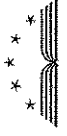


ALDO LEOPOLD

A SAND COUNTY ALMANAC &
OTHER WRITINGS ON ECOLOGY
AND CONSERVATION

Curt Meine, *editor*



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Foreword

THESE are some who can live without wild things, and some who cannot. These essays are the delights and dilemmas of one who cannot.

Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild, and free. For us of the minority, the opportunity to see geese is more important than television, and the chance to find a pasque-flower is a right as inalienable as free speech.

These wild things, I admit, had little human value until mechanization assured us of a good breakfast, and until science disclosed the drama of where they come from and how they live. The whole conflict thus boils down to a question of degree. We of the minority see a law of diminishing returns in progress; our opponents do not.

* * *

One must make shift with things as they are. These essays are my shifts. They are grouped in three parts.

Part I tells what my family sees and does at its week-end refuge from too much modernity: 'the shack.' On this sand farm in Wisconsin, first worn out and then abandoned by our bigger-and-better society, we try to rebuild, with shovel and axe, what we are losing elsewhere. It is here that we seek—and still find—our meat from God.

These shack sketches are arranged seasonally as a 'Sand County Almanac.'

Part II, 'Sketches Here and There,' recounts some of the episodes in my life that taught me, gradually and sometimes painfully, that the company is out of step. These episodes, scattered over the continent and through forty years of time, present a fair sample of the issues that bear the collective label: conservation.

Part III, 'The Upshot,' sets forth, in more logical terms, some of the ideas whereby we dissenters rationalize our dissent. Only the very sympathetic reader will wish to wrestle with

To my ESTELLA

the philosophical questions of Part III. I suppose it may be said that these essays tell the company how it may get back into step.

* * *

Conservation is getting nowhere because it is incompatible with our Abrahamic concept of land. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. There is no other way for land to survive the impact of mechanized man, nor for us to reap it from the esthetic harvest it is capable, under science, of contributing to culture.

That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics. That land yields cultural harvest is a fact long known, but latterly often forgotten.

These essays attempt to weld these three concepts.

Such a view of land and people is, of course, subject to the blurs and distortions of personal experience and personal bias. But wherever the truth may lie, this much is crystal-clear: our bigger-and-better society is now like a hypochondriac, so obsessed with its own economic health as to have lost the capacity to remain healthy. The whole world is so greedy for more bathtubs that it has lost the stability necessary to build them, or even to turn off the tap. Nothing could be more salutary at this stage than a little healthy contempt for a plethora of material blessings.

Perhaps such a shift of values can be achieved by reappraising things unnatural, tame, and confined in terms of things natural, wild, and free.

Madison, Wisconsin

4 March 1948

ALDO LEOPOLD

PART I: A Sand County Almanac

JANUARY

January Thaw

EACH YEAR, after the midwinter blizzards, there comes a night of thaw when the tinkle of dripping water is heard in the land. It brings strange stirrings, not only to creatures abed for the night, but to some who have been asleep for the winter. The hibernating skunk, curled up in his deep den, uncurls himself and ventures forth to prowling the wet world, dragging his belly in the snow. His track marks one of the earliest datable events in that cycle of beginnings and ceasings which we call a year.

The track is likely to display an indifference to mundane affairs uncommon at other seasons; it leads straight across country, as if its maker had hitched his wagon to a star and dropped the reins. I follow, curious to deduce his state of mind and appetite, and destination if any.

* * *

The months of the year, from January up to June, are a geometric progression in the abundance of distractions. In January one may follow a skunk track, or search for bands on the chickens, or see what young pines the deer have browsed, or what muskrat houses the mink have dug, with only an occasional and mild digression into other doings. January observation can be almost as simple and peaceful as snow, and almost as continuous as cold. There is time not only to see who has done what, but to speculate why.

* * *

A meadow mouse, startled by my approach, darts damply across the skunk track. Why is he abroad in daylight? Probably because he feels grieved about the thaw. Today his maze of secret tunnels, laboriously chewed through the matted grass under the snow, are tunnels no more, but only paths exposed to public

view and ridicule. Indeed the thawing sun has mocked the basic premises of the microtine economic system!

The mouse is a sober citizen who knows that grass grows in order that mice may store it as underground haystacks, and that snow falls in order that mice may build subways from stack to stack: supply, demand, and transport all neatly organized. To the mouse, snow means freedom from want and fear.

* * *

A rough-legged hawk comes sailing over the meadow ahead. Now he stops, hovers like a kingfisher, and then drops like a feathered bomb into the marsh. He does not rise again, so I am sure he has caught, and is now eating, some worried mouse-engineer who could not wait until night to inspect the damage to his well-ordered world.

The rough-leg has no opinion why grass grows, but he is well aware that snow melts in order that hawks may again catch field mice. He came down out of the Arctic in the hope of thaws, for to him a thaw means freedom from want and fear.

* * *

The skunk track enters the woods, and crosses a glade where the rabbits have packed down the snow with their tracks, and mottled it with pinkish urinations. Newly exposed oak seedlings have paid for the thaw with their newly barked stems. Tufts of rabbit-hair bespeak the year's first battles among the amorous



bucks. Further on I find a bloody spot, encircled by a wide-sweeping arc of owl's wings. To this rabbit the thaw brought freedom from want, but also a reckless abandonment of fear. The owl has reminded him that thoughts of spring are no substitute for caution.

* * *

The skunk track leads on, showing no interest in possible food, and no concern over the romplings or retributions of his neighbors. I wonder what he has on his mind; what got him out of bed? Can one impute romantic motives to this corpulent fellow, dragging his ample beltline through the slush? Finally the track enters a pile of driftwood, and does not emerge. I hear the tinkle of dripping water among the logs, and I fancy the skunk hears it too. I turn homeward, still wondering.

Draba

WITHIN A few weeks now Draba, the smallest flower that blows, will sprinkle every sandy place with small blooms.

He who hopes for spring with upturned eye never sees so small a thing as Draba. He who despairs of spring with downcast eye steps on it, unknowing. He who searches for spring with his knees in the mud finds it, in abundance.

Draba asks, and gets, but scant allowance of warmth and comfort; it subsists on the leavings of unwanted time and space. Botany books give it two or three lines, but never a plate or portrait. Sand too poor and sun too weak for bigger, better blooms are good enough for Draba. After all it is no spring flower, but only a postscript to a hope.

Draba plucks no heartstrings. Its perfume, if there is any, is lost in the gusty winds. Its color is plain white. Its leaves wear a sensible woolly coat. Nothing eats it; it is too small. No poets sing of it. Some botanist once gave it a Latin name, and then forgot it. Altogether it is of no importance—just a small creature that does a small job quickly and well.

The Green Pasture

SOME PAINTINGS become famous because, being durable, they are viewed by successive generations, in each of which are likely to be found a few appreciative eyes.

I know a painting so evanescent that it is seldom viewed at all, except by some wandering deer. It is a river who wields the brush, and it is the same river who, before I can bring my friends to view his work, crases it forever from human view. After that it exists only in my mind's eye.

Like other artists, my river is temperamental; there is no predicting when the mood to paint will come upon him, or how long it will last. But in midsummer, when the great white fleets cruise the sky for day after flawless day, it is worth strolling down to the sandbars just to see whether he has been at work.

The work begins with a broad ribbon of silt brushed thinly on the sand of a receding shore. As this dries slowly in the sun, goldfinches bathe in its pools, and deer, herons, killdeers, raccoons, and turtles cover it with a lacework of tracks. There is no telling, at this stage, whether anything further will happen.

But when I see the silt ribbon turning green with *Eleocharis*, I watch closely thereafter, for this is the sign that the river is in a painting mood. Almost overnight the *Eleocharis* becomes a thick turf, so lush and so dense that the meadow mice from the adjoining upland cannot resist the temptation. They move *en masse* to the green pasture, and apparently spend the nights rubbing their ribs in its velvety depths. A maze of neatly tended mouse-trails bespeaks their enthusiasm. The deer walk up and down in it, apparently just for the pleasure of feeling it underfoot. Even a stay-at-home mole has tunneled his way across the dry bar to the *Eleocharis* ribbon, where he can heave and hump the verdant sod to his heart's content.

At this stage the seedlings of plants too numerous to count and too young to recognize spring to life from the damp warm sand under the green ribbon.

To view the painting, give the river three more weeks of solitude, and then visit the bar on some bright morning just

after the sun has melted the daybreak fog. The artist has now laid his colors, and sprayed them with dew. The Eleocharis sod, greener than ever, is now spangled with blue mimulus, pink dragon-head, and the milk-white blooms of Sagittaria. Here and there a cardinal flower thrusts a red spear skyward. At the head of the bar, purple ironweeds and pale pink joe-pyes stand tall against the wall of willows. And if you have come quietly and humbly, as you should to any spot that can be beautiful only once, you may surprise a fox-red deer, standing knee-high in the garden of his delight.

Do not return for a second view of the green pasture, for there is none. Either falling water has dried it out, or rising water has scoured the bar to its original austerity of clean sand. But in your mind you may hang up your picture, and hope that in some other summer the mood to paint may come upon the river.

A Mighty Fortress

EVERY FARM woodland, in addition to yielding lumber, fuel, and posts, should provide its owner a liberal education. This crop of wisdom never fails, but it is not always harvested. I here record some of the many lessons I have learned in my own woods.

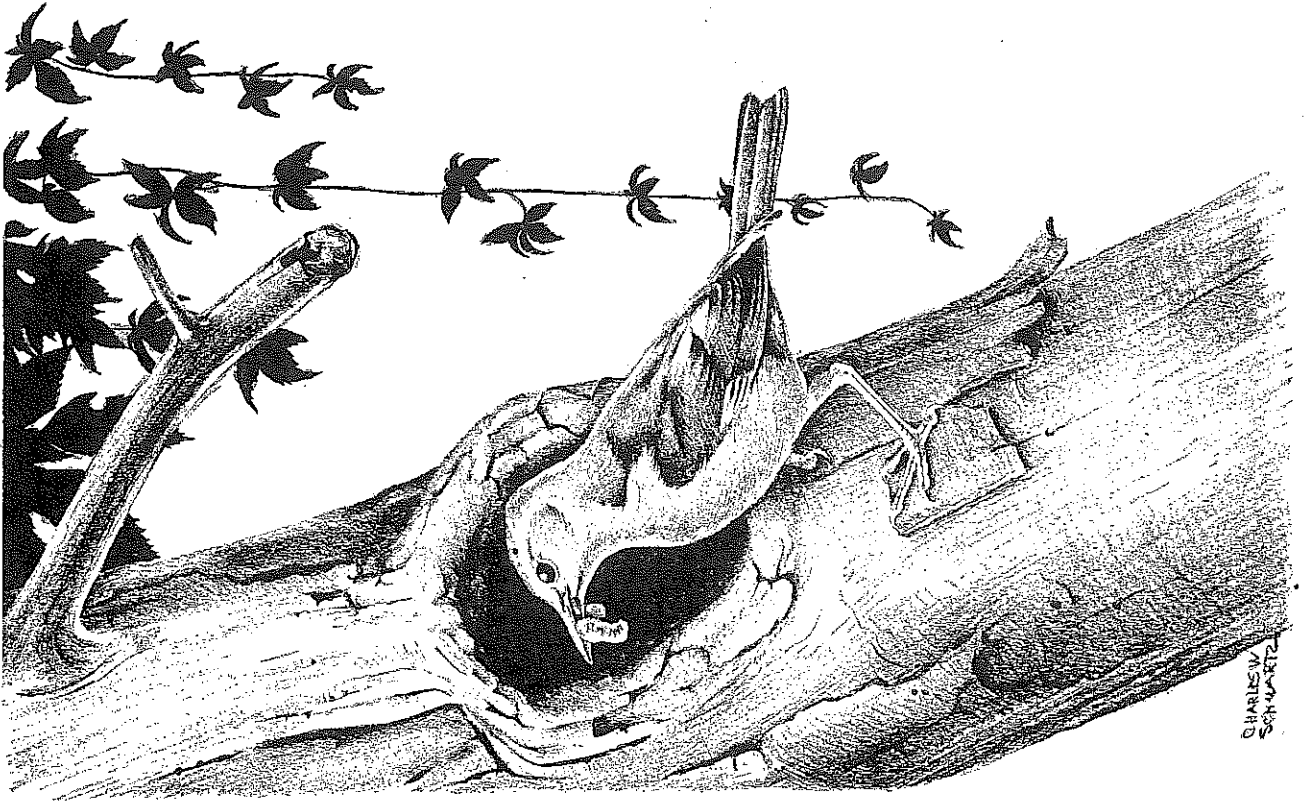
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Soon after I bought the woods a decade ago, I realized that I had bought almost as many tree diseases as I had trees. My woodlot is riddled by all the ailments wood is heir to. I began to wish that Noah, when he loaded up the Ark, had left the tree diseases behind. But it soon became clear that these same diseases made my woodlot a mighty fortress, unequaled in the whole county.

My woods is headquarters for a family of coons; few of my neighbors have any. One Sunday in November, after a new snow, I learned why. The fresh track of a coon-hunter and his hound led up to a half-uprooted maple, under which one of my coons had taken refuge. The frozen snarl of roots and earth was too rocky to chop and too tough to dig; the holes under the roots were too numerous to smoke out. The hunter had quit coonless because a fungus disease had weakened the roots of the maple. The tree, half tipped over by a storm, offers an impregnable fortress for coondom. Without this 'bombproof' shelter, my seed stock of coons would be cleaned out by hunters each year.

My woods houses a dozen ruffed grouse, but during periods of deep snow my grouse shift to my neighbor's woods, where there is better cover. However, I always retain as many grouse as I have oaks wind-thrown by summer storms. These summer windfalls keep their dried leaves, and during snows each such windfall harbors a grouse. The droppings show that each grouse roosts, feeds, and loaf for the duration of the storm within the narrow confines of his leafy camouflage, safe from wind, owl, fox, and hunter. The cured oak leaves not only serve as cover, but, for some curious reason, are relished as food by the grouse.

These oak windfalls are, of course, diseased trees. Without



disease, few oaks would break off, and hence few grouse would have down tops to hide in.

Diseased oaks also provide another apparently delectable grouse food: oak galls. A gall is a diseased growth of new twigs that have been stung by a gall-wasp while tender and succulent. In October my grouse are often stuffed with oak galls.

Each year the wild bees load up one of my hollow oaks with combs, and each year trespassing honey-hunters harvest the honey before I do. This is partly because they are more skillful than I am in 'lining up' the bee trees, and partly because they use nets, and hence are able to work before the bees become dormant in fall. But for heart-rots, there would be no hollow oaks to furnish wild bees with oaken hives.

During high years of the cycle, there is a plague of rabbits in my woods. They eat the bark and twigs off almost every kind of tree or bush I am trying to encourage, and ignore almost every kind I should like to have less of. (When the rabbit-hunter plants himself a grove of pines or an orchard, the rabbit somehow ceases to be a game animal and becomes a pest instead.)

The rabbit, despite his omnivorous appetite, is an epicure in some respects. He always prefers a hand-planted pine, maple, apple, or wahoo to a wild one. He also insists that certain salads be preconditioned before he deigns to eat them. Thus he spurns red dogwood until it is attacked by oyster-shell scale, after which the bark becomes a delicacy, to be eagerly devoured by all the rabbits in the neighborhood.

A flock of a dozen chickadees spends the year in my woods. In winter, when we are harvesting diseased or dead trees for our fuel wood, the ring of the axe is dinner gong for the chickadee tribe. They hang in the offing waiting for the tree to fall, offering pert commentary on the slowness of our labor. When the tree at last is down, and the wedges begin to open up its contents, the chickadees draw up their white napkins and fall to. Every slab of dead bark is, to them, a treasury of eggs, larvae, and cocoons. For them every ant-tunneled heartwood bulges with milk and honey. We often stand a fresh split against a nearby tree just to see the greedy chicks mop up the ant-eggs. It lightens our labor to know that they, as well as we, derive aid and comfort from the fragrant riches of newly split oak.

But for diseases and insect pests, there would likely be no

food in these trees, and hence no chickadees to add cheer to my woods in winter.

Many other kinds of wildlife depend on tree diseases. My plicated woodpeckers chisel living pines, to extract fat grubs from the diseased heartwood. My barred owls find surcease from crows and jays in the hollow heart of an old basswood; but for this diseased tree their sundown serenade would probably be silenced. My wood ducks nest in hollow trees; every June brings its brood of downy ducklings to my woodland slough. All squirrels depend, for permanent dens, on a delicately balanced equilibrium between a rotting cavity and the scar tissue with which the tree attempts to close the wound. The squirrels referee the contest by gnawing out the scar tissue when it begins unduly to shrink the amplitude of their front door.

The real jewel of my disease-ridden woodlot is the prothonotary warbler. He nests in an old woodpecker hole, or other small cavity, in a dead snag overhanging water. The flash of his gold-and-blue plumage amid the dank decay of the June woods is in itself proof that dead trees are transmuted into living animals, and vice versa. When you doubt the wisdom of this arrangement, take a look at the prothonotary.



PART II: Sketches Here and There

WISCONSIN

Marshland Elegy

A DAWN wind stirs on the great marsh. With almost imperceptible slowness it rolls a bank of fog across the wide marsh. Like the white ghost of a glacier the mists advance, riding over phalanxes of tamarack, sliding across the bog-meadows heavy with dew. A single silence hangs from horizon to horizon.

Out of some far recess of the sky a tinkling of little bells falls soft upon the listening land. Then again silence. Now comes a baying of some sweet-throated hound, soon the clamor of a responding pack. Then a far clear blast of hunting horns, out of the sky into the fog.

High horns, low horns, silence, and finally a pandemonium of trumpets, rattles, croaks, and cries that almost shakes the bog with its nearness, but without yet disclosing whence it comes. At last a glint of sun reveals the approach of a great echelon of birds. On motionless wing they emerge from the lifting mists, sweep a final arc of sky, and settle in clangorous descending spirals to their feeding grounds. A new day has begun on the crane marsh.

* * *

A sense of time lies thick and heavy on such a place. Yearly since the ice age it has awakened each spring to the clangor of cranes. The peat layers that comprise the bog are laid down in the basin of an ancient lake. The cranes stand, as it were, upon the sodden pages of their own history. These peats are the compressed remains of the mosses that clogged the pools, of the tamaracks that spread over the moss, of the cranes that bugled over the tamaracks since the retreat of the ice sheet. An endless caravan of generations has built of its own bones this bridge into the future, this habitat where the oncoming host again may live and breed and die.

To what end? Out on the bog a crane, gulping some luckless

frog, springs his ungainly hulk into the air and flails the morning sun with mighty wings. The tamaracks re-echo with his bugled certitude. He seems to know.

* * *

Our ability to perceive quality in nature begins, as in art, with the pretty. It expands through successive stages of the beautiful to values as yet uncaptured by language. The quality of cranes lies, I think, in this higher gamut, as yet beyond the reach of words.

This much, though, can be said: our appreciation of the crane grows with the slow unraveling of earthly history. His tribe, we now know, stems out of the remote Eocene. The other members of the fauna in which he originated are long since entombed within the hills. When we hear his call we hear no mere bird. We hear the trumpet in the orchestra of evolution. He is the symbol of our untamable past, of that incredible sweep of millennia which underlies and conditions the daily affairs of birds and men.

And so they live and have their being—these cranes—not in the constricted present, but in the wider reaches of evolutionary time. Their annual return is the ticking of the geologic clock. Upon the place of their return they confer a peculiar distinction. Amid the endless mediocrity of the commonplace, a crane marsh holds a paleontological patent of nobility, won in the march of aeons, and revocable only by shotgun. The sadness discernible in some marshes arises, perhaps, from their once having harbored cranes. Now they stand humbled, adrift in history.

Some sense of this quality in cranes seems to have been felt by sportsmen and ornithologists of all ages. Upon such quarry as this the Holy Roman Emperor Frederick loosed his gyrfalcons. Upon such quarry as this once swooped the hawks of Kublai Khan. Marco Polo tells us: 'He derives the highest amusement from sporting with gyrfalcons and hawks. At Changanor the Khan has a great Palace surrounded by a fine plain where are found cranes in great numbers. He causes millet and other grains to be sown in order that the birds may not want.'

The ornithologist Bengt Berg, seeing cranes as a boy upon the Swedish heaths, forthwith made them his life work. He

followed them to Africa and discovered their winter retreat on the White Nile. He says of his first encounter: 'It was a spectacle which eclipsed the flight of the roc in the Thousand and One Nights.'

* * *

When the glacier came down out of the north, crunching hills and gouging valleys, some adventuring rampart of the ice climbed the Baraboo Hills and fell back into the outlet gorge of the Wisconsin River. The swollen waters backed up and formed a lake half as long as the state, bordered on the east by cliffs of ice, and fed by the torrents that fell from melting mountains. The shorelines of this old lake are still visible; its bottom is the bottom of the great marsh.

The lake rose through the centuries, finally spilling over east of the Baraboo range. There it cut a new channel for the river, and thus drained itself. To the residual lagoons came the cranes, bugling the defeat of the retreating winter, summoning the on-creeping host of living things to their collective task of marsh-building. Floating bogs of sphagnum moss clogged the lowered waters, filled them. Sedge and leatherleaf, tamarack and spruce successively advanced over the bog, anchoring it by their root fabric, sucking out its water, making peat. The lagoons disappeared, but not the cranes. To the moss-meadows that replaced the ancient waterways they returned each spring to dance and bugle and rear their gangling sorrel-colored young. These, albeit birds, are not properly called chicks, but *colts*. I cannot explain why. On some dewy June morning watch them gambol over their ancestral pastures at the heels of the roan mare, and you will see for yourself.

One year not long ago a French trapper in buckskins pushed his canoe up one of the moss-clogged creeks that thread the great marsh. At this attempt to invade their miry stronghold the cranes gave vent to loud and ribald laughter. A century or two later Englishmen came in covered wagons. They chopped clearings in the timbered moraines that border the marsh, and in them planted corn and buckwheat. They did not intend, like the Great Khan at Changanor, to feed the cranes. But the cranes do not question the intent of glaciers, emperors, or pioneers. They ate the grain, and when some irate farmer failed to

concede their usufruct in his corn, they trumpeted a warning and sailed across the marsh to another farm.

There was no alfalfa in those days, and the hill-farms made poor hay land, especially in dry years. One dry year someone set a fire in the tamaracks. The burn grew up quickly to bluejoint grass, which, when cleared of dead trees, made a dependable hay meadow. After that, each August, men appeared to cut hay. In winter, after the cranes had gone South, they drove wagons over the frozen bogs and hauled the hay to their farms in the hills. Yearly they plied the marsh with fire and axe, and in two short decades hay meadows dotted the whole expanse.

Each August when the haymakers came to pitch their camps, singing and drinking and lashing their teams with whip and tongue, the cranes whinnied to their colts and retreated to the far fastnesses. 'Red shitepokes' the haymakers called them, from the rusty hue which at that season often stains the battleship-gray of crane plumage. After the hay was stacked and the marsh again their own, the cranes returned, to call down out of October skies the migrant flocks from Canada. Together they wheeled over the new-cut stubbles and raided the corn until frosts gave the signal for the winter exodus.

These haymeadow days were the Arcadian age for marsh dwellers. Man and beast, plant and soil lived on and with each other in mutual toleration, to the mutual benefit of all. The marsh might have kept on producing hay and prairie chickens, deer and muskrat, crane-music and cranberries forever.

The new overlords did not understand this. They did not include soil, plants, or birds in their ideas of mutuality. The dividends of such a balanced economy were too modest. They envisaged farms not only around, but *in* the marsh. An epidemic of ditch-digging and land-booming set in. The marsh was gridironed with drainage canals, speckled with new fields and farmsteads.

But crops were poor and beset by frosts, to which the expensive ditches added an aftermath of debt. Farmers moved out. Peat beds dried, shrank, caught fire. Sun-energy out of the Pleistocene shrouded the countryside in acrid smoke. No man raised his voice against the waste, only his nose against the smell. After a dry summer not even the winter snows could extinguish

the smoldering marsh. Great pockmarks were burned into field and meadow, the scars reaching down to the sands of the old lake, peat-covered these hundred centuries. Rank weeds sprang out of the ashes, to be followed after a year or two by aspen scrub. The cranes were hard put, their numbers shrinking with the remnants of unburned meadow. For them, the song of the power shovel came near being an elegy. The high priests of progress knew nothing of cranes, and cared less. What is a species more or less among engineers? What good is an undrained marsh anyhow?

For a decade or two crops grew poorer, fires deeper, woodlands larger, and cranes scarcer, year by year. Only reflooding, it appeared, could keep the peat from burning. Meanwhile cranberry growers had, by plugging drainage ditches, reflooded a few spots and obtained good yields. Distant politicians bugled about marginal land, over-production, unemployment relief, conservation. Economists and planners came to look at the marsh. Surveyors, technicians, CCC's, buzzed about. A counter-epidemic of reflooding set in. Government bought land, resettled farmers, plugged ditches wholesale. Slowly the bogs are re-wetting. The firepocks become ponds. Grass fires still burn, but they can no longer burn the wetted soil.

All this, once the CCC camps were gone, was good for cranes, but not so the thickets of scrub popple that spread inexorably over the old burns, and still less the maze of new roads that inevitably follow governmental conservation. To build a road is so much simpler than to think of what the country really needs. A roadless marsh is seemingly as worthless to the alphabetical conservationist as an undrained one was to the empire-builders. Solitude, the one natural resource still undowered of alphabets, is so far recognized as valuable only by ornithologists and cranes.

Thus always does history, whether of marsh or market place, end in paradox. The ultimate value in these marshes is wildness, and the crane is wildness incarnate. But all conservation of wildness is self-defeating, for to cherish we must see and fondle, and when enough have seen and fondled, there is no wildness left to cherish.

Some day, perhaps in the very process of our benefactions, perhaps in the fullness of geologic time, the last crane will trumpet his farewell and spiral skyward from the great marsh. High out of the clouds will fall the sound of hunting horns, the baying of the phantom pack, the tinkle of little bells, and then a silence never to be broken, unless perchance in some far pasture of the Milky Way.

Thinking Like a Mountain

A DEEP CHESTY bawl echoes from rimrock to rimrock, rolls down the mountain, and fades into the far blackness of the night. It is an outburst of wild defiant sorrow and of contempt for all the adversities of the world.

Every living thing (and perhaps many a dead one as well) pays heed to that call. To the deer it is a reminder of the way of all flesh, to the pine a forecast of midnight scuffles and of blood upon the snow, to the coyote a promise of gleanings to come, to the cowman a threat of red ink at the bank, to the hunter a challenge of fang against bullet. Yet behind these obvious and immediate hopes and fears there lies a deeper meaning, known only to the mountain itself. Only the mountain has lived long enough to listen objectively to the howl of a wolf.

Those unable to decipher the hidden meaning know nevertheless that it is there, for it is felt in all wolf country, and distinguishes that country from all other land. It tingles in the spine of all who hear wolves by night, or who scan their tracks by day. Even without sight or sound of wolf, it is implicit in a hundred small events: the midnight whinny of a pack horse, the rattle of rolling rocks, the bound of a fleeing deer, the way shadows lie under the spruces. Only the ineducable tyro can fail to sense the presence or absence of wolves, or the fact that mountains have a secret opinion about them.

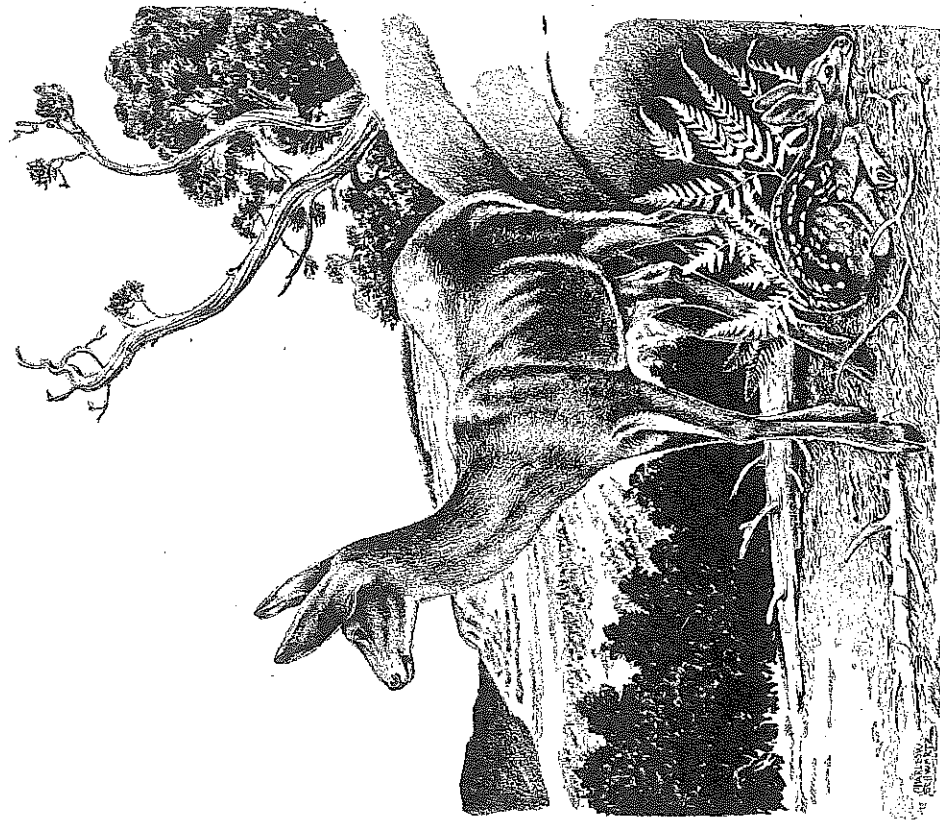
My own conviction on this score dates from the day I saw a wolf die. We were eating lunch on a high rimrock, at the foot of which a turbulent river elbowed its way. We saw what we thought was a doe fording the torrent, her breast awash in white water. When she climbed the bank toward us and shook out her tail, we realized our error: it was a wolf. A half-dozen others, evidently grown pups, sprang from the willows and all joined in a welcoming *mélee* of wagging tails and playful maulings. What was literally a pile of wolves writhed and tumbled in the center of an open flat at the foot of our rimrock.

In those days we had never heard of passing up a chance to kill a wolf. In a second we were pumping lead into the pack, but with more excitement than accuracy: how to aim a steep downhill shot is always confusing. When our rifles were empty,

the old wolf was down, and a pup was dragging a leg into impassable slide-rocks.

We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes—something known only to her and to the mountain. I was young then, and full of trigger-itch; I thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view.

* * *



Since then I have lived to see state extirpate its wolves. I have watched the face of many a newly wolfless mountain, and seen the south-facing slopes wrinkle with a maze of new deer trails. I have seen every edible bush and seedling browsed, first to anaemic desuetude, and then to death. I have seen every edible tree defoliated to the height of a saddlehorn. Such a mountain looks as if someone had given God a new pruning shears, and forbidden Him all other exercise. In the end the starved bones of the hoped-for deer herd, dead of its own too-much, bleach with the bones of the dead sage, or molder under the high-lined junipers.

I now suspect that just as a deer herd lives in mortal fear of its wolves, do does a mountain live in mortal fear of its deer. And perhaps with better cause, for while a buck pulled down by wolves can be replaced in two or three years, a range pulled down by too many deer may fail of replacement in as many decades.

So also with cows. The cowman who cleans his range of wolves does not realize that he is taking over the wolf's job of trimming the herd to fit the range. He has not learned to think like a mountain. Hence we have dustbowls, and rivers washing the future into the sea.

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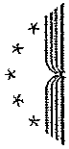


We all strive for safety, prosperity, comfort, long life, and dullness. The deer strives with his supple legs, the cowman with trap and poison, the statesman with pen, the most of us with machines, votes, and dollars, but it all comes to the same thing: peace in our time. A measure of success in this is all well enough, and perhaps is a requisite to objective thinking, but too much safety seems to yield only danger in the long run. Perhaps this is behind Thoreau's dictum: In wildness is the salvation of the world. Perhaps this is the hidden meaning in the howl of the wolf, long known among mountains, but seldom perceived among men.

ALDO LEOPOLD

A SAND COUNTY ALMANAC & OTHER WRITINGS ON ECOLOGY AND CONSERVATION

Curt Meine, *editor*



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Wilderness

WILDERNESS is the raw material out of which man has hammered the artifact called civilization.

Wilderness was never a homogeneous raw material. It was very diverse, and the resulting artifacts are very diverse. These differences in the end-product are known as cultures. The rich diversity of the world's cultures reflects a corresponding diversity in the wilds that gave them birth.

For the first time in the history of the human species, two changes are now impending. One is the exhaustion of wilderness in the more habitable portions of the globe. The other is the world-wide hybridization of cultures through modern transport and industrialization. Neither can be prevented, and perhaps should not be, but the question arises whether, by some slight amelioration of the impending changes, certain values can be preserved that would otherwise be lost.

To the laborer in the sweat of his labor, the raw stuff on his anvil is an adversary to be conquered. So was wilderness an adversary to the pioneer.

But to the laborer in repose, able for the moment to cast a philosophical eye on his world, that same raw stuff is something to be loved and cherished, because it gives definition and meaning to his life. This is a plea for the preservation of some tag-ends of wilderness, as museum pieces, for the edification of those who may one day wish to see, feel, or study the origins of their cultural inheritance.

THE REMNANTS

Many of the diverse wildernesses out of which we have hammered America are already gone; hence in any practical program the unit areas to be preserved must vary greatly in size and in degree of wildness.

No living man will see again the long-grass prairie, where a sea of prairie flowers lapped at the stirrups of the pioneer. We shall do well to find a forty here and there on which the prairie plants can be kept alive as species. There were a hundred such plants, many of exceptional beauty. Most of them are quite unknown to those who have inherited their domain.

But the short-grass prairie, where Cabeza de Vaca saw the horizon under the bellies of the buffalo, is still extant in a few spots of 10,000-acre size, albeit severely chewed up by sheep, cattle, and dry-farmers. If the forty-niners are worth commemorating on the walls of state capitals, is not the scene of their mighty hegira worth commemorating in several national prairie reservations?

Of the coastal prairie there is one block in Florida, and one in Texas, but oil wells, onion fields, and citrus groves are closing in, armed to the teeth with drills and bulldozers. It is last call. No living man will see again the virgin pinerics of the Lake States, or the flatwoods of the coastal plain, or the giant hardwoods; of these, samples of a few acres each will have to suffice. But there are still several blocks of maple-hemlock of thousand-acre size; there are similar blocks of Appalachian hardwoods, of southern hardwood swamp, of cypress swamp, and of Adirondack spruce. Few of these tag-ends are secure from prospective cuttings, and fewer still from prospective tourist roads.

One of the fastest-shrinking categories of wilderness is coastlines. Cottages and tourist roads have all but annihilated wild coasts on both oceans, and Lake Superior is now losing the last large remnant of wild shoreline on the Great Lakes. No single kind of wilderness is more intimately interwoven with history, and none nearer the point of complete disappearance.

In all of North America east of the Rockies, there is only one large area formally reserved as a wilderness: the Quetico-Superior International Park in Minnesota and Ontario. This magnificent block of canoe-country, a mosaic of lakes and rivers, lies mostly in Canada, and can be about as large as Canada chooses to make it, but its integrity is threatened by two recent developments: the growth of fishing resorts served by pontoon-equipped airplanes, and a jurisdictional dispute whether the Minnesota end of the area shall be all National Forest, or partly State Forest. The whole region is in danger of power impoundments, and this regrettable cleavage among proponents of wilderness may end in giving power the whip-hand.

In the Rocky Mountain states, a score of areas in the National Forests, varying in size from a hundred thousand to half a million acres, are withdrawn as wilderness, and closed to roads, hotels, and other inimical uses. In the National Parks the same

principle is recognized, but no specific boundaries are delimited. Collectively, these federal areas are the backbone of the wilderness program, but they are not so secure as the paper record might lead one to believe. Local pressures for new tourist roads knock off a chip here and a slab there. There is perennial pressure for extension of roads for forest-fire control, and these, by slow degrees, become public highways. Idle CCC camps presented a widespread temptation to build new and often need-less roads. Lumber shortages during the war gave the impetus of military necessity to many road extensions, legitimate and otherwise. At the present moment, ski-tows and ski-hotels are being promoted in many mountain areas, often without regard to their prior designation as wilderness.

One of the most insidious invasions of wilderness is via predator control. It works thus: wolves and lions are cleaned out of a wilderness area in the interest of big-game management. The big-game herds (usually deer or elk) then increase to the point of overbrowsing the range. Hunters must then be encouraged to harvest the surplus, but modern hunters refuse to operate far from a car; hence a road must be built to provide access to the surplus game. Again and again, wilderness areas have been split by this process, but it still continues.

The Rocky Mountain system of wilderness areas covers a wide gamut of forest types, from the juniper breaks of the Southwest to the 'illimitable woods where rolls the Oregon.' It is lacking, however, in desert areas, probably because of that under-aged brand of esthetics which limits the definition of 'scenery' to lakes and pine trees.

In Canada and Alaska there are still large expanses of virgin country

Where nameless men by nameless rivers wander
and in strange valleys die strange deaths alone.

A representative series of these areas can, and should, be kept. Many are of negligible or negative value for economic use. It will be contended, of course, that no deliberate planning to this end is necessary; that adequate areas will survive anyhow. All recent history belies so comforting an assumption. Even if wild spots do survive, what of their fauna? The woodland caribou, the several races of mountain sheep, the pure form of woods

buffalo, the barren ground grizzly, the freshwater seals, and the whales are even now threatened. Of what use are wild areas destitute of their distinctive faunas? The recently organized Arctic Institute has embarked on the industrialization of the Arctic wastes, with excellent chances of enough success to ruin them as wilderness. It is last call, even in the Far North.

To what extent Canada and Alaska will be able to see and grasp their opportunities is anybody's guess. Pioneers usually scoff at any effort to perpetuate pioneering.

WILDERNESS FOR RECREATION

Physical combat for the means of subsistence was, for unnumbered centuries, an economic fact. When it disappeared as such, a sound instinct led us to preserve it in the form of athletic sports and games.

Physical combat between men and beasts was, in like manner, an economic fact, now preserved as hunting and fishing for sport.

Public wilderness areas are, first of all, a means of perpetuating, in sport form, the more virile and primitive skills in pioneering travel and subsistence.

Some of these skills are of generalized distribution; the details have been adapted to the American scene, but the skill is worldwide. Hunting, fishing, and foot travel by pack are examples.

Two of them, however, are as American as a hickory tree; they have been copied elsewhere, but they were developed to their full perfection only on this continent. One of these is canoe travel, and the other is travel by pack-train. Both are shrinking rapidly. Your Hudson Bay Indian now has a put-put, and your mountaineer a Ford. If I had to make a living by canoe or packhorse, I should likely do likewise, for both are grueling labor. But we who seek wilderness travel for sport are foiled when we are forced to compete with mechanized substitutes. It is footless to execute a portage to the tune of motor launches, or to turn out your bell-mare in the pasture of a summer hotel. It is better to stay home.

Wilderness areas are first of all a series of sanctuaries for the primitive arts of wilderness travel, especially canoeing and packing.

I suppose some will wish to debate whether it is important to

keep these primitive arts alive. I shall not debate it. Either you know it in your bones, or you are very, very old.

European hunting and fishing are largely devoid of the thing that wilderness areas might be the means of preserving in this country. Europeans do not camp, cook, or do their own work in the woods if they can avoid doing so. Work chores are delegated to beaters and servants, and a hunt carries the atmosphere of a picnic, rather than of pioneering. The test of skill is confined largely to the actual taking of game or fish.

There are those who decry wilderness sports as 'undemocratic' because the recreational carrying capacity of a wilderness is small, as compared with a golf links or a tourist camp. The basic error in such argument is that it applies the philosophy of mass-production to what is intended to counteract mass-production. The value of recreation is not a matter of ciphers. Recreation is valuable in proportion to the intensity of its experiences, and to the degree to which it *differs from* and *contrasts with* workaday life. By these criteria, mechanized outings are at best a milk-and-water affair.

Mechanized recreation already has seized nine-tenths of the woods and mountains; a decent respect for minorities should dedicate the other tenth to wilderness.

WILDERNESS FOR SCIENCE

The most important characteristic of an organism is that capacity for internal self-renewal known as health.

There are two organisms whose processes of self-renewal have been subjected to human interference and control. One of these is man himself (medicine and public health). The other is land (agriculture and conservation).

The effort to control the health of land has not been very successful. It is now generally understood that when soil loses fertility, or washes away faster than it forms, and when water systems exhibit abnormal floods and shortages, the land is sick.

Other derangements are known as facts, but are not yet thought of as symptoms of land sickness. The disappearance of plants and animal species without visible cause, despite efforts to protect them, and the irruption of others as pests despite efforts to control them, must, in the absence of simpler explanations, be regarded as symptoms of sickness in the land organism. Both

are occurring too frequently to be dismissed as normal evolutionary events.

The status of thought on these ailments of the land is reflected in the fact that our treatments for them are still prevalently local. Thus when a soil loses fertility we pour on fertilizer, or at best alter its tame flora and fauna, without considering the fact that its wild flora and fauna, which built the soil to begin with, may likewise be important to its maintenance. It was recently discovered, for example, that good tobacco crops depend, for some unknown reason, on the preconditioning of the soil by wild ragweed. It does not occur to us that such unexpected chains of dependency may have wide prevalence in nature.

When prairie dogs, ground squirrels, or mice increase to pest levels we poison them, but we do not look beyond the animal to find the cause of the irruption. We assume that animal troubles must have animal causes. The latest scientific evidence points to derangements of the *plant* community as the real seat of rodent irruptions, but few explorations of this clue are being made.

Many forest plantations are producing one-log or two-log trees on soil which originally grew three-log and four-log trees. Why? Thinking foresters know that the cause probably lies not in the tree, but in the micro-flora of the soil, and that it may take more years to restore the soil flora than it took to destroy it.

Many conservation treatments are obviously superficial. Flood-control dams have no relation to the cause of floods. Check dams and terraces do not touch the cause of erosion. Refuges and hatcheries to maintain the supply of game and fish do not explain why the supply fails to maintain itself.

In general, the trend of the evidence indicates that in land, just as in the human body, the symptoms may lie in one organ and the cause in another. The practices we now call conservation are, to a large extent, local alleviations of biotic pain. They are necessary, but they must not be confused with cures. The art of land doctoring is being practiced with vigor, but the science of land health is yet to be born.

A science of land health needs, first of all, a base datum of normality, a picture of how healthy land maintains itself as an organism.

We have two available norms. One is found where land

physiology remains largely normal despite centuries of human occupation. I know of only one such place: northeastern Europe. It is not likely that we shall fail to study it.

The other and most perfect norm is wilderness. Paleontology offers abundant evidence that wilderness maintained itself for immensely long periods; that its component species were rarely lost, neither did they get out of hand; that weather and water built soil as fast or faster than it was carried away. Wilderness, then, assumes unexpected importance as a laboratory for the study of land-health.

One cannot study the physiology of Montana in the Amazon; each biotic province needs its own wilderness for comparative studies of used and unused land. It is of course too late to salvage more than a lopsided system of wilderness study areas, and most of these remnants are far too small to retain their normality in all respects. Even the National Parks, which run up to a million acres each in size, have not been large enough to retain their natural predators, or to exclude animal diseases carried by livestock. Thus the Yellowstone has lost its wolves and cougars, with the result that elk are ruining the flora, particularly on the winter range. At the same time the grizzly bear and the mountain sheep are shrinking, the latter by reason of disease.

While even the largest wilderness areas become partially deranged, it required only a few wild acres for J. E. Weaver to discover why the prairie flora is more drought-resistant than the agronomic flora which has supplanted it. Weaver found that the prairie species practice 'team work' underground by distributing their root-systems to cover all levels, whereas the species comprising the agronomic rotation overdraw one level and neglect another, thus building up cumulative deficits. An important agronomic principle emerged from Weaver's researches.

Again, it required only a few wild acres for Togrédia to discover why pines on old fields never achieve the size or wind-firmness of pines on uncleared forest soils. In the latter case, the roots follow old root channels, and thus strike deeper.

In many cases we literally do not know how good a performance to expect of healthy land unless we have a wild area for comparison with sick ones. Thus most of the early travelers in the Southwest describe the mountain rivers as originally clear, but a doubt remains, for they may, by accident, have

seen them at favorable seasons. Erosion engineers had no base datum until it was discovered that exactly similar rivers in the Sierra Madre of Chihuahua, never grazed or used for fear of Indians, show at their worst a milky hue, not too cloudy for a trout fly. Moss grows to the water's edge on their banks. Most of the corresponding rivers in Arizona and New Mexico are ribbons of boulders, mossless, soil-less, and all but treeless. The preservation and study of the Sierra Madre wilderness, by an international experiment station, as a norm for the cure of sick land on both sides of the border, would be a good-neighbor enterprise well worthy of consideration.

In short all available wild areas, large or small, are likely to have value as norms for land science. Recreation is not their only, or even their principal, utility.

WILDERNESS FOR WILDLIFE

The National Parks do not suffice as a means of perpetuating the larger carnivores; witness the precarious status of the grizzly bear, and the fact that the park system is already wolfless. Neither do they suffice for mountain sheep; most sheep herds are shrinking.

The reasons for this are clear in some cases and obscure in others. The parks are certainly too small for such a far-ranging species as the wolf. Many animal species, for reasons unknown, do not seem to thrive as detached islands of population.

The most feasible way to enlarge the area available for wilderness fauna is for the wilder parts of the National Forests, which usually surround the Parks, to function as parks in respect of threatened species. That they have not so functioned is tragically illustrated in the case of the grizzly bear.

In 1909, when I first saw the West, there were grizzlies in every major mountain mass, but you could travel for months without meeting a conservation officer. Today there is some kind of conservation officer 'behind every bush,' yet as wildlife burcaus grow, our most magnificent mammal retreats steadily toward the Canadian border. Of the 6000 grizzlies officially reported as remaining in areas owned by the United States, 5000 are in Alaska. Only five states have any at all. There seems to be a tacit assumption that if grizzlies survive in Canada and Alaska, that is good enough. It is not good enough for me.

The Alaskan bears are a distinct species. Relegating grizzlies to Alaska is about like relegating happiness to heaven; one may never get there.

Saving the grizzly requires a series of large areas from which roads and livestock are excluded, or in which livestock damage is compensated. Buying out scattered livestock ranches is the only way to create such areas, but despite large authority to buy and exchange lands, the conservation bureaus have accomplished virtually nothing toward this end. The Forest Service has, I am told, established one grizzly range in Montana, but I know of a mountain range in Utah in which the Forest Service actually promoted a sheep industry, despite the fact that it harbored the sole remnant of grizzlies in that state.

Permanent grizzly ranges and permanent wilderness areas are of course two names for one problem. Enthusiasm about either requires a long view of conservation, and a historical perspective. Only those able to see the pageant of evolution can be expected to value its theater, the wilderness, or its outstanding achievement, the grizzly. But if education really educates, there will, in time, be more and more citizens who understand that relics of the old West add meaning and value to the new. Youth yet unborn will pole up the Missouri with Lewis and Clark, or climb the Sierras with James Capen Adams, and each generation in turn will ask: Where is the big white bear? It will be a sorry answer to say he went under while conservationists weren't looking.

DEFENDERS OF WILDERNESS

Wilderness is a resource which can shrink but not grow. Invasions can be arrested or modified in a manner to keep an area usable either for recreation, or for science, or for wildlife, but the creation of new wilderness in the full sense of the word is impossible.

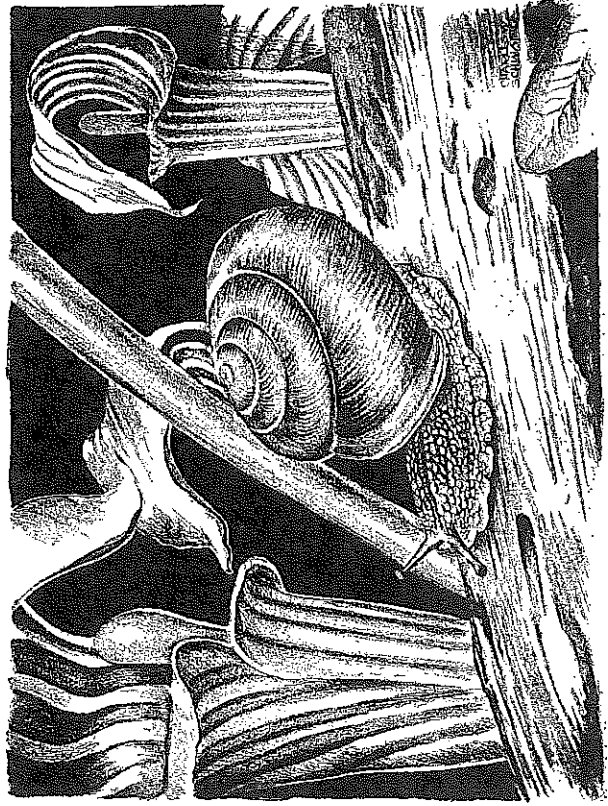
It follows, then, that any wilderness program is a rear-guard action, through which retreats are reduced to a minimum. The Wilderness Society was organized in 1935 'for the one purpose of saving the wilderness remnants in America.'

It does not suffice, however, to have such a society. Unless there be wilderness-minded men scattered through all the conservation bureaus, the society may never learn of new invasions

until the time for action has passed. Furthermore a militant minority of wilderness-minded citizens must be on watch throughout the nation, and available for action in a pinch.

In Europe, where wilderness has now retreated to the Carpathians and Siberia, every thinking conservationist bemoans its loss. Even in Britain, which has less room for land-luxuries than almost any other civilized country, there is a vigorous if belated movement for saving a few small spots of semi-wild land.

Ability to see the cultural value of wilderness boils down, in the last analysis, to a question of intellectual humility. The shallow-minded modern who has lost his rootage in the land assumes that he has already discovered what is important; it is such who prate of empires, political or economic, that will last a thousand years. It is only the scholar who appreciates that all history consists of successive excursions from a single starting-point, to which man returns again and again to organize yet another search for a durable scale of values. It is only the scholar who understands why the raw wilderness gives definition and meaning to the human enterprise.



The Land Ethic

WHEN GOD-LIKE Odysseus returned from the wars in Troy, he hanged all on one rope a dozen slave-girls of his household whom he suspected of misbehavior during his absence.

This hanging involved no question of propriety. The girls were property. The disposal of property was then, as now, a matter of expediency, not of right and wrong.

Concepts of right and wrong were not lacking from Odysseus' Greece: witness the fidelity of his wife through the long years before at last his black-prowed galleys clove the wine-dark seas for home. The ethical structure of that day covered wives, but had not yet been extended to human chattels. During the three thousand years which have since elapsed, ethical criteria have been extended to many fields of conduct, with corresponding shrinkages in those judged by expediency only.

THE ETHICAL SEQUENCE

This extension of ethics, so far studied only by philosophers, is actually a process in ecological evolution. Its sequences may be described in ecological as well as in philosophical terms. An ethic, ecologically, is a limitation on freedom of action in the struggle for existence. An ethic, philosophically, is a differentiation of social from anti-social conduct. These are two definitions of one thing. The thing has its origin in the tendency of interdependent individuals or groups to evolve modes of co-operation. The ecologist calls these symbioses. Politics and economics are advanced symbioses in which the original free-for-all competition has been replaced, in part, by co-operative mechanisms with an ethical content.

The complexity of co-operative mechanisms has increased with population density, and with the efficiency of tools. It was simpler, for example, to define the anti-social uses of sticks and stones in the days of the mastodons than of bullets and billboards in the age of motors.

The first ethics dealt with the relation between individuals; the Mosaic Decalogue is an example. Later accretions dealt with the relation between the individual and society. The Golden