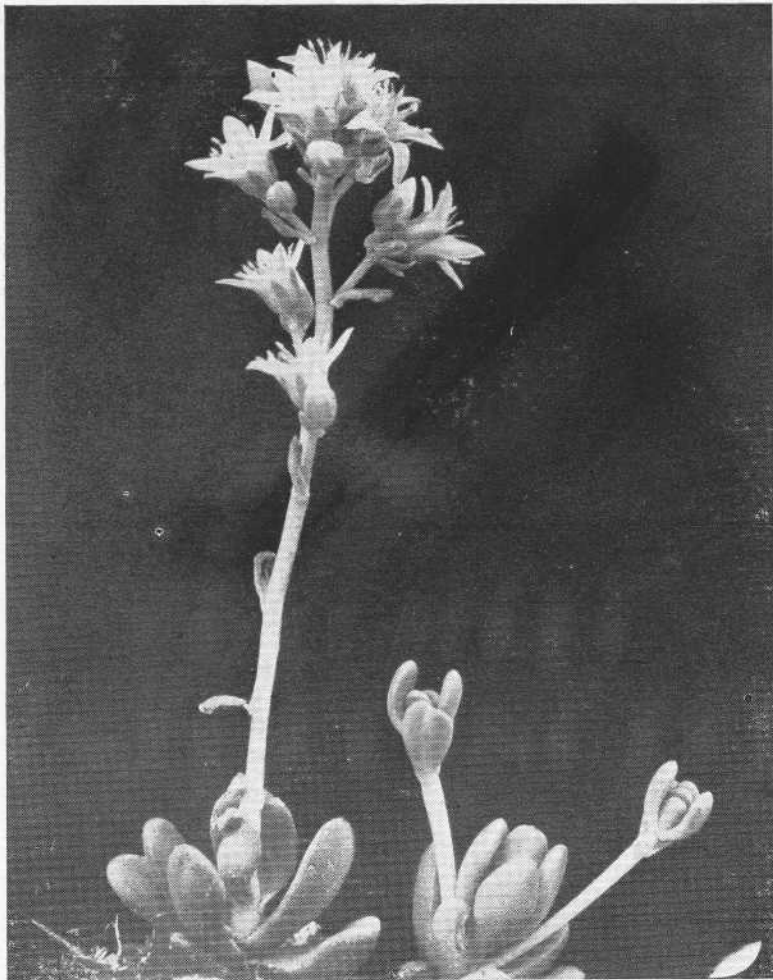


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THE GRANITE STONECROP (*Sedum obtusatum* Gray)

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THE WHITE-BARK PINE

By Ranger Naturalist Carl W. Sharsmith

Fringing all the high peaks of Yosemite is a ragged forest of storm-beaten trees, the zone of timberline. This forest is almost entirely composed of a single species, the White-bark Pine (*Pinus albicaulis*), of which much has been written, and of which much remains to be told. Of the facts that follow there is little new; rather an attempt is made to give a general account intended as an appreciation of this most interesting tree.

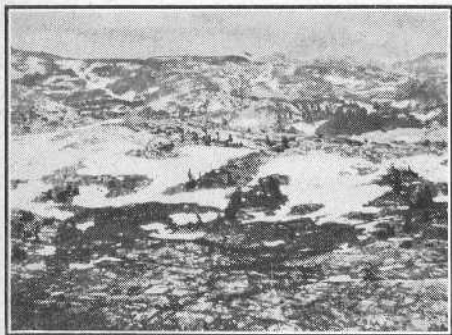
Descriptions enabling one to recognize the White-bark Pine are to be found in numerous tree books. Briefly, it is the only five-needled timberline pine in Yosemite, occurring from about 9500 to an extreme of 11500 feet altitude. It is generally a low, rather bushy tree (Muir called it the Dwarf Pine), with numerous erect trunks, or the trunks frequently sprawling along the ground. The bark of young trunks is smooth, pale or whitish. This whitish color, which is retained until a stem diameter of six inches or more is attained, is responsible for the name "White-bark," as is that of "albicaulis," which in Latin means white stem. In addition to these more ob-

vious features are several details of interest to be considered below.

White-bark Pine is the dominant and usually exclusive timberline tree in most of the Sierra Nevada, but in the Cascades and more northerly Rocky Mountains of Wyoming, Montana, and Idaho to central British Columbia and adjacent Alberta it alternates with or is intermixed with other timberline species. Elsewhere at timberline in the West it is either mostly replaced by Limber Pine (*Pinus flexilis*), or, in the more southerly Rocky Mountains and Great Basin, completely replaced by both Limber and Bristle-cone Pine (*Pinus aristata*). The latter situation is duplicated in the southern Sierra Nevada, where White-bark Pine drops out entirely, and the dominant role of timberline tree is taken over by Foxtail Pine (*Pinus balfouriana*, a very close relative of Bristle-cone Pine), with Limber Pine as occasional. Very far northward of the northernmost limits of White-bark Pine, where forest gives way to arctic tundra, timberline is formed mainly by White Spruce and Black Spruce. Contrary to what one might expect, it is Lodgepole Pine (*Pinus contorta*),

rarely a timberline tree in Yosemite, and not White-bark Pine which goes farthest north. Lodgepole Pine, in fact, gets pretty close to arctic timberline in interior Alaska and Yukon.

This distributional outline of some of our timberline trees is of interest since it is easy to fall into the error of believing White-bark Pine to be the timberline tree everywhere in our western mountains and northward. Rather, it is relatively localized, and probably only in the Sierra does it form the most extensive pure stands.



The features which permit successful existence of the White-bark Pine under the rigors of timberline conditions are not completely known. Some of them lie in the special physiology of the tree; others are structural. The branches are extremely flexible, and in its growth the whole tree can readily accommodate itself to the direction of the prevailing winds. Indeed, few trees attain a better "streamlined" shape. Some of the most perfectly streamlined are those clumps crouched in the lee of some exposed block of granite. Each winter sees the new shoots, which in

a more genial season have grown beyond the rock's shelter, trimmed away by the cutting blasts. Few trees are more tenacious of life. An individual may be blown down, over half of it may already have been long dead, yet the prostrate trunk sees centuries more of life and develops a new thicket of branches.

The prostrate habit of White-bark Pine is a remarkable feature. Wind pressure may make the tree prostrate from the very beginning, or it may be later overthrown. In either case the short, thickset, prostrate or semiprostrate trunks send up dense branches which become trimmed off above by the winds, often forming a type of "forest" over which we can walk. This form of growth is best developed in the most exposed places. In somewhat more sheltered spots, the taller prostrate clumps form snug protected nests for our sleeping bags when we camp closest to the high peaks, and of these more must be said subsequently. In connection with the prostrate form of White-bark Pine, it is noteworthy that this form is never assumed by the Foxtail Pine of the southern Sierra timberline. Contrary to White-bark Pine, Foxtail Pine is always erect to the last ditch.

It is difficult always to be sure one is dealing with an individual tree, since so often a number of separate erect trunks are formed, which, judging from the ground surface, do not seem to be joined. They may, however, all spring from the same root system. Often a number of such trunks arising from one root system,

all of about the same height, stand in a row athwart the winds. They then form ideally what John Muir would have called "a harp for the winds." Certainly they are the most advantageously located of all Yosemite trees to make the most continuous "pine music," and when they take the form just described they can perhaps be likened to an aeolian harp or lyre. Again, several trunks may join near the base so that it is difficult to know whether one or several trees is involved. Near Mono Pass several good sized, erect trunks, all apparently fused near the base, together form the largest single trunk diameter known to me for White-bark Pine, in what may or may not be a single tree. The diameter of the common trunk near the base is ten feet and the circumference is 31 feet. The dimensions of this tree were more fully described by me in Nature Notes, XI, September 1932, p. 2.

Little if anything seems to be known concerning the maximum age attained by White-bark Pine. That the age of individuals in high exposed situations runs into many centuries is obvious. Growth in such localities is extremely slow, as the very narrow layers of growth in the wood testify. In cutting off a branchlet to examine the annual rings (annual growth layers) on the cut surface with a lens, it is common to find forty years of growth in a diameter of three-sixteenths of an inch inside the bark. John Muir observed seventy five years of growth in a branchlet scarcely one eighth inch in diam-

eter inside the bark. This means that it took seventy-five years to grow one-sixteenth of an inch thickness of wood, yet this is quite a plausible record for White-bark Pine.

The bark is worthy of consideration. In White-bark Pine, as in all the white pine group of pines to which our tree belongs, cork formation is very late; the smooth whitish primary bark persisting for a long time—sometimes until the trunk is eight inches in diameter. As mentioned previously this whitish primary bark gives the tree its name, although it is frequently also a beautiful purplish tint. On small branchlets this bark is surprisingly thick and may occupy half to two thirds the total diameter of the stem. A large proportion of this young bark is taken up by big, closely spaced resin vesicles. As is well known, the flexibility of the branchlets is so great they may be tied into knots without breaking. This great flexibility is no doubt much assisted by the lubricating effect of the abundant resin.

Another feature connected with the bark is the peculiar moniliform branchlet (branchlet resembling a chain of beads). This appears in some other Yosemite conifers, but is best developed in White-bark Pine. Here the leafless portion of the branchlet is made up of a succession of oval to spherically swollen portions or joints of bark each separated from its neighbor by a constriction. The likeness of such a branchlet to a chain of beads is quite marked, both as to size and form. Each of these "beads" repre-

sents a complete season's growth in length; thus seven such "beads" within an inch length would represent seven years of growth; a not unusual number.

Among all the pines native not only to Yosemite, but also to all of North America, White-bark Pine possesses the only cone which after ripening ultimately falls to pieces. Thus it is usually useless to hope to find White-bark Pine cones under a tree; all one finds are cone scales and cone cores scattered over the ground. In this respect the cone resembles in behavior those of the true fir, though, of course, there is only a remote relationship between them. The remarkable disintegration of the cone is of further interest when we realize it occurs again in only one or two other of the world's pines native to high altitudes in Europe and eastward through Siberia (i. e. the Swiss Stone Pine). The disintegrating cone peculiar to these and White-bark Pine, as well as other similarities, indicates they are a very closely related group of "brothers." Such close resemblance in nature is not accidental, but rather is probably tied up with common ancestry and migration. In this connection it is of added significance to note that with all the disintegrating cone group of pines some kind of Nutcracker finds a congenial habitat and prime food supply; in fact, the total world range of the genus of Nutcrackers (*Nucifraga*) is more or less restricted, especially during the breeding season of these birds, to the range of these pines. Thus the familiar

raucous cries of Nutcrackers would greet us in timberline in Europe and Siberia as in our own Yosemite. This constant association of these birds with the disintegrating cone pines of timberline is an association which has its roots in a lengthy and eventful common history of the two. With us the Clark Nutcracker harvests probably at least seventy five per cent of each season's crop of seeds of White-bark Pine. In doing so it inadvertently drops some here and there, and thereby greatly assists in spreading new White-bark Pines, a task for which our tree is poorly equipped since contrary to most pines the seeds have no wing at all.

No sketch such as has been given seems complete without some comment on the relation of White-bark Pine to camping within its range in Yosemite or elsewhere in the Sierra. There are few other mountain ranges where one can camp more comfortably so high up, and while this is in large part due to the generally ideal high Sierra summer climate, much is also due to the presence of White-bark Pine as a resource of shelter, bed, and fuel. Clumps of our tree form fine shelters from the wind, and deep accumulations of needles form a springy mattress on which to lay our sleeping bags. Muir stated this about White-bark Pine long ago, that "in detached clumps never touched by fire the fallen needles of centuries of growth make fine elastic mattresses for the weary mountaineer, while the tasseled branchlets spread a roof over him, and the

dead roots, half resin, usually found in abundance, make capital campfires . . ." ("Our National Parks," p. 107).



As to the phrase "never touched by fires," it is quite true that fire, the arch enemy of forests, seldom reaches these trees, the scattered clumps separated and protected as they are by rock fields. Only very rarely will one find a group burned by a lightning-caused fire, its isolation in rocky terrain preventing spread of the fire to neighboring groves. Aside from the rare occurrence of fire, the needles truly accumulate quite undisturbed for cen-

turies beneath the thick-set clusters of trunks. On preparing a sleeping place beneath a clump of White-barks, the camper will dig with his fingers to lift up big chunks of the matted dry needles and crumble these over the level spot chosen for his bed already provided with a deep needle layer, making it even more deep and soft. Such a shelter and such a bed make a truly snug nest, and the long dead, dry resinous wood in easily manageable chunks is all about for the campfire.

A final point which must not be overlooked when camp is made high up in the outposts of the White-bark forest is the comparative or complete freedom from the early season snow mosquitoes because of the mountain breeze.

"Shelter and fuel fit for the gods from the same tree" is the camping characterization John Muir once gave to White-bark Pine. In this statement Muir had in mind not only the remarkable qualities which make it ideally adapted for camping, but also the combination of this unique tree and its wonderful high mountain home. Snugly esconced beneath its shelter amid the high peaks, the camper is in a world apart; the alpine world of the high Sierra. The glory of the alpenglow suffuses the landscape each morning and evening. Diminutive meadows and rock gardens are starred with beautiful flowers met nowhere but here, refreshed by rills of the purest sparkling water. All day the groves and mountainsides resound to the raucous calls of the Clark Nutcracker,

and intermittently from the neighboring rock slides is heard the curious bark of the cony. Other high mountain birds and mammals carry on their various affairs and enliven the day. In evening after the alpenglow fades they fall silent, the landscape practically vanishes, and its place is taken by the night overhead filled with seemingly billions of stars, which in the arc of the Milky Way glow like pulverized diamonds. When the full moon rises the landscape appears anew in a silvery cold light. Truly the night sky dominates the alpine world in a fashion never dreamed of by the lowland dweller. But the little camp beneath the White-barks is now filled with the ruddy glow of the campfire. A tiny sanctum of intimacy, warmth and good cheer remains, excluding the cold light of illimitable space.

A BEAR'S NAP RUDELY INTERRUPTED

C. F. Brockman, Park Naturalist

For several years the toboggan

slide in the vicinity of Camp Curry, which was so popular with Yosemite winter visitors not so long ago, has been unused. Most of our visitors in recent years had a decided preference for skiing or skating as a winter sport.

This year, since the Navy has taken over the Ahwahnee Hotel as a convalescent hospital, interest was again manifest in the toboggan slide and on the evening of January 20th a large group of sailors gathered there to sample a bit of fun. Imagine their surprise when, on the trial run, as the first toboggan glided swiftly downward, a black bear suddenly appeared from beneath the runway and, aided by the whoops of the audience and particularly the shouts of the two men on the toboggan, quickly sought refuge in a nearby tree. Soon after the toboggan swept by the bear descended to the ground and was last seen moving through the trees toward the base of the cliffs where a more suitable location for quiet rest was undoubtedly located.





YOSEMITE SUCCULENTS

leid Moran, Ranger-Naturalist, 1941

Most of the succulent plants grown in rock gardens come from far countries: Mexico, the Canary Islands, South Africa. Yet here in Yosemite grow succulents as pretty and as interesting, little noticed because they are so much a part with their natural surroundings.

The Mexican Hen-and-Chickens or Echeverias, so commonly cultivated, have their counterparts here in California. Though ill-adapted to cultivation, the native Echeverias are attractive in the wild—sometimes strikingly so. In Yosemite the Nevada Echeveria (*Echeveria nevadensis**) clings to rocky ledges along the north side of the Valley; it may be seen on John Muir's Sunny Side Bench, at Snow Creek Falls, and above the All Year Highway. The fleshy leaves, forming a rosette, may be green or covered lightly with whitish powder. In May and June the clusters of bright yellow or orange-yellow flowers are conspicuous and beautiful.

The Mossy Stonecrop (*Sedum spathulifolium*) forms green mats on

rocks, especially on the south wall of the Valley. It may be found along the four mile trail to Glacier Point, between Vernal and Nevada Falls, and near the mouth of the Wawona Tunnel. Its flat, paddleshaped leaves form neat little rosettes which in spring grow out into reddish stems bearing yellow flowers.

The Granite Stonecrop (*Sedum obtusatum*) makes mats on granite rocks and in decomposed granite soil at high elevations throughout the Sierra Nevada. On the trails leading out of the Valley, it is not encountered until one approaches the rim. The fat, blunt leaves are bluish green when young but often assume a bright rusty orange color. The bright yellow flowers are borne on reddish stems.

The Roseroot Sedum (*Sedum roseum* var. *integrifolium*) is not a very succulent succulent; its leaves are comparatively thin. It grows in damper places than its more succulent relatives and at high elevations. It is most common back in the Sierra well above the level of the Valley,



THE ROSEROOT SEDUM (*Sedum roseum* var. *integrifolium*)

Cover cut and the above cut - Courtesy DESERT PLANT LIFE MAGAZINE

but a few clumps grow in damp crevices near the top of the Ledge Trail. The roseroot is so called because its underground parts have a strong odor of roses. The clusters of dark purplish-red flowers contrast well with the light bluish-green leaves.

The Wormleaf Stonecrop (***Sedum stenopetalum***) is seen in Yosemite only along the high country trails, and there not commonly. Widespread through the Sierra Nevada and Rocky Mountains clear to the

Yukon Territory, it was first discovered by the Lewis and Clark Expedition. Low and tufted, it grows inconspicuously in gravelly areas, catching the eye only when it bears its few bright yellow flowers.

These succulents, like all other plants in our National Parks, must be left undisturbed; but anyone who has a collection of succulents at home will enjoy seeing their wild relatives growing in nature's rock garden.

*Names used here follow "Standardized Plant Names" in accordance with National Park Service regulation. See also *The Crassulaceae of Yosemite National Park*. *Desert Plant Life*. 14:4-9. 1942.



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Dan Anderson