

the gregarious universe, and of which the majority of mankind is still a part.

## The Round River

ONE OF the marvels of early Wisconsin was the Round River, a river that flowed into itself, and thus sped around and around in a never-ending circuit. Paul Bunyan discovered it, and the Bunyan saga tells how he floated many a log down its restless waters.

No one has suspected Paul of speaking in parables, yet in this instance he did. Wisconsin not only *had* a round river, Wisconsin *is* one. The current is the stream of energy which flows out of the soil into plants, thence into animals, thence back into the soil in a never ending circuit of life. 'Dust unto dust' is a desiccated version of the Round River concept.

We of the genus *Homo* ride the logs that float down the Round River, and by a little judicious 'burling' we have learned to guide their direction and speed. This feat entitles us to the specific appellation *sapiens*. The technique of burling is called economics, the remembering of old routes is called history, the selection of new ones is called statesmanship, the conversation about oncoming riffles and rapids is called politics. Some of the crew aspire to burl not only their own logs, but the whole flotilla as

well. This collective bargaining with nature is called national planning.

In our educational system, the biotic continuum is seldom pictured to us as a stream. From our tenderest years we are fed with facts about the soils, floras, and faunas that comprise the channel of Round River (biology), about their origins in time (geology and evolution), about the technique of exploiting them (agriculture and engineering). But the concept of a current with drouths and freshets, backwaters and bars, is left to inference. To learn the hydrology of the biotic stream we must think at right angles to evolution and examine the collective behavior of biotic materials. This calls for a reversal of specialization; instead of learning more and more about less and less, we must learn more and more about the whole biotic landscape.

Ecology is a science that attempts this feat of thinking in a plane perpendicular to Darwin. Ecology is an infant just learning to talk, and, like other infants, is engrossed with its own coinage of big words. Its working days lie in the future. Ecology is destined to become the lore of Round River, a belated attempt to convert our collective knowledge of biotic materials into a collective wisdom of biotic navigation. This, in the last analysis, is conservation.

Conservation is a state of harmony between men and land. By land is meant all of the things on, over, or in the earth. Harmony with land is like harmony with a friend; you cannot cherish his right hand and chop off his left. That is to say, you can-

not love game and hate predators; you cannot conserve the waters and waste the ranges; you cannot build the forest and mine the farm. The land is one organism. Its parts, like our own parts, compete with each other and co-operate with each other. The competitions are as much a part of the inner workings as the co-operations. You can regulate them—cautiously—but not abolish them.

The outstanding scientific discovery of the twentieth century is not television, or radio, but rather the complexity of the land organism. Only those who know the most about it can appreciate how little is known about it. The last word in ignorance is the man who says of an animal or plant: 'What good is it?' If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.

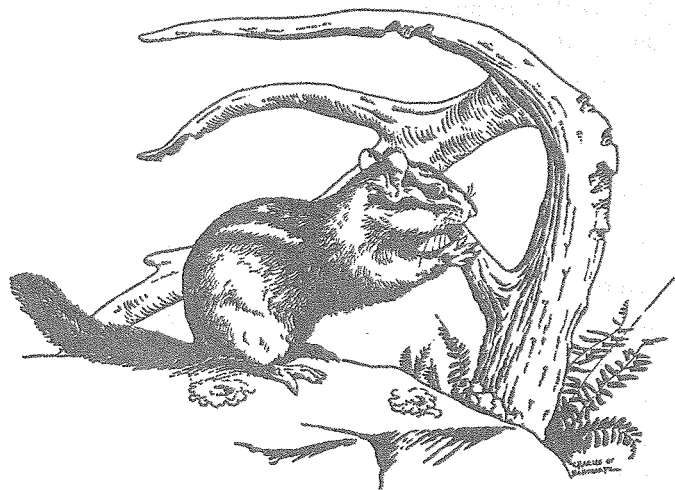
Have we learned this first principle of conservation: to preserve all the parts of the land mechanism? No, because even the scientist does not yet recognize all of them.

In Germany there is a mountain called the Spessart. Its south slope bears the most magnificent oaks in the world. American cabinetmakers, when they want the last word in quality, use Spessart oak. The north slope, which should be the better, bears an

indifferent stand of Scotch pine. Why? Both slopes are part of the same state forest; both have been managed with equally scrupulous care for two centuries. Why the difference?

Kick up the litter under the oak and you will see that the leaves rot almost as fast as they fall. Under the pines, though, the needles pile up as a thick duff; decay is much slower. Why? Because in the Middle Ages the south slope was preserved as a deer forest by a hunting bishop; the north slope was pastured, plowed, and cut by settlers, just as we do with our woodlots in Wisconsin and Iowa today. Only after this period of abuse was the north slope replanted to pines. During this period of abuse something happened to the microscopic flora and fauna of the soil. The number of species was greatly reduced, i.e., the digestive apparatus of the soil lost some of its parts. Two centuries of conservation have not sufficed to restore these losses. It required the modern microscope, and a century of research in soil science, to discover the existence of these 'small cogs and wheels' which determine harmony or disharmony between men and land in the Spessart.

For the biotic community to survive, its internal processes must balance, else its member-species would disappear. That particular communities *do* survive for long periods is well known: Wisconsin, for example, in 1840 had substantially the same soil, fauna, and flora as at the end of the ice age, i.e. 12,000 years ago. We know this because the bones of its animals and the pollens of its plants are preserved in the



peat bogs. The successive strata of peats, with their differing abundance of pollens, even record the weather; thus around 3000 B.C. an abundance of ragweed pollen indicates either a series of drouths, or a great stamping of buffalo, or severe fires on the prairie. These recurring exigencies did not prevent the survival of the 350 kinds of birds, 90 mammals, 150 fishes, 70 reptiles, or the thousands of insects and plants. That all these should survive as an internally balanced community for so many centuries shows an astonishing stability in the original biota. Science cannot explain the mechanisms of stability, but even a layman can see two of its effects: (1) Fertility, when extracted from rocks, circulated through such elaborate food chains that it accumulated as fast as or faster than it washed away. (2) This geological accumulation of soil fertility paralleled the diversifi-

cation of flora and fauna; stability and diversity were apparently interdependent.

American conservation is, I fear, still concerned for the most part with show pieces. We have not yet learned to think in terms of small cogs and wheels. Look at our own back yard: at the prairies of Iowa and southern Wisconsin. What is the most valuable part of the prairie? The fat black soil, the chernozem. Who built the chernozem? The black prairie was built by the prairie plants, a hundred distinctive species of grasses, herbs, and shrubs; by the prairie fungi, insects, and bacteria; by the prairie mammals and birds, all interlocked in one humming community of co-operations and competitions, one biota. This biota, through ten thousand years of living and dying, burning and growing, preying and fleeing, freezing and thawing, built that dark and bloody ground we call prairie.

Our grandfathers did not, could not, know the origin of their prairie empire. They killed off the prairie fauna and they drove the flora to a last refuge on railroad embankments and roadsides. To our engineers this flora is merely weeds and brush; they ply it with grader and mower. Through processes of plant succession predictable by any botanist, the prairie garden becomes a refuge for quack grass. After the garden is gone, the highway department employs landscapers to dot the quack with elms, and with artistic clumps of Scotch pine, Japanese barberry, and Spiraea. Conservation Committees, en route to some important convention, whiz by and applaud this zeal for roadside beauty.

Some day we may need this prairie flora not only to look at but to rebuild the wasting soil of prairie farms. Many species may then be missing. We have our hearts in the right place, but we do not yet recognize the small cogs and wheels.

In our attempts to save the bigger cogs and wheels, we are still pretty naïve. A little repentance just before a species goes over the brink is enough to make us feel virtuous. When the species is gone we have a good cry and repeat the performance.

The recent extermination of the grizzly from most of the western stock-raising states is a case in point. Yes, we still have grizzlies in the Yellowstone. But the species is ridden by imported parasites; the rifles wait on every refuge boundary; new dude ranches and new roads constantly shrink the remaining range; every year sees fewer grizzlies on fewer ranges in fewer states. We console ourselves with the comfortable fallacy that a single museum-piece will do, ignoring the clear dictum of history that a species must be saved *in many places* if it is to be saved at all.

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We need knowledge—public awareness—of the small cogs and wheels, but sometimes I think there is something we need even more. It is the thing that *Forest and Stream*, on its editorial masthead, once called 'a refined taste in natural objects.' Have we made any headway in developing 'a refined taste in natural objects'?

In the northern parts of the lake states we have

a few wolves left. Each state offers a bounty on wolves. In addition, it may invoke the expert services of the U.S. Fish and Wildlife Service in wolf-control. Yet both this agency and the several conservation commissions complain of an increasing number of localities where there are too many deer for the available feed. Foresters complain of periodic damage from too many rabbits. Why, then, continue the public policy of wolf-extermination? We debate such questions in terms of economics and biology. The mammalogists assert the wolf is the natural check on too many deer. The sportsmen reply they will take care of excess deer. Another decade of argument and there will be no wolves to argue about. One conservation inkpot cancels another.

In the lake states we are proud of our forest nurseries, and of the progress we are making in replanting what was once the north woods. But look in these nurseries and you will find no white cedar, no tamarack. Why no cedar? It grows too slowly, the deer eat it, the alders choke it. The prospect of a cedarless north woods does not depress our foresters; cedar has, in effect, been purged on grounds of economic inefficiency. For the same reason beech has been purged from the future forests of the Southeast. To these voluntary expungements of species from our future flora, we must add the involuntary ones arising from the importation of diseases: chestnut, persimmon, white pine. Is it sound economics to regard any plant as a separate entity, to proscribe or encourage it on the grounds of its individual performance? What will be the effect on animal life, on the soil, and on the

health of the forest as an organism? 'A refined taste in natural objects' perceives that the economic issue is a separate consideration.

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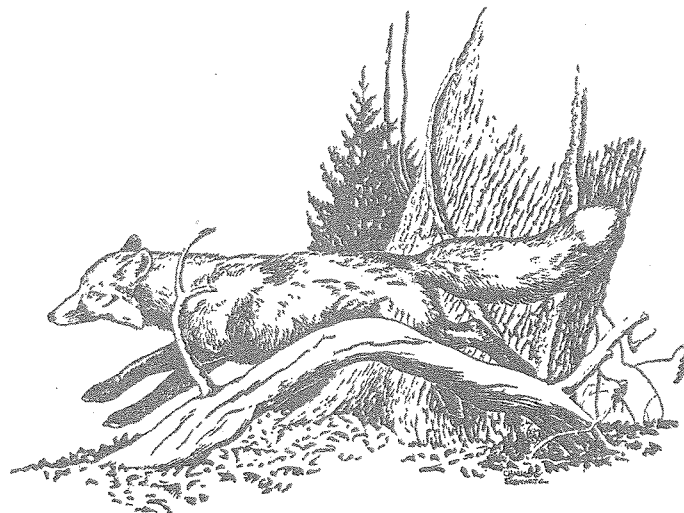
We who are the heirs and assigns of Paul Bunyan have not found out either what we are doing to the river or what the river is doing to us. We burl our logs of state with more energy than skill.

We have radically modified the biotic stream; we had to. Food chains now begin with corn and alfalfa instead of oaks and bluestem, flow through cows, hogs, and poultry instead of into elk, deer, and grouse, thence into farmers, flappers, and freshmen instead of Indians. That the flow is voluminous you can determine by consulting the telephone directory, or the roster of government agencies. The flow in this biotic stream is probably much greater than in the pre-Bunyan eras, but curiously enough science has never measured this.

Tame animals and plants have no tenacity as links in the new food chain; they are maintained, artificially, by the labor of farmers, aided by tractors, and abetted by a new kind of animal: the Professor of Agriculture. Paul Bunyan's burling was self-taught; now we have a 'prof' standing on the bank giving free instruction.

Each substitution of a tame plant or animal for a wild one, or an artificial waterway for a natural one, is accompanied by a readjustment in the circulating system of the land. We do not understand or foresee these readjustments; we are unconscious of them unless the end effect is bad. Whether it be the President

rebuilding Florida for a ship canal, or Farmer Jones rebuilding a Wisconsin meadow for cow pasture, we are too busy with new tinkerings to think of end effects. That so many tinkerings are painless attests the youth and elasticity of the land organism.



One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen. An ecologist must either harden his shell and make believe that the consequences of science are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise.

The government tells us we need flood control and comes to straighten the creek in our pasture. The engineer on the job tells us the creek is now

able to carry off more flood water, but in the process we have lost our old willows where the owl hooted on a winter night and under which the cows switched flies in the noon shade. We lost the little marshy spot where our fringed gentians bloomed.

Hydrologists have demonstrated that the meanderings of a creek are a necessary part of the hydrologic functioning. The flood plain belongs to the river. The ecologist sees clearly that for similar reasons we can get along with less channel improvement on Round River.

Now to appraise the new order in terms of the two criteria: (1) Does it maintain fertility? (2) Does it maintain a diverse fauna and flora? Soils in the first stages of exploitation display a burst of plant and animal life. The abundant crops that evoked thanksgiving in the pioneers are well known, but there was also a burst of wild plants and animals. A score of imported food-bearing weeds had been added to the native flora, the soil was still rich, and landscape had been diversified by patches of plowland and pasture. The abundance of wildlife reported by the pioneers was in part the response to this diversity.

Such high metabolism is characteristic of new-found lands. It may represent normal circulation, or it may represent the combustion of stored fertility, i.e. biotic fever. One cannot distinguish the fever from normality by asking the biota to bite a thermometer. It can only be told *ex post facto* by the effect on the soil. What was the effect? The answer is written in gullies on a thousand fields. Crop yields per acre have remained about stationary. The vast technological improvements in farming have only off-

set the wastage in soil. In some regions, such as the dust bowl, the biotic stream has already shrunk below the point of navigability, and Paul's heirs have moved to California to ferment the grapes of wrath.

As for diversity, what remains of our native fauna and flora remains only because agriculture has not got around to destroying it. The present ideal of agriculture is clean farming; clean farming means a food chain aimed solely at economic profit and purged of all non-conforming links, a sort of *Pax Germanica* of the agricultural world. Diversity, on the other hand, means a food chain aimed to harmonize the wild and the tame in the joint interest of stability, productivity, and beauty.



Clean farming, to be sure, aspires to rebuild the soil, but it employs to this end only imported plants, animals, and fertilizers. It sees no need for the native flora and fauna that built the soil in the first place. Can stability be synthesized out of imported plants

and animals? Is fertility that comes in sacks sufficient? These are the questions at issue.

No living man really knows. Testifying for the workability of clean farming is northeastern Europe, where a degree of biotic stability has been retained (except in humans) despite the wholesale artificialization of the landscape.

Testifying for its non-workability are all the other lands where it has ever been tried, including our own, and the tacit evidence of evolution, in which diversity and stability are so closely intertwined as to seem two names for one fact.

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I had a bird dog named Gus. When Gus couldn't find pheasants he worked up an enthusiasm for Sora rails and meadowlarks. This whipped-up zeal for unsatisfactory substitutes masked his failure to find the real thing. It assuaged his inner frustration.

We conservationists are like that. We set out a generation ago to convince the American landowner to control fire, to grow forests, to manage wildlife. He did not respond very well. We have virtually no forestry, and mighty little range management, game management, wildflower management, pollution control, or erosion control being practiced voluntarily by private landowners. In many instances the abuse of private land is worse than it was before we started. If you don't believe that, watch the strawstacks burn on the Canadian prairies; watch the fertile mud flowing down the Rio Grande; watch the gullies climb the hillsides in the Palouse, in the Ozarks,

in the riverbreaks of southern Iowa and western Wisconsin.

To assuage our inner frustration over this failure, we have found us a meadowlark. I don't know which dog first caught the scent; I do know that every dog on the field whipped into an enthusiastic backing-point. I did myself. The meadowlark was the idea that if the private landowner won't practice conservation, let's build a bureau to do it for him.

Like the meadowlark, this substitute has its good points. It smells like success. It is satisfactory on poor land which bureaus can buy. The trouble is that it contains no device for preventing good private land from becoming poor public land. There is danger in the assuagement of honest frustration; it helps us forget we have not yet found a pheasant.

I'm afraid the meadowlark is not going to remind us. He is flattered by his sudden importance.

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Considering the prodigious achievements of the profit motive in wrecking land, one hesitates to reject it as a vehicle for restoring land. I incline to believe we have overestimated the scope of the profit motive. Is it profitable for the individual to build a beautiful home? To give his children a higher education? No, it is seldom profitable, yet we do both. These are, in fact, ethical and aesthetic premises which underlie the economic system. Once accepted, economic forces tend to align the smaller details of social organization into harmony with them.

No such ethical and aesthetic premise yet exists for the condition of the land these children must live in.

Our children are our signature to the roster of history; our land is merely the place our money was made. There is as yet no social stigma in the possession of a gullied farm, a wrecked forest, or a polluted stream, provided the dividends suffice to send the youngsters to college. Whatever ails the land, the government will fix it.

I think we have here the root of the problem. What conservation education must build is an ethical underpinning for land economics and a universal curiosity to understand the land mechanism. Conservation may then follow.

## Natural History

ONE SATURDAY night not long ago, two middle-aged farmers set the alarm clock for a dark hour of what proved to be a snowy, blowy Sunday. Milking over, they jumped into a pickup and sped for the sand counties of central Wisconsin, a region productive of tax deeds, tamaracks, and wild hay. In the evening they returned with a truck full of young tamarack trees and a heart full of high adventure. The last tree was planted in the home marsh by lantern-light. There was still the milking.

In Wisconsin 'man bites dog' is stale news compared with 'farmer plants tamarack.' Our farmers have been grubbing, burning, draining, and chopping

tamarack since 1840. In the region where these farmers live the tree is exterminated. Why then should they want to replace it? Because after twenty years they hope to reintroduce spagnum moss under the grove, and then lady's-slippers, pitcher plants, and the other nearly extinct wildflowers of the aboriginal Wisconsin bogs.

No extension bureau had offered these farmers any prize for this utterly quixotic undertaking. Certainly no hope of gain motivated it. How then can one interpret its meaning? I call it Revolt—revolt against the tedium of the merely economic attitude toward land. We assume that because we had to subjugate the land to live on it, the best farm is therefore the one most completely tamed. These two farmers have learned from experience that the wholly tamed farm offers not only a slender livelihood but a constricted life. They have caught the idea that there is pleasure to be had in raising wild crops as well as tame ones. They propose to devote a little spot of marsh to growing native wildflowers. Perhaps they wish for their land what we all wish for our children—not only a chance to make a living but also a chance to express and develop a rich and varied assortment of inherent capabilities, both wild and tame. What better expresses land than the plants that originally grew on it?

I talk here about the pleasure to be had in wild things, about natural-history studies as a combination sport and science.

History has not conspired to make my task an easy one. We naturalists have much to live down. There was a time when ladies and gentlemen wandered