1897 Unknown, 1905	Poor
Sentinel Creek	None	No fishing
Slide Canyon Cr.	None	No fishing
Smith Creek	Eastern Brook, 1916	Fish all small
Snow Creek	Species and date unknown	Fish all small
Spiller Creek	None	No fishing
Stubblefield Canyon Cr.	None	No fishing
Sunrise Creek	Species and date unknown	Poor
Tamarack Creek	Eastern Brook, 1896, 1920 Rainbow or Cutthroat, 1919	Fish all small
Tenaya Creek in Yosemite Valley	Eastern Brook, 1907 Rainbow, 1909	Fair
Thompson Canyon Cr.	None	No fish
Tilden Canyon Cr.	Species and date unknown	Good
Tiltill Creek	Species unknown, 1897 Eastern Brook, 1905	Fair
Tripple Creek	Eastern Brook. 1907	Good
Tuolumne River at Hetch Hetchy	Tahoe Trout, 1896 Cutthroat, 1896 Rainbow, 1896, 1906 Eastern Brook, 1906	Good
at Conness Creek	Cutthroat, 1896	Good
at Soda Springs	Tahoe, 1895 Loch Leven, 1920 Rainbow. 1896, 1915, 1920	Good
Tuolumne River, Lyell Fork	Tahoe, 1896 Rainbow, 1896, 1915 Eastern Brook, 1897, 1899, 1919 Cutthroat, 1896	Good
Tuolumne River, Dana Fork	Rainbow (Date not known)	Good
		Good

Tuolumne River, Middle Fork	Loch Leven, 1897 Eastern Brook, 1906, 1917, 1918, 1919	
Tuolumne River, South Fork	Species unknown, 1905 Rainbow, 1899 Eastern Brook, 1906, 1917, 1918, 919	Good
Virginia Canyon Cr.	Loch Leven, 1920 Rainbow, 1920	?
Wilson Creek	Eastern Brook, 1916	?
Yosemite Creek	Eastern Brook, 1893, 1897, 1917 Rainbow, 1893, 1905 Cutthroat, 1897	Fair

r r

r [1] = Outside park boundaries.r

r r r r r r

THE IDENTIFICATION OF TREES

r r

r In using the following key the trees are eliminatedr by groups until the species is finally determined.r For example: We may first examine the leaves tor determine whether they are in bundles or arrangedr singly on the branchlets; this will eliminate the larger group "I" or "II." If the tree falls in group "I"r we then determine whether there are 5, 3, 2, or 1 needlesr in a sheath; this will put the tree in class "A," "B,"r "C," or "D." If the species falls in class "A" it mayr be further traced by comparing the characteristicsr listed under subdivisions "1," "2," and "3"; theser will determine the species.r

r r

KEY TO THE CONE-BEARING TREES OFr r YOSEMITE NATIONAL PARK

r r

r (All have needle-like, awl-like, or scale-like leaves)r

r r r

r I.—Leaves in bundles with a sheath around the baser (Pines)r

r r

r

r A—Needles in bundles of 5 (**White Pines**)r

r r

r

r 1—Cone large (12 to 24 in.). Bark red-brown, inr large plates, and flaky. Alt. 4000 to 7000.r

r r

r **SUGAR PINE** . . . *Pinus lambertiana*r

r r

r 2—Cone medium (6 to 10 in.). Bark dark grayr and in small 5-sided plates. Alt. 7500 to 9500.r

r r

r **WESTERN WHITE PINE** . . . *Pinus monticola*r

r r

r 3—Cone small (about the size of a hen's egg) andr hard. Bark white and smooth. Alt. 9000 to 11,000.r

r r

r **WHITE BARK PINE** . . . *Pinus albicaulis*r

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r

r r r r

r

r B—Needles in bundles of 3 (**Yellow pines**)r

r r

r

r 1—Foliage silver-gray. Small or medium-sizer tree, generally branching into several main trunks.r Cones large (5 to 8 in.), heavy, and armed withr stout hooks. Alt. only below 3000.r

r r

r **DIGGER PINE** . . . *Pinus sabiniana*r

r r

r 2—Foliage green. Tree large and generally withr but one main trunk. Bark in large plates and flaky.r Alt. 2000 to 8000.r

r r

r

r (a)—Cones 2 1/2 to 5 1/2 in. long. Foliage green.r Bark yellow-brown.r

r r

r **WESTERN YELLOW PINE** . . . *Pinus ponderosa*r

r r

r (b)—Cones 5 1/2 to 11 in. long. Foliage blue-green.r Bark reddish brown. Generally at higherr altitudes than western yellow pine.r

r r

r **JEFFREY PINE** . . . *Pinus jeffreyi*r

r

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r r

r

r C—Needles in bundles of 2. Cones small (3/4 tor 2 1/2 in.). Small tree (average 70 ft. tall and 2 ft.r in dia.). Bark purple-gray and in flakes (notr plates).r

r r

r **LODGEPOLE PINE OR "TAMARACK"** . . .r *Pinus contorta*r

r

r r

r

r D—Needles one in a sheath. Cones small (2 tor 3 in.) but seeds large. Tree small. Occursr entirely on eastern slope of Sierra Nevada exceptr one tree in Pate Valley.r

r r

r **PINYON OR NUT PINE** . . . *Pinus monophylla*r

r

rr r

r II.—Leaves **not** in bundles.r

r r

r

r A—Leaves linear (*i.e.,* needle-like.) Bark neverr fibrous or stringy.r

r r r r

r

r 1—Fruit a cone.r

r r

r

r (a)—Cones erect and occur only near tops ofr trees. Leaves without petioles (leaf stalks). (**Firs**)r

r r

r

r I—Bark of old trees gray and deeply furrowed.r Needles on lower branches spread flatr (2-ranked). Alt. 4000 to 8000.r

r r

r **WHITE FIR** . . . *Abies concolor*r

r r

r II—Bark of old trees red and roughened byr vertical and transverse fissures. Needles allr around branchlets and curved up. Alt.r above 7000.r

r r

r **RED FIR** . . . *Abies magnifica*r

r

r r

r (b)—Cones pendent. Leaves with petioles.r

r r

r

r I—Cone medium sized (2 to 4 in.) and withr trident-shaped bracts sticking from betweenr the scales. Tip of tree erect. Alt. 3000r to 6000.r

r r

r **DOUGLAS FIR** . . . *Pseudotsuga taxifolia*r

r r

r II—Cone small (i in.) and without exsertedr bracts. Tip of tree drooping. Alt. onlyr above 8500.r

r r

r **MOUNTAIN HEMLOCK** . . . *Tsuga mertensiana*r

r

r

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r r

r

r 2—Fruit a drupe (like a plum) with a kernel muchr like a nutmeg when dried. Needles sharp-pointedr and two-ranked. Small tree occurring in ther canyon of the Merced only below Cascade Falls.r

r

r **CALIFORNIA NUTMEG** . . . *Tumion californicum*r

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r r

r

r B—Leaves scale-like or awl-like. Bark of all olderr trees fibrous and stringy.r

r r r r

r

r 1—Fruit a blue berry (really a modified cone).r Leaves scale-like and closely pressed around twigs.r Spray round. Inhabits open rocky sites above 7000r ft. alt.r

r r

r **WESTERN JUNIPER** . . . *Juniperus occidentalis*r

r r

r 2—Fruit a true cone.r

r

r (a)—Cones medium size (1 1/2 to 3 in.) and withr many scales. Needles of lower branches awl-like.r Mature trees very large. Occurs only in scatteredr groves, the nearest of which is 17 1/2 miles fromr Yosemite.rr r

r **GIANT SEQUOIA** . . . *Sequoia gigantea*r

r r

r (b)—Cones small (i inch or less) and with only 5r (apparently 3) scales. Needles scale-like andr decurrent (i.e., with a portion of their bases fastenedr along the branchlets). Trees up to 5 feet in diameter.r Spray flattened. Occurs abundantly inr Yosemite Valley and up to 8000 ft. alt.r

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r **INCENSE CEDAR** . . . *Libocedrus decurrens*r

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r http://www.yosemite.ca.us/library/handbook_of_yosemite_national_park/appendix.htmlr

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r Yosemite > Library >r Handbook >r

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Handbook of Yosemite National Park (1921) edited by Ansel F. Hall

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r Next: Introductory Noter

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Overview

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r Ansel F. Hall edited *Handbook of Yosemite National Park*r after arriving at Yosemite in 1920.r The young National Park Service was just established in 1916,r and Ansel Hall, on his own initiative, established the Yosemite Museumr and began continuous, innovativer interpretative programs in Yosemite National Park.r Various sections of the *Handbook* were written by specialistsr in various fields, such as Willis Linn Jepson's chapters on plantsr or A. L. Kroeber's section on Yosemite Indians.r While some chapters drag on with too much detailr on park telephone lines and NPS badge designs,r others, such as Kroeber's "Indians of Yosemite,"r provide concise, authoritative information in a readable, interesting style.r

r r

r Keep in mind that since this book was published in 1921,r many new discoveries have been made in Yosemite Park history and science.r That said, most of the ideas and facts given in the *Handbook*r are still relevant to Yosemite National Park today.r

r r

r —Dan Anderson, August 2004r

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About the Editor

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r *r Ansel F. Hallr*

r (Merrie Winkler Collection)r r

r r r Ansel F. Hall was born May 6, 1894 in Oakland, California.r He graduated in 1917 from University of California in forestry.r He served first in Sequoia National Park as a ranger,r then served during World War I in France.r After the war, he was a park naturalist in Yosemite National Parkr during 1920 to 1923, when he wrote the *Handbook*.r He established innovative interpretative program in Yosemite,r started the Yosemite Museum Association, made geological models,r native crafts, and mounted natural history specimens.r Mr. Hall rose in the ranks as chief naturalistr of the Park Service and similar positions.r Ansel Hall wrote two other books on Yosemite.r *Guide to Yosemite* (1920)r describes trails in the park (98 pages and map).r r *Yosemite Valley: An Intimate Guide* (1920)r is a pocket book that describes the valley for touristsr (90 pages, maps, and illustrations).r Mr. Hall married June Alexander in 1924, and they had 6 children,r including triplets.r He left the park service in 1938 to operate concessionsr in Mesa Verde National Park.r Later he worked as a consultant in park design and interpretationr and wrote books on the topic.r Ansel Hall died suddenly in 1962.r Ar r biographical sketch of Ansel Hallr by John Bingaman isr inr r *Guardians of the Yosemite* (1961), p. 111.rr r

Bibliographical Information

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r Hall, Ansel Franklin (1894-1962)r *Handbook of Yosemite National Park:r a compendium of articles on the Yosemite region by the leading scientific authorities*r (New York : G. P. Putnam's Sons, 1921).r 347 pp. ill. folded map. 20 cm.r Brown cloth covering with ivory and black lettering and cover art.r Dust jacket with green lettering and art.r LCCN 21014069.r Library of Congress Call No. F 868.Y6 H18r

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