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October 1959

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Sierra Club Bulletin

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Sierra Club Bulletin

An Oregonian here proposes a bold step toward rescuing some of the finest of Oregon's fast-vanishing scenic resources while there is still time. The author tells of the beauty of the place, then applies keen analysis to the forces which threaten it. The club is evaluating his careful study and invites comment.

These Are the Shining Mountains

By David R. Simons

Against the dark fire peak of the North Sister, the wind of the world buffets: the wind of the pole, the Aleutians, Kamchatka. The wind of the Pacific, thundering in from Bering Sea. Volcanic roarings from the wilds of Katmai and the jungles of Indonesia, from the oceanic rim of fire. The wind of the wilderness.

Great billowy waves of clouds race in from the Pacific, enveloping the surrounding panorama of lakes and thick green forests. The distant river roar of the Willamette, Santiam, McKenzie, and Deschutes is stilled to a murmur in the mist. Now the white sea shreds itself on gentle green alpine slopes and the jagged blackness of high-altitude lava fields, swirling into unseen vapor over the eastern plateau.

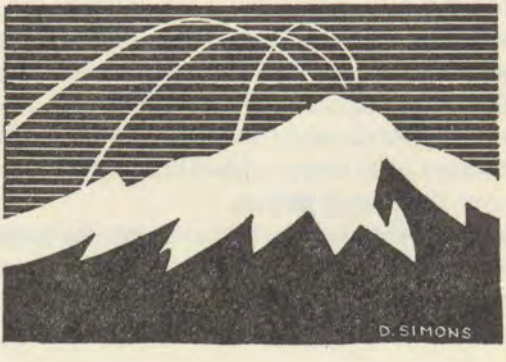
Soaring in lonely procession above the clouds, the great Oregon Cascade sentinel domes march away to the north and to the south, subdued only by the curvature of the earth itself. It is a magnificent sight. Behind the sharp, splintered uplifts of Mount Washington and Three Fingered

Jack, Mount Jefferson rises in architectural perfection, complemented by the distant snowy cone of Mount Hood. Nearby, their fires only recently stilled, the Middle and South Sisters lift massively against the skyline. Beyond, the imagination leaps many-summited Diamond Peak to the calderal blue of Crater Lake. ,

These are the shining mountains. Glacier-sheathed, they dominate a living wilderness of near-rain forests, volcanic wonders, calm lakes, rushing streams and flashing waterfalls, varied wildlife, and a diversified flora. This is one of the two great wilderness climax regions of the Cascade Range, a region which could be one of the brightest gems in the crown of our National Park System.

IT IS NIGHT, some time in the Pleistocene. Over the Central Cascades the sky is starless, obliterated by floating clouds of volcanic ash. Only the pulsating melt of living magma glows. The earth trembles underfoot. Without warning, sharp crackling explosions rip upward as if from the core of the planet. Heaving thunder against the horizon, a great pyroclastic cone erupts molten bombs. They rain down in fiery orange parabolas. Still incandescent, these ropy, spindle- and pear-shaped ejecta burn in chaos over the earth. In the distance, men can be seen fleeing in terror from the once-protective circle of their own fire—now but a feeble echo of the surrounding inferno of light and sound. Massive fissures split the surface. Within them, seething fountains of lava boil with quiet power. Irresistibly, liquid rock wells forth, speeding away in immense sheets. Streams vanish in steam. Forests are vaporized. Miles away, the flow exhausts itself in its own spectral wreckage of red, orange, green, and blue flames.

Today the volcanoes are still. Glaciers have deeply carved many of the



peaks, dramatically revealing their internal structures. Yet it is as if the fires of the earth had died only yesterday. Surrounding mile-high McKenzie Pass, a great black wilderness of basalt—nearly one hundred square miles—lies new-congealed and nearly treeless. Small islands of green float like jewels on the jagged lava, having been bypassed in the molten floods of a few centuries ago. Fresh fields of blocky obsidian glass and young cinder cones provide additional evidence of recent volcanism.

Geologically, the Central Oregon Cascades are unique. The McKenzie Pass basalts form one of the most impressive fields of recent lava in the United States. Nowhere else in the entire Cascade Range has there been as much recent volcanism as in this central portion of the High Cascades and on the plateau immediately to the east. And for magnificence of glacial scenery and graphic examples of dissected volcanoes, no part of this seven-hundred-mile mountain chain surpasses the Mount Jefferson–Three Sisters region.

The Cascade wall is one of the most dramatic climatic barriers of the world. The contrast is sharpest in its central portion. Within a few miles of the divide, the mossy west-slope world of Douglas fir, cedar, and hemlock undergoes a swift metamorphosis to sunny, open Ponderosa pine. (Before the rise of the range, wet redwood forests flourished far to the east.) In winter, one of the continent's heaviest snowpacks—fifteen to twenty feet at moderate elevations—blankets the western watersheds, nourishing extensive glaciers. In the group of seventeen ice bodies clustered on the Three Sisters and Broken Top is the Collier Glacier, Oregon's largest. Mount Jefferson, just to the north, is perpetually whitened by four major glaciers.

But most wondrous is the fragile film of life. Susceptible to even the slightest cosmic tremor, and subject to man's whims, life clings, ever-changing but luxuriant, to the surface of the Cascades. It pulses in the swift motion of wild creatures through grove and alpland. It vibrates in delicate forest tapestries along torrential rivers and flames in the red swords of wildflowers thrust through the snow. Life—free, untouched life—is the essence of wilderness.

Just below the peaks' perpetual winter living things seem almost conscious of their fleeting existence. Flowers sweep away in riotous carpets of blue, pink, and carmine. Crystal streams ripple through the shining emerald grasses. Isolated spires of alpine fir and mountain hemlock are reflected in mossy pools. Always near, a snow mountain blends its sharp, icy blue in complete harmony. Probably the finest of these mountain meadows is Jefferson Park. The long, curving trail descent under towering

Mount Jefferson to its color-flecked green is surpassed only by an intimate walk through its flower gardens. The parkland experience at its best is unhurried and unmechanized.

The wilderness experience is deepest in the primeval forest below the snows. Enter a western valley. Perhaps it is Horse Creek, Rebel Creek, or a dark canyon near wild Waldo Lake. Beyond the chaotic logging slash at the foot of the trail, a portal of moss-draped colunms leads into a brooding yet luminous world strongly reminiscent of the rain forest of Olympic National Park. Often rising over two hundred feet from seedbeds on virgin forest floor, pillarlike Douglas fir and cedar cleave sunlight into cathedral rays, or pierce and shred the scudding winter storm clouds. In dim green and gold half lights, luxuriant mosses, ferns, and leafy plants repeat on the forest floor a pattern of abundance expressed in the dense forest crown. Only the subdued tonal coloration of murmuring water filters into the green silence, focusing on an eternal regenerative cycle. Perfectly balanced by milleniums of evolution, with each element related in infinite complexity to every other, this forest stirs the intellect, and the spirit. The greatest value to be discovered here is discovery itself.

Higher, the way bends upward over the gently folded basalts and andesites of the old Western Cascades. Gradually, the trees change to true firs, mountain hemlock, and whitebark pine. Suddenly illumined by a shaft of sun, a glorious pink wall of rhododendron waves in the northwest wind. Beyond a gently swaying tree cluster, the guardian peaks of this wilderness stand silent.

A bend in the trail and—a sagebrush meadow! Tilted gray-green against a dark conifer backdrop, it is one of several relict islands of xeric plant associations isolated climatically by the rise of the High Cascades to the east. Here, in the western section of the Three Sisters wilderness, is a meeting of species from east, north, west, and south, and from the highlands and lowlands. Still intact are the most valuable of the four Central Cascade life zones. To many, the spirit of the region is most evident in the ecological complexities of such spots as Quaking Aspen Swamp. Its dense, chest-deep glade is sheltered in a ring of near-climax ridge forest. Fifteen great quaking aspen trees, very rare west of the Cascades, look out upon spreading alder thickets and sphagnum bogs. Such areas, with their extensive surrounding virgin forests, have scientific value if preserved intact. Unmodified land is needed by science for study of the interrelationships of plants, animals, soil, water, and air, and the effects of man's activities on all. Wilderness is a control, a gauge of progress toward the best utilization of managed lands.

Three Sisters and Broken Top. By Ray Atkeson

The Lonely Procession

Soaring into the cloud space, cloudlike themselves, the great sentinel domes of the Oregon Cascades march down the horizon, subdued only by the curvature of the earth itself, one of the noblest of the world's displays of ancient fire peaks.

These are the shining mountains, glacier-sheathed, dominating a world of near-rain forest, of lakes and streams, of wildlife and wild gardens and strange rocks, of wilderness. Here could be one of the brightest gems in the National Park System.

Olallie-Horsepasture trail, Three Sisters. By David Simons

If you are lucky enough to be high when the clouds relent, you can stand there on the shoulder of one of the shining mountains and watch the procession. You will not see the most distant peak if you look too fast. You must fix your eye on the high place in the sky where you suspect it should be—and wait. Only then, evanescently, will it emerge.

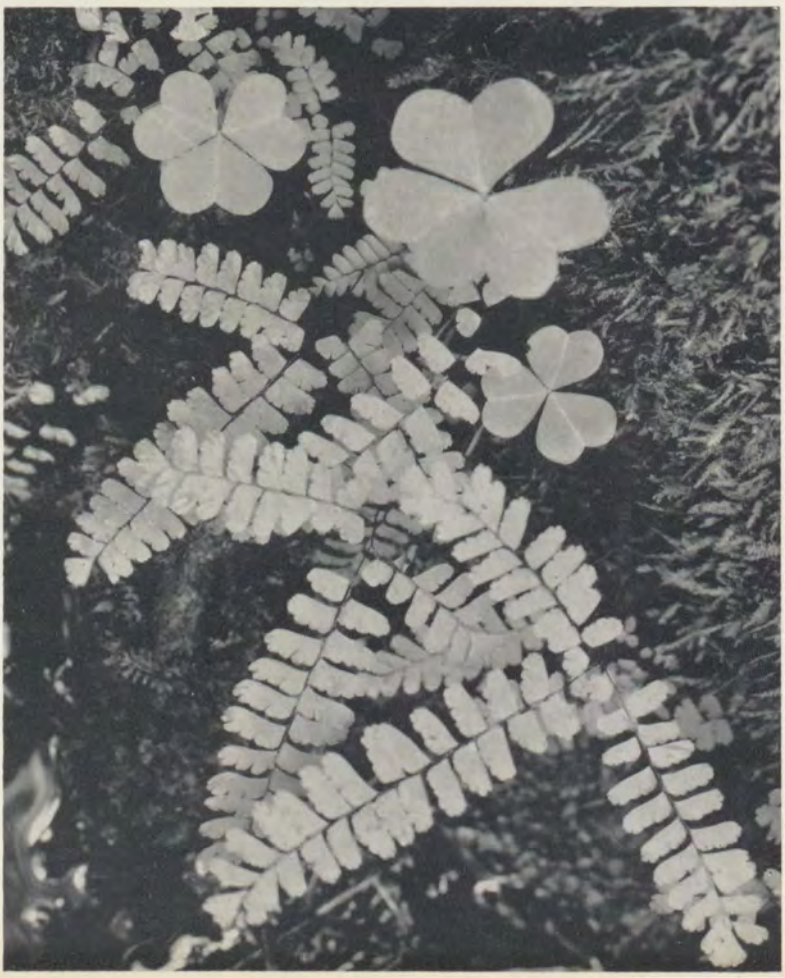
Mount Jefferson, two miles high on the crest of Oregon's Central Cascades. Three Fingered Jack, Mount Washington, and Three Sisters in distance. By Ray Atkeson

Elk Lake and the South Sister. By Ray Atkeson

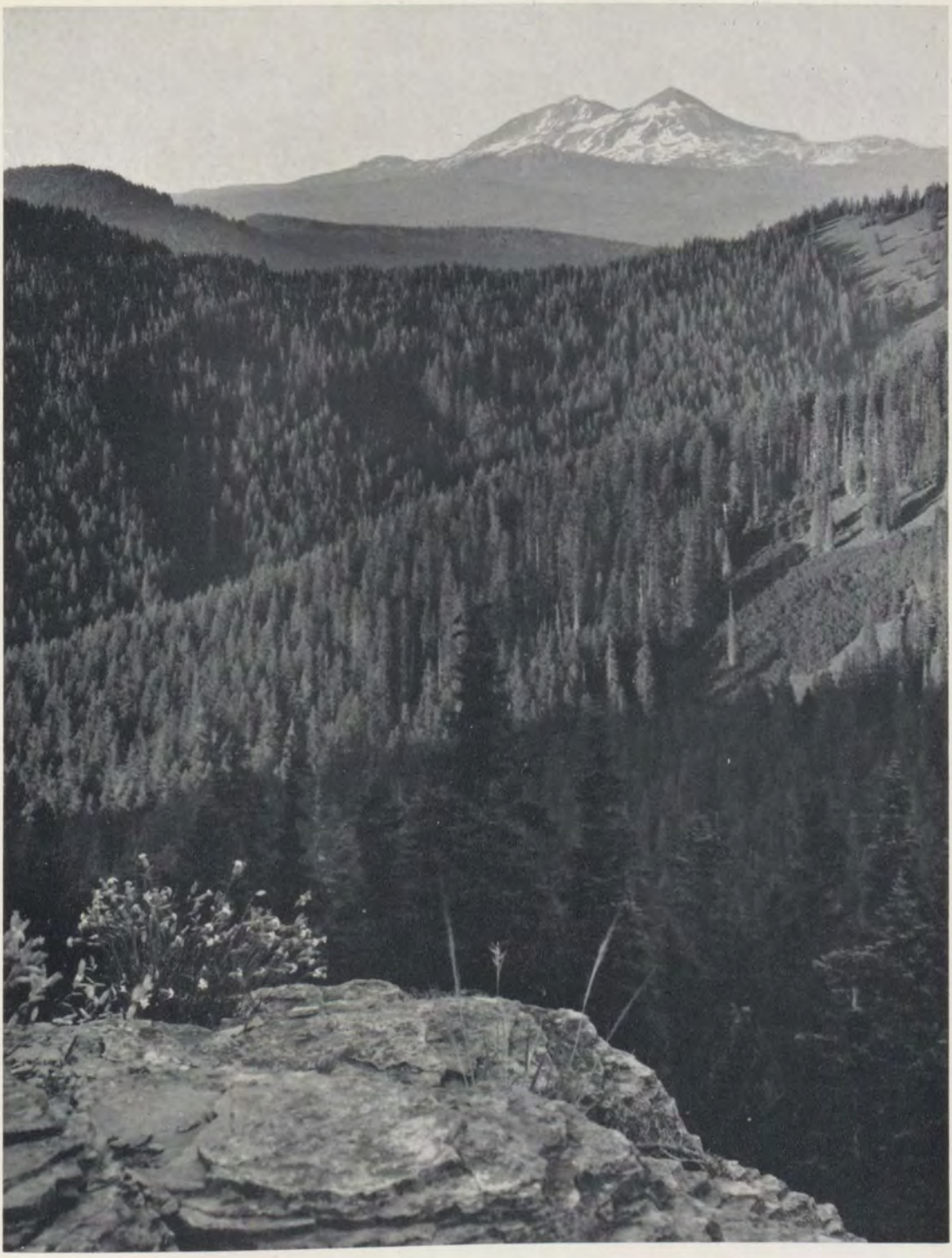
North and Middle Sisters
from McKenzie Pass.
By Ray Atkeson

Sometimes it seems almost miraculous how few demands life makes in order to sustain itself. How could a tree possibly pioneer its way over such sterile lava? Once the old fires cooled, how could enough soil ever form to grow a meadow, to hold a pool? Just pause, look, and ask. The answers may come another day.

The Potholes
(eliminated from the
Three Sisters Wilderness).
By David Simons



(Opposite) North and Middle Sisters—and all the foreground excluded. Photos by David Simons

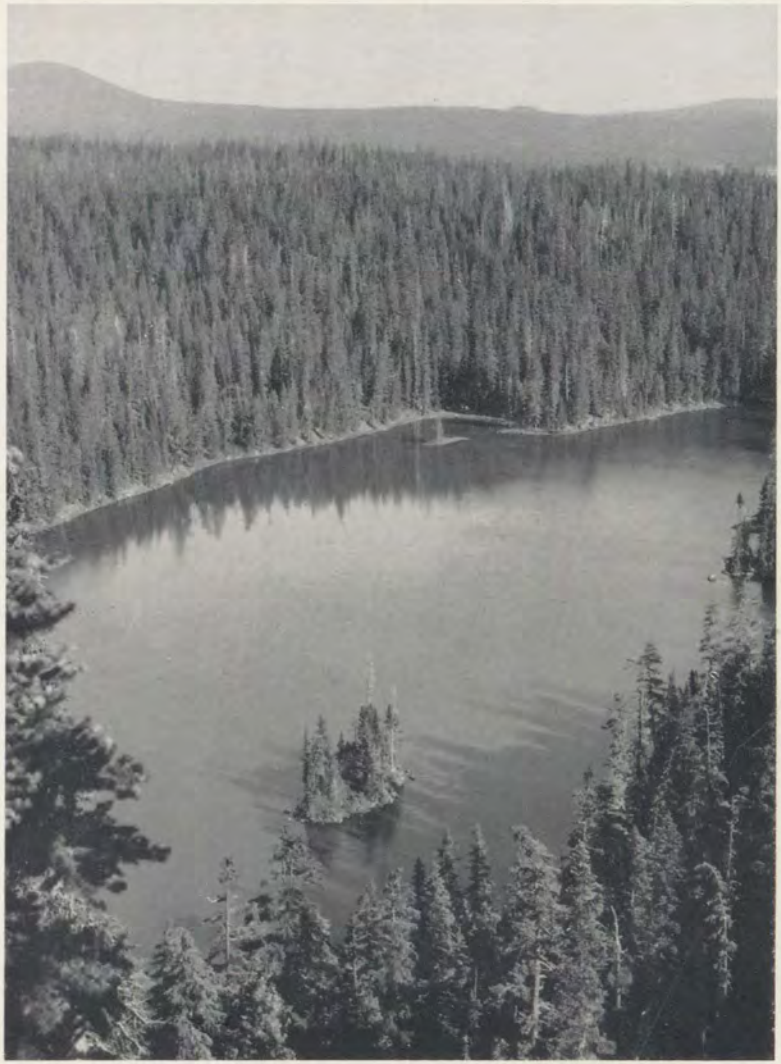


Here the life force has gone on, uninterrupted by man and his technology, ever since life could first begin. This is a special place, and saving it unspoiled is little to ask. But the answer has been no; this must be added to the inventory of operable forests, even while the mills stand glutted. So much to be taken from so many; so little added for so few.

Jefferson Park
from Park Ridge.
By Ray Atkeson

The chainsaws roar ever closer, in land they need never enter in order to supply man's need for timber and pulp. When loggers have felled the trees and silence comes again to the places where the great trees were, there will never again be the miracle of unspoiled forest floor, wonder of the cool green world, that could build, renew, and renew again—but not if men take the trees out.

Rebel Creek forest,
excluded from protection.
By David Simons



Rigdon Lake, just north
of Waldo Lake.
By Gene Renard

Salt Creek Falls,
second highest in Oregon.
By Oregon State
Highway Commission

Broken Top Mountain
By Ray Atkeson

Here is one of the last superb places in which the kind of wisdom that began the system of national parks can reveal itself again. This is the kind of country that fully warrants having its use so regulated as to be preserved unimpaired for this generation, for the next, and down into the future. Time is short, however, in which to apply such wisdom. The opportunity to choose is being foreclosed.

South across Waldo Lake to Diamond Peak. By Gene Renard

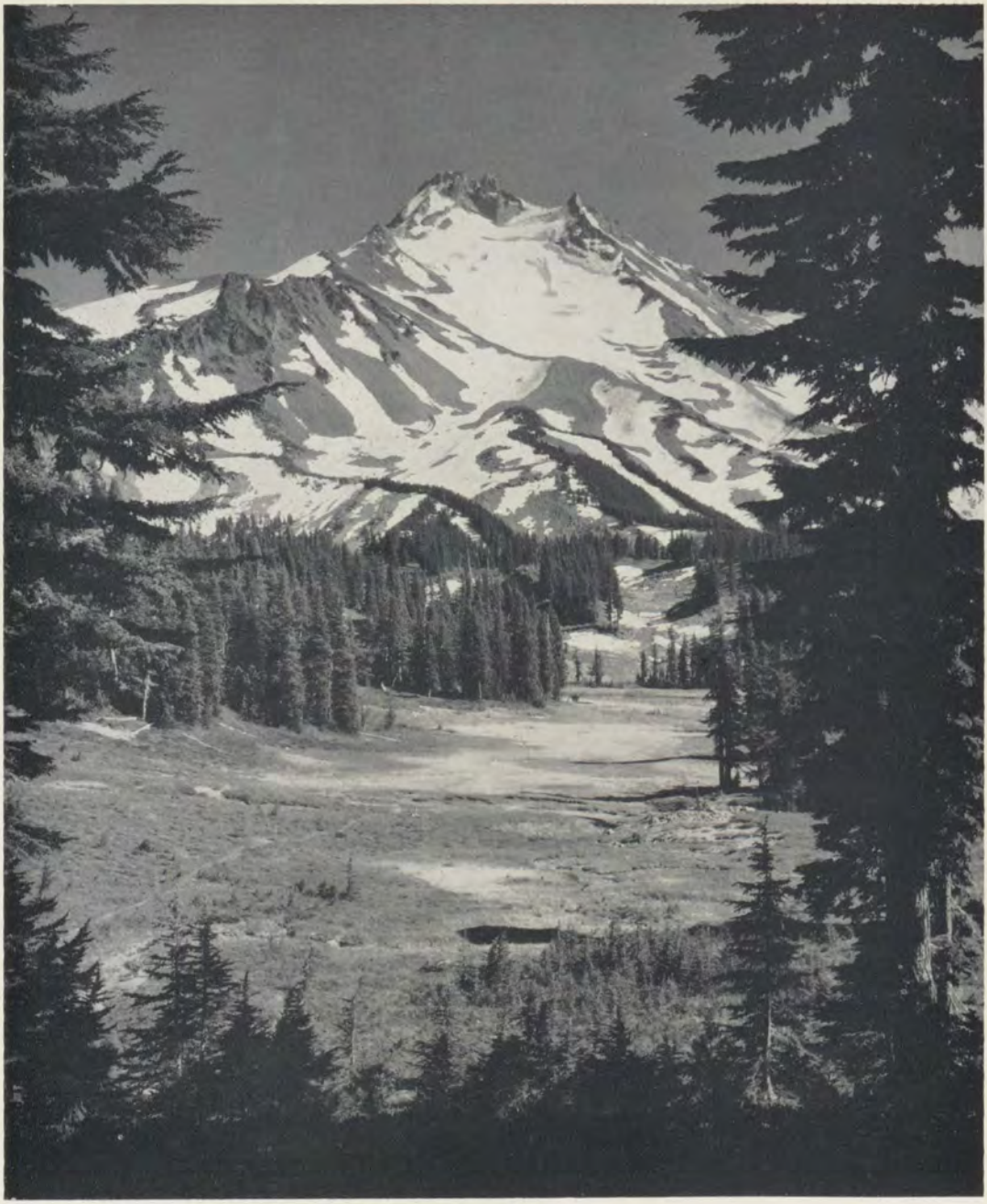
The wide lake is one of Oregon's finest displays of natural world. It could always remain so but will not if the search for sawlogs leaves only false-front wilderness. And what happens to what a churning river can do for man's spirit when only a veneer of forest rims the stream, or when the law is too weak to protect the river itself?

McKenzie whitewater.
By Ken Metzler

McKenzie River highway, autumn. By Oregon State Highway Commission

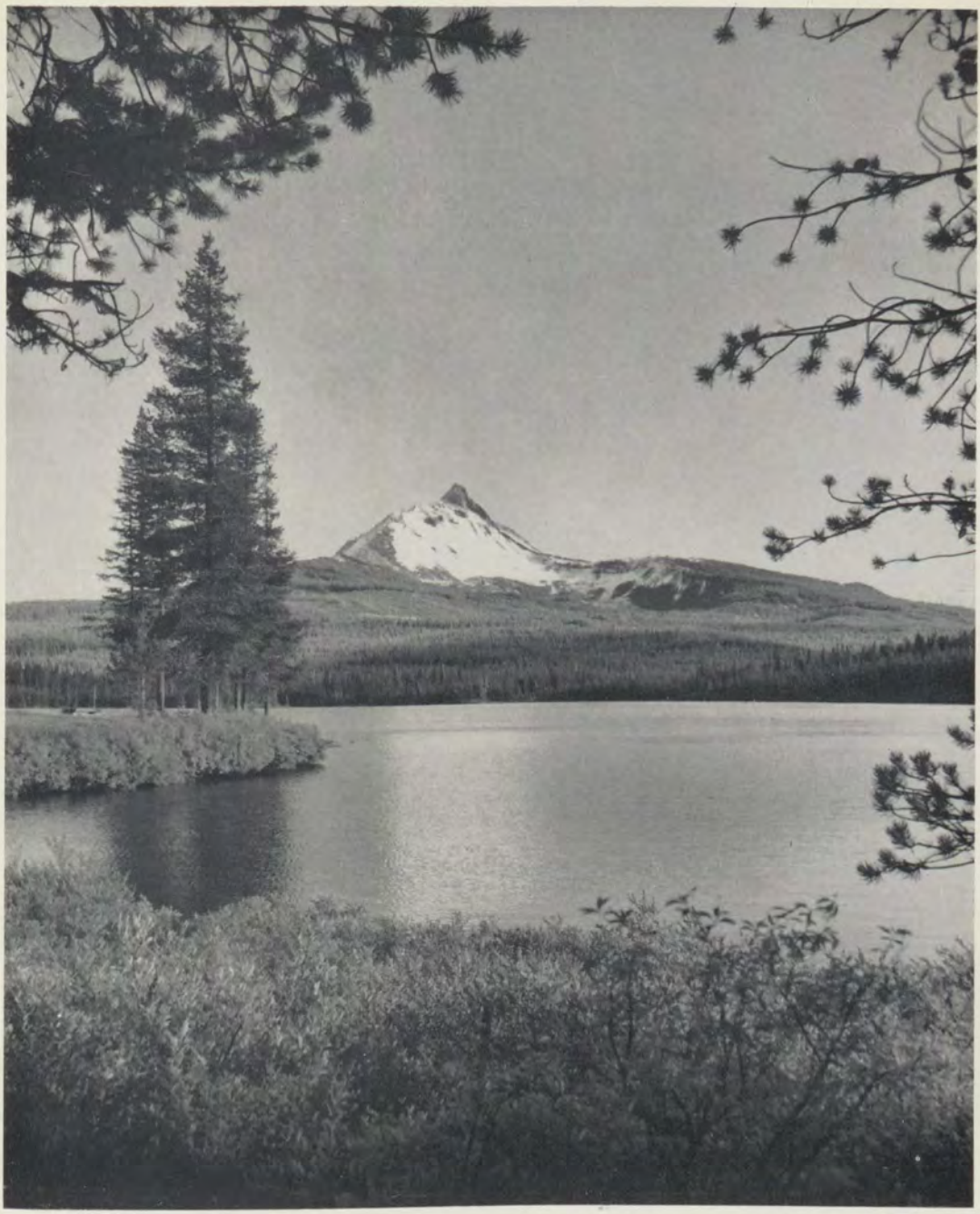
What happens, too, to the leisurely drive you wanted to make across the pass, looking up to the peaks, looking into the forest—what happens inside you and to what you get from the place if instead of all the great things God put into that forest you see only the heaps the chainsaws left there? And what happens if that's all you can show your sons from a high trail?

Middle Sister
from Oregon Skyline Trail.
By Ken Metzler



Mount Jefferson from Jefferson Park. By Ray Atkeson

Gems need a setting. You mount them in beauty, not in sawdust. The highest peaks can hardly be spoiled themselves, for the rocks are enduring, and there's more lava there than man is likely ever to covet. But the meaning of the peaks to man is a fragile thing. The unspoiled slope of verdure that leads the eye to the peak, the texture



Mount Washington from Big Lake. By Ray Atkeson

of forest that clothes the mountain—these are good things. Fine words about multiple use will not improve them nor substitute for them. If there were no other sources of sawtimber and pulp, beauty might need to give way here. No such decision is needed now, nor as far ahead as perceptive men can see.

North and Middle Sisters from Lamb Butte (in eliminated western section of the former Three Sisters Primitive Area). By David Simons. ¶ Text by David Brower.

This is Oregon's finest. What there is left of these great virgin forests is all that all men will ever have, and all their children. Man can take it apart. He cannot put it back together. He has made laws to protect such places elsewhere and he has respected those laws. He can do so here.

Far below the high ridges and peaks, the Cascade streams surge wild and free, born of yet unscarred watersheds. Rushing between lava flows and thickly wooded slopes, the Upper McKenzie is one of the finest of these. Swirling upward from springs to fill the pure white bowl of Clear Lake, the McKenzie's waters cover with crystal a submarine forest, drowned when lava dammed a river. Then they tumble downstream over three superb waterfalls: Sahalie, Koosah, and Tamolitch.

To stand on the golden moss dais facing the surging white arch of Sahalie Falls is an awesome experience. In spring, the roar shakes the earth. The trees clinging to the basalt amphitheater rim seem certain to be soon wrenched loose and flung headlong by the mere sound. The urge to venture closer is irresistible. Every rock, every boulder is enveloped in ankle-deep layers of emerald growth, sparkling with mist dew. Vibration is almost overwhelming, and footing threatens to vanish in the spray. A final scramble—and you see Sahalie crash into its canyon from nearly one hundred feet directly overhead, its torrent whirling past in solid hurricanes. Glistening scimitars of vapor vanish downstream through the arch of a rainbow.

Or watch the orange band of dawn widen from vast, remote Waldo Lake. Through the perfect smoothness of the surface, details of the lake floor are visible—and how many feet below? Here, no less than in Crater Lake, is faultness sapphire clarity. The ancient Cascade glaciers carved deeply and, one could think with aesthetic sensitivity. The first rays of morning streak wide-spaced skyline summits, texturing undulating expanses of fir and mountain hemlock. Fresh vistas are revealed at each sinuosity of the shore, new peaks wild and untouched. Beyond each cove, bay, and inlet lies the transparent blue ellipse of a hidden lakelet, tree-rimmed. Now the full warmth of the sun touches Waldo. Refracted scintillations from the boat wake flash across the bottom in shimmering vortices of light. The effect is hypnotic. Gradually all physical substance blends into a single aquamarine vision. But in an instant, the world is shattered by an echo. The bull elk bugles along the lakeshore.

THE CENTRAL OREGON CASCADES are a wilderness still intact. But this is a time of decision for a shining mountain land. Logging, roads, and fluctuating reservoirs are penetrating its flanks. The meaning of the peak vistas will be transformed—as the natural blending of virgin forest and mountain is shattered by the recurrent destruction of clearcutting. Only

those areas of beauty reserved and defended by positive action of the people will be preserved.

The region of prime concern (see map) lies within the Willamette and Deschutes national forests, and is almost entirely federally owned.* It should be considered as a unit. Until recently, the U. S. Forest Service partly protected by administrative regulation 247,000 acres of the range designated as the Three Sisters Primitive Area. Nearby, the smaller Mount Washington and Waldo Lake Limited Areas were outlined for study pending classification. In 1957, an administrative decision of the Secretary of Agriculture established a Three Sisters Wilderness Area excluding the major 53,000-acre wilderness section west of Horse Creek, and simultaneously establishing the small Diamond Peak and Mount Washington Wild Areas. It was assured that "features disclosed as of extraordinary botanical significance" in the excluded wilderness would be established as Natural Areas (which, in the Pacific Northwest, average only 1,100 acres in size). These have not yet been reserved. The Diamond Peak area was, by official statement, a substitute for the Summit Lake Limited Area to the south, which was opened to logging. In 1958, the Forest Service announced plans which would essentially open the entire Waldo Lake Limited Area to lumbering. The Service has studied the Upper McKenzie River, but has not made its findings public. In the near future, the Mount Jefferson Primitive Area is to be studied for reclassification.

If Forest Service planning for the Central Cascades has crystallized, the crystal is indeed a murky one. Three profound gaps in scenic resource

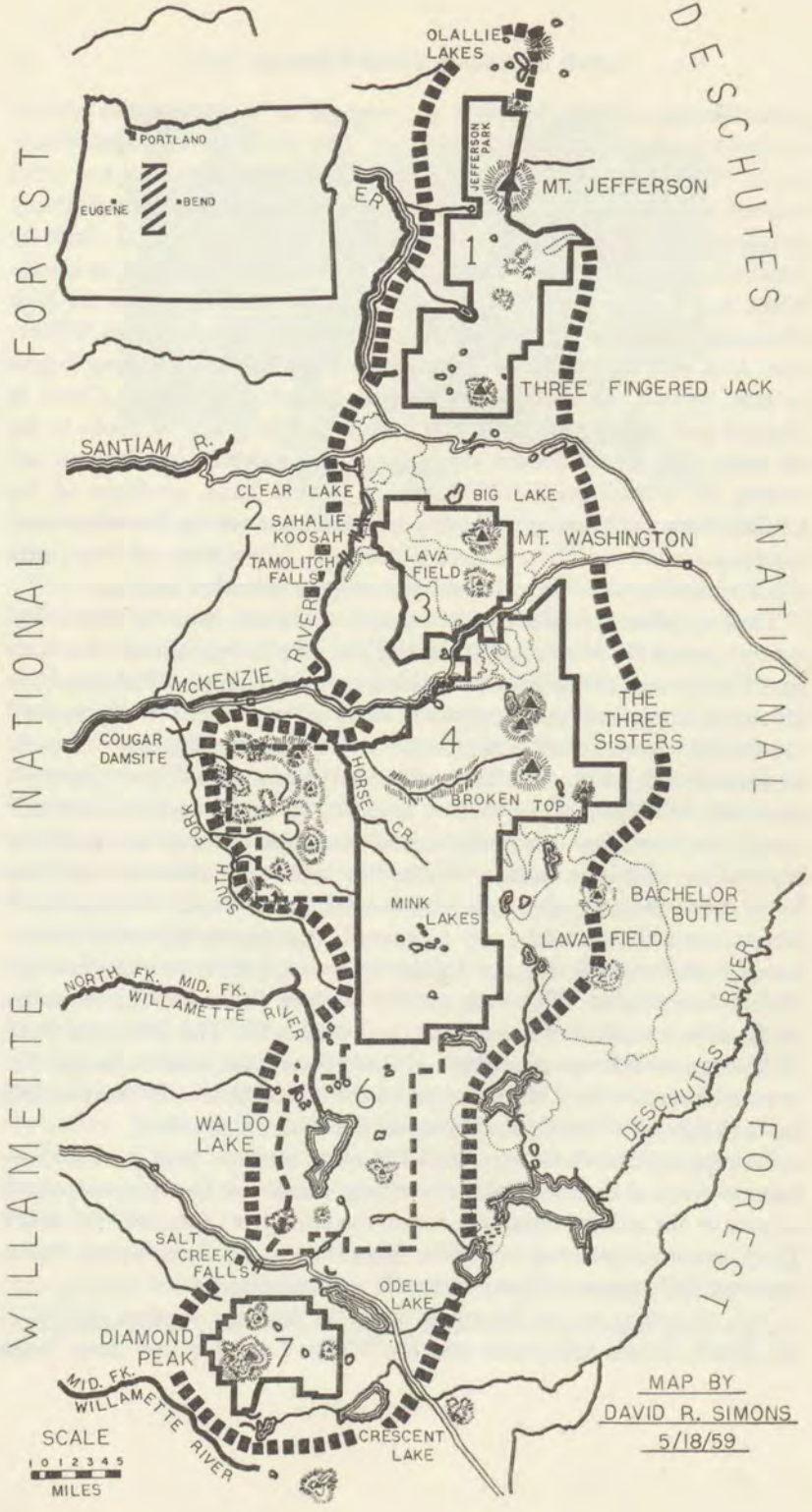
* Statistics which follow were derived from the references cited at the end of this paper.

protection are evident. The first gap emerges in the extent and content of presently dedicated wilderness areas. The 47,000-acre Mount Washington Wild Area and the 35,000-acre Diamond Peak Area are small isolated sections which do not possess sufficient depth to constitute really satisfactory reserves. The Mount Jefferson Primitive Area is similarly unsatisfactory, being quite elongated. Yet these areas are part of a still-intact and largely unprotected scenic-resource unit. Shorn of its high wilderness values in the western 53,000 acres, the Three Sisters Wilderness Area will lose much of its wilderness quality if lumbering begins in that section. Moreover, the western boundary at Horse Creek is illogical and highly vulnerable, for heavy demands will be made to log the remaining Three Sisters virgin forest. Plans have already been advanced for a dam on Horse Creek. At Waldo Lake, abolition of the Limited Area would essentially open up—*and close out*—a fine wilderness, contiguous with the Three Sisters Wilderness. It would be clearcut, with a few narrow protective strips subject only to selective logging.

Thus a pattern appears of too-small, scattered reserved areas. But acreage is not the sole factor in partial planning here, nor even the basic one. The *content* of the reservations is a primary concern. The protective values of areas consisting primarily of lava, peak tops, and perpetual snows may be questioned. Yet such scenic but barren surfaces are balanced in acreage tally with luxuriant primeval forests. The Forest Service's practical definition of wilderness appears to be undergoing a tragic change. In case after case, "wilderness" has come to mean an absence of exploitable economic values. With this monetary criterion, national forest wilderness is undergoing systematic study—and elimination of forests, road routes, and areas supposedly containing minerals, regardless of their very real worth as living wilderness. Nearly two-thirds of the Mount Washington Wild Area consists of lava flows and barren peaks, while only six per cent is covered by Douglas fir. The Diamond Peak Wild Area contains a mixed high-altitude forest, but a mere twenty-five acres of Douglas fir. The reduction of the Three Sisters Wilderness will bring chainsaws virtually to the foot of the Sisters themselves.

Forests—primeval forests—and the clear streams they produce, are integral parts of the wilderness experience. These are the most hospitable aspects of the natural mountain scene, the vital living spaces of the wilds. They are also priceless scientific laboratories and irreplacable biotic reserves. Wilderness without forests is not complete.

Yet, according to the Forest Service, the forested western section of the Three Sisters wilderness and the Waldo Lake Limited Area "have


PORTLAND
EUGENE
BEND
OLALLIE LAKES
JEFFERSON PARK
MT. JEFFERSON
1
THREE FINGERED JACK
SANTIAM R.
CLEAR LAKE
2
SAHALIE
KOOSAH
TAMOLITCH FALLS
BIG LAKE
MT. WASHINGTON
LAVA FIELD
3
McKENZIE RIVER
THE THREE SISTERS
4
COUGAR DAMSITE
HORSE CR.
BROKEN TOP
5
SOUTH FORK
MINK LAKES
BACHELOR BUTTE
LAVA FIELD
NORTH FK. MID. FK. WILLAMETTE RIVER
DESCHUTES RIVER
6
WALDO LAKE
SALT CREEK FALLS
ODELL LAKE
DIAMOND PEAK
7
MID. FK. WILLAMETTE RIVER
CRESCENT LAKE
SCALE
0 1 2 3 4 5
MILES
DESCHUTES NATIONAL FOREST
WILLAMETTE NATIONAL FOREST
MAP BY
DAVID R. SIMONS
5/18/59

greater public value for multiple-use management than for classification and management as wilderness." What again and again is seen to be a basic economic motivation in "multiple use" is obscured by promises of "roadside recreation." But little has been done to develop for recreation the extensive, presently accessible national forest roadside areas. Moreover, it is doubtful if the average recreationist prefers the logging road (when open), logging truck, and the chainsaw on the one hand to pristine surroundings on the other. If he comes to prefer to have stumps, slash, cat-tracks, and sawdust mixed with his mountain recreation, chances are he will do so because little else is spared. This is the ominous portent of the 400,000 miles of new roads promised in Secretary Ezra Taft Benson's "A Program for the National Forests" presented to Congress this spring.

Does the primary economic argument advanced against scenic-resource preservation in the Oregon Cascades have justification? No timber shortage exists, no emergency need for logs. Oregon's 1956 live sawtimber cut was an astronomical 9.34 billion board feet (compared with a 1952 standing commercial timber volume of 434 billion board feet of sawtimber and 81 billion cubic feet of growing stock), of which Lane County alone logs approximately one and a quarter billion—420 million feet over its allowable sustained yield cut. The annual allowable cut from all of the

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Facing: Central Oregon Cascades
Proposed Cascade Volcanic National Park, Oregon, outlined by heavy dashed line. Approximate acreage 972,000. Acreage of present Forest Service dedicated areas within the proposed park, 365,513 (excluding the Waldo Lake Limited Area, and the eliminated western portion of the former Three Sisters Primitive Area).

Key to map:

1) Mount Jefferson Primitive Area (86,700 acres)
2) Upper McKenzie River
3) Mount Washington Wild Area (46,665 acres)
4) Three Sisters Wilderness Area (196,708 acres)
5) Eliminated western portion of former Three Sisters Primitive Area (53,380 acres)
6) Waldo Lake Limited Area (53,978 acres)
7) Diamond Peak Wild Area (35,440 acres)

The proposed park would be fifth in size among the national parks (sixth if the Northern Cascades National Park were established), and would be exceeded in area by three national monuments. It would be nearly 100,000 acres larger than Olympic National Park (896,599 acres), and would exceed in size Grand Canyon, Kings Canyon-Sequoia, and Yosemite. Oregon's only present national park, Crater Lake, contains only 160,290 acres.

Central Cascade wilderness climax forests would total less than one per cent of Oregon's yearly timber production. Lane County's obsolete waste burners alone consume each year many times the prospective annual cut from the excluded 53,000 acres of the Three Sisters wilderness. Further, there are 3.38 million acres of nonstocked and poorly stocked commercial forest lands in Oregon, an acreage exceeding the combined size of the Willamette and Deschutes national forests. The optimum in forest utilization is far from attainment.

Moreover, the nation's peak demand for lumber was passed in 1910, and independent studies indicate that wood products consumption will remain approximately stable owing to competition of substitutes, despite a rapidly increasing population. That population, however, will exert great pressures upon strictly limited recreational resources. A tourist industry supported by adequately protected scenic resources can help bring an essential diversity to Oregon's economic base. State tourist income for the 1957–58 biennium alone was $280,000,000.

One major planning deficiency, then, is in the extent and content of present wilderness dedications. Another basic gap lies in the legal protection Forest Service dedicated areas receive. Protection is by administrative regulation alone; an executive's pen stroke can alter or abolish every Wilderness, Wild, Primitive, and Natural Area. In contrast, the national parks are protected by Act of Congress. No primary law directs the wilderness or scenic-resource policies of the Forest Service. Consequently, these policies are peculiarly subject to economic pressures. Wilderness Area protection is incomplete. Mining, dam building, grazing, and hunting are permitted.

The third principal hiatus is evident in deficient planning and legal protection for the forested gateways or semiprimeval corridors. A prime example is the Upper McKenzie River. Here (at Waldo Lake and Horse Creek too), the Forest Service cannot prevent destructive water projects. No really effective legal protection exists for these lakes, streams, and waterfalls, despite recent recreational reservation of a portion of the upper river by the Oregon Water Resources Board. The Forest Service has made public no plans for protection of the virgin surroundings of the Upper McKenzie against logging and rather random development, but indications are that only narrow strips would be given limited protection. Other gateways—the Santiam, McKenzie, and Willamette (and Waldo Lake if it is opened by roads)—are similarly affected. No regulation or administrative inclination exists to protect firmly the natural qualities of the forested gateway zones.

Lord Kelvin, the famous English physicist, once said that unless a phenomenon can be described in precise numerical terms, nothing is actually known about it. Extended to inapplicable areas of perception, this view has become pervasively dogmatic, requiring the quantitative measure of all things. Dollars, board feet, man-days, cow-months—these are our brave new units.

Even the chemical engineer cannot yet reduce to tidy equations and statistics the essence of the catalyst, that substance which transforms others, yet emerges unchanged. Wilderness, too, is a catalyst. It transforms men, and their souls. Used with discretion, it remains unharmed and ever-reusable, like its chemical analog. Wilderness can be a resource that is used but never consumed.

Yet the uncomprehending continue to attempt quantitative measurement of the qualitative wilderness catalyst. Only the printed numeral, the draftsman's map line, are deemed of value. Evaluated by this criterion alone—the quantity of use—the recreational value of land rises in proportion to travel density. A conservation program based on this would quickly reduce itself to a saving of the arterials and no more. The all-important *cause* of use, however—the natural quality of the land—would have been ignored. Wilderness as a catalyst serves as the unaltered essence, the very thing that attracts. Without wilderness, the roadhead would resemble the floor of Yosemite Valley without its surrounding cliffs, domes, waterfalls, and forests. It would be as if only the most worn portions of an art museum's floors were preserved, and the paintings, walls, and roof were taken away! This is the readily observed and accelerating trend of Forest Service planning.

Dr. James Gilligan, Professor of Forestry at the University of California, commented in his 1953 doctoral dissertation upon the long-range problems and contradictions inherent in wilderness and recreation administration by the U.S. Forest Service. Diagnostic excerpts follow:

"Efforts to preserve these [wilderness] areas or meet recreation needs have frequently been belated attempts to adjust an existing situation. It is as if administrators were awaiting economic demands in order to break the larger wilderness areas into units satisfactory to multiple use planning . . . . The end result has been the extension of a number of situations which now make preservation difficult, but which, had they been approached with a sincere belief in the idea and aggressive effort through a long-range plan, could have been averted . . . . The assertion that there [are] not enough Forest Service men sufficiently concerned about forest recreation to carry out such work enthusiastically, is substantiated by

Forest Service recreation administration—of which wilderness reservation is a part . . . . It is not conceivable that the Forest Service ever thought seriously of excluding from sustained yield management most of the 2,000,000 acres of commercial timberland now in large wilderness and primitive areas, even though public relations releases and the creation of U–1 and U–2 Regulations may have intimated otherwise."

The strong, integral unit of a Cascade Volcanic National Park could adequately protect the Central Cascades scenic and wilderness resources. Encompassing superb peaks, glaciers, subalpine parks, unsurpassed volcanic exhibits, contrasting wilderness forests, rushing streams, waterfalls, and lakes, such a park would be one of the nation's finest. It would contain about 970,000 acres, guarding Mount Jefferson, the Upper McKenzie, Mount Washington, the Three Sisters Wilderness (including the presently excluded western portion), Waldo Lake, Diamond Peak, and the gateway approaches of the Santiam, McKenzie, and Willamette. Its establishment would be a triumph of positive, unitary planning.

A Cascade Park would meet a great need for preservation of natural values in the seven-hundred mile long Cascade Range, which has only three small peak-top national parks: Lassen Volcanic, Crater Lake, and Mount Rainier, averaging 170,000 acres each. Oregon, despite its scenic grandeur and diversity, has only 160,770 acres in the National Park System, in Crater Lake National Park and Oregon Caves National Monument. This comprises a microscopic 0.26% of the state.* The vaguer protection of Forest Service wilderness status extends over 747,633 acres.

Legal protection for a national park would be firm. In addition to the Act of Congress establishing the park, the National Park Service Act would apply, providing "for the enjoyment of the scenery, the natural wonders and historic objects, and the wildlife in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." A national park would exclude logging, mining, grazing, water projects, and hunting, and would provide for close regulation of development. Enactment of the Wilderness Bill would provide legal safeguards for wilderness zones within the national park. The Park Service is the agency specifically empowered to preserve the country's scenic resources, and is logically the one to guard the climax of the Oregon Cascades.

The Cascade Volcanic National Park would protect a fine balance of land types, including the vital semiprimeval gateways and wilderness

* California has 25 times more area in national parks and monuments than Oregon; Japan, 40 times.

forests. Within the park, facilities for interpretation of the natural scene would greatly increase public appreciation of the region. The McKenzie valley, for instance, is an excellent location for a museum, being an ecological and geological focal point. Volcanic exhibits might be established on scenic McKenzie Pass, and a rain forest museum in the lower Horse Creek valley. A long period of public concern could end.

The national park concept is a simple, direct one with a vigorous tradition of public backing. The National Park System has acquired world fame. Forest Service Wilderness, Wild, Recreation, Primitive, and Natural Areas do not enjoy such sustenance. This is due to the relatively simple, straightforward regulation of the national parks, which have a strong basis in law containing protective teeth, and the wide acquaintance of the public with the national parks, as contrasted with the complicated, obscure, and weak administrative protection afforded by the Forest Service to areas almost completely unknown to the general public.

The United States needs more national parks, and it needs to establish them while great primeval areas still exist to be reserved. The seventy million visits to the National Park System in 1957 were to a total park area less than that under the nation's pavement. As concrete and asphalt expand with a mushrooming population, primeval America shrinks and dwindles much as does the last snowbank under a summer sun. (Soon, we are assured the entire western valley system of Oregon and Washington will coalesce into a single giant metropolitan region.) Natural landscape is one thing our technology cannot build, cannot restore. Once gone, it is beyond recall.

Man needs in his civilization places which technology has not harmed or modified. In the Oregon Cascades he still has a primeval sanctuary where he can rediscover his own nature and where he can forego imposing his own patterns on natural things.

He will not have it long, however, unless he acts to save it.

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The Multiple-Use Concept in Forest Service Policy

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IN THE years since 1891, the date of the establishment of the nation's great system of national forests, the United States has come to rely upon a widely-advertised policy for the allocation of a major segment of its land resources. This, the "multiple-use" policy of the U.S. Forest Service, has been acclaimed as democratic in purpose and effect. This policy, however, bears the ambiguities and uncertainties of the particular point of view from which it emerged. These ambiguities have had only minor practical significance until recently. Now, however, they raise serious questions concerning the quality and character of administration in an important part of what we intend shall be a responsible and democratic government.[1]

The law of 1891 by whose authority President Harrison set aside the first of the forest reserves marked a break with the long-existing American land policy, whose essence had been to distribute the public domain into the hands of those free, independent settlers who were regarded as the backbone of the nation. With the passage of this law, the president was empowered to "set apart and reserve" public lands from private entry and acquisition. Within days the president proceeded to exercise his new authority, and the first reserves were created. This law, as much as anything else, set the seal on the end of the era noted by Frederick Jackson Turner two years later.

Yet, for all the law's historic importance, its break with the past should not be exaggerated. The general land hunger which had virtually dictated the previous policy had not suddenly been satisfied, nor had the belief in a natural right to untrammeled exploitation of the public domain been banished. Land scandals continued for several decades afterward. Indeed, there are some grounds for believing that the Forest Reserve Act was ill understood and possibly unpopular. Like several other major pieces of

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[1] Part of this article was read in another version at the meeting of the Western Political Science Association, Los Angeles, February 23, 1957. I am indebted to Dean Samuel T. Dana and Professor Myron E. Krueger for information and advice in the preparation of this article; neither of them, of course, is responsible for the statements contained herein.

legislative policy, this was the accomplishment of a relatively few far-seeing governmental and citizen groups acting perseveringly over a number of years. The names of a few persons and associations are conspicuous in this history: Bernard Fernow, Franklin B. Hough, William H. Brewer, John W. Noble, the American Association for the Advancement of Science and the American Forestry Congress. There were others in the roster of those to whom the nation owes much gratitude for the accomplishment, but the list is not a long one.

The bill that established the forest-reserve authority was in some respects obscure. The vital part, that about forest reserves, actually did not appear until the bill reached the conference committee. John Ise has commented vividly on the peculiar combination of circumstances which permitted the bill's passage.[2] As he pointed out, not least among the reason's for the bill's success was the inattention of members of Congress and the general lack of appreciation of its significance. The outcries against the terms of the act which came later also seem to suggest that few people really understood at the time what had been brought about.

With such origins, then, it seems reasonable to expect to find that later policy changes can only be relative and in degree. This is in fact what developed. In broad outline, four different features of forest policy deriving from the historic American land policy may be distinguished: First, the resources of the land—including those of the reserved lands—were to be available for use. This later came to be explicitly stated by the first chief of the Forest Service (or forester, to use the title he chose), Gifford Pinchot. This was in part a matter of expediency, a bowing to the hostile pressures which the administrators of the reserved forests had to placate. However, it was also an article of belief with Pinchot and the other doctrine-formers of the Forest Service. Second, the reserved forest lands and their resources were not to become the basis of any system of socialism. The resources were to be available through competitive entrepreneurial activity. There were undertones of criticism of the new policy then and later that the national forests were the product of a socialist scheme, but these have remained undertones and have not carried great conviction.

The third feature of the developing policy that derived from early beginnings was one closely associated with the first. It was far less articulated and perhaps not even acknowledged. It was the traditionally exist-

[2] John Ise, *The United States Forest Policy* (New Haven; Yale University Press, 1920), pp. 114-118. Ise's discussion is quoted in part in Samuel T. Dana, *Forest and Range Policy* (New York; McGraw-Hill, 1956), pp. 101-102.

ing right and even the obligation to rearrange without limit the natural environment. This principle of belief was precisely what had permitted and brought about the forest devastation which at last aroused the members of the American Association for the Advancement of Science and others to press for the establishment of forest reserves. In a sense, the reserves were to be a means of limiting the rearrangement which was thus limited. The idea of permissible rearrangement of the environment was not repudiated. Indeed, with the rise of the profession of forestry in the United States, the idea took on increased vitality, and today the concept of forest management implies recognition only of limits upon bad management.[3]

Multiple-use as a policy had another source antedating the introduction of forestry into the United States. This was the long-established practice of using the public domain for a variety of private purposes. Grazing in particular was a use of forest lands of long standing. The tradition of the open range was to be broken somewhat by the active administration of the reserved lands, but recent controversies between officials of the Forest Service and livestock interests have centered on arguments derived from this nineteenth-century tradition. Timber use was not the only use of the forest lands generally recognized at the time of the beginning of National Forest policy. In many areas, grazing was the first use.

Formal legislative declaration of use policy came with the passage of the Forest Reserve Act of 1897. This was in intent a limitation on the vigorous executive policy followed by President Cleveland in adding to the forest reserves. The essential passage declared: "No public forest reservation shall be established except to improve and protect the forest within the reservation for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States." Moreover, "lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes" should not be included in the reserves.[4] This law remains a fundamental source of administrative authority for regulating the use of the national forests.

Early in 1905, administration of the forest reserves was transferred from the Department of the Interior to the Department of Agriculture, where the task was assigned to the Forest Service. The transfer was the culmination of a long campaign led by Gifford Pinchot, and it was re-

[3] For a divergent view see George Perkins Marsh, *Man and Nature* (New York; Scribner), 1864.

[4] 30 Stat. 34-36.

garded by him and others as the real beginning of scientific public forest management in America.[5] Immediately, the secretary of agriculture addressed a letter of instructions to Pinchot. Since this letter (the work of Pinchot) is the fount of administrative doctrine in the Forest Service and is often cited by Service personnel today, it deserves quotation here:

> In the administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people, and not for the temporary benefit of individuals or companies. All the resources of the reserves are for *use,* and this use must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources. The vital importance of forest reserves to the great industries of the Western States will be largely increased in the near future by the continued steady increase in settlement and development. The permanence of the resources of the reserves is therefore indispensable to continued prosperity, and the policy of this department for their protection and use will invariably be guided by this fact, always bearing in mind that the *conservative use* of these resources in no way conflict with their permanent value.
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> You will see to it that the water, wood, and forage of the reserves are conserved and wisely used for the benefit of the home builder first of all, upon whom depends the best permanent use of lands and resources alike. The continued prosperity of the agricultural, lumbering, mining, and livestock interests is directly dependent upon a permanent and accessible supply of water, wood, and forage, as well as upon the present and future use of their resources under businesslike regulations, enforced with promptness, effectiveness, and common sense. In the management of each reserve local questions will be decided upon local grounds; the dominant industry will be considered first, but with as little restriction to minor industries as may be possible; sudden changes in industrial conditions will be avoided by gradual adjustment after due notice; and where conflicting interests must be reconciled the question will always be decided from the standpoint of the greatest good of the greatest number in the long run.[6]

The ideas thus stated were elaborated upon in the first issue of a manual, several times revised, which came to be known—officially ultimately—as *The Use Book.*[7] Probably no fledgling agency of government has ever

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[5] The story is told in Gifford Pinchot, *Breaking New Ground* (New York; Harcourt Brace, 1947).

[6] This letter was reproduced in U. S. F. S., *The Use of the National Forest Reserves* (1905), pp. 10, 11.

[7] This was the title used for the manual when revised in 1906. The title for the rapidly growing book of regulations and instructions was changed in 1911 to *The National Forest Manual,* and later to *The Forest Service Manual.*

had the benefit of a clearer, better written or more coherent book of instructions than the Forest Service had at the beginning of its assumption of large responsibility. And in these qualities the early editions of the *Manual* show unmistakably the stamp of the personality and thought of the chief of the service, Gifford Pinchot. By the same token, however, these manuals betray the time of their origin and the particular cast of thought to which their first writer was committed, progressivism.[8]

From the very first, those manuals explicitly recognized a multiplicity of uses of the reserved forest lands. Among the named uses were: trails and roads used by settlers, schools and churches, hotels, stores, mills, stage stations, apiaries, miners' camps, stables, summer residences, sanitariums, dairies, trappers' cabins, canals, ditches, pipe lines, tunnels, dams, steamboats, ferries, aerial tramways, private railroads, telegraph and electric power lines, protection of game and various others. Grazing was to be permitted under a fairly strict system of regulation. And as for timber—"all timber on forest reserves which can be cut safely and for which there is actual need, is for sale."[9]

Despite, then, the narrow statement of forest purpose which was given in the act of 1897, the administrative policy of the Forest Service recognized a large variety of purposes to which the forest lands could be put. The largest addition to the list of recognized uses came with the provision in the Agricultural Appropriation Act of 1915 authorizing the granting of permits for summer homes in the national forests. The concept of recreational use was considerably broadened when the Forest Service manual was redrafted in 1921. This edition included the following policy statement:

> No plan of national forest administration would be complete which did not conserve and make them (the mountains, cliffs, natural formations, etc., found in the national forests) fully available for public use. Their preservation, development, and wise use for the promotion of the public welfare is an important and essential feature of timber and forage and the conservation of water resources.[10]

While recreational use had been mentioned in earlier manuals, this statement marked a new departure because it was designed to correct the atti-

[8] I have commented elsewhere on this aspect of the Conservation Movement. *See* Grant McConnell, "The Conservation Movement—Past and Present," *Western Political Quarterly* (September, 1954), pp. 463-478.

[9] U. S. F. S., *The Use of the National Forest Reserves,* pp. 15, 25, 32, 81.

[10] Quoted in L. F. Kneipp, "Recreational Use of the National Forests," *Journal of Forestry,* XXVIII (May, 1930), 618-625.

tude of some foresters who had actively discouraged recreational travel and use. With this statement, however, the official recognition of the various possible uses of the national forests was well-nigh complete.

II

The devotion of forest lands to many uses, then, has been a principle of Forest Service policy from the beginning of active public-forest administration in the United States. In a simple sense it is true to say that multiple-use *is* Forest Service policy. Moreover, it is clear that no course other than recognition of a variety of uses of the national forests was open to the administrators of the agency, even had some other course been desired.

Despite the certainty which must be granted to the recognition of different uses of forest lands, however, neither the legislative acts nor the statements of policy just surveyed present an adequate statement of multiple-use policy. They were undoubtedly sufficient in the early years of the Forest Service, when problems were simpler than they are today. Then, the major problem was to arrest the heedless devastation of range and forest which was progressing so rapidly, and to preserve some of these resources for later generations. A lesser problem then, although one which bulked large in the thinking of Gifford Pinchot and his associates in the administration of Theodore Roosevelt, was to prevent the rise of monopoly in the use of forest resources.[11] This was not strictly speaking a part of the multiple-use policy, but then neither was it completely separate and distinct.

For much of the history of National Forest Administration, a large part of the task was sheer protection of the forest lands. This most conspicuously meant fire protection. This was a major undertaking since it required road and trail building, establishment of buildings and other facilities, training of suppression personnel, and public education. The timber being cut for the most part was still that in private holdings. Some problems arose with the management of grazing lands within the forests, and although the decisions of Forest Service officers were challenged from time to time, the administration of grazing could generally be justified on fairly technical grounds. Problems of a troublesome sort arose from the terms of the mining law, which gave first priority to exploitation of

[11] This objective permeates the statements of Pinchot and of official Forest Service policy that stem from this time. *See*, for example, Gifford Pinchot, *The Fight for Conservation* (New York; Doubleday Page, 1910), a collection of his speeches and articles. It abounds in antimonopoly statements characteristic of the period.

mineral deposits wherever these could be found. No few resorts and no small amounts of valuable timber were exploited in national forests under the protection of mineral claims staked under the mining laws, but which had slight subsurface values. Nevertheless, there was substantial ground for satisfaction that the Forest Service in the administration of its large public responsibility had governed wisely and fairly. So far as the inherent problem of multiple-use was concerned, the testimony of C. M. Granger of the Forest Service that "almost every national forest furnished an example of a large variety of overlapping uses so harmonized as to avoid any measurable conflict"[12] summed up the first half-century's experience.

With the end of the Second World War, however, there were indications that a new era in forest administration had begun. Inevitably, a larger part of the nation's timber supply now lay in the national forests. Moreover, the prospects for introduction of scientific forestry in management of the large amount of timber in small private holdings had dimmed. Various attempts to develop programs to this end had fallen far short of their goal. Beyond this were the facts that the population was now growing rapidly and that the nation was enjoying an unprecedented prosperity, conditions which meant an unprecedented consumption of resources. In short, the era of abundance was over and, with it, the simple solutions to many problems.

The implications of the new conditions under which forestry must be practiced have been pressing themselves upon the personnel of the Forest Service in recent years. For example the present chief of the Service stated not long ago:

> This country will continue to need national forests. There will be national forests for the simple reason that rain and snow will continue to fall on the mountains. So most of our water—particularly in the West—will continue to come from national forest lands. And we will have national forests because the use of these great public properties for healthful outdoor recreation will steadily become a more dominant use. Just as grazing was the first major use of these forests, and now timber takes its place as a major use, so too in the years to come will water and recreation become major uses and probably the dominant uses in many places.
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> Millions of people will continue to insist on having these products and services of the national forests. They can get them best through a system of multiple-use management—in fact, this is the only way all of these products

[12] Statement in *A National Plan for American Forestry,* Sen. Doc. No. 12, 73d Cong., 1st sess. (1933).

and services can be gotten from these lands. In a very real sense successful multiple-use management is the best justification for continued public ownership of these lands.

We are rapidly leaving behind the custodial stage in management of these immensely valuable public properties.[13]

This is increasingly the refrain of Forest Service thinking: "The Forest Service is no longer a custodial agency." "We are entering the period of intensive management." These are remarks frequently heard among Forest Service officers. The term *management* implies multiple use as stated by Chief McArdle.

With this change in direction, it is legitimate to ask what multiple use actually means. Essentially the same idea has been debated in public water projects. But, as indicated above, the idea has been imbedded in Forest Service policy for the entire lifetime of the national-forest system. Historically multiple use in forestry has meant that virtually all nondestructive uses would be recognized as permissible somewhere in the national forests. Curiously enough, however, it is only in fairly recent years that the term, "multiple-use policy" has come into usage. The term seems to have had little currency more than a few decades ago. What are the guides that it provides for the exercise of the large and increasingly important discretionary powers of the agency?

It has become apparent that increasingly the various uses of the forest lands are in conflict. The issue was succinctly stated in an editorial of the *Journal of Forestry* some years ago:

> Simultaneous use of the same piece of land for several purposes is often difficult since many uses compete with as well as supplement each other. Maximum production of timber interferes with maximum production of wild life. Full utilization of forage reduces the yield of wood. Heavy cutting may make the forest less effective as a regulator of run-off and certainly it impairs its value for recreation. Complete preservation of natural conditions for the benefit of the water supply or the nature lover puts a stop to all industrial uses.[14]

During an era of scarcity and pressure of population on the forest resources choices will inevitably be necessary. How are these choices to be made? What will the criteria of decision be?

The general answer which seems to be offered by the Forest Service

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13 Speech by Richard E. McArdle, chief, U. S. F. S., quoted in U. S. F. S. *Information Digest,* April 5, 1955.

14 *Journal of Forestry,* XLI (September, 1943), 25-26.

and by many professional foresters is that technical forest management can produce standards which can be justified in most instances. Thus, for example, careful on-the-spot examination of a bit of rangeland will give the basis for a ruling that so many sheep may safely graze the terrain without causing an appreciable erosion problem. Similarly, study and experiment will determine what method—clear cutting, selective cutting, or patch cutting—will bring about the quickest return and largest yield of, say, lodge-pole pine at high elevations. There are fairly typical examples of the technical studies on which the Forest Service is currently relying to produce answers to important administrative problems.

Many administrative problems will be solved by such methods. As more information is accumulated, uses which appear to conflict will prove capable of adjustment so that different benefits can be made compatible. Thus, by requiring certain practices of cutting, it may be possible to increase the deer population through the subsequent increase in browse and brush cover on which the deer depend. Mere cutting in itself will often have this effect. Some studies suggest that sometimes water content of the snow cover can be increased by the thinning of timber. Forest management may thus satisfy different interests concurrently by such means.[15]

In other instances of conflicts in use, it is sometimes possible to make assessments of economic return which can be expressed in dollar terms. Thus, the receipts from timber sales may be compared with the income to resorts, to produce a rough measure of the value of these different uses. This economic measure is as much a part of technical management as measures based upon the science of silviculture.[16]

It is satisfying to reflect that management can frequently achieve the resolution of conflict by such techniques, but not all conflicts can be erased by study and further information. Sometimes, it must be anticipated, study and information may even bring to light conflicts which had not previously been apparent. More important than this, however, is the fact that some uses which have been recognized in legislation and administrative practice are not only incompatible but not measurable on any common scale. Thus, how can the worth of lives saved through flood control be weighed against the possible dollar returns from the sale of

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[15] David Lilienthal has been particularly eloquent on the possibilities of resolving conflicts by bringing expert knowledge to bear. *See* his *TVA-Democracy on the March* (New York: Pocket Books, 1944), pp. 75-77.

[16] Cost-benefits analysis has had little application in decision-making in forest land-use conflicts.

timber? Alternatively, how can the inspirational worth derived from visits to scenes of great natural beauty be measured against any of the economic uses to which the resources of those areas might be put?

Where choices of this sort appear, the administrator charged with decision is in a difficult position unless he has some more or less objective basis for his action. It is insufficient to say, as the editorial writer for the *Journal of Forestry* said, that, "with skillful handling and within the limitations imposed by the site itself we can produce any combination [of uses] we want." The task "calls for technical and administrative ability of the highest order."[17] Just what combination "we want" is the essence of the administrative problem. There is no magic in either technical or administrative skill that can resolve the inherent problem. However able and however dispassionate the administrator may be, he is open to the charge of arbitrary action based on his personal tastes and preferences, if his discretion is too great.[18]

III

The question that must be asked, then, is how well equipped is the Forest Service administratively to deal with the insensibly grown discretion it must exercise?

In somewhat schematic outline it may be said that there are four types of solution to the problem with which the Forest Service is faced. First, objective criteria of choice may derive from the technical standards of the various sciences available to the trained administrator. Second, standards may be given in legislation. Third, policy developed out of administrative experience over time may provide guides. Fourth, the choices may be referred to some system of consultation with the public.

The first of these solutions has been dicussed in part already. Without doubt scientific studies can often settle vexing problems in a manner excluding personal preferences. Thus soil studies, for example, may conclusively determine that logging on a particular area would result in a large erosion problem and hence should not be permitted. In such a way the scope of controversy can frequently be narrowed. Where there are questions of techniques, such as the best means to gain the greatest sus-

[17] *Journal of Forestry,* editorial, XLI (September, 1943), 25-26.

[18] The principal form in which the issue appears in Forest Service administration is allocation of land use. However, it can also be expected to appear in budgeting. *See* comments of Luther Gulick, *American Forest Policy* (New York: Duell, Sloan & Pearce, 1951), pp. 178-179.

tained yield of timber, the decision of a competent forester should be—and generally will be—above question except by other foresters.

The problems concerning different kinds of use, however, are often nontechnical. After the boundaries of the controversies have been delineated, after the technically *possible* solutions have been determined, a large area of uncertainty is likely to remain. Nothing in forestry training will give technical competence on which to base a choice as between, say, lumber or scenery. In fact, too great an emphasis on purely technical standards may create dangers of unseen bias. Entirely aside from the all-too-human failing of assuming that expertise in one field means expertise in other fields, there are problems deriving from the nature of the forestry education to which most Forest Service personnel have been subjected.

The first of these problems is that the curricula of the forestry schools are weighted heavily on the side of timber management. This is partly the result of the specialization resulting from the increase of knowledge. However, it is also partly the result of the changed market for forestry-school graduates. Today, approximately three-fourths of these graduates find jobs in industry. Formerly, this fraction was smaller and more foresters looked forward to careers in the Forest Service and other branches of public service. Both of these factors have contributed to the mentality that has long been known as that of the "sawlog forester."

A more fundamental problem is that the doctrines of the forestry schools and the Forest Service are founded on the tenets of progressivism set forth in the letter from Secretary of Agriculture Wilson to Gifford Pinchot cited above. "The greatest good of the greatest number in the long run" carries a bias in favor of objectively measurable benefits and tends to disguise value choices of other kinds. Thus, by implying that these choices are technical matters, an initial preference for decisions justifiable in quantitative economic terms is implicit. It is the more insidious for being disguised.

The conclusion that is difficult to escape here is that to the degree that "technical" grounds are relied upon for decision in problems of multiple-use management of public forest lands, uses yielding the greatest dollar returns will be preferred and timber production will stand first among these. This is hardly the concept of multiple use as it is sometimes presented.

The second type of solution, by legislation, has also been discussed in part: although a fairly large mass of legislation relating to the national forests is on the statute books, little of it deals with multiple use. The

act of 1897 referred to the purposes for which forest reserves could be created and perhaps says something about the uses of the forests. It has sometimes been taken to mean that water and wood are the first uses of the forests. However, experience and the development of practices do not seem to bear out this reading at every point. Other uses have been permitted a higher priority in certain areas. The 1897 law does not say that water and wood must head the list of uses, and such an interpretation has not always been made.

Of the other laws significant to the multiple-use policy, the law of 1915, authorizing certain types of recreational leases has been mentioned. More important is an act passed by the 84th Congress in 1955 amending the mining law.[19] Sometimes called the "Multiple-Use Mining Law," this act limited the surface rights of the holders of unpatented claims regarding timber and exclusion of hunters and fishermen. It also provided for the removal of inactive claims.[20] Although this law goes far to solve some of the troublesome abuses of forest lands, it adds little clarification of the administrative problem of the choice among uses.

Existing law, then, is of little assistance in the solution of this administrative problem. Just at the present time a controversy is going on over a bill in Congress that would provide a legislative basis for classification of certain wild lands for preservation as wilderness. This is being opposed by leaders of the American Forestry Association, an organization that is sometimes a spokesman for Forest Service views. Although the particular bill touches on only one type of use problem, it is the sort of bill that would treat the administrative problem directly. The response of one American Forestry Association writer is particularly interesting: "In the past, foresters have proven that they have the ability to adjust to new needs and put first things first."[21] This argument is linked closely with an appeal to the principle of multiple use. In this linkage, the American Forestry Association writer comes perilously close to making multiple

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[19] 69 Stat. 367.

[20] For an account of progress made so far under this law *see,* Edward P. Cliff, U. S. F. S., "Progress Report on Public Law 167," *American Forests,* LXIII (January, 1957), 15 ff.

[21] James B. Craig, "The Wilderness Bill—Two Points of View," *American Forests* (January, 1957), p. 57. This is part of a two-part article, the other written by Ernest Swift, director of the National Wildlife Federation. Swift specifically raises the issue of the exercise of administrative discretion: "It is also a well-known fact that most public agencies desire broad managerial powers, to which there is a great deal of merit and substance. But there is inherent in this philosophy the danger of rule by man instead of by law" (p. 42).

use a formula for government by experts in an area in which expertise is necessarily limited.[22]

Turning to the third general type of solution, the evolution of administrative policy, it is apparent that although some progress has been made, much of the problem remains. As has been noted already, a diversity of uses of the forests has been recognized in the administrative regulations of the Forest Service from the beginning. In the first "use book" the various uses seemed to be on a plane of equality, but in 1911 a new principle was introduced:

> National Forest land should not be devoted to an inferior use so as to preclude a higher use. For instance, after the issuance of a pasture permit it may be found that the area covers the only available reservoir site for the water supply of the community. In such a case the District Forester should exercise his discretion and cancel the permit. The welfare of the community or the number of people benefited should be the factor determining a higher use, rather than the amount of money to be obtained for the use.[23]

Here was a recognition of the problem of discretion and the first attempt to deal with it.

Curiously, however, relatively little has been done by the Forest Service to develop and refine this principle. The term "highest use" has remained in currency, but it has received no elaboration in the regulations of the service. There are probably several reasons for this lack. First, the problem of conflicting uses has not been serious until recently. Second, the idea of a hierarchy of uses is inconsistent with the large degree of discretion which multiple use has so far been taken to imply. Third, no criteria for determining such a scale of values are available.

Probably, the following current instruction relating to grazing in the national forests is the clearest statement of Service policy on multiple use: "Demands on the national forests for timber production, watershed production, grazing, recreation, wildlife and other purposes require flexibility in their administration. Experience has demonstrated the importance of permanently maintaining the principle of multiple land-use management in the administration of the national forests if they are to contribute maximum benefits to the public."[24]

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[22] The chief of the Forest Service has on occasion taken a similar position. *See* his testimony in Hearings before the Committee on Interior and Insular Affairs, U. S. Senate, National Wilderness Preservation Act (June, 1957), pp. 92-96.

[23] *The National Forest Manual* (1911), p. 11.

[24] U. S. F. S. *Manual,* 202.3.

Other instructions relate only to the caution that "public usefulness" of timber should not be weighed only on "the basis of years of age or value on the stump" or purely in terms of dollar returns to the government, and similar negative and general statements.[25]

In general, then, the Forest Service still adheres to an administrative system relying on large-scale discretion by its officers in matters of land use. A few tentative departures from this have been made in the "U-regulations" providing for classification of certain areas for particular uses. However, these apply frequently to lands that have little economic potentiality, or are quite restricted in extent. At points, these regulations are decidedly vague.[26]

Land-use classification may prove the general avenue by which many problems inherent in land use may be solved. Professional thought seems to be tending in this direction. Thus:

> The Society of American Foresters subscribes to the principle of multiple use of forest and other wild lands, meaning by that a conscious effort to manage each unit of land for its highest sustained productivity. In some cases, this may mean utilization of different parts of an administrative unit for different single or limited purposes. In all cases, the development of management policies and plans require adequate recognition of all resources and benefits, with due consideration of the relative social and economic values of each resource present and of the effects of utilizing one resource upon the stability, value and appreciation of the others.[27]

Although this statement lacks definiteness, it is also at points clearer than official Forest Service policy. This Society of American Foresters statement has the outstanding merit of recognizing that it is impossible to achieve all values and that the attempt to achieve them all on the same unit of land will result in the extinction of some by others.

The statement does not, however, answer the question of what size of the unit to take for satisfaction of particular values and how to determine it? Inevitably, here the discretionary element remains. Nevertheless, it is clear that the position of the Society of American Foresters points toward an administrative development that will help to limit discretion.

The Forest Service has throughout its history been particularly careful to adopt some form of consultation with the public, the fourth type of solution which was enumerated above. It is probably in part the result

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[25] The language quoted here is from *ibid.*, 102.3.

[26] See, for example, Regulation U-3.

[27] Policy statement approved by referendum, Society of American Foresters, December 13, 1947). Printed in *Journal of Forestry*, XLVI (January, 1948), 15.

of this care that the agency's problem of its discretion in land use has not been more evident. Ever since the days of Gifford Pinchot, the agency has been alert and sensitive to the currents of public opinion. Its system of studied decentralization of administration, for which it has been praised by some students of public administration, is well calculated to adjust to politically powerful local interests. For this reason, the system carries a frequent bias for particular interests and against the national interest. For more than two decades, moreover, the Forest Service has used the assistance of advisory committees attached to the national organization and the regional offices. Approximately half of the individual forests also have such committees. These advisory committees have in general lent strong support to agency operations and have helped interpret the agency to the public. Moreover, they represent a certain recognition of the discretionary problem.

As a means for solving this basic problem, however, the device of advisory committees has questionable merit, because the members are appointed by agency officials. Some students of forestry administration feel that the committees tend to overrepresent lumber interests and are sometimes selected on the basis of the probable support they will give to existing Forest Service practices.

The conclusion must be that, despite a record of remarkable achievement extending over more than half a century, the Forest Service is not as well equipped administratively as it needs to be to deal with the problems of conflict in land use which it must face in the years to come. The Service has primary responsibility for administration of approximately 8 per cent of the land surface of the nation. The magnitude of this area has in the past permitted simple solutions to the problem of discretion. In the future, however, conflicts of land use will be progressively more important and the size of the areas administered by the Service will make development of further guides to the exercise of discretion imperative. Some of these guides may come from legislation, some from evolution of the land sciences and some from improved methods of public consultation. Much promise would seem to lie in the steady development of administrative policy, carefully drawn and clearly stated for observance by the officers of the Service. As it stands, multiple use is less of a policy and less of a guide than it may appear. At worst, it may be the disguise for an absence of policy and for the arbitrary exercise of large-scale discretion. If the reputation of this Forest Service as a responsible agency of democratic government is to be maintained, active efforts for a solution to this problem cannot be long postponed.

Economic Potential of Wilderness in the Northern Cascades

By Philip H. Zalesky and Founta Butler

How often we find opponents of wilderness preservation speaking one language and ourselves another! To those whose measuring stick is exclusively monetary, defense of wilderness based on human values frequently achieves little more than vocal exercise. Apparently we must talk dollars and cents if we wish to be heard at all in some quarters. The Northern Cascades share this handicap with other wilderness areas.

The scenic resources of Washington have fostered the rise of tourism to a position of fourth among the leading industries of the state. Professor C. Frank Brockman of the College of Forestry, University of Washington, in his *Recreational Use of Wild Lands,* breaks down financial accruals from recreational lands as follows:

1. Stimulation of vacation travel. As a result of our higher standard of living many Americans have found that recreational values are worth their cost. Travelers look for these values much as they examine the merits of more tangible merchandise, spending their time, and dollars, in areas with the greatest personal appeal. Vacationers also compare the values gained from recreational travel with those of tangible needs (e.g., a new car, refrigerator, increased life insurance) and make purchases in accordance with the results of that comparison.

2. Development of business activity in areas within, adjacent to, or en route to recreational areas. Supplies and services in great variety are required by visitors attracted to recreational areas (e.g., hotel accommodations, meal services, supplies and equipment, gas and oil), thereby resulting in an inflow of money which might not otherwise have been spent in a given area.

3. Stimulation of business activities relative to the manufacture of recreational equipment, clothing, and supplies. The specialized needs of recreationalists (e.g., campers, hunters and fishermen, mountain climbers, skiers, boating enthusiasts) promote and develop manufacturing enterprises whose activities are reflected in the national economy.

4. Increased property valuations. Vacation travel and other recreational activities, in stimulating business activity in and adjacent to recreational areas, bring about increased property valuations which are reflected in increased property tax revenue to cities, counties, states, and the nation.

5. Increased miscellaneous tax revenue. With particular reference to out-of-state visitors, recreational expenditures of all types include taxes of various

kinds (e.g., gasoline tax, sales taxes, amusement taxes) which are reflected in a direct monetary return to the nation and to various municipalities and states.

As Professor Brockman points out: "Further, since recreational lands are often located in relatively remote areas, the business activity which they stimulate is a vital factor in the stability and economic development of such regions. Even backward or retarded areas may be improved economically and certain localities, characterized by decline or past mismanagement of natural resources may, through development of recreational interests, be given a new lease on life."[1]

Olympic National Park seems a logical object of appraisal in assessing returns from recreational resources to be anticipated in the North Cascades. In 1945 about 50,000 people visited Olympic National Park; by 1958 the number soared to 1,181,523. The National Park Service estimates that 34% of these were out-of-state visitors (representing a source of "new money" rather than a redistribution of local expenditures) who spent an average of four to six days in our state.[2] From various studies has been derived the average hourly sum of 23¢ spent per tourist[3,4] Applying this figure to a four-day stay by out-of-state tourists in Olympic National Park yields an income of $8,869,000[5]; from six days the gain is $14,304,000.[6]

Estimates of tourist expenditures in the State of Washington as a whole are illustrated below:

1940	$ 90,000,000[a]
1948	116,000,000[a]
1950	122,700,000[a]
1952	134,500,000[a]
1955	271,000,000[b]
1958	330,000,000[c]

[a] *Recreational Use of Wild Lands,* C. Frank Brockman, 1959
[b] 1955 study by State College of Washington
[c] Estimate by Dept. of Commerce & Economic Development

It is interesting to project the 22 per cent increase between the years of 1955-1958 into the future. Taking into account the expanding population with higher incomes and greater leisure at its disposal, the shrinking wilderness resource and wider dissemination of knowledge concerning the heretofore relatively unknown North Cascades, it is not unreasonable to conjecture an accelerating increase in the percentages of revenue growth. At current levels the Department of Commerce and Economic Development, State of Washington, figures that if we could keep each

tourist in our state just one more day, tourism would become the second ranking industry, topped only by defense.

It is scarcely necessary to describe the attractions of the North Cascades to readers of this bulletin. Suffice it to say, in comparison with most of the existing national parks, it's doubtful if praise for the region's scenic qualities could be exaggerated. That tourist selection is motivated largely by such values is demonstrated in excerpts from the following studies:

> Scenery is revealed as being the most significant value to park visitors, outweighing the combined appeal of all other values and recreational features. In the summer season alone, with its large visitation, 79.7 per cent of the visitors indicated scenery as first preference in attractions of the park.[7]
>
> A section of the questionnaire offered a multiple choice in order of preference for the various features and activities available for the visitors' pleasure at the Grand Canyon. This part was included to aid the Park Service in planning activities for the time the visitor was not viewing the Canyon. It was not discovered until tabulating the results, that the inclusion of the dominant items of scenery, climate and watching wildlife, as choices, made the resulting data as to other items valueless.[8]

To gain perspective, we are obliged to investigate the economics of claims made upon this area by the major competing land use: the forest industry. The merest mention of "wilderness area" is likely to bring down upon one's head a veritable deluge of "timber famine," "bankruptcy" and "unemployment." Such protests correspond oddly with pride exhibited simultaneously by the timber interests in strides made toward intensive forestry. As one noted member of the industry has stated:

> The confounding of all such statements is in publications of the timber industry itself. Tree farming, we are assured, insures the production of all the wood needed by the nation. There are claims this goal has been reached. If most of the 358,269,000 acres of privately owned commercial forest land is "farmed" as productively as the 41,827,683 acres in certified tree farms, this could be.
>
> The official of any timber company who proposes logging be allowed within national parks, monuments and dedicated wilderness areas, is out to make a fast and easy dollar.[9]

In further repudiation of the hysteria induced by irresponsible segments of the timber industry, we may refer to the Forest Industries Council statement:

> Thus, an impartial and scholarly study of Timber Resources Review leads to the conclusion that not only is there no timber shortage in prospect but, under

continuing good management, the forests can grow enough wood to meet the increasing needs of a rising population and permit an expansion in the use of timber in our national life.[10]

Most competent foresters are predicting a healthy future for supply. F. K. Weyerhaeuser at the 50th anniversary of the University of Washington College of Forestry predicted "that the harvest of old-growth timber would be extended well into the 21st century, and that beginning about 1970 the rise in Washington saw timber would more than offset the decline in use of old-growth timber."[11] Weyerhaeuser went on to point out, "If the demands for wood warrant it, we may some time be able to grow two crops during the period it now takes to grow one."

A significant portion of a Cascade wilderness park would be within the confines of Snohomish County. If studies for Snohomish County, Washington, are any indication, the year 1970 may be too far distant for our second-growth saw timber to catch up with cut in the Northwest. Forest Service data show that in Snohomish County between 1932 and 1955, 474 million board feet of timber grew in excess of the cut—an increase from 20,098 million board feet (adjusted to present d.b.h. and top diameters) to 20,572 million board feet.[12]

The Service explains this surplus in part: "One factor that increased the board foot volume of sawtimber during the periods of inventory was forest growth. Both net growth in sawtimber trees and the ingrowth of poletimber trees into the sawtimber class contributed to this increase."[13]

Pertinent to the issue is the slight downward trend in consumption of lumber from 41 billion board feet in the year 1900 to 33.3 billion board feet in 1958.[14] There is substantial reason to believe that this figure will remain stable in the future in spite of the growing population and the Forest Service projection of a saw timber cut of 58.8 billion board feet in 1975 and 79.3 billion board feet in the year 2000.[15] Mr. Robert M. Ingram, a high official of one of the nation's large organizations in the forest industries, said:

> Those who have analyzed the situation closely suggest that our danger is more an over-supply, rather than an under-supply of timber. I suggest the situation demands a comprehensive, carefully considered 10-year plan to cover the entire era during which our industry will be called upon to prove its worth or be prepared to accept the role of a second-class power in the building products field.[16]

Regardless of a rising per capita consumption of physical structure materials as a whole, the Stanford Research Institute reports: "Lumber

consumption has declined steadily from 18,900 board feet per dwelling unit in 1920 to 10,520 board feet in 1953, a 44 per cent drop. By 1975 lumber consumption per dwelling unit will probably decline to about 8,700 board feet, or about 17 per cent below 1953 levels."[17]

There are many contributing factors to the downward trend in per capita consumption. Increased logging costs as operations are shifted to more rugged terrain are reflected in higher prices. But more dramatic than rising prices is the competition the forest industries meet at the market place. Steel and concrete have made great dents in the per capita consumption of lumber in the 20th century. However, the worst is yet to come—aluminum and plastics are on their way. Kaiser, Alcoa, and Reynolds Aluminum Companies have all introduced aluminum siding for houses recently. National Homes has introduced its aluminum-sided Viking line with the prediction that these homes will account for at least half its total sales of 1959.[18] Apparently, displacing lumber is fair game in the scramble to enter the building business. Plastics manufacturers consider themselves only on the threshold of a field they plan to dominate.[19] Already 15 per cent of the plastic output is channeled into the building industry.

A gaping hole in the logic of wilderness opposition is the question of intensive forestry. Dr. George Marra of Washington State College has pointed out that more wood is wasted in the Northwest than is turned into marketable products: "The 60 per cent of timber potential we are failing to utilize must be processed to meet changing economic conditions." Disregarding the example of Southern tree farms, where in 1952 "growth has surpassed removal by a whopping 31 per cent,"[20] our Northwest industry has not made intensive integrated forestry a standard practice, even though research has provided the technological knowhow. However, credit is certainly due Weyerhaeuser, Scott, Simpson, and Crown Zellerbach for intensive management of their lands. The documentation which has accumulated in support of intensive forestry is temptingly abundant, but space requires that we continue the pursuit of our original theme.

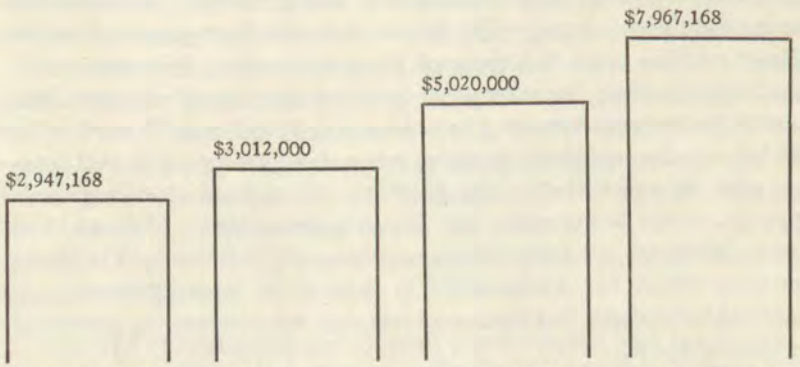
Having plowed through the propaganda to the underlying facts, all evidence indicates the forest industry threatened by market famine rather than timber famine. Competitive substitutes for forest products are here to stay. Therefore the future would appear to hang on the industry's ability to adapt; to increase its productivity; to lower its operating costs. Disaster is inherent in the ostrich policy of proceeding with methods suited to that past in which big saw timber was in limitless supply. If the

forest industries' economic health were dependent on the remaining vestiges of virgin timber in the proposed North Cascades wilderness area, their plight would be a pitiful thing indeed.

A comparison of the economic benefits to be derived from dedication of the Mount Baker Forests to logging or reserving the area under discussion as a wilderness national park with the balance in the hands of the timber interests is set forth in the diagram. Column 1 indicates the receipts from the Mount Baker National Forest (which are higher than the average for the past five years). The price for cut logs in 1957 was higher than in 1958. The average cut price for 1957 was $20.15.[21]

Columns 2 and 3 contain the average visitor stay at 48 hours within the state, contributed by a Cascade National Park. This estimate is conservative when we view the average stay for Olympic National Park as 96 to 144 hours.

Column 4 shows the total potential that might be derived from Mount Baker National Forests. At present the Forest Service is far from extracting the possible annual cut from Cascade forests. In all likelihood a national park could be inserted, and the Forest Service, operating at full capacity with sufficient access roads, would continue to equal current cut. The revenues in this figure must also be considered a conservative estimate.



Forest Receipts from Mount Baker National Forest, 1957	State of Washington tourist revenues from a Cascade National Park with 300,000 tourists staying 48 hrs. in state @23¢ per hr.	Washington tourist revenues from a Cascade National Park with 500,000 tourists staying 48 hrs. @ 23¢ per hr.	Combination of Columns 1 & 3 showing potential revenues from a Cascade National Park and current annual cut from remaining forest lands

The U. S. Department of Commerce calculates that 24 tourists per day per year is the economic equivalent to an industry with an annual payroll of $100,000.[22] For Olympic National Park under these figures, tourism amounts to the equivalent of over 183 industries with payrolls of $100,000 per year. [23] A Cascade National Park would have a similar potential to that of Olympic National Park.

There are no means of measuring various other economic benefits bestowed by wilderness. How can we estimate the dollar value of our watersheds? We would surely be impoverished by their loss. And how can we compute the gains wilderness renders in scientific study and control plot comparisons? Or the increased productivity afforded the nation's work force through such recreation?

This analysis is perhaps best concluded with Professor Brockman's words in *Recreational Use of Wild Lands*. "The values of outdoor recreational lands are fragile, but they can be marketed indefinitely, provided that those values are known and understood, and provided that they are administered in a manner that will insure their preservation and proper maintenance. Like the fabled goose and the golden egg, recreational values can be destroyed by overuse or improper development in an effort to make them function purely as profit-producing enterprises. The economic value of recreational lands is not only reflected in the dollars which a region derives as a result of the existence of such areas but also in what costs we are willing to bear in order to have and to preserve their varied interests."

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An eminent scientist, past president of the AAAS, considers physical law and moral choice and warns that too much is being expected of Science

On Coming to Terms With Our Environment

By Paul B. Sears

THE DREAM of universal harmony is an ancient one. Often it has taken the nostalgic form of a Golden Age, long past. Again it appears as future promise. The dreamer who looks ahead often sees it all very simply. Let him and all who think alike with him have their way. Never has this been better set forth than by Dr. Rabelais:

"Then, ah then . . . then plenty of all earthly goods here below. Then uninterrupted and eternal peace through the universe, an end of all wars, plunderings, drudgeries, robbings, assassinates unless it be to destroy these cursed rebels, the heretics."

There are today four times as many human beings in the world as when those words were written. Old and stable social orders have broken up. New powers, through new knowledge, are at man's disposal. He has, in truth, become a geological force. The dream of ultimate harmony still persists, but the old cleavage remains. There are those who think the blessed state must come by eliminating all who do not think as they do. There are others who hope for a condition of mutual tolerance and restraint, founded upon some measure of common understanding.

These are moral problems, using that term in its broad and classic sense. But morality today involves a responsible relationship toward the laws of the natural world of which we are inescapably a part. Violence toward nature, as the Tao has it, is no less an evil than violence toward fellow man. There can be no ultimate harmony among our own species in defiance of this principle. But more than that, we can find in certain concepts of natural science an invaluable guide as we struggle to attain a better order in our own affairs.

A disturbing paradox of this scientific age is the fact that its most profound implications have not sunk into our minds and become manifest

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Professor Sears is chairman of the Yale University Conservation Program and author of *Deserts on the March*. This article is a slightly revised version of his address to the 1958 Council, Phi Beta Kappa, as printed in *The Key Reporter*, January 1959, with the title "The Steady State: Physical Law and Moral Choice."

in our behavior. Commonly—too commonly—we hear such glib phrases as "man's control of nature," "the necessity of an expanding economy," and "the conquest of space." As Ortega y Gasset has said, the effect of the industrial revolution has been to create an illusion of limitless abundance and ease, obscuring the ancient doctrine that effort and struggle are the price of human survival.

Thus in one sweep are brushed away the lessons of history, the wisdom so painfully gained through disciplined thought and intuition in the fields of ethics and aesthetics, as well as those aspects of natural science that could afford us perspective, rather than immediate convenience. A subtle and dangerous symptom of this last is the recurring objection to physical and biological analysis of man's estate.

Whatever else he may be, a human being is a physical object and a living organism. He is by no means an inert particle, nor is he exempt from physiological limitations. Enough of us have been caught, afoot or on wheels, in traffic jams, have been hungry and thirsty, and are sufficiently familiar with birth and death to appreciate these facts. To mention them is not to say that human beings are mere particles or mere animals. Yet certainly one must be free to weigh any consequences that may result from a particular quality of property of mankind, without being condemned for applying physical or biological analogy to the demigod, man.

There is precisely here a most delicate and important job of identification and discrimination. Could we clarify it, it might help lower the costly barriers that hamper free intercourse between scholars in the humanities and those in science—indeed, among scientists themselves.

An initial difficulty comes from confusing analogy with proof. Yet no matter how much the role of analogy may be abused, its importance as an aid to scientific investigation is very great indeed. Wisely selected parallels, or analogies, are the source of models that science can then test. A new situation, structure, or process suggests a familiar one, and we go on from there. The brown discoloration of a peeled apple suggests oxidation, and so it proves to be.

We can also isolate certain qualities in a system and study them profitably on their own merits. A notable instance is afforded with respect to mere increase in human numbers within a finite space. Obviously we cannot apply the laws that govern the dynamics of gas molecules strictly unless we are all playing blind man's buff with motion at random. This we are not doing, for eyesight and judgment enable human beings to pick open pathways, which molecules cannot do. Yet the general principle

that freedom tends to diminish (or stress to increase) as numbers multiply not only applies in theory, but in historical fact.

The application may be pressed still further. When energy is introduced into a system, the stress increases. This obviously applies to the molecules in a kettle of heated water. I am unable to see why it does not apply with equal rigor to modern man who, through the internal combustion engine, is drawing upon the fossil energy of oil deposits, now being consumed at an estimated rate one million times faster than they have accumulated. By virtue of this process the average American moves, I should judge, some ten times faster than he did in 1900, and if so, covers one hundred times more territory. The evidence of stress as a function of numbers and energy is manifold. Yet we have reassuring voices telling us not to be disturbed, because the earth can support an indefinitely increased population.

Perhaps, with so much at stake, it is time to make certain we understand what science is, and what is its role in human affairs.

Science is the discovery and formulation of the laws of nature. In our enthusiasm we may forget that a law not only tells you what you can do, but what you cannot do. When we use our knowledge of natural law for specific problems we are practicing technology, not science. And because scientific technology has placed an estimated minimum equivalent of three dozen servants at the disposal of the average American, we are, quite naturally, more inclined to listen to promises than to warnings.

Yet the necessary warning can be stated quite simply. *The applications of science must be guided, managed, controlled, according to ethical and aesthetic principles and in the light of our most profound understanding.* Unfortunately we cannot set up an equation to show that because a thing is possible, it is necessarily wise and proper. If we could, it might simplify matters.

Certainly the application of science has been selective. An astute student of cultural processes, examining the western world, would note that science has been applied in spectacular fashion to the elaboration of consumers' goods, the reduction of mortality rates, and the tapping of fossil energy. He would also note certain consequences of this situation. Among them would be an explosion of human population without known precedent in the biological world, a lessening of the need for muscular effort, increased leisure, a startling multiplication of the rate of individual movement, dissipation of nonrenewable resources, and disruption of natural cycles in the landscape. Nor would he be likely to overlook the signs of increasing tension upon the individual and the disintegration of

value systems, which, whatever their limitations, have always exerted a stabilizing effect on human societies.

Our observer would find the question of man's relation to environment relegated to the fringes of serious scientific inquiry. He would uncover a widespread belief in the possibility of and necessity for a perpetually expanding economy. He would find economists well pleased if they could look ahead twenty-five years while a few scientists try honestly to peer much farther into the future. He would see that a great deal of effort is being given by the latter group to estimating the maximum number of human beings that could possibly be kept alive on earth, such estimates ranging from three to ten or more times the present population. Concerning the quality of existence possible under such conditions he would discover a strange silence broken only by such bold prophets as Orwell, Huxley, and Sir Charles Darwin, the physicist.

Persisting, he would recognize other interesting conditions. Although the devising of means of human destruction continues uninhibited, frontal attack on the control of population pressure—difficult enough for technical reasons—is largely taboo. So are suggestions that human happiness might well be possible under a far less wasteful and consumptive economy. And while analysts are beginning to demonstrate that, beyond a certain limit, the expansion of any urban center means economic loss, not gain, their warnings carry little weight.

Modern society seems incalculably rich in means, impoverished in ends. The dazzling success of science in placing facilities at our disposal has left us all, including the scientist, a bit confused. Yet wisely enough the editor of a recent collection of studies on population points out that while the scientist possesses no special magic or superior methods for reaching policy decisions, he can offer sound knowledge, highly relevant to the making of value judgments.

There appears to be some consensus on one point: that an improved level of living for mankind is desirable. Such a blanket statement covers a multitude of possibilities, of course, although it clearly implies adequate nutrition, a better distribution of benefits, and relief from unnecessary hardship and suffering. But on the means of attaining this objective, we find ourselves in a bipolar atmosphere of world politics. One doctrine holds the individual generally competent to take part in decisions and provides elaborate safeguards to ensure him this privilege. The other sets up a monolithic structure in which the individual is submerged, ostensibly for his own good.

It would clarify, if not resolve, matters if we were to admit frankly that

our Cold War is the third great religious conflict of the western world. The two previous ones were abated, not simply by military means, but more basically by concession to the idea of survival through dynamic equilibrium. Hope today lies in arriving at some similar agreement in principle, powerful enough to carry conviction, broad enough to tolerate the inevitable diversity that should enrich rather than impoverish human culture.

This brings us inescapably to a well-worn topic—the need for a better entente between the sciences and the humanities. Granting freely that science has frightfully disturbed the orderly world of the humanist, the latter has not, in my judgment, risen to the full opportunities that are his.

One cannot generalize about either humanists or scientists with any assurance, good manners aside. But this restriction does not apply so strictly to the fields they represent. A safe proposition is that neither of these vital activities should be carried on in isolation from the other.

Complicating the situation is the prevailing conviction that science holds the key to man's future. Julian Huxley has described this mood as "the airy assumption that 'science' will surely find a way out," a mood intensified by recent developments in the exploration of outer space. Yet it is clear enough that the fundamental problems of mankind are no longer technological, if they ever were, but rather cultural.

The need, in this neo-technical world, for the best that the humanities can offer is well-nigh desperate. It is the business of science to minimize the areas of uncertainty in human affairs. They remain large enough when this is accomplished. At this point we must begin to draw on the accumulated experience and wisdom of mankind to formulate, refine, and dramatize the ethical and aesthetic values that will guide us.

Values are the business of the humanities, and values clearly determine the direction of human effort. With incalculable powers at the disposal of mankind, the need for responsible control is correspondingly great. People shape their values in accordance with their notions of the kind of universe they believe themselves to be living in. The basic function of science is to illuminate our understanding of that universe—what it may contribute to human ease and convenience is strictly secondary.

Personally I am far less interested in guessing how thickly mankind can be amassed on this planet and still survive than I am in the optimum quality of existence for those who do. It is on this issue that the humanist must not desert us. We need his tempered judgment, his knowledge of great human achievement, his sensitive awareness of the creative human spirit to help us understand what, indeed, constitutes the good life.

Doubtless this is an issue that can never be completely settled, but with each step that clarifies it, we shall have more guidance in our quest for a worthy goal.

Yet this goal must be sought with a realistic understanding of the natural world of which we are a part. We must know its possibilities and respect its limitations. We must scan it for hints and models, remembering that the organized system of life and environment has been operating more than a thousand times as long as the experience of our own species. Our knowledge of the vicissitudes of geological and climatic change, of organic competition, conflict, even extinction, should not blind us to the essential order behind it all. In our consumptive age we hear much talk of the danger of depleting our environment. A far more profound threat lies in our power to disrupt its orderly transformations of material and energy.

The confidence with which the physical scientist faces his task rests essentially upon a few basic assumptions with respect to the orderly behavior of energy and matter. One of the important concepts corollary to these principles is that of the steady state. Systems tend toward conditions of minimum stress and least unbalance—that is, toward equilibrium. Energy flowing into a system operates to upset this trend, unless the system is so organized as to transform that energy in orderly fashion, using it meanwhile to keep the system in good working condition. Such a system, that is, an open steady state, is approximated in living communities. Green plants utilize solar energy to build carbon compounds that sustain themselves and animals as well, while complementary processes return materials for fresh re-use.

The heat from a stove—energy—will keep the pot boiling so long as there is water in it. But it will not replace the water when it is gone, nor mend the pot when it melts. By contrast, an organized pattern of living communities is self-maintaining if energy is available.

These circumstances have long since caught the imagination of men. Harrison Brown and other analysts point out that if man continues to increase in numbers and per capita requirements his fate will depend on his success in tapping additional energy sources rather than on lack of materials. For example, the mineral content of a ton of granite or a cubic mile of sea water is most reassuring. The hitch comes in the energy cost of reclamation, yet the literature abounds in optimistic assurances that man is clever enough to turn the trick. Now and then, but not always, we see the added proviso that he must first learn how to behave himself better than he does. On a less responsible plane we continue to hear talk

of an expanding economy, the conquest of nature, and man's unlimited future.

Poking about such an imposing edifice of technological statesmanship is creepy business, not unlike that of being near neighbor to a high-tension wire or an unguarded atomic pile. Yet certain naive probings seem unavoidable. Why not, for example, divert more of our scientific enterprise to studying the model that is before us, that has operated for more than a billion years, and has made our own existence possible?

Again, why continue, not only to tolerate, but to sponsor reckless and irresponsible multiplication of human numbers? Why accede to the notion that in a world where millions are hungry and malnourished through failure to apply the knowledge we now have, industrial enterprise must concentrate so largely on the mass production of what a philosopher would consider toys for adults?

Why worry so much about the other side of the moon when our cities, bursting at the seams, are erupting into an unplanned chaos? Why dream of escape to other planets when our own would respond generously to kinder treatment? Right and proper it is to push knowledge to the uttermost limits, but why not use what we have to clean the open sewers we call rivers, purify the air we must breathe, slow down the tragic waste of human ability, and get things about us shipshape? We are sweeping too much stuff under the bed, locking up too many closets.

Probably men will always differ as to what constitutes the good life. They need not differ as to what is necessary for the long survival of man on earth. Assuming that this is our wish, the conditions are clear enough. As living beings we must come to terms with the environment about us, learning to get along with the liberal budget at our disposal, promoting rather than disrupting those great cycles of nature—of water movement, energy flow, and material transformation that have made life itself possible. As a physical goal we must seek to attain what I have called a steady state. The achievement of an efficient dynamic equilibrium between man and his environment must always, in itself, have the challenge and the charm of an elusive goal. The infinite variety and beauty of the world about us, the incalculable facets of human experience, the challenge of the unknown that must grow rather than diminish as man advances in stature and becomes at home here—these are sufficient guarantee that a stable world society need never be a stagnant one.

Man and Fire in Ponderosa Pine in the Sierra Nevada of California

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Two cultures have used the pine forests of the Sierra Nevada of California—the redman, or aborigine, and the white, or civilized man. Because of their differing attitudes and customs regarding the use of fire, each culture has profoundly influenced the vegetation and landscape.[1]

The climate of the Sierra Nevada is typically Mediterranean. The summers are long, hot, and almost completely dry at the lower elevations, and warm with occasional thunderstorms at the higher elevations. This makes the landscape especially susceptible to the propagation of fire, so much so that it must be considered a natural and characteristic feature of the environment. Lightning fires are numerous in the Sierra Nevada. Current studies by Arnold Court, meteorologist with the California Forest and Range Experiment Station, show that in an area of about 5,000,000 acres of forest and brushland from Yosemite Park north to the Feather River the number of lightning caused fires per year for the last decade varied from 50 to 300, averaging somewhat more than 100 per year; seasons with 200 or more lightning fires in this area seem to come at intervals of five to ten years (Court, 1959).

Red Man Culture and Fires

While the white man must regard wildfire as a menace—something to be quickly suppressed—the red man, who roamed the pine forests during ages past, permitted the lightning fires to burn, and even used fire as a tool for clearing the brush and undergrowth, and in hunting his game. Students of geography and ethnography (Sauer, 1947; Stewart, 1951, 1954, 1956) have informed us that the aborigines throughout America used fire in the vegetation for these reasons. Jepson (1921), one of our early-day botanists, reported that native tribes also fired the country to improve the browse for deer. Since man has been in the new world for at least 15,000 years, and perhaps 200,000 or 300,000 years (Sauer, 1950), it is conceivable that some pine forests of the Sierra Nevada were

[1] The historical sections of this article apply to most coniferous forests of the Sierra Nevada, while the section on prescribed burning experiments applies only to ponderosa-pine areas where sufficient pine needles are on the forest floor to carry ground fire.

burned hundreds of times by his fires, to say nothing about the thousands caused by lightning.

Thus, when civilized man first looked upon the pine forests, he observed that they were open and parklike with the mature trees large and spread rather far apart, except perhaps in certain areas where the fires were not so intense. Jepson (1923, 1933) concluded that the Sierra Nevada forest, as the white man found it, was clearly the result of periodic or irregular firing continued over many thousands of years; furthermore, observations forced his conviction that this is a fire-type forest. The important morphologic or silvical features listed by Jepson for his convictions were (*a*) The forest stand as found by Anglo-Saxon explorers was for the most part a mature one. (*b*) The stand was open, with broad spacings of the trees and a forest floor destitute of a ground story or carrying only scattered or somewhat scattered shrubs or a carpetlike or matlike ground cover. This spacing undoubtedly represents an adaptation to fire conditions. (*c*) The individual trees of all species were of the largest size. Fire brought about the production of extremely large individual trees by limiting competition. (*d*) Nearly all species have developed a trunk bark of marked thickness which serves as protection for the cambium. The bark is 1-5 inches thick in *pinus ponderosa* and 6-24 inches thick in *Sequoia gigantea.* (*e*) In this region occurs the extreme biologic type in relation to fire, known as the fire-type pines, an example of which is *pinus attenuata.* This species holds its cones unopened under normal conditions for twenty to thirty years. In case of fire the cones gradually open.

The geographer and naturalist Richard Reynolds (1955) wrote that fire was the red man's most powerful tool for shaping his landscape. Reynolds said that many forests in which the red man lived were in dynamic relation to the periodic fires which ran through them. Frequent fires permitted little opportunity for undergrowth, litter or dry grass to accumulate before another fire would consume them. Thus the green canopy above provided by the trees was seldom burned.

By studying the fire scars found on the trees themselves, plant ecologists are able to tell a great deal about the fires that burned hundreds and even thousands of years ago. In the process of healing, each fire wound becomes covered with a layer of woody growth which serves as a permanent record of a fire that once covered an area. Even centuries later, it has been possible to date the year of fire injury.

An opportunity for wide-scale dating occurred when scientists conducted a study of the dry rot of incense cedar (Kotok, 1930). According

to Kotok, thousands of trees of this species were cut down in an area extending from the Oregon line, through the Sierra Nevada, to the southernmost part of the California pine region. Numerous fire scars on the trees were dated, and these served as a basis for reconstructing the fire history during aboriginal times, but not beyond the age of the incense cedars. The evidence showed that fires were particularly severe throughout the entire pine-forest region in the years 1685, 1690, 1699, 1702, 1708, 1719, 1726, 1735, 1743, 1747, 1757, 1759, 1766, 1786, 1796, 1804, 1809, 1815, 1822, 1829, 1837, 1843, 1851, 1856, 1865, 1870, 1879, and 1899, as indicated by thousands of scarred trees throughout the mountains.

A study in the Stanislaus National Forest where detailed data were collected on 74 acres, showed that 221 distinct fires swept that area between 1454 and 1912 (Kotok, 1934). This would average one fire about every two years. Speculation might arise whether these were set by lightning or aborigines. I believe that some were set by both. From a recent study of lightning fires in this area and the Central Sierra Nevada in general, Reynolds (1959), concluded that many of the fires must have been set by aboriginals.

After studying this evidence, I thought it interesting to study the fire scars on the Sierra Big Trees (*Sequoia gigantea*). The Big Trees live an estimated 3,000–4,000 years. They retain the telltale burn marks for centuries. I made observations on numerous trees 10 feet or more in diameter growing in Yosemite and Sequoia National Parks. Every tree of this size examined showed signs of fire. Some trees had charred material more than 100 feet up, probably caused from lightning strikes in the tops of the trees themselves. Jepson (1923) recorded that probably all old trees of *Sequoia gigantea* have been struck by lightning, and that one of the most remarkable forest experiences is to see at night a fire burning 150 or 200 feet in the air in the top of a great *Sequoia gigantea*. Jepson also observed that nearly all mature trees or trees past maturity show some signs of fire or fire ravage, although many times the attack was negligible.

Fires have been dated in the Mariposa Grove of Big Trees in Yosemite Park back to 450 A.D. Other dated fires in this grove were in 1622, 1652, 1690, 1710, 1734, 1742, 1752, 1760, 1775, 1803, 1807, 1809, 1842, and 1862 (McFarland, 1949).

From all these studies it may be concluded that the forests of the Sierra Nevada were relatively clean, open and parklike during aboriginal times and that the most important agent in maintaining this condition

was frequent light fires. I agree with Jepson who wrote in 1921 that the primitive parts of this forest are still worthy of study, which will throw further light on the highly interesting life story of that great Sierran woodland. That story, when fully written, will reveal fire as a factor of great biological importance.

White Man Culture and Fires

This discussion will be confined roughly to the past sixty years in which the custom of white man has been to suppress all fires, natural and otherwise. This is essential, of course, in modern-day society. It has served to prevent fire losses of incalculable magnitude. Without effective protection against wildfires, forests cannot be managed for recreation, timber growing and the other uses they provide. But in excluding fire, the white man acted to remove an ecological factor important in shaping the aboriginal forest—frequent light fires.

For about fifty years before this—during the time of gold discovery—livestock producers burned the forests nearly every fall to clear the pine needles and other debris to improve conditions for grazing.

As a result of fire protection, great changes have taken place in the vegetation and landscape of the forests and national parks. First, the more shade-tolerant white fir and incense cedar have increased in relative abundance and are developing in dense thickets beneath ponderosa pine and sugar pine, and even beneath the Big Trees. In undisturbed areas they are sure to become dominant at some later date because they reproduce well in dense shade and heavy litter, while the pines and Big Trees do not. Many ecologists view this as natural, undisturbed succession leading toward climax vegetation. In this reasoning, however, they fail to recognize that fire, too, is a natural and characteristic feature of the environment.

Some people are concerned about the changes taking place in the Big Trees areas of our national parks, particularly the invasion by white fir. It was pointed out that the parks were in a "natural" condition when the stands of great trees were discovered. But because of the suppression of nature's fires, the whole forest prospect is gradually being altered. White firs are crowding in among the Big Trees and are closing out the views. The end result of these changes is likely to be the destruction of the very thing the parks were set up to preserve. This poses a challenging dilemma for those concerned with maintaining these primeval areas.

A personal experience by a member of the university's botany department illustrates this point (Mason, 1955). In the summer of 1923, Pro-

fessor Mason, in the company of Drs. H. M. Hall and F. E. Clements, stopped in Yosemite National Park on the Big Oak Flat road, a short distance inside the park entrance, to admire what Clements referred to as "a magnificent panorama of columns." Exactly three decades later, in 1953, the botanist took his wife and son to view the same prospect and found that although the trees were still there, the magnificent panorama was gone. In its place, and obscuring it, was a thirty years' growth of young trees and brush. Not only had the view disappeared, but an extremely dangerous fire hazard had been created there.

A second change in our forest areas has been that larger quantities of debris have accumulated on the forest floor. Many forests that were relatively clean, open, and parklike under the Indian culture and could be easily traveled through, are now so full of dead material and young trees and brush as to be nearly impassable to white man. Certainly the redman, without much clothing, could never have penetrated such areas as can be attested by one who has fought his way, fully clothed, through dense thickets of manzanita and other shrubs in young stands of pine.

Thus, the sixty-year-old policy of fire exclusion has brought about wildfire hazard. Those aboriginal pine forests which were so frequently burned consisted of two fuel layers, the one of green canopy above and the other of herbs and pine needles on the ground below. Exclusion of fire from these forests has encouraged the development of a solid fuel layer in many places from the tops of the tallest trees to the young saplings and brush and litter on the ground. During the hot, dry windy days in late summer, when fire fighters cannot reach every fire after the outbreak, these fuel conditions promote the large crown fires which in recent years have been nearly impossible to stop until the weather changed. Under these difficult circumstances, the fire fighters are doing the best possible job; but they appear to be battling against increasingly serious odds wherever the dangerous fuel build-up continues.

The changes leading to these severe fire hazards took place at an almost imperceptible pace. The young trees and brush plants grew slowly because they were competing with the older trees, and mortality was gradual. Some sixty years ago when the fire-suppression policy was adopted, a ranger could go out on horseback with his shovel and usually not have difficulty in extinguishing a fire, and little damage was done. But today, a fire in the same spot would probably require twenty men with bulldozers, airplanes, borax sprays, tankers, and back pumps, and when the fire is out the landscape will be scarred with great attendant damage.

In recent years wildfires have destroyed a wealth of vital national resources. For example, in the late summer of 1955, a series of wildfires, many of them sparked by lightning, burned 141,222 acres of tree-covered land. At the same time, other fires burned 165,891 acres of brush and woodland-grass vegetation (U.S. Forest Service, 1955). These fires were a major disaster, perhaps the worst on record in California, but they indicate the seriousness of the situation. One fire alone covered 87,000 acres, and was so intense that spots as large as 5,000 acres were left almost treeless. Each year Californians spend $25,000,000 on fire prevention and suppression and annually lose many millions more in flaming timber and resulting flooding and soil erosion. As the population and wealth of the state increase, and as hazardous fuel conditions build up in certain forest areas, the costs and damages from wildfire will become even greater unless improved methods of hazard reduction and fire prevention and suppression are developed.

The wildfire situation presents a dilemma. Nobody wants the crown fires, but they seem to occur anyway. What is the answer? In writing on the subject, "Do we want sugar pine?" Professor Mason (1955) suggested: "In the long run the cheapest method will be to maintain a forest in low-fire-hazard condition through controlled burning at intervals that will prevent the fire hazard from building up. . . . Nature before us successfully managed the forest with her own system of controlled burning. As fire seems inevitable in our arid climate, would not the wisest course be to see that fire occurs only at such times and in such places as we choose? Under such circumstances the fire would no longer present a threat to our forests." He also recommended that experimental areas be established on a sufficiently large scale to test such a plan and to determine the frequency and extent of controlled burning necessary to manage the forest in a continuing state of low fire hazard.

From this discussion one may conclude that white man has forced important changes on the Sierra Nevada forests as a result of suppressing a formerly "naturally" functioning factor of the environment. One must also conclude that by all accounts the situation he is creating is one of constantly increasing fire hazard so far as fuels are concerned. The tragedy of this condition is that white man has created exactly the thing which he desired most to eliminate—wildfire hazard. It is true that under this culture the fires are less frequent than formerly; but instead of being widespread and benign, many are now concentrated holocausts against which he has been almost powerless.

Prescribed Burning Experiments

After I had studied the ecology of aboriginal pine forests and observed the contemporary wildfire situation, it became obvious that new ways must be sought to avert the mounting danger of great fires and the destruction of our vital national resources. Furthermore, I had just finished six years of study in the use of fire in the pine forests of the Southeastern United States and was favorably impressed with the results. In California the prospects of fire use seemed so good that my associates and I started experiments in the spring of 1951 in ponderosa pine. The purpose of these experiments, which are still continuing, is to determine if fire could be used to reduce wildfire hazards and, more important, how it could be used with forest management to keep an area in a continuing state of low fire hazard consistent with improvement of forest conditions for game and recreation. As areas of research we chose the Teaford Forest in the Central Sierra Nevada near North Fork, and Hoberg's in southern Lake County (Biswell and Schultz, 1956*a*, 1956*b*; Biswell, *et al.*, 1955). Although Hoberg's is not in the Sierra Nevada, the ecology of this area and that of the Teaford Forest is very similar, and the particular location need not be of much concern in this discussion. In both places, ponderosa pine is dominant, with California black oak secondary. It has long been known that ponderosa pine is thick-barked and relatively fire resistant. A small quantity of incense cedar is found on the Teaford Forest, and Douglas fir (*Pseudotsuga menziesii*) on Hoberg's. The principal shrubs are nonsprouting manzanitas (*Arctostaphylos* spp.).

In both places the plant succession following cutting or other opening of forest stand is ordinarily toward pine and manzanita. If pine seeds are present, the seedlings of both may appear and start growth together. If this happens, the pine may overtop the manzanita in eight or ten years, and in two or three decades most of the manzanita will have died. This wood rots very slowly; since it becomes draped with pine needles the fire hazard is extremely high.

Our experiments are being carried out in two steps: broadcast burning followed by cleanup burning. Broadcast burning is done by raking a trail and igniting the pine needles on the edge. This operation is carried out only in the wet season after enough rain has fallen to wet the duff—or vegetable matter—to the mineral soil. Such burning is stopped in the spring when the soil becomes dry. After rain, the top needles dry in a day or two and burn readily, but the lower ones dry slowly. This allows for many days when broadcast burning is possible. Records at Hoberg's for

five of the years since 1951 have shown 47 to 74 days per season available for broadcast burning. Although the records are not being kept beyond the first of April, there are usually many days after that when such burning could have been carried out. Research also has shown that broadcast burning in the wet season is best done when the relative humidity is 25 per cent or above and the air temperature is below 65° Fahrenheit.

In heavy accumulations of debris, the higher humidities and lower temperatures are desirable. After one burning, or two of them in successive years, the fires can be set under drier conditions. Best results are obtained by burning downhill. A fire that will burn gently downhill may burn out of control if permitted to burn uphill. A broadcast burn removes much of the flash fuel, old logs, and stumps on the ground.

Cleanup burning, the second step, consists of piling and burning dead brush, slash, dead fallen trees, and prunings after an area has had a broadcast burn. A fire is started, and dead material gradually piled up as it burns. One person can keep a half dozen piles going at one time. This kind of burning can be done under a wider range of weather conditions than broadcast burning can because the fire hazard has already been reduced. Also, techniques have been developed for starting fires under wet conditions, even in light rain.

After an area has been broadcast burned and cleaned, the falling pine needles can then drop on the ground rather than draping themselves over the dead brush; consequently, the fire hazard builds back slowly.

Forest management for maintenance of continuous low fire hazard may be built around even-aged pine stands and groups where fully stocked reproduction is obtained only at the end of the rotation cycle, after the final harvest cut. As I visualize it, this is almost identical with the way in which the forest reproduced itself and developed during aboriginal time. Of course it is essential to keep fire out of the newly stocked areas until enough needles have fallen from the new trees to carry ground fire. Thereafter, periodic fire can be used through the rotation cycle to remove slash and maintain a continuous low-fire-hazard condition.

In continuous low-fire-hazard management, burning is not done more often than necessary, because it is time consuming and costly. The frequency depends somewhat on the forest cuttings. Broadcast and cleanup burning should follow each intermediate harvest cut. At Hoberg's it seems that a burn in any one spot would not be necessary more often than about every ten years, based on growth in well-managed stands. However, it would be desirable to do some burning each year in a rota-

tion fashion. If intermediate harvest cuts are made each year over a management unit, the burning can follow in those places. In the absence of timber cutting each year, some broadcast burning should be done nevertheless as assurance against wildfires.

Research at Teaford Forest and Hoberg's shows clearly that prescribed burning in ponderosa-pine forests has a positive effect in reducing the ease with which crown fires start in summer. Furthermore, when summer fires break out they can be more quickly controlled and do much less damage. These results are similar to those obtained by Weaver (1955, 1957) in Arizona and in the state of Washington where he found fuels to be reduced 50 per cent by a single broadcast burn, and the damage done by wildfires to be reduced by 90 per cent.

Our studies show also that prescribed burning results in more browse on the ground (Biswell and Schultz, 1958) and that conditions can be improved for deer. Besides, forest visitors enjoy walking through areas so treated. Owners of forest properties immediately become more interested in allowing use of their lands because they see less fire hazard and have less fear that their lands will be destroyed by summer wildfires.

From this research, it may be concluded that prescribed burning is simulating the most important element that had functioned in aboriginal times to develop a stable "fire-type" climax forest—frequent light fires. Such deliberate burning can be an improvement on nature since it can be controlled in time and space. Certainly it is an effective means of reducing fire hazards. It has other benefits as well. Now that the new method has emerged from an experimental stage, it is recommended that prescribed burning be widely tested in ponderosa pine in strategic places where the benefit will be maximum and the cost minimum. It is necessary, of course, that prescribed burning be done only by qualified and experienced persons.

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Where Frémont Crossed the Sierra Nevada in 1844

By Vincent P. Gianella

In the winter of 1843–44 Lieutenant John C. Frémont led an exploring party of twenty-five men south from the Dalles, on the Columbia River, along the east front of the Cascade Range. They were homeward bound to the United States, after an absence of many months. They had 104 horses and mules, much camp equipment, and a howitzer "for protection from the Indians." Among the men were Charles Preuss, cartographer, and the noted mountain men Kit Carson and Thomas Fitzpatrick, who served as guides. Much of the responsibility for the operation of the party was delegated to Fitzpatrick. Preuss left a diary (1)* containing interesting sidelights on the journey which are not to be found elsewhere.

Frémont's party entered the northwestern corner of Nevada, then in Mexican territory, late in December, 1843. Frémont's route has been described by several writers. Both Smith (2) and Dellenbaugh (3) mapped the route traveled through Nevada and across the Sierra Nevada. One of the best analyses of the passage through the Sierra is that by Farquhar (4).

In 1845 Frémont published his report (5); before that none of the travelers to the Far West, and particularly through the Great Basin had accurately located his route by astronomical observations, or made available reliable detailed maps. The report was an immediate success and proved to be valuable to later travelers, particularly during the gold rush a few years later. Copies were carried by the thousands of emigrants coming westward to the Pacific Coast during the next decade.

Today, more than a century later, there is confusion about the route followed by the Frémont party in crossing the Sierra Nevada in February, 1844. The Guddes believe that "the actual point of the crossing has never been definitely established. It was somewhere near Carson Pass or north of it" (1, p. 111). Most investigators took it for granted that Frémont went through the pass named after that intrepid scout, Kit Carson, who accompanied him on this and other journeys. However, it is improbable that Frémont or any of his men, entered the gorge leading up to Carson Pass. Some writers discussing this part of the journey have bent the trail around to the north so as to make Frémont cross at that place

* Figures in parenthesis indicate references at the end of the article.

without giving full consideration to the difficulties such a detour would have added to the almost unendurable conditions under which the party labored. Their animals were so nearly exhausted that they were unable to carry their loads over the snow, and the men were on near-starvation rations.

Many writers credit Kit Carson for guiding Frémont across the Sierra Nevada. However, Carson was not the guide; neither he nor anyone of the party had been in this region before and was able to select the best route to travel. Frémont relates of hiring one Indian guide after another. Each refused to enter the territory of the adjacent tribes. It seems that all the various small Indian groups in the area were at war with their neighbors. Preuss states: "We were getting deeper and deeper into the mountains and snow. We pay one roving Indian after another to guide us across. They march with us for a few miles and leave us as soon as they have a chance. Now we have engaged another one who is to take us all the way across to the white people" (1, p. 105). Preuss also says: "Later, when we got into more trouble, we followed the Indians part of the time. When the latter left us or we could not understand them, we followed the best, often the only passes to the west or south" (1, p. 106). Their last guide was hired on February 1, while the party was encamped on the East Carson River preparing their equipment to force a passage of the Sierra. The weather was cold, deep snow covered the ground, and it was storming in the high mountains ahead of them. Everyone realized that the passage would be difficult and possibly unsuccessful. However, Frémont finally decided that an attempt must be made because his animals were in very poor condition and his food supply was dangerously low. Once he had decided he made a frontal attack and drove directly toward that objective.

To give a proper setting for the passage through the Sierra Nevada let us begin on the morning of February 2. The party was then on the East Carson River where the stream leaves its gorge and turns northwestward across the Carson Valley toward the bold front of the Sierra. They had arrived here after a forced march of 26 miles from Antelope Valley on the West Walker River. "Crossing the river on the ice, and leaving it immediately, we commenced the ascent of the mountain along the valley of a tributary stream" (5, p. 229). The route was southwesterly up Long Valley, and probably into Diamond Valley, then south across the low hills until they again came upon the East Carson. They went into camp in the meadow where Markleeville Creek joins the river, about a mile northeast of Markleeville. During much of this 16-mile journey they had to break a

passage through deep snow, and had a preview of what difficulties lay ahead of them. On February 3 the party advanced about 7 miles up Markleeville Creek and camped at Grovers Springs. Because of the lack of pasture the stock were returned to their previous camp. The difficulty of ascending the steep mountain was to detain the main party at Grovers Springs until February 16.

Frémont, with a few men and the Indian guide, advanced up Markleeville Creek, on the 4th, passed along Charity Valley and camped on the east side of Faith Valley but a few miles from the main ridge of the Sierra Nevada lying directly to the west. This presented the barrier over which they must go to reach the Sacramento Valley. Frémont described Faith Valley as "an open basin, some ten miles across, whose bottom presented a field of snow. At the further or western side rose the middle crest of the mountain, a dark-looking ridge of volcanic rock" (5, p. 230). The travelers were contemplating the dark-colored lava which forms the conspicuous, almost black, mass of Elephant's Back rising 600 feet above the nearly level skyline formed by the light-colored granitic ridge. Frémont states: "Annexed you are presented with a view of this ridge from a camp on the western side of the basin. Towards a pass which the guide indicated here, we attempted to force a road; but after a laborious plunging for two or three hundred yards, our best horses gave out, entirely refusing to make any further effort; and, for the time, we were brought to a stand."

It was from this camp that the Indian guide pointed out the pass, just north of Elephant's Back, and it was there that the crossing of the Sierra was to be attempted. From this time on all effort was expended for the crossing until they stood on the summit about a half mile south of Carson Pass.

On the fourth, Fitzpatrick, with the main party, had failed to get many of the animals up the steep pitch in the deep canyon, immediately above Grover Springs. There the canyon floor rises abruptly 1,500 feet in little more than one mile. This steep, snow-covered, icy slope was to cause a long delay in getting the animals and camp baggage up into Charity and Faith valleys. Much labor was to be expended to beat down the snow to pack it so it would support the almost exhausted animals. The men, said Preuss, became the pack horses. He commented: "Tomorrow we shall probably know whether it is possible to get through. The men had to work terribly hard to drag the baggage up the steep mountain; the beasts were too weak for it" (1, p. 106). After this attempt, the animals were sent back to the grassy area. During the crossing the party

was visited, at various times, by Indians. On the night of the fourth: "Two Indians joined our party here [Faith Valley]; and one of them, an old man, immediately began to harangue us, saying that ourselves and the animals would perish in the snow; and that if we would go back, he would show us another and better way across the mountains. . . . Seated around the tree, the fire illuminating the rocks and the tall bolls of the pines round about, and the old Indian haranging, we presented a group of very serious faces" (5, p. 231).

On the sixth: "Accompanied by Mr. Fitzpatrick, I set out today with a reconnoitering party, on snow shoes. We marched all in single file, trampling the snow as heavily as we could. Crossing the open basin, in a march of about ten miles we reached the top of one of the peaks, to the left of the pass indicated by our guide. Far below us, dimmed by the distance, was a large snowless valley, bounded on the western side, at a distance of about one hundred miles, by a low range of mountains, which Carson recognized with delight as the mountains bordering the coast" (5, p. 232). Carson also recognized "the little mountain" [Mount Diablo] which he had seen fifteen years before. He had entered California in 1829 with a party of trappers under the leadership of Ewing Young. Everyone upon reaching the summit that day, or later, greatly underestimated the distance to the valley; most of them thought that it was not more than thirty miles whereas it was more than twice that far.

The Indian guide deserted: "His bad faith and treachery were in perfect keeping with the estimate of Indian character, which a long intercourse with this people had gradually forced upon my mind" (5, p. 231). The Indians later had good reasons for regarding the white men in about the same light. One may contemplate the Indian's reaction to these white madmen who persisted in this adventure through the impassable snowy mountains.

Frémont gives the latitude of this camp as 38° 42′ 26″, and an elevation of 7,400 feet (5, pp. 232, 325, 482). The camp has an elevation of about 7,600 feet and a latitude of 38° 41′ 30″ according to present maps.(6)

The high point from which they looked down on the Sacramento Valley was undoubtedly Elephant's Back, as recognized by Smith (2, p. 142) and Farquhar (4, p. 82). The next day the advance party moved westward a few miles while Bernier and Alex Godey "had been sent to ascend a higher peak" (5, p. 233). We do not know whether they reached their objective, but they apparently saw the valley because "they confirmed what we already had seen" (5, p. 233).

In discussing this incident Farquhar suggested (4, p. 82) that, as they were supposed to have climbed a peak higher than Elephant's Back, they must have ascended either Round Top, Red Lake Peak, or Stephens Peak; all of which are higher than 10,000 feet. Had these men reached the top of any of these peaks they would probably have anticipated Frémont's discovery of Lake Tahoe. If they climbed a peak higher than Elephant's Back, it might well have been a high point on the summit of the ridge rising above Winnemucca Lake. This peak is one mile south of, and 300 feet higher than Elephant's Back. Still higher peaks lie some miles farther to the southeast.

For a few days little progress was made, but on the tenth "we had the satisfaction to encamp within two and a half miles of the head of the hollow, and at the foot of the last mountain ridge" (5, p. 233). This was at the foot of Elephant's Back, on the western side of Faith Valley. The elevation of the camp was given as 8,050 feet, which is close to that indicated by the topographic map of the region (6). They camped here, in cavities melted in the snow through the burning of large tree stumps. As this remained the advanced station until the surmounting of the summit, it was given the name of "the long camp." It was probably in the vicinity of Forestdale Creek, surely not at the head of Hope Valley as stated by Smith (2, p. 144) and shown on the map of Dellenbaugh (3, p. 218).

The longitudes determined in this region are in error due to a faulty pocket chronometer. The time was apparently slow, indicating positions about 26 miles too far west. This is a probable cause of connecting, on the map, the headwaters of the streams with more northern streams that the party crossed farther east on the southward journey.

For several days everyone was busily packing the snow so that the animals could pass. On the thirteenth "a party of Indians had passed on snow shoes, who said they were going to the western side of the mountain for fish. This was an indication that salmon were coming up the streams" (5, p. 234). However, Frémont's little group settled for "an extraordinary dinner—pea soup, mule and dog."

On February 13 Preuss enters in his diary: "Yesterday I walked to an elevation only about three miles away to take a look for myself at the promised land. . . . In the valley everything was in fog yesterday. One could only dimly discern a low mountain range on the other side, which Kit claims to recognize as the one which stretches between the Sacramento and the Ocean. . . . I estimate the distance from the summit to the foot of the mountain range to be thirty miles. We shall see" (1, p. 109). It was probably nearer 75 miles by the route they had to travel.

Facing page 234 of the Frémont report is an excellent sketch (figure 1), presumably done by Preuss, which is a work of art and worthy of careful study. It depicts many features which should dispel faulty interpretation of this part of the route. On the extreme left is the ridge leading southwest to Round Top, next is a fairly faithful outline of Elephant's Back, even to the dark lava ridge, showing columnar jointing, on its southeastern slope. Across the central portion is the relatively level summit ridge where the party was to cross on the twentieth. Farther to the right is the canyon containing Red Lake, and on the far right is the highest point, and southern slope, of Red Lake Peak. Figure 2 is from a photograph taken from the approximate position of Frémont's camp on the eastern side of Faith Valley. It was from this vicinity that the Indian guide indicated the pass. The distant part of this photograph closely resembles the sketch in figure 1. Many of the features shown by Preuss may be recognized.

Frémont clearly indicates the peak he ascended, which led to the discovery of Lake Tahoe. "February 14.—Annexed is a view of the dividing ridge of the Sierra Nevada taken from this encampment. With Mr. Preuss, I ascended today the highest peak to the right; from which we had a beautiful view of a mountain lake at our feet, about fifteen miles in length, and so entirely surrounded by mountains that we could not discover an outlet" (5, p. 234). This leaves no doubt that they climbed Red Lake Peak, and not Stevens Peak as preferred by Smith (2, p. 145), Farquhar (4, p. 83) and others. Anyone who has enjoyed viewing Lake Tahoe from this vantage point can readily appreciate the thrill that Frémont and Preuss must have experienced (5, p. 234) "The rock composing the summit consists of a very dark volcanic conglomerate; the lower parts appeared to be a slaty structure." Frémont's volcanic conglomerate is now designated as volcanic agglomerate, or breccia, of the Sierran andesites. The volcanic agglomerate lies on the surface eroded across the edges of the steeply dipping, metamorphosed, Mesozoic rocks. These old sedimentary and volcanic rocks, forming the base of Red Lake Peak, have been intruded by granitic rock and mineralized. Through weathering they have acquired a reddish cast, and this color has influenced the naming of the peak, as well as the beautiful little lake lying in the glaciated canyon at the southern base of the mountain.

On the seventeenth and eighteenth Frémont, with his servant Jacob, went over the pass and followed down the western slope along Strawberry Creek until "I was now perfectly satisfied that we had struck the stream on which Mr. Sutter lived; and, turning about, made a hard push,

FIGURE 1. Summit of the Sierra Nevada, Alpine County, California. To the left is Elephant's Back. On the right is Red Lake Peak rising above the canyon leading up to Carson Pass. Sketch by Preuss (?) at the 'Long Camp'.

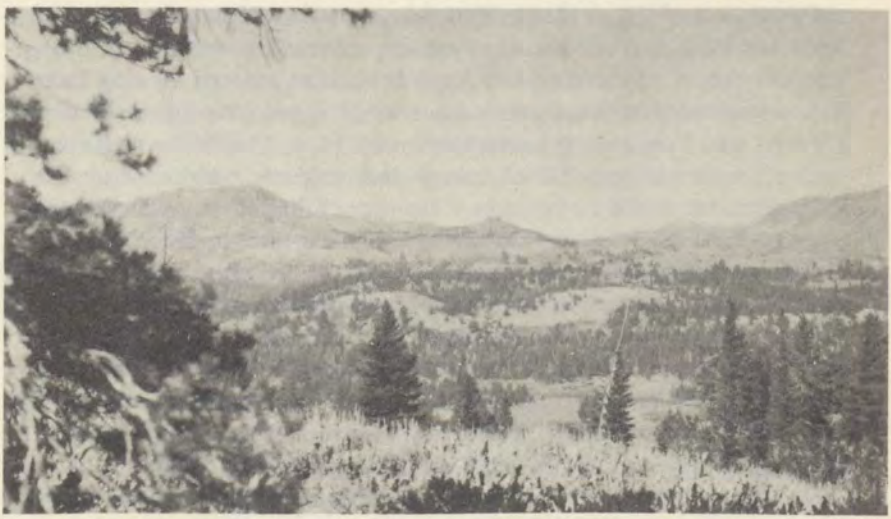

FIGURE 2. The Sierra Nevada as viewed from the east side of Faith Valley about four miles from the summit. Frémont's party passed between Elephant's Back, left, and the low peak in the center. On far right is Red Lake Peak. (Compare with Figure 1.)

and reached the camp at dark" (5, p. 235). He was much pleased to find that all the animals had been brought to a grassy hill near the camp. This hill is probably the high, practically bald, ridge east of Forestdale Creek. The party had long been out of salt, but the men found some at an Indian camp nearby. Still, Preuss's cheerfulness was qualified (4, pp. 110–111): "Today a horse was killed, and since we have salt now, I shall eat with relish. Baking bread has come to an end; only a few handfuls of flour are left to give a little body to the horse meat and pea soup for a few more days. . . . Still in the old snow hole. The horses are now near-by on a snow-free hill, where the grass is said to be rather plentiful. . . . The horse meat is all right as long as the salt holds out." The animals were hungry too: "The mules grew so hungry that they ate the tail of Fitzpatrick's horse, also parts of saddles, my bridle, etc." (1, p. 113).

They were now all prepared for the final assault at the last barrier between them and the westward slope leading down to the Sacramento Valley to food, comforts, and supplies: "On the 19th, the people were occupied in making a road and bringing up the baggage; and on the afternoon of the next day, *February 20, 1844,* we encamped with the animals and all the *materiel* of the camp, on the summit of the pass in the dividing ridge, 1,000 miles by our traveled road from the Dalles of the Columbia" (5, p. 235). The men, who had not been to the summit before "climbed the neighboring peak [Elephant's Back] to enjoy a look at the valley."

It is well to note here that Frémont had made clear that the "long camp" was at the foot of "the dividing ridge" and on the west side of Faith Valley. From this advanced position many of the party had climbed onto the summit ridge to view the Sacramento Valley and the Coast Ranges far to the west. He and Preuss had climbed Red Lake Peak; on this trip they had a good opportunity to examine the ridge from Elephant's Back and the peak. They had traveled along the ridge at the head of the canyon leading to Carson Pass. At that time this steep-walled canyon contained much snow and it is doubtful that their animals could have climbed it; certainly not so readily as the ridge west of their camp. Neither Frémont nor Preuss mention a change in plans so as to make the long detour northward into Hope Valley. Nothing is said, by either, of going up such a canyon to attain the summit. An important point is that, while still at the "long camp," they completed preparing the road and bringing up the baggage on the nineteenth. On the afternoon of the next day they had all the animals and camp baggage on the summit. Judging from the progress they had been making, they could not

have made the long loop around through Hope Valley in so short a time. It appears evident that they went directly up the ridge west of the 'long camp' and over the trail which many members of the party had been traveling, to and from the summit, during the previous two weeks.

The latitude of the 'long camp' is given as 38° 41′ 57″ and for the summit (apparently estimated) 38° 44′. However, Frémont (3, pp. 403, 485), determined the latitude of the "long camp" as 38° 41′ 03″ and, on the nineteenth, 38° 41′ 51″. An average for the two determinations gives 38° 41′ 27″. It would appear that there are two misprints here; the 57″ given in the body of the report, should read 51″, and 38° 44′ for the summit, should be 38° 42′. Present-day maps (5) indicate a latitude of 38° 41′ for the "long camp," and 38° 42′ for the summit where the party crossed. This figure is in agreement with that which Frémont determined under such trying circumstances.

According to Preuss (p. 111), of the 104 animals that started from the Columbia River only 53 were left, and probably 3 or 4 of these would be slaughtered for food. He expressed the opinion that if the men were not "tied to our miserable beasts" they could reach the valley in two or three days. It took the party sixteen days to make the journey and, without having had horses and mules to eat, they probably would have perished from starvation. Only 33 of the animals reached Sutter's Fort. Some of them fell off the high cliffs as the old Indian had predicted.

Leaving the summit the party went to the northwest and down the high ridge, partly free from snow, between Silver Fork and the headwaters of the Upper Truckee River. Farther down they had Strawberry Creek on their left and Sayles Canyon to the right, and forced their way through the snow, among large trees and rocky ridges, until finally they reached the American River at Strawberry Valley. During most of the trip down the ridge they had the Sacramento Valley in view to the west and Lake Tahoe to the north. At night they saw the fire from tules being burned in the valley, which appeared to them as being much closer than it later proved to be.

On the twenty-first the world appeared to be much brighter, and the climate came in for its share of praise even under such trying conditions. Preuss (4, p. 112) wrote: "We gaze into the distant valley from which we expect consolation. . . . Even up here it is milder. On the twenty-second he wrote: "But what an atmosphere! One does not [often] see such sunrises and morning and evening glows. . . . We are in the latitude of Smyrna and Palermo. The sky is as blue as forget-me-nots."

They suffered great privation while following down the river to the val-

ley. It is now known that Frémont, despite the difficulties of the crossing, was fortunate in being guided through a region that offered a relatively short distance of travel over snow. He was also favored by a comparatively mild winter, without excessive snow. A different route, a less favorable winter, or even a single prolonged snow storm, might well have brought the entire party to a tragic end.

It was the Indians, not Carson, who guided Frémont across the Sierra; Frémont did not go over Carson Pass, but farther to the south; it was from the summit of Red Lake Peak that Lake Tahoe was discovered.

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Traveling in Arctic Lapland

By Marigay Barron Pelto

The North European Arctic is a land of varied terrains. To the south the landscape is forested with pine and birch, and dotted with myriad lakes, which are frozen eight months of the year. North of the wooded area emerges the stark rolling tundra, and to the northwest rise the high mountainous fells of northern Sweden and Norway.

My husband and I are presently engaged in an ethnological field study for the University of California. We are living at Sevettijärvi, a forest-lands outpost settlement in the northeast corner of Finland, about twenty miles from the Norwegian border and about 50 miles from the Russian. The Sevettijärvi area has been settled more recently by the Skolt Lapps (who were moved into the territory after being evacuated from their former village, which fell to the Russian side after World War II), but has been sparsely settled by Inari Lapps for many years earlier. Only six miles to the north of the main settlement area, the coniferous forests stop altogether and the bare tundra rolls up through northern Norway to the Barents Sea. Snow is on the ground from October to May, and most travel is by reindeer sled or ski.

To look at the map, this area may appear to be the end of nowhere. Actually, transportation and trading routes through here to the Norwegian coast have been open several hundred years. The reindeer is the most practical animal to use for this transportation, for it is light enough not to break through the crusted snow, and is capable of digging deep in the snow to procure a meal of lichen—sometimes as much as four or five feet under the snow surface. A heavy horse would often merely flounder in the deep snow, and hay would always have to be hauled along for food. A reindeer's strength is only sufficient for a load of about two hundred pounds, so if any extensive hauling is necessary, from three to twenty-five reindeer, each pulling a sled, are tied together in trains. The main "roads" then become hard-packed from use, and they are marked with birch limbs stuck deep in the snow so that they will not become obliterated in a snow storm. Wild animals will often follow these roads for some distances, so that if the markings should be down in an area, a traveler can sometimes follow recent fox tracks, which will show him the road. This is fine so long as the fox doesn't decide to make a little side-trip off into the woods.

There are many situations, however, when skiing is the only possible means of moving over the deep snow. The Lapp arctic skis are quite dif-

ferent from the American, Swiss, or Norwegian mountain skis. The terrain here is usually only gently rolling, and the skis are built for deep-snow, cross-country endurance travel. They are sometimes as much as ten feet long and four and a half inches wide (the average height of a Lapp is only a little more than five feet). The skis are fastened to the feet by narrow leather straps, about two inches wide. The strap fits over the top of the foot, catching behind the turned-up toe point of the Lapps' fur boots. This leaves the heel entirely free to move. This movement at the toe joints means that the feet will be less tired over the many tens of miles of cross-country skiing that are often necessary. There are seldom any hills that cannot be taken "straight," although even with these free bindings one can become pretty adept at downhill turns. European metal ski bindings are known here, and used to some extent, but generally considered dangerous; should a metal binding get broken, it would be a serious affair to be without a ski in the deep, loosely-packed snow, which is virtually impassable on foot; a broken leather strap, on the other hand, can easily be replaced in an emergency with string or rope, or even birch bark.

Arctic winter clothing is of course a very important factor in keeping warm in subzero temperatures. The feet and hands are perhaps the most vulnerable points to the cold. The Lapp covers his hands with one or two pairs of double-knitted mittens, and sometimes adds to that a pair of reindeer fur mittens. On his feet are some boots of reindeer fur, on which the toes curl up in order to catch in the leather ski bindings. Inside, the boots are stuffed with dried grass to make a matted insulation between the foot and the boot, and the fur outside adds much warmth and protects the boot from becoming too wet in the snow. The top of the boots are lashed down tight over the trouser leg to prevent any snow from coming into the boot from the top. The Lapps nowadays generally wear European-style wool pants, although, in earlier times, trousers of tanned reindeer hide were often used. The Lapps don't want to be bundled up in heavy coats, for it is important to have loose, warm clothing to give freedom to the arms, legs, and waist when skiing. Hence the Lapp wears a knee-long, full skirt-coat affair over sweaters and warm shirts, and tied loosely around the hips, so that it doesn't hinder movement. These skirt-coats are either blue or black wool, with bright-colored strips of red, yellow, and green wool sewn on them. For extremely cold weather the legs are covered to above the knee with leggings of reindeer fur, also trimmed with colored cloth. Although today European-style fur caps are frequently used, one can still often see the traditional Lapp Cap of the Four Winds, which consists of a band of reindeer fur encircling the head over the temples, on top

of which are four pointed pieces of wool that are filled with stuffing, so that the points stand out in four different directions. The points are made of blue or black wool to match the coat, and the whole hat is decorated with bands and streamers of colored wool: all in all, a very colorful picture against the arctic background. When one is riding in the boat-shaped reindeer sled—assuredly vying with Eskimo dog sled as the world's coldest transit system—the wool skirt-coat is insufficient, for there is no body movement to generate warmth. On such occasions the Lapp wears an overcloak of reindeer fur. This cloak goes on over the head, and swings full down almost to the feet, so that it acts as a blanket when one is sitting in the narrow boat-shaped sled.

In the spring, snow glasses must be used to protect the eyes from the blinding snow glare, which increases daily as the sun mounts higher in the sky and stays many more hours above the horizon. Today, commercial snow glasses are used, but earlier, a piece of dark-stained cloth was wrapped over the eyes. One could still see through the cloth but the glare was cut down.

Although much of this costume style is very old, it is still used extensively today as practically and economically the most efficient means for coping with the tremendous cold and other special conditions in the Arctic. Other Europeans who come here for extended visits or to settle, soon fall into the habit of using this Lapp clothing themselves when traveling. When sitting at home around the fire, Lapps generally wear conventional European clothing, but for outdoor work they usually change into their traditional Lapp costume.

If the Lapland traveler is forced to spend the night out in the snowy wilderness, he will first look for a wind-protected spot. Then, if he is in the woods, he will cut down a dead tree for firewood; if he is on the tundra, he will have some pitchy wood with him as a starter, and he can then add fuel by cutting the low, scraggly tundra dwarf birch. Snow can be melted for water, and there is always at least coffee or tea and sourdough rye bread in his pack. Reindeer hides and pine branches are put on the snow as a mattress against the cold, and more hides are used as blankets. Most commonly, however, a traveler, especially a skier, will stop in at a Lapp house, often at the house of a relative or good friend. Arctic hospitality is always open-door, and even a total stranger can sleep on hides on the floor at no cost. The traveler brings his own food and cooks it on his host's fire, or perhaps buys a bowl of reindeer-potato soup from the wife of the house. The hosts will usually offer the traveler some coffee or tea and rye bread.

There is gradually more contact with the Western world in these more back areas of Lapland. In the Sevettijärvi region perishable food supplies are often flown in by air, the planes landing on skis on the frozen lakes. Although there is as yet no telephone service in this locality, a plane can be ordered by Forest Service radio in an emergency such as serious illness. There are no automobile roads in this region, but the mail chuggs in the sixty miles to Sevettijärvi from the main Finnish-Norwegian highway by snowmobile—an orange monster that has skis under its nose and a tractor rear. The mobile makes its own road through the wilderness, and there is room for eight or nine passengers (if they dare to brave the jerking, rocking ride) along with the mail. Theoretically the mail is scheduled to arrive three times a week, but owing to weather conditions and the tremendous mechanical strain the machine must go through, it can be held up two or three weeks. Actually there is a murmur of surprised comment around here if the snowmobile should arrive on time. There is a period of about six weeks in the late spring, however, when communication with the outside is practically nil. The snow has thawed, but the ice has not left the lakes, and floats on the surface in huge broken chunks, moving with the whims of the wind. Then the reindeer sleds are put away until next fall, the snowmobile is put in storage, the planes cannot land, boats cannot pass, skis are useless, and everyone sits around speculating on the arrival of the first summer mail boat.

Yet despite snowmobile and planes, many customs that we see here in Lapland today have existed for hundreds of years. The specialized clothing, the energy-giving, economical sourdough food, and the open hospitality will not for a long time be replaced with more modern ways of living, for as yet there is nothing in Western society to take the place of many of these economic and socially practical customs.

Mountaineering Notes

Edited by JOHN I. SHONLE

HIGH SIERRA

MOUNT CONNESS, EAST FACE

The *Climber's Guide to the High Sierra* does not mention any routes on the east face of Mount Conness but there is a reference in the *SCB* of April 1938, page 97 ("but less so is the rocky but delightful climb up the east face of Conness from Slate Creek"). In July 1958, George Harr, Lynn Grey, and myself ascended this face. From the large amount of loose rock it looked as if no one had used this route before. The climb led over the glacier to a point almost directly below the summit. A very steep section of snow requiring step kicking and hand-hold digging was encountered in the bergschrund area. The route led up a gully sloping to the left of a prominent buttress dividing the east face. At the top of the gulley we traversed to the north, crossing the buttress. Several fourth-class pitches led to an overhang. A sling around a rock furnished protection for a traverse to what looked like a suitable crack. As the crack was reached, so was a large loose rock. The leader was unable to keep the rock from falling, and it barely missed the rope (expensive) and belayers (irreplaceable). The falling rock did uncover a large recess which we entered by removing our packs and doing much squirming. It held all three. Several more pitches led to a notch about 200 feet north of the summit. We descended by the glacier route.

RAY VAN AKEN

FAIRVIEW DOME, NORTH FACE

Early in the summer of 1958, Wally Reed and I established a high point on the north face of Fairview Dome about 400 feet above the remnants of a snow bank that still remained around the base of the rock. We were not prepared for a bivouac, and upon finding that the climb would require two days, we abandoned the face and postponed the attempt.

On our second try, in August, we packed food, water, and sleeping bags into a large duffle bag, planning to haul it up at intervals of 200 to 300 feet. The route consists of a series of disjointed cracks which sweep up the center of the face until they merge with a wide, crescent-shaped ledge. This ledge, halfway up the face, was our goal for the first day.

The 600 feet of climbing that brought us to this ample bivouac site was predominantly sixth class, requiring careful piton work in thin and frequently bottomed cracks. Occasionally the cracks became wide enough to use the jam or chimney techniques. The angle was less than vertical all the way, although it did become steeper as we climbed higher. Twice it was necessary to belay from slings. At one point, about halfway to our crescent ledge, the cracks bottomed out completely and two bolts had to be placed for direct aid. Higher up, a delicate fifth-class lead and a long sixth-class pitch brought us to the exposed but very spacious ledge where we prepared to spend a comfortable night.

We had hauled the duffel bag three times during the day and despite the occa-

sional jamming and the problem of rope management, we welcomed the sleeping bags, as the temperature dropped to nearly freezing. The next morning we found that no direct aid would be required to reach the summit. Two fifth-class leads were followed by a series of fourth-class pitches, and then easy scrambling brought us to the summit before noon. The total climbing time was fourteen hours. With an early start the climb can be completed in one day.

CHUCK PRATT

MOUNT HOFFMANN, NORTH FACE

Considered for several years as a major High Sierra climbing problem, the north face of Mount Hoffmann was ascended on July 23, 1957, by Merle Alley and me. We climbed the snow field at the base to a chimney 200 feet to the west of the overhanging summit block. The chimney was followed all the way to the summit ridge, with several variations to the east. Three delicate overhangs presented the most difficult problems throughout the 500 feet of fifth-class climbing.

GEORGE SESSIONS

THE TURRET, MOUNT HOFFMANN

From the north face of Mount Hoffmann a low ridge runs to the north, rising abruptly in a turretlike projection at its end. On August 30, 1958, a first ascent of the northeast face of the turret was made by Jerry Gray, George Ewing and myself.

The route begins to the west of a gently sloped buttress of the turret, in the right hand (west) of two large jam cracks which are spaced about 15 feet apart. Moderately strenuous fifth-class climbing leads to a large, sloping V-shaped opening. Above the left-hand slope of the *V* are three large steps, each of which can hold several climbers. The lead rope was 150 feet, which allowed us to proceed up the base of the *V* to where an open crack afforded a hand traverse across the left slope. The only alternative to a party with a lead rope of 120 feet is to ascend the left slope immediately on entering the *V* by means of a vertical finger jam crack. From the highest step the route proceeds to the right around a buttress and horizontally across a friction pitch to an open chimney. The chimney was the most difficult lead, and several sixth-class pitons had to be placed, largely because of rope friction. At the end of this pitch easy scrambling leads to the summit. Climbing time for this was about six hours.

LES OVERSTREET

MOUNT MENDALL, NORTH COULOIR

At dawn on June 21, 1958, John Whitmer and I were standing under the north face of Mount Mendall in the Evolution region of the High Sierra. Above us a steep and forbidding snow-and-ice couloir twisted its way upward to a notch in the summit ridge. This was the unclimbed Mendall Couloir.

Roping up just below the bergschrund we cramponed on steep snow to the base of a buttress which splits the couloir. To our left very steep ice swept upward for a few hundred feet, running out against a rock face. As this face was plastered with snow and verglas we turned into the right-hand (western) branch of the couloir. With a climbing traverse we crossed just under the first large ice patch to gain the rocks and the most welcome sunshine. About 300 feet of easy fourth-class rock climbing brought us to the crux of the route: a 60-degree ice slope that spanned the couloir and stretched upward out of our sight.

John led off with a 110-foot traverse to a rock-piton belay point, placing an ice

piton midway to avert a pendulum fall. Felix followed and then cut directly up the ice, using the rock wall for handholds wherever possible. His ice hammer broke, 60 feet out on this lead, but thanks to 12-point crampons progress was not delayed. John then took over, finding most of his route on the verglas-encrusted rocks. Again both ice and rock pitons were used. The final pitch, a 15-foot vertical wall of crusty snow, gave us a few ticklish moments because of steps breaking out. From the notch a few short third-class pitches brought us quickly to the summit.

FELIX KNAUTH

KEN MINARET, SOUTH RIDGE

On Labor Day, 1958, Chuck and Ellen Wilts, and I made a first ascent of this ridge. From camp at Minaret Lake we followed the snow slopes leading to the South Notch. A traverse toward the amphitheater and a short scramble led to the notch between the first tower on the ridge and the rest of the ridge. After looking at the slabs above the notch we descended a short distance to where the west face was more broken. Several pitches on the west face led to the top of the cliff rising out of the notch. The next step was turned to the east (fifth class). Several more pitches led directly up the ridge to the tower below the big step. A rappel from a piton took us into the notch below the big step. A traverse onto the east face and a fifth-class pitch took us to the top of the big step. Easy climbing led to the lower of the two summits. We climbed down into the notch, then up the higher summit tower.

We descended by the "class-two west face" which we all thought was fourth class (the upper pitch, that is). Two weeks later Ernst Bauer and I climbed the tower just above the South Notch. From the ridge the summit of this tower appeared lacking a cairn. On the first pitch out of the notch the leader discovered a piton. A pitch above also contained a piton, although no cairn was found on top. We built a cairn and inserted a piece of candy. No sling was found either. A search of the literature indicates nothing. Who was there?

RAY VAN AKEN

WHITE DIVIDE

In August, 1958, Gordon Oates and I climbed in the White Divide, which lies between South Goddard Canyon and Blackcap Basin. We ascended three peaks between Mount Reinstein and Finger Peak. They were thought to be first ascents—we found no cairns. We climbed Peak 12,209 from the upper end of South Goddard Canyon via the east ridge (third class) and traversed to Peak 12,309. The next day we climbed Peak 12,479, where a hidden chute led almost to the top.

GEORGE WALLERSTEIN

MORRO ROCK (SEQUOIA)

On September 28, 1958, Jerry Dixon, George Sessions, George Whitmore and I did what we believe was a new route on the east side of Morro Rock. After descending from the left side of the trail near the beginning of the stairs we traversed 100 yards and scrambled up to the base of the crack. The first pitch was fifth and sixth class and proved to be the only difficulty of the climb. Bearing to the left during the remaining 400 feet we kept the stairs out of reach, and reached the summit fourth class. There are other possibilities farther south on this same east face that are likely to be more difficult.

MERLE ALLEY

YOSEMITE VALLEY

EI CAPITAN FLAKE

Approximately 150 yards to the west of the toe of El Capitan and leaning against its west face there is a 350-foot flake. It was first ascended on August 2, 1958, by Wally Reed and myself. The route lies in the prominent chimney at the right edge of the flake. The first problem is to get into the chimney, because the lower 60 or 70 feet are missing; we climbed up one pitch on the face to the right of the area below the chimney. The face, which is liberally scattered with hand holds, offers obvious fifth-class climbing. The pitch ends at a good belay position behind a loose, teetering block, which is approximately 30 to 40 feet to the right of the chimney and about 70 feet above the ground. From here the route requires a traverse to the left in order to reach the chimney. The next pitch is completely sixth class until the chimney is reached. It requires two pendulum traverses. About eight pitons for direct aid and two bolts for pendulum points were used on this pitch. The second pendulum ends in the chimney which is quite comfortable and is easily climbed fifth class. The rest of the climb follows the chimney and is fourth class except at one point where the chimney becomes too wide to stem. The point is passed easily by sixth class on the right wall.

To anybody looking for a leisurely half-day climb without a long approach, we recommend this climb as not difficult and enjoyable.

CHARLES RAYMOND

EL CAPITAN BUTTRESS, EAST END

From the main road at the end of Eagle Creek a prominent crack can be seen on the most eastern part of El Capitan Buttress. The crack, on a near-vertical face, ends at a narrow ledge which widens gradually, leading to the summit of El Capitan. Gerry Czamanske and I climbed this route for the first time on December 7, 1958.

The belay spot at the beginning of the crack can be reached by a variety of fifth- or sixth-class routes (about two pitches) from directly below, or by a third-class route from above and to the right. The route goes through an evergreen branch out onto the vertical face on narrow flakes of rock. The ledge can be reached in one lead, if direct-aid pitons upward are used, under somewhat rotten flakes. Six sixth-class pitons with one bolt for protection were used on the first ascent. It is not possible to rappel back, hence it is necessary to hike to the top of El Capitan and descend by another route.

HENRY KENDALL

SPLIT PINNACLE, EAST ARETE

On September 6, 1958, Chuck Pratt and I made the first ascent of Split Pinnacle from the base. The first pitch is a deep 200-foot-long chimney that is obvious from the east of the pinnacle. Although getting into the chimney from the ground is difficult, the rest is enjoyable, offering varying width. The pitch can be broken by belaying from an adequate chock stone near the top. From the top of the chimney, about 30 feet above the chock stone, we climbed a wall on the right to a large tree-covered ledge beneath a formidable right-angle chimney. This chimney affords only the meager protection of one extra-wide angle piton and is quite difficult. After about 25 feet, it is necessary to traverse to the left out of the chimney and onto a vertical

face which is exposed but easier than the chimney. Upon reaching a prominent tree above this face, we traversed to the left and downward to the base of a cleft in a short face. This cleft is only about 15 feet high, but it overhangs, and we found it strenuous. It leads up to the left onto a smooth 70-degree face with small, well-polished, doubtful-looking handholds. This face leads to the West Pinnacle where the regular route is joined. From the previously mentioned tree above the right-angle chimney a route appears to be leading straight up the ridge third class to a point just below the summit to the east. Then a traverse along the north wall and up a difficult-looking crack, probably requiring direct aid, should lead to the summit from the northeast. We did not choose this alternative because of the darkness, which caught us on the summit. The ascent took about six hours.

KREHE RITTER

LOWER BROTHER, SOUTHEAST FACE

On August 16, 1958, Wally Reed and I climbed what is probably a new route on Lower Brother. The route lies generally under the south face of Middle Brother and terminates somewhat to the east of the usual point where one meets Michael's Ledge when descending from the summit of Lower Brother. We started climbing at the top of the prominent scree fan to the left of Rixon's Pinnacle. Four pitches of intermittent fifth and sixth class brought us to the large ledge which divides this face. A little third class on the ledge and three pitches above it finishes the climb.

CHARLES RAYMOND

SUNDAY TREE

Yosemite rock climbers are always on the lookout for a suitable climb for Sundays when one would prefer a short, interesting, route with little or no talus and which one had not climbed several times before. On October 19, 1958, Bill Briggs of Dartmouth and I made a new climb which should be the answer for some. Directly north of Camp 4 is a great wall harboring a large tree about halfway up to the rim. This tree is not to be confused with a similar tree several hundred yards to the west which may be easily reached from the valley and from which Jon Lindbergh made his ascent to the rim. Our climb is easily approached by the Yosemite Point Trail until it crosses the open talus slope leading to the base of the main waterfall chimney descending to the left of the tree ledge. This route may not be feasible in the spring. After some unsuccessful work on the principal chimney we finally started the climb on the wall to the left which led in one rope length back into the chimney above the difficult portion. After a short scramble the next difficult lead bears right, up a subsidiary, loose-rock, open chimney. After about 40 feet the top of this chimney is reached, at which point the route leads up and around a corner to the right across a rather smooth face to the belay ledge. A stump, 15 feet above, makes possible a traverse back to the left toward the main chimney which by now is better described as a gully. After a short face lead, easy scrambling takes one up the next 150 feet of steep rock to the final wall below the tree ledge. This is surmounted by an interesting chimney to the right. If the route becomes popular, a register might be put in the cairn which we left at the base of the tree. It should certainly prove possible to continue up the ledges to the right and reach the rim, but our limited time did not permit investigation. This climb is to be recommended to those looking for six interesting pitches, not easy but not severe, which may be ascended in only a

few hours and descended via rappels in only one hour. Only fifteen minutes are required to reach Camp 4 from the bottom of the last rappel.

LEIGH ORTENBURGER

ARROWHEAD SPIRE, NOTCH ROUTE

On August 14, 1958, Dick Scheible and I found a new fifth-class route on the Arrowhead Spire. Starting about 100 yards north of the regular east-face route we climbed a series of cracks and ledges to the notch between Arrowhead Spire and the Arrowhead Arête. Traversing first west then east on the north side of the spire we found a fingertip traverse which enabled us to reach the south ridge of the spire and the regular route. The climbing required a variety of face and crack techniques on all seven pitches. This route offers sufficient challenge to be considered comparable to the Flake Alternate route of the Lower Cathedral Spire, yet it is one of the most enjoyable climbs in Yosemite.

JOHN FISKE

LOWER ROYAL ARCH TRAVERSE

On August 19, 1957, Mara Unterman, Judy Byers, and I made the first known traverse of the lowest of the Royal Arches. This is a pleasant, short, three-pitch climb that can be done in a couple of hours and offers an interesting supplement to the Lunch Ledge climb on Washington Column. The climb begins on the left side of the arch and ends at the bolt at the start of the Lunch Ledge climb. The climbing technique consists mainly of pulling up under a crack by your feet and moving sideways where the arch projects out from the 60-degree face. All goes well until about halfway through the last pitch, which is by now heading downward, where the crack runs out. A little beyond here a piton is advisable as otherwise a fall by the last man would be a long pendulum ending in a pile of rocks. The rest of the pitch is negotiated by a little delicate climbing down to the main ledge. Except for the mentioned piton, the climb is fourth class and should be a good one for inexperienced climbers provided the party includes an experienced leader.

KREHE RITTER

WATKINS PINNACLES FROM TENAYA CANYON

Lately there has been much emphasis on finding long, interesting and difficult climbs. Larry Lackey, Gary Hemming, Jim Wilson and I were interested in finding a long, interesting, but easy climb. In pursuit of this objective, we climbed thirty pitches of third, fourth, and fifth class on May 24–25, 1958.

The climb started in Tenaya Canyon directly below Mount Watkins, not below the Pinnacles. A series of scree ledges lead left and upward to a large ledge and a big pine tree. About six pitches up in an open 10-foot chimney, Long used a sixth-class step and failed to notify Hemming, who, after a 10-foot slip, climbed this pitch fifth. Three pitches above the pine-tree ledge, "air-flight delight" is crossed. This six-foot jump can be avoided by a sixth-class pendulum. A ledge, several pitches above the tree ledge, will lead into the large open couloir. We stayed on the right side of this couloir until crossing it led directly to a series of brush-covered ledges. We continued to circle both pinacles until we arrived at the southwest of Lower Watkins Pinnacle. At this point the buttress used in the descent is joined. A 40-foot vertical narrow chimney led to a ledge that opens into a large chimney on the west face of the pinnacle. We named this 40-foot chimney "Long's Chimney" because he

led it after losing at drawing straws. We ascended to the notch of Lower Watkins Pinnacle. Our final highlight occurred when we crossed Snow Creek, which had risen several feet. Hemming, being the only one in favor of crossing the creek on foot, plunged neck deep into the water and reached safety on the opposite shore, thus proving the feasibility of such a crossing.

DICK LONG

MONDAY MORNING SLAB

At the bottom of the Glacier Point apron is a triangular slab some 400 feet high and darker than the surrounding rock. Mac Fraser and I climbed it a few years ago and called it "Monday Morning Slab." Pleasant fourth- and fifth-class pitches took us up the right edge, past a piece of sling rope in a puzzling location, and onto the large, well-defined ledge at the top of the slab. One more pitch was possible.

This route is ideal for beginners—easy, short, closer to the road, and with better rock than the Arrowhead, more interesting and with a more definite objective than the Lunch Ledge. In these times when "new climb" and "hero climb" are usually synonymous, and the decimal rating of a route seems to be more important than its beauty, perhaps this practical use is a sufficient excuse for pointing out a route that gave us more pleasure than pain.

DONALD GOODRICH

POHONO PINNACLE

On August 3, 1958, George Sessions and I made a probably first ascent of a spire (really a slightly detached buttress) one mile west of Sentinel Rock. We started at the bottom of the left (west) corner of this buttress and worked out an ascending traverse right across its face, ending in a large, distinct rock-slide gully. The climbing consisted of fourth-class ledges, two fifth-class jam cracks, and one long fifth-class chimney. Ascending the gully we turned into another fifth-class chimney which brought us to the notch which separated our summit from the valley wall. A very short scramble put us on top, and six messy rappels down the west arête put us back on the talus again. We propose the name "Pohono Pinnacle" for this summit. It is a nice Sunday climb for a party of moderately competent climbers. We will always wonder whether those rocks on the summit were a disintegrated cairn or just a pile of erosion-fractured stones.

FELIX KNAUTH

LOWER CATHEDRAL SPIRE, NORTHEAST CHIMNEY

From the summit of Church Tower, a long deep chimney is strikingly obvious on the northeast corner of the Lower Spire. Steve Roper and I climbed this chimney, which runs from the base of the spire all the way to Main Ledge, in July, 1958. We found little information beforehand: only that apparently the climb had not been made even though a number of climbers had considered it.

A late start got us to the base of the climb about 1:00 PM, so the climbing became somewhat hurried. The first and longest pitch was a face rather than a chimney climb. The climbing here was of moderately difficult fifth class except at two points where direct aid was used to surmount holdless overhangs. More than a full rope length was necessary to reach a belay spot, which was the top of a thick growth of branches. They were extremely thick and grew straight down the face, thus making it impossible to climb on the rock. I had to grasp a handful of branches and haul myself up. The next pitch was the start of the real chimney work. With Steve

leading, the fairly wide, high-angle chimney brought us to the most interesting part of the climb. The chimney continued, but higher up was a ceiling which cut the width of the chimney in half. Climbing this part was strenuous but not sustained. The fourth pitch proved to be the crux of the climb. The chimney slashed back into the spire nearly 50 feet and upward for 100. From the top of this strenuous and continuous pitch, an easier fourth-class lead and some scrambling brought us to Main Ledge, where we continued to the summit via the right-hand traverse. The climb took six hours and ranks in over-all difficulty with the higher spire.

CHUCK PRATT

PENNY-NICKEL ARETE

On September 13, 1958, George Sessions, Chuck Pratt, and I made the first ascent of the prominent arête from which Penny and Nickel pinnacles rise. The route leads up the valley side of the arête and starts with a short fourth-class pitch leading to a chock stone in a notch on the arête. From here a short sixth-class pitch requiring 4 pitons for direct aid, including 3 extra-wide angles, leads to a tree. A moderate fifth-class pitch leads to the base of a short but tricky narrow chimney, which is followed for about 10 feet until the face on the left becomes easier than the chimney. We traversed out of the chimney onto the face and up another 10 feet. The pitch ends with an easy traverse to the left leading to a large broken area with a foot-wide ledge directly beneath the next pitch, which is the crux of the climb. This pitch is 130 feet long, requiring some 25 pitons for direct aid in addition to a pendulum near the top. About halfway up a loose flake resembling a stalactite threatened to come down and impale the belayer if too much force were placed on it. The flake is hard to get by without using it, but the temptation should be firmly resisted to avoid wear and tear on the belayer directly below. After this pitch a chimney leads to a tree at the base of a wall which seems to have two possibilities. The route goes up a seeming jam crack to the left, next to another wall. This pitch is actually a moderately easy, 120-foot lie-back that looks hard from the bottom. The holds are solid, but there can be little or no protection because it would be difficult for the leader to stop. From the top, easy scrambling leads to the base of Nickel Pinnacle. The first ascent took a full day and required about 35 pitons. We descended in the dark into Cathedral Chimney.

KREHE RITTER

THE ROOF

A prominent roof can be seen from the road, about halfway up the northwest face of Lower Cathedral rock, and about 150 yards north of the Overhang Bypass route. It caps a steep crack formed by the intersection of two smooth 75 degree slabs. It was first ascended by Tom Frost and myself in April, 1958.

From the bushy ledges at the start of roped climbing on the Overhang Bypass, we continued north second class until the roof was directly above. A 120-foot fourth-class lead ended at a tree just below the steep crack. A belay from slings at the top of the crack allowed a complete ascent of the 15-foot horizontal roof and the vertical section above. Two delicate steps on the face to the left of the crack lead to three bolts just below the roof. Fifteen sixth-class pitons, nine under the roof, and three bolts were used in the first ascent. From the end of this pitch easy third-class climbing lead to the summit.

HENRY KENDALL

WORST ERROR

Labor day of 1957 found Wayne Merry and me struggling in the chimneys that constitute the climbing route up the ominous-looking column lying against the northwest face of Elephant Rock. By 1:00 PM we were established on the small chock stone that marked the high point of my earlier attempts. Beyond, leading to the summit, lay the worst-looking pitch in my experience. Four and a half hours, three expansion bolts, and four pitons later I was at the top of the most difficult stretch I had ever led. Wayne soon joined me at the interesting belay spot and continued upward, beautifully stemming the wide flaring chimney. By 6:00 PM we were standing on the summit.

The route is not obvious: Ascend easy chimneys on the southwest (downstream) side of the column to a point about halfway up. Tunnel into the "dark chimney" to a depth of about 50 feet, then upward to a chock stone, 90 feet above. From the chock stone traverse to the northeast edge of the column. Around the corner lies the "horror pitch," an 80-foot high-angle jam crack or squeeze chimney with two overhangs. Three bolts, including the one used for an anchor at the top of the pitch, and four pitons are required. A final 12-foot, fourth-class pitch leads to the summit.

While eating a belated lunch and building a summit cairn, we cast about for a name. We finally settled on the "Worst Error" because in a way it was somewhat reminiscent of the classic succession of "Errors" in the Lost Arrow Chimney. It was not nearly so great a climb, of course, but it has a tougher pitch than any in the "Errors."

WARREN HARDING

More Books from the Sierra Club

For the convenience of members, the Sierra Club office carries a few books by other publishers which pertain particularly to the club's fields.

A Sand County Almanac, by Aldo Leopold (Oxford, $4). As the author writes in his foreword, "There are two kinds of people; those who can live without wild things and those who cannot. These essays are the experiences and dilemmas of one who cannot."

Round River, by Aldo Leopold (Oxford, $3), is more of journal than of essays and reveals more of the experience out of which Leopold wrote; of how he came to notice "that a deer's taste in scenery and solitudes is very much like my own."

Arctic Wilderness, by Robert Marshall (Univ. Calif. Press, $3.75). Exciting travels in Alaska by one of the originators of the wilderness-system idea, beautifully illustrated. Foreword by A. Starker Leopold.

The Singing Wilderness, by Sigurd Olson (Knopf, $5), re-creates the sights and sounds and meaning of the Quetico-Superior country, where the trails are for canoes. Beautifully written, illustrated, and designed.

This Is Dinosaur: Echo Park Country and Its Magic Rivers, edited by Wallace Stegner. The great controversy over the proposed Echo Park dam has brought wide recognition to Dinosaur National Monument. *This Is Dinosaur* will let you see why there has been furore. The books puts you there, through the ages; it gives the place meaning and perspective. (Knopf, $5.)

Birds and Mammals of the Sierra Nevada, by Lowell Sumner and Joseph Dixon ($7.50); *The Incomparable Valley: A Geologic Interpretation of the Yosemite* ($1.95); and *Sequoia National Park: A Geological Album* ($1.95), both by François E. Matthes; and *The Sierra Nevada: The Range of Light* (various authors, $6.00); *Sunset Sportsman's Atlas: The High Sierra and Its Environs,* maps by C. E. Erickson ($1.75)—all these add greatly to an understanding of the Sierra scene.

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