A Paul Shepard Reader

THE ONLY WORLD WE'VE GOT

edited by Paul Shepard

EIGHT

Ten Thousand Years of Crisis

THE DAWN OF CIVILIZATION, associated with the first agriculture, is generally seen as a great sunrise before which men lived in a mental and social twilight, waiting, straining to become fully human. We see those vague predecessors as incomplete, with a few crude tools, living days of fear and monotony, nights of terror and discomfort, with a short, brutish existence as the only reward for the struggle to survive.

Today's myth of progress and gospel of radical change, orientation to tomorrow and frantic exchange of old things for new are modern only in terms of the whole human span that preceded them. Though we may picture ourselves as very unlike old-world peasants, it is in the agrarian mind that modern life begins.

Nobody knows for certain how or why agriculture began. How man began the earliest tending of plants and animals may remain a secret forever, but the epidemic of acquisitive proprietorship and territorial aggrandizement that resulted from this development is apparent. It was neither a worldwide event nor a single event, but a shifting mixture of hunting, fishing, and planting, at first in a rather limited geographical area from Turkey to the Caspian basin and south to the Red Sea and Palestine and later expansions from centers in equatorial Asia and America.

Despite many specific domestications and forms of early agriculture in other parts of the world, particularly Southeast Asia and Central America, the set of techniques and of mind seems first to have taken form at the eastern end of the Mediterranean Sea and to have

spread from there by cultural contact. In time, Asia and America became "centers of domestication" as agriculture spread around the globe.

The climate, species of plants and animals, types of available food, and the man-made combinations of tools and ideas had been changing for a million years. Men had expanded their range, shifted with the slow tides of glacial ice, learned the ways of other living creatures, and achieved a rich humanity long before metals, pots, wheels, kings, and theocracies appeared.

Because of the limited archaeological evidence, it was still thought until recently that domestication appeared abruptly, as an inexplicable breakthrough that transformed human life about ten thousand years ago. Now it is clear that its sudden appearance in archaeological diggings was a local accident. Between outright gathering and full food production there were stages of food collecting and incipient domestication, lifeways mixing hunting and gathering in different proportions, and finally the culling or artificial hunting of animals and collecting from an extended garden plants that were more or less constantly protected and probably genetically altered by men.

The story of some caveman genius bringing home a baby wild sheep to raise or capturing a cub-wolf from its den, or realizing in some bold flash of intuition how to grow tomatoes, thus inventing in one mighty stroke a new way of life that was thereafter imitated by the genius's friends and descendants, is nonsense; it is part of the same civilized myth that would have us believe that in some miraculous way the farmer discovered agriculture and thus raised himself above his predecessors.

A sequence of events east of the Mediterranean some twenty thousand years ago may have led by uncertain steps toward agriculture. Whether these stresses and deformations of human society were the consequence of the climate and the glaciers of the last ice age has been argued inconclusively for half a century. The great wetness of

the time has suggested to some that men who had previously chased big game were impeded by the waterways and swamps, that hunting faltered as large mammals became locally extinct, that fishing may have seduced men into a sedentary life, which made for a different kind of attention to the plants and earth around them. It has been suggested that after the wet came the dry; that the principal wild herd animals remaining were aurochs (the wild cattle) and the ancestors of domestic goats and sheep; and that grasses flourished on the slopes so abundantly that their seeds became an increasingly available food for people. If the use of cereals was the crux of man's prehistory, then it was inseparable from the use of fire for cooking, making them edible in large amounts.

During this stage of deteriorating cynegetics (that is, hunting and its culture) local tribes apparently tried a great variety of foods that earlier had been rejected by the reindeer hunters who preceded them. Archaeological records have shown signs of crisis during the four thousand years preceding the first farming communities. It was a time of intense food experimentation in which acorns, nuts, seeds, snails, clams, fish, and other aquatic animals were gathered. The mastery of stone tool-making faded, but there were new utensils of wood, leather, and bone, evidence of swimming and the use of boats, flint sickles, the pestle and mortar, and the bow and arrow. These innovations by seed-gleaners, shore-scavengers, and sheep-followers in the Tigris-Euphrates watershed and on the slopes of the Zagros and Palestinian mountains preceded the earliest concrete signs of domestication—the bones of livestock and seed types found only in association with man.

This was a time of trial and difficulty for the societies and cultures that had created an art and a religion that had endured for twenty thousand years over much of Europe and Asia, yet it favored experiment and goaded men into versatility. By the time the climate warmed around the Mediterranean, some twelve thousand years ago,

sedentary, seed-conscious people were munching local mutton in villages. For them the bison, the woolly mammoth and the rhino, the wild horse, cave bear, and reindeer had all but passed from memory.

The lands they occupied may have looked very different from the more northerly tundras and steppes or the more southerly savannas where hunters still flourished. The rolling, open, upland terrain was flecked with patches of woodland and streams separated by grassy swards. Roaming herds of sheep and goats gradually became habituated to people, tolerating human presence even within the "flight-distance" at which wild animals normally flee. They were an increasingly easy kill for men whose durability, strength, and cunning had been honed through generations by their hunting forebears. But compared to their ancestors' grand chases and spearing of wild horses, plugging goats with arrows must have been a profound though perhaps unconscious disappointment.

The virtual collapse of hunting and gathering, the central activity of the ancient culture, would surely have affected the very heart of human existence. The great mystery of domestication is therefore not so much how men achieved control of plants and animals, but how human consciousness was reorganized when the cynegetic life was shattered—that is, the mental, social, and ecological complex based on hunting. All major human characteristics—size, metabolism, sexual and reproductive behavior, intuition, intelligence—had come into existence and were oriented to the hunting life. How, for example, did the male prerogative shift from the chase to the harvest of plants? Even though men at all times have continued to hunt with great élan and pride, just as women have continued to gather and to be the center of the household, it is astonishing that such a shift in vocation took place.

In the course of a few thousand years men assumed control over the harvest, however much it was ritualized in female symbols. Throughout history agriculture has been represented in feminine

terms and images. Even so, men generally dominate the political order in such societies—as among biblical peoples. Perhaps this is because, from the earliest times of farming, a major purpose of man's pastures and fields was the production of meat from grazing animals, and the harvest of meat was the ancient domain of the male as a hunter. Or did control of surplus grain in some way acquire the prestige and potential power traditionally associated with the hunt and the hunter's honor in distributing the parts of the kill?

Driving the bezoar goat and urial sheep, however it may have been compensated in social status, must have seemed, as the animals became more and more tame, less worthy of a man's life. Cut off from hunting reindeer, horse, and elephant, men lost both the models and the means by which personal prestige was achieved and measured within the group by peaceful means. They found a substitute in the biggest and most dangerous potential prey remaining—men themselves.

The collapse of an ecology that kept men scarce and attuned to the mystery and diversity of all life led as though by some devilish Fall to the hunting and herding of man by man. To defend his fields a farmer needed many kinsmen: sons, and codefenders, and cofighters, and ultimately brother ideologists.

What must surely have preceded farming was a shift in style and in man's sense of his place in the world; a shift whereby man would presume to own the world and wild organisms would be screened for those having a certain infantile, trusting placidity that could be nurtured and increased in captivity. Long before some degenerate auroch or wild cow was hitched to a set of stone wheels in Egypt, the density of the planet was altered. A group of deprived hunters, caught in a geographic and biological crisis, took up crayfish stomping and seed gleaning—activities that had not occupied the full attention of their ancestors for millions of years, since the earliest genus of man, *Ra-*

mapithecus, ambled about pond and prairie edges and the father of modern men, *Australopithecus,* scavenged, sought small game, and snatched crustaceans in the shallows of ancient African lakes.

HUSBANDRY, A FAILURE OF BIOLOGICAL STYLE

It is hard to speak of domestic animals as failures because we are so fond of them. To us they are fellow beings, whereas we regard wild creatures as curiosities or shadows whose wills oppose our own. To denounce farming and rural life, so relatively serene at a time of urban crisis, seems to flout the last landscape of solace and respite. But in my view the urban crisis is a direct consequence of the food-producing revolution. In a sense, although farmers domesticated particular varieties of plants and animals, the farm domesticated the habitat. For whom was food mass-produced and food surpluses stored if not for the town?

"Domestication" means much more than the dictionary definition, "to become a member of the household." Individual wild creatures brought into the house, no matter how much they are loved or how long they are kept, do not become domesticated. If they live they may not thrive as well as in the wild; if they thrive they still may not reproduce or generate a lineage; and if they breed, the offspring may still prefer to go free if they can escape. There is an inborn difference between domesticates and all other animals.

"To domesticate" means to change genetically, to alter a group of organisms so that their behavior and appearance are quite different from their wild relatives, and these changes are transmitted to their offspring. By selecting parents, culling undesirables, inbreeding and crossbreeding, man uses the same processes that operate in nature.

Each gene in an individual organism acts in the context of many other genes. Hence the genetic changes resulting from domestication may affect the whole creature, its appearance, behavior, and physi-

ology. The temperament and personality of domestic animals are not only more placid than their wild counterparts, but also more flaccid—that is, there is somehow less definition. Of course there is nothing placid about an angry bull or a mean watchdog, but their mothers were tractable, and once an organism has been stripped of its wildness it can be freaked in any direction the breeder wishes. It may be made fierce without being truly wild. The latter implies an ecological niche from which the domesticated animal has been removed. Niches are hard taskmasters. Escape from them is not freedom but loss of direction. Man substitutes controlled breeding for natural selection; animals are selected for special traits like milk production or passivity, at the expense of overall fitness and naturewide relationships.

All populations are composed of individuals who differ from one another. Among wild animals, the diversity is constantly pared at its fringes. Reproductive success and survival are best for individuals of a certain type. In this way, natural selection is a stabilizing pressure, shaping populations into distinctly different and recognizable species. This pressure does not exclude genetic variation. Indeed, the appearance and behavior of a wild species holds true to type in spite of genetic variation. Apparent uniformity masks genetic difference. When natural selection is removed, much of that hidden variation emerges and the population is flooded with external diversity.

Our subjective experience of this is in terms of individuality, and the concept of individuality in our society carries such a strong emotional force as well as political overtones that individualizing as a by-product of domestication may not easily be seen as undesirable. Though domestication broadens the diversity of forms—that is, it increases visible polymorphism—it undermines the crisp demarcations that separate wild species and it cripples our recognition of the species as a group. Knowing only domestic animals dulls our understanding of the way in which unity and discontinuity occur as

patterns in nature and substitutes an attention to individuals and breeds. The wide variety of size, color, form, and use of domestic horses, for example, blurs the distinctions among different species of *Equus* that once were constant and meaningful.

It is important to know, when any two organisms are compared, how they are related. However trivial that distinction may seem at first, its triviality simply signifies the poverty of biology in modern philosophy. With domestication, arbitrary reestablishment of inconsequential groupings and relationships damaged the perceptual powers of mankind. If evolutionary human ecology had only one lesson it would be that the development of human intelligence is linked to man's conscious exploration of the species system in nature. But this lost-sensibility aspect carries us away from the biological consequences of domestication.

The glandular and anatomical alterations of animal domestication are fairly well known. Consider the white rat, whose history has been comparatively well documented since it was created from the wild brown rat in the middle of the nineteenth century. In breeding for ease of keeping and uniformity, a variety of related and inadvertent changes have occurred. The tamer, more tractable, less aggressive, more fecund white rat, with its early gonadal development, less active thyroid, and smaller adrenals, is cursed with greater susceptibility to stress, fatigue, disease, and has less intelligence than its wild relative. Many of the deleterious changes have been unavoidable side effects, because of the interplay of gene action or because genes favored by the breeder are closely linked to undesirable genes on the chromosomes.

The strong, firm style of the wild animal is due to a mix of genes that work well together—in other words, it has a stable epigenetic system. The similarity of individuals is shielded by this system against disruption by mutation. In addition, certain chromosomal aberrations may serve to keep blocks of genes together in the wild

form; that is, they tend to reduce mixing or recombination in later generations. In domestication the breeder breaks up these blocks, allowing new combinations to appear in the offspring, which would render most of them unfit in nature. Some of these will be especially desirable to him, others simply monsters. Once a cluster is broken up by man-controlled breeding, producing genetic "goofies" that are protected from the rigors of the wild, new sets of captivity types can then be winnowed from them on the farm or in the laboratory. Even in zoos, where the majority of wild animals soon die, the captives that survive are those that, because of their genetic difference, are least exacting about territory, least subtle about social signals and cues, least precise in behavioral discrimination, the loss of mates and companions, and fear about human ubiquity. All domestic animals are highly social, but their social relations are degraded and generalized, just as their physiology is radically altered. They have been bred for readiness to accept human control. "Releasers"—those signals from others of their kind that trigger complex behavior sequences—are lost, along with genetically regulated responses. For them the world grows simpler.

Ritual behavior becomes abbreviated. Symbolic fighting to settle conflicts peacefully is less frequent among domestics than among wild species. Mating patterns lose their elaborate timing as segments are lost. Hormonal changes, such as a decrease in adrenocortical steroids, lead to submissiveness. The reproductive systems of the kept animals lose their fine tuning to the season and to display postures, which in nature are a tightly woven sequence of steps from courtship through parental behavior. Differences between male and female—the secondary sexual characteristics—are diluted. The animals become crude pawns in the farmer's breeding game, shorn of finesse and the exquisite detail so characteristic of wild forms. The animal ceases to be an adequate representation of a natural life form. Its debased behavior and appearance mislead us and miseducate us in fundamental perceptions of the rhythms of continuity and discontinuity and of the specific patterns of the multiplicity of nature.

Interpretations of this debauched ecology were formulated for civilization by its "educated" members. Effete dabblers from the city looked over the barnyard fence at the broken creatures wallowing and copulating in their own dung, and the concept of the bestial brute with untrammeled appetites was born. This was the model for "the animal" in philosophy, "the natural" from which men, understandably, yearned for transcendent release.

Among animals, suitable candidates for domestication are social, herd-oriented, leader- or dominance-recognizing forms. Their response to their own species (possible sex partners) and their own habitat is more a matter of learning and less of fixed responses to fixed signals. Husbandry seeks out and exploits three characteristics of these animals: the tendency of the young to follow whoever is caring for it by imprinting—the process of irreversible attachment; the gradualness of the transition from nursing to eating; and the way in which different social relations may be mediated by different senses. For example, mother-daughter nurture relationships may be based on an imprinted taste. A Scottish milkmaid lets the cow lick her bloodied hands (as well as the calf) at birth, and thereafter the cow will "let down"—give milk—for the milkmaid and the calf, but only for them.

Inborn metabolic errors condemn wild animals to swift destruction. In captivity such cripples are sometimes not only protected but prized. These flaws ("hypertrophies") in growth result in the production of extra meat, wool, silk, eggs, and milk. All such freaks carry a burden of genetic weakness. The nurture of these weaklings is a large part of modern animal science, which may be defined as the systematic creation of animal deformities, anomalies, and monsters, and the practice of keeping them alive.

Another mutant trait common to domestics is excessively delayed

maturity and sexual precocity combined with rapid growth. In culling out the irascible and stubborn individuals, the hard, mature, lean line is sacrificed for animals with submissive and infantile responses. Individuals maturing at slower rates are favored. Cows and horses have long-enduring mother-child relationships just as primates do. By exploiting this relationship, new social interdependencies can be created. Infantile animals are less attached to their own kind and readily join other barnyard animals or the human household. Children are eager to adopt them as "people," and adult humans are attracted by their helpless appeal and immature faces—for juvenile qualities are as apparent in face and body as in behavior. The effect of all this is that domestic breeds are creatures who never grow up in spite of their sexual precocity.

The protected environment of domestic animals cushions them from the sculpturing forces of nature and cuts them off from many physical resources. Only when their place-preferences are removed by breeding is this loss tolerable for them. Instead of being more flexible than his wild ancestor, the domestic is specialized to accept human judgment concerning habitation and food. The capacity for living with deficiency is not a true liberation of behavior but the weakening of the choice-making faculty. Wild cattle range widely over diverse types of soils and vegetation in search of plants for which they have a special need at certain times or for trace elements and other minerals that they lick directly from the earth. They seek mud or sand, shade or bright sun, humidities and winds—the conditions that are right for them. Their deliberate instinctive exposure to rain and snow is precisely regulated to their requirements. Many have special relationships with birds, who feed near or on them, and with other animal and plant parasites, internal and external, beneficial to their health. Each step in their life cycle is carried out in the right surroundings, which may be different for feeding, giving birth, courting, resting, hiding, playing, or socializing. In zoos, mental and

physical breakdowns are common because the animals lack the extensive range of choices necessary to a healthy physical or social existence. Some species simply cannot be kept alive, necessitating a constant flow of "living material" to replace the dead or dying.

Domestic animals, who also live in restricted environments, are not stir-crazy and malnourished because they are the survivors of hundreds of generations of captives. They are the well-padded drudges, insulated by blunted minds and coarsened bodies against the uniformity of the barnyard, having achieved independence from the demands of style by having no style, coming to terms with the gray world of captivity by arriving at the lowest common denominator of survival.

If this seems to slander some favorite dog or horse or pig, remember that artificial selection of juvenile qualities also favors immaturity, flexibility, and adaptability. The qualities that are admired—responsiveness to men in dogs and trainability in horses—are achieved through breeding at the expense of the traits of maturity. No one can judge the pathos of the domestic animal who has not watched its wild cousin in its natural habitat over a period of months. As long as civilized mythology ranks wild animals as poor relations to barnyard forms it will be almost impossible for most people to make unbiased comparisons.

Occasionally man himself is included in lists of domestic animals. But man is civilized, not domesticated. Domestication is the process by which the genetic make-up of organisms is modified by man to make breed lines and by which civilized man regulates the genetic inheritance of organisms that constitute part of his own habitat. These lines are disengaged from the niche of the wild stock, stripped of biological integrity, simplified in behavior and requirements.

Among domestic animals social relationships are reduced to the crudest essentials. Pre-reproductive parts of the life cycle are minimized, courtship is reduced, and the animal's capacity to recognize

its own species is impaired. Since these changes have not taken place in man, man is not properly a domestic animal, although civilization has disrupted his epigenetic stability and loosed a horde of "goofies."

THE INVENTION OF DRUDGERY AND CATASTROPHE

The first cultivation was south and west of the Caspian Sea on uplands covered at that time with sparse woods and grass, much of it steppe and oak-pistachio savanna. The climate was warm, though glacial ice still occupied high mountain valleys. The soil on these open-forest flanks of the Zagros, Lebanese, and Palestinian mountains was light and could be worked easily. The routine was no worse than the gathering of wild grain and the digging of wild roots.

The eminent American geographer Carl Sauer has suggested that casual planting in the form of seed-waste disposal may have preceded cultivation. However, there is no evidence of early vegetable growing, and grain-producing grasses require at least a modicum of soil-breaking. By 9000 B.C. there were at least two groups of early Near East farmers, the Natufian and the Karim Shahirian. These people lived in caves and small clusters of mud huts and had domestic sheep, goats, and two grains. In archaeological digs a preponderance of immature animal bones have been found, along with flint sickle blades, grinding stones, and celts (stone axes). Living in the same region were other men subsisting entirely by hunting and gathering, some in the open, others in caves or huts. "Pure hunters" continued to persist for another two thousand years in the Near East, though as the climate grew steadily warmer, game animals like the red deer diminished. As cool habitats migrated up the mountain slopes, human population increased. When hunters finally gave way entirely to farmers in that area about 7000 B.C., the towns of Jericho in the Jordan Valley and Jarmo in the Zagros Mountains each contained as many as a hundred and twenty-five people living in houses. Subsistence farming was under way.

During this time the early techniques of agriculture were spreading from the Near East, evoking other domestications in Asia and America, which then returned new varieties of crop plants and breeds of farm animals to the Near East.

Production of storable cereals that could feed large numbers of nonfarmers marked the transition from subsistence farming to institutional agriculture. By 5000 B.C. there were farmers in alluvial valleys of the Tigris and Euphrates who were using slaves to cope with the weeds and heavy soils and to cultivate vast fields planted to a single crop of hybrid grain. Agricultural surpluses and new distribution and storage systems made craft and class specializations possible and necessary.

Pigs, pottery, and weaving were developed, and the first temples signified the rise of cosmologies based on a model of the universe as a barnyard, of hierarchical theocracies, political states, tyranny, war, and work. The coincidence of the first domestic cattle with the temples and signs of sacred bulls indicates that cows were first kept for religious rather than economic reasons.

A thousand years later there were towns of ten thousand people; farmers had occupied the floodplains of the Nile and Danube; and nomads with herds of cattle were munching their way across the Sahara, Persia, Arabia, Morocco, Ethiopia—expanding the traditions, arrogance, and destructiveness of pastoral nomadism. In Europe, in time, the use of tree-cutting axes combined with the teeth and hooves of livestock to destroy the great forests that had closed in on ground vacated by glacial ice. Mankind stood at the gate of the modern world.

There are many kinds of farmers and herders in the world, but they differ mainly in the mixture of certain common qualities, and the qualities derive from the basic nature of tilling and tending. The early agriculturists varied widely among different peoples in the mix of hunting, gathering, and planting. The qualities derived from

planting are most clearly seen in the later peasant farmers of the civilized or historical agricultural state. They adhere to the native soil, revere their ancestors, are sober-minded, and have strong codes of conduct. They are simple, industrious, tenacious, and predictable. But simplicity can mean dull wits, and industry can be a kind word for toil, the price and token of security, respect, and piety. The other virtues are euphemisms for the simplified, repetitive life of people whose bulldog grip on their humanity is misinterpreted as contentment and wise serenity.

The peasant has wedded domesticity to agriculture. His household is like field work: banal and monotonous. Like the mating of ram and ewe, the partnership of marriage is usually arranged—at most a choice of convenience. Procreation is the household extension of production, the means of ensuring children as field hands. Prudence and practicality rule family relationships. An economy of normal abundance, combined with the fear of scarcity and famine years, creates the authoritarian family based on dogged partnerships, dominance, and submission. Children grow up holding a grudge against their elders. Where the father is a tyrant, meals are eaten in silence. The desperate, unhuman plight of the serf in an agricultural society forces him to repress his family frustrations in order to survive, to convert them into a bitter conformity, and to redirect hatred outward—toward competitors, aliens, and wild nature. Fierce unity and loyalty become the core of class struggle and ideological exploitation, expressing the fellowship of slaves.

Peasants face the outside world with coarse sullenness, emotions concealed or deadened except for scorn for the soft-hearted. Decorum and sobriety substitute for manners and gaiety. Resentment and suspicion run deep. A stoic numbness and lack of imagination are inseparable from religious faith. Ask the peasant what he enjoys and you get no answer. Depth interviews reveal an intense dislike of his situation and a strong desire to leave the bleak rural environment. It

is likely that many of us see some of these traits in our urban contemporaries and in ourselves, far from the pigsty and plow. The peasant is in us all and his warp and values are part of modern culture.

With his anthropomorphic view of the world, as expressed in the invention of humanist gods—matriarchy and patriarchy forever contending—the peasant and villager see all misfortune as caused by someone, to be countered by magic or vengeance.

Men obtain images of themselves from the natural world. Planters and tillers see themselves as domestic animals in a cosmic garden. Reserving part of the harvest for the gods is part of the custom of renewal ceremonies. Hence sacrifice came into existence; the murder of the first-born is a logical myth of men as numerous as weeds. Herders see themselves as sheep who follow "a great shepherd." Living amidst collapsing ecosystems, agrarians accept a religion of arbitrary gods, catastrophic punishments by flood, pestilence, famine, and drought in an apocalyptic theology.

It is common in sociological studies to distinguish between the planters or tribal herdsmen of the earliest agriculture and later peasants and farmers. The first do not live in such a highly structured and complex society of rulers and workers as do, say, the traditional peasants of Central Europe. However useful these distinctions are for social comparisons, they are ecologically inconsequential. All agrarian societies share hatred of predatory wild animals, show blunted body or blunted sensitivity, lack of interest in noneconomic plants and animals, and the willingness to drudge, with its deep, latent resentments, crude mixtures of rectitude and heaviness, and absence of humor.

■

In official history 3000 B.C. marks the beginning of civilization, corresponding to the rise of equatorial valley irrigation monocultures, the urban-rural complex of specialized, single-crop farms and

ruling bureaucracies of the great river valleys. In the archaeological residue of the Mesopotamian states there is evidence of ox-drawn carts, trade, writing, slaves, wars, and theocratic kingships. During this same period there was debilitation of the total natural complex, pillaged ecosystems that never recovered. The signs of this were the local extinction of large wild mammals, deserts replacing forests, the degradation of grasslands and disappearance of soil, the instability of streams and drying up of springs, and the depletion of land fertility—all of which affected water supply, climate, and economy. The creeping dereliction was largely invisible then, as it seems extraneous now. Individuals were born into harsh, stony surroundings where floods and drought seemed to be eternal, a world given to rather than made by man.

The connection between the rise and fall of great alluvial valley civilizations was clearly traced by Dr. W. C. Lowdermilk, an American soils expert.[1] First Lowdermilk noticed that the bottomlands along the great rivers are still fertile, though they now support only one-fifth as many people as they did three thousand years ago. The debacle that overtook Babylon, Kish, Ezion Geber, Timgad, Petra, Carthage, and other cities of the Near East and North Africa was not simply exhaustion of the land. Two kinds of clues helped Lowdermilk to puzzle out the role of ancient hydraulic agriculture in the ruin of these now-buried cities. One was the silted-in waterways, buried irrigation channels, and hydraulic works. Even the cities themselves were buried, as any spade-wielding archaeologist will testify. Jerash, once a city of 250,000, now lies under thirteen feet of earth, on which exists a village of 3000.

The other was the barren rocky slopes beyond the city walls, so characteristic of the Mediterranean world from Portugal to Palestine, of most of the Near East and North Africa, and much of India, China, and Mexico. The evidence is incontrovertible that the land was once covered with soil, grasses, and woody plants. In the Judean

hills and on the slopes of Shansi province, Lowdermilk found ancient upland temples whose walls kept out livestock and whose sacredness repulsed the woodcutter. Within the walls forest groves survived on good soils, oases in thousands of square miles of man-made desert. On Cyprus, where lowland temple walls held off mudflows, the plain is now eight feet above the churchyard. The church has a new floor laid over a silt flow thirteen feet deep. Twenty-three feet of silt had therefore come down from the slopes since the church was built, the result of clearing, burning, and grazing.

The barren slopes and buried cities were only part of the story. Intensive land use was not primarily the cause of urban collapse. Lowdermilk reasoned that a great burst of population had followed the mastery of irrigation agriculture, which incorporated the use of the plow and the strategy of crop rotation. Faster than famine and wars could cut them down, the human hordes increased. Density in the city and floodplain sent surplus people farther upstream, up the tributaries, and up the slopes of the watershed itself. Clearing and cultivating the lower slopes drove the shepherds and their four-legged locusts higher. Timber for ship and other construction was logged from the highlands—which were occupied in turn by charcoal-makers, subsistence farmers, and stockkeepers. The silt that began to crawl down the slopes became a perpetual revenge, so that the vast terrace systems and valley flumes required constant maintenance, not only by farmers but by armies of laborers—mostly slaves. The city that preceded the present Beirut was an example of this sequence: expansion of the population of Phoenician Semites through hydraulic monocultures; increased manufacture and trade; the export of migrants; the clearing and cultivation of an upstream watershed once covered for two thousand square miles by the cedar of Lebanon tree; followed by an unremiting struggle to secure the waterworks against siltation. When some social upheaval interfered with the routines of control, the state fell.

As increasing populations and demands on the land led to further subdivision and fragmentation, either the farmer relapsed into a bare subsistence economy or agriculture was reorganized on a feudal basis. In the latter case some formerly "free" men became serfs and slaves. In time a growing landless, underemployed proletariat came to be a menace to the ruling classes and was placated by the state with bread and circuses.

Rome is a later example of a process that began when the ancient theocratic state reached the limits of production and, in the desert, of water. The growing population could do one of three things: starve, emigrate to the hinterland and farm the slopes, or enter urban roles of begging, brigandage, or military service. This last required increased taxation and regimentation, to implement as well as to resist it, which generated revolt or evoked invasion from without, eventually followed by bureaucratic collapse—and the flumes, ditches, pipelines, conduits, terraces, reservoirs, and dikes disappeared under an avalanche of mud. War, invasion, insurrection, epidemic, and famine could each break the temporary balance maintained by infinite drudgery against the consequences of the agrarian revolution.

The destructive combination of hydraulic agriculture and theocratic state has been the major force in the creation of our apocalyptic culture.

Historians have blamed the Moroccan demise on Arab nomads who hated trees, just as the Mongols were blamed for the collapse of the Mesopotamian irrigation systems. Ideology has been used to explain ecological situations. It is as though there were some mental block against recognizing the fatal mishandling of the natural environment by the agricultural society and its urban overlords.

In China men struggled to control the Yellow River for four thousand years, while at the same time other men ravaged the upper watershed, creating gullies six hundred feet deep. The mud that came

down settled in the river bed, gradually lifting it high above the surrounding floodplain, and the river was contained entirely by man-made dikes. Flooding runoff from the denuded slopes occasionally overtopped the dikes. The great flood of 1852 shifted the mouth of the river four hundred miles and drowned hundreds of thousands of people. The biblical Flood of the Old Testament about fifty-five hundred years ago, which was probably the Euphrates River, had the same basic cause. There is evidence that the early Sumerian civilizations did not know floods of the Euphrates, and that flooding began with upper watershed destruction. The soils that were ripped off the earth by hooves and teeth and sent down the Tigris and Euphrates, forming a delta that advanced 180 miles into the Persian Gulf, as though the skin had been peeled from the earth and heaped into the sea, making 35,000 square miles of salt marsh from topsoil.

Such destruction was not necessarily the result of poor agricultural practices. It was rather the nature of husbandry itself. The record of agriculture everywhere on the planet is that of a blind force extending sand dunes and other wind damage by excavation and burial, lowering water tables, increasing flooding, altering the composition of plant and animal communities, and diminishing the nutritive quality and stability of ecosystems. The loss of certain substances from the soil—especially phosphates, nitrates, and calcium—decreases crop food value. Changes in floral composition affect a complex, stable species by replacing it with a simpler, shifting association. A forest may remain a forest or grassland remain grassland, yet be drastically altered in richness, productivity, resistance, and soil-building ability. Changes in composition are brought about directly by overgrazing and indirectly by the cultivation of surrounding lands; they are invisible to most people, even cattlemen and other pastorialists.

No other organisms are more intricately associated with civilization than the cereals—wheat, barley, rye, corn, rice: all modified an-

nual grasses on whom the masses of mankind depend. Ecologically, the cereals are takers, not makers of soil. By contrast, perennial wild grasses work as pumps; their deep roots bring fresh nutrient minerals to the surface and structure the soil. They live in conjunction with a wide variety of flowering legumes and composites, two groups of plants essential for good soil formation, which are dependent on insect pollinators for their continued existence and in turn support a rich animal life.

As men undertook the cultivation of vast fields of cereals, they turned away from an ancient relationship with the wild nectar- and pollen-seeking bees, flies, butterflies, and beetles. Such insects had made possible the arboreal life of early primates in flowering and fruit-making tropical forests. Then they were instrumental in the evolution of prairies and savannas, which supported the first prehuman ground apes. Finally, pollinating insects supervised the evolution of the steppe and tundra flora, where the great herds of Pleistocene mammals fostered the final hunting phases of mankind.

The earliest subsistence agriculture did not abandon its dependence on flowering plants and their pollinators, but when men moved into the great river valleys and planted vast fields of grain they repudiated ancient connections with a host of tiny animals who compose the richest and most diverse fauna on our planet. The cereals are wind-pollinated annuals, shallow-rooted, ephemeral, without soil-forming virtues, and their association with flowering forms or pollinator insects is minimal. By supporting large, minimally nourished human populations and by their destructive effects in the environment when grown in cultivated uniformity, the cereals are truly the symbol and agent of agriculture's war against the planet.

It may seem quaint to write fervently of "land-use practices" at a time when pollution is the fashionable topic of environmental concern and the space and solitude of the sheep-herding life seem idyllic. With such a small fraction of society in the industrial state "living by the soil," erosion, forest destruction, and desert making hardly

seem urgent, but the soil was the source of complex life long before men or agriculture first appeared. It is as fundamental to our well-being now as ever, though most of us never put our hands into it.

The ancient catastrophes no longer seem so ghastly as they did when Lowdermilk made his report. Those immense tides of people and cities seem, in the light of our atomic era, to have fallen in a peaceful ebb. In view of their modest technology it seems almost academic to recall them now. Yet we share with them a worldview generated by monocultures. Current technology has become more efficient and complicated without changing the direction established by ancient irrigation states. However noble the spirit and grand the human aspirations since the earliest Egyptian dynasties may be, the written record and the fortunes of the state have usurped the human record. Its vision of a man-centered universe and its impoverished ecology, bedecked as destiny, is a heritage too uncritically accepted. In view of the enormous scope of human time and experience, perhaps mankind has unwittingly embraced a diseased era as the model of human life.

The crippling of the natural realm by hooved animals and the replacement of the rich and varied flora of evolution with domestic varieties set precedents for the machine age. Scalping with the bulldozer succeeds gleaning with the goat; disinfecting the forest with pesticides is an extension of cleaning kitchen pots and pans with soap; polluting the air with fumes is not much different from the Sumerians polluting the water with silt. But the most damaging blows of all are the extinctions of the "useless" forms of life, those wild things that seem outside our economy and inimical to agriculture. The success of that practical philosophy is measured in human numbers. The great increase in human population began in earnest ten thousand years ago; by 1980 there were five billion and there will be about eight billion by the year 2010. We have loosed a population epidemic since men ceased to hunt and gather that is the most terrifying phenomenon of the million years of human experience.