


CHANGES *in the* LAND

*Indians, Colonists,
and the Ecology of New England*

WILLIAM CRONON

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For Nan

I

THE VIEW FROM WALDEN

On the morning of January 24, 1855, Henry David Thoreau sat down with his journal to consider the ways in which his Concord home had been altered by more than two centuries of European settlement. He had recently read the book *New England's Prospect*, in which the English traveler William Wood recounted his 1633 voyage to southern New England and described for English readers the landscape he had found there. Now Thoreau sought to annotate the ways in which Wood's Massachusetts was different from his own. The changes seemed sweeping indeed.¹

He began with the wild meadow grasses, which appeared, he wrote, "to have grown more rankly in those days." If Wood's descriptions were accurate, the strawberries too had been larger and more abundant "before they were so cornered up by cultivation." Some of them had been as much as two inches around, and were so numerous that one could gather half a bushel in a forenoon. Equally abundant were gooseberries, raspberries, and especially currants, which, Thoreau mused, "so many old writers speak of, but so few moderns find wild."

New England forests had been much more extensive and their

trees larger in 1633. On the coast, where Indian settlement had been greatest, the woods had presented a more open and parklike appearance to the first English settlers, without the underbrush and coppice growth so common in nineteenth-century Concord. To see such a forest nowadays, Thoreau wrote, it was necessary to make an expedition to "the sample still left in Maine." As nearly as he could tell, oaks, firs, plums, and tulip trees were all less numerous than they had been in Wood's day.

But if the forest was much reduced from its former state, most of its tree species nevertheless remained. This was more than could be said for many of its animal inhabitants. Thoreau's list of those that were now absent was stark: "bear, moose, deer, porcupines, 'the grim-fac'd Ounce, and rav'nous howling Wolf,' and beaver. Martens." Not only the mammals of the land were gone; the sea and air also seemed more empty. Bass had once been caught two or three thousand at a time. The progeny of the alewives had been "almost incredible." Neither was now present in such abundance. Of the birds, Thoreau wrote: "Eagles are probably less common; pigeons of course . . . heath cocks all gone . . . and turkeys . . . Probably more owls then, and cormorants, etc., etc., sea-fowl generally . . . and swans." To Wood's statement that one could purchase a fresh-killed swan for dinner at the price of six shillings, Thoreau could only write in wonderment, "Think of that!"

There is a certain plaintiveness in this catalog of Thoreau's, a romantic's lament for the pristine world of an earlier and now lost time. The myth of a fallen humanity in a fallen world is never far beneath the surface in Thoreau's writing, and nowhere is this more visible than in his descriptions of past landscapes. A year after his encounter with William Wood's New England of 1633, he returned to its lessons in more explicitly moral language. "When I consider," he wrote, "that the nobler animals have been exterminated here,—the cougar, panther, lynx, wolverene, wolf, bear, moose, deer, the beaver, the turkey, etc., etc.,—I cannot but feel as if I lived in a tamed, and, as it were, emasculated country." Seen in this way, a changed landscape meant a loss of wildness and virility that was ultimately spiritual in its import, a sign of declension in both nature and humanity. "Is it not," Thoreau asked, "a maimed and imperfect nature that I am conversant with?"

It is important that we answer this question of Thoreau's carefully: how did the "nature" of New England change with the coming of the Europeans, and can we reasonably speak of its changes in terms of maiming and imperfection? There is nothing new to the observation that European settlement transformed the American landscape. Long before Thoreau, naturalists and historians alike were commenting on the process which was converting a "wilderness" into a land of European agricultural settlement. Whether they wrote of Indians, the fur trade, the forest, or the farm, colonial authors were constantly aware that fundamental alterations of the ecological fabric were taking place around them. The awareness increased as time went on. By the late eighteenth century, many individuals—Peter Kalm, Peter Whitney, Jeremy Belknap, and Timothy Dwight chief among them—were commenting extensively on these changes.

For the most part, unlike Thoreau, they did so approvingly. As early as 1653, the historian Edward Johnson could count it as one of God's providences that a "remote, rocky, barren, bushy, wild-woody wilderness" had been transformed in a generation into "a second England for fertility." In this vision, the transformation of wilderness betokened the planting of a garden, not the fall from one; any change in the New England environment was divinely ordained and wholly positive. By the end of the eighteenth century, the metaphors for environmental change had become more humanistic than providential, but were no less enthusiastic about the progress such change represented. In a passage partially anticipating Frederick Jackson Turner's frontier thesis, for instance, Benjamin Rush described a regular sequence for clearing the forest and civilizing the wilderness. "From a review [of] the three different species of settlers," he wrote, speaking of Pennsylvania, "it appears, that there are certain regular stages which mark the progress from the savage to civilized life. The first settler is nearly related to an Indian in his manners— In the second, the Indian manners are more diluted: It is in the third species of settlers only, that we behold civilization completed." Though landscape was altered by this supposed social evolution, the *human* process of development—from Indian to clearer of the forest to prosperous farmer—was the center of Rush's attention. Environmental change was of secondary interest. For Enlightenment thinkers like Rush, in each stage, the

shape of the landscape was a visible confirmation of the state of human society. Both underwent an evolutionary development from savagery to civilization.¹

Whether interpreted as declension or progress, the shift from Thoreau's forest of "nobler animals" to Rush's fields and pastures of prosperous farmers signaled a genuinely transformed countryside, one whose changes were intimately bound to the human history which had taken place in its midst. The replacement of Indians by predominantly European populations in New England was as much an ecological as a cultural revolution, and the human side of that revolution cannot be fully understood until it is embedded in the ecological one. Doing so requires a history, not only of human actors, conflicts, and economies, but of ecosystems as well.

How might we construct such an ecological history? The types of evidence which can be used to evaluate ecological change before 1800 are not uniformly reliable, and some are of a sort not ordinarily used by historians. It is therefore important to reflect on how they should best be criticized and used. The descriptions of travelers and early naturalists, for instance, provide observations of what New England looked like in the early days of European settlement, and how it had changed by the end of the eighteenth century. As such, they provide the backbone of this study. But to use them properly requires that we evaluate each traveler's skills as a naturalist, something for which there is often only the evidence of his or her writings. Moreover, we can only guess at how ideological commitments such as Thoreau's or Rush's colored the ways they saw the landscape. How much did William Wood's evident wish to promote the Massachusetts Bay Colony lead him to idealize its environment? To what extent did the anonymous author of *American Husbandry* shape his critique of American agriculture to serve his purpose of preserving colonial attachments to Britain? Even if we can remove most of these ideological biases to discover what it was a traveler actually saw, we must still acknowledge that each traveler visited only a tiny fraction of the region. As Timothy Dwight once remarked, "Your travelers seize on a single person, or a solitary fact, and make them the representatives of a whole community and a general custom." We are always faced with the problem of generalizing from a *local* description to a *regional* landscape, but our under-

standing of modern ecosystems can be of great help in doing so.⁴

A second fund of data resides in various colonial town, court, and legislative records, although here the evidence of ecological change can sometimes be tantalizingly elliptical. We cannot always know with certainty whether a governmental action anticipated or reacted to a change in the environment. When a law was passed protecting trees on a town commons, for example, did this mean that a timber shortage existed? Or was the town merely responding with prudent foresight to the experience of other localities? If a shortage existed, how severe was it? Was it limited only to certain species of trees? And so on. Only by looking at the overall pattern of legal activity can we render a reasonable judgment on such questions. These problems notwithstanding, town and colony records address almost the entire range of ecological changes in colonial New England: deforestation, the keeping of livestock, conflicts between Indians and colonists over property boundaries, the extermination of predators such as wolves, and similar matters. Deeds and surveyor records can be used statistically to estimate the composition of early forests, and are usually more accurate than travelers' accounts even though subject to sampling errors.⁵

Then there are the less orthodox sorts of evidence which historians borrow from other disciplines and have less experience in criticizing. Relict stands of old-growth timber, such as the Cathedral Pines near Cornwall, Connecticut, can suggest what earlier forests may have looked like. The relict stands which exist today, however, are by no means identical to most of the forests which existed in colonial times, so that the record of earlier forests must be sought in less visible places. Ecologists have done very creative detective work in analyzing tree rings, charcoal deposits, rotting trunks, and overturned stumps to determine the history of several New England woodlands. The fossil pollen in pond and bog sediments is a reliable but fuzzy indicator of the changing species composition of surrounding vegetation; despite problems in determining the absolute age of such pollen, it supplies some of the most reliable evidence for reconstructing past forests. In addition, a wide variety of archaeological evidence can be used to assess past environments, particularly the changing relations of human inhabitants to them.⁶

Finally, there are those awkward situations in which an ecological change which undoubtedly must have been occurring in the colonial period has left little or no historical evidence at all. These include microscopic changes in soil fauna and flora, soil compaction, changes in the transpiration rates of forests, and so on. Here all arguments become somewhat speculative. Given what we know of ecosystem dynamics, however, it would be wrong simply to ignore such changes, since some of them almost certainly occurred even though no one noticed them at the time. I will occasionally appeal to modern ecological literature to assert the probability of such changes, and trust that, by so doing, I am not straying too far from the historian's usual canon for evaluating evidence. Silences in the historical record sometimes require us to make the best-informed interpolations we can, and I have tried always to be conservative on the few occasions when I have been forced to do this.

Although caution is required in handling all these various forms of evidence (and nonevidence), together they provide a remarkably full portrait of ecological change in colonial New England. But they also raise intriguing questions, questions which are both empirical and theoretical. One, for instance, follows directly from the imprecision of the data: travelers' accounts and other colonial writings are not only subjective but often highly generalized. Colonial nomenclature could be quite imprecise, so much so that the French traveler Chastellux wrote of the impoverishment of American English as a result:

Anything that had no English name has here been given only a simple designation: the jay is the blue bird, the cardinal the red bird; every water bird is simply a duck, from the teal to the wood duck, and to the large black duck which we do not have in Europe. They call them "red ducks," "black ducks," "wood ducks." It is the same with respect to their trees: the pine, the cypresses, the firs, are all included under the general name of "pine trees."

More confusing still could be the natural tendency for colonists to apply European names to American species which only superficially resembled their counterparts across the ocean.⁷

The problems which this fuzzy nomenclature can create for

those doing ecological history should be obvious. For instance, many early descriptions, including those by William Wood, make no mention at all of hemlock, although they do mention fir and spruce. On just such evidence, Thoreau concluded—incorrectly—that the fir tree had been much more common in colonial times. But since fir and spruce are now largely absent in southern New England, and since fossil pollen shows that hemlock has long been a significant component of the New England forest, it seems reasonable to conclude that "hemlock" was subsumed by colonists under the names of "fir," "spruce," and probably "pine." But how common was it? Only the fossil pollen can tell us. As another example, the hickory was rarely mentioned by name, but instead was for a long time known as the "walnut," an entirely different genus of tree. Because white pine was valuable economically, many early visitors seem to have seen it everywhere, thus leading them to exaggerate its numerical significance. Colonists confused the native junipers with European cedars for the same economic reasons, so that the red cedar has carried a misleading name ever since. All of these problems of nomenclature must be borne in mind if one is not to give a distorted picture of the colonial ecosystem.⁸

A second difficulty is the old and familiar fallacy of *post hoc ergo propter hoc*.⁹ When reading colonial accounts describing floods, insect invasions, coastal alterations, and significant changes in climate, we are perhaps all too tempted to attribute these by some devious means to the influence of the arriving Europeans. This will not always do. Not all the environmental changes which took place after European settlement were caused by it. Some were part of much longer trends, and some were random: neither type need have had anything to do with the Europeans. Trickier still are instances where Europeans may or may not have altered the *rate* at which a change was already occurring. Unless one can show some plausible mechanism whereby settlement could and probably did cause a change, it seems best not to attribute it to European influence. One cannot escape the fallacy altogether—any discussion of causality in history must encounter it with some frequency—but one must at least be aware of when one is flirting with it. I shall have occasion to do so here.

This brings us to the heart of the theoretical difficulties involved in doing ecological history. When one asks how much an

ecosystem has been changed by human influence, the inevitable next question must be: "changed in relation to what?" There is no simple answer to this. Before we can analyze the ways people alter their environments, we must first consider how those environments change in the absence of human activity, and that in turn requires us to reflect on what we mean by an ecological "community." Ecology as a biological science has had to deal with this problem from its outset. The first generation of academic ecologists, led by Frederic Clements, defined the communities they studied literally as superorganisms which experienced birth, growth, maturity, and sometimes death much as individual plants and animals did. Under this model, the central dynamic of community change could be expressed in the concept of "succession." Depending on its region, a biotic community might begin as a pond, which was then gradually transformed by its own internal dynamics into a marsh, a meadow, a forest of pioneer trees, and finally to a forest of dominant trees. This last stage was assumed to be stable and was known as the "climax," a more or less permanent community which would reproduce itself indefinitely if left undisturbed. Its equilibrium state defined the mature forest "organism," so that all members of the community could be interpreted as functioning to maintain the stability of the whole. Here was an apparently objective point of reference: any actual community could be compared with the theoretical climax, and differences between them could then usually be attributed to "disturbance." Often the source of disturbance was human, implying that humanity was somehow outside of the ideal climax community.¹⁰

This functionalist emphasis on equilibrium and climax had important consequences, for it tended to remove ecological communities from history. If all ecological change was either self-equilibrating (moving toward climax) or nonexistent (remaining in the static condition of climax), then history was more or less absent except in the very long time frame of climatic change or Darwinian evolution. The result was a paradox. Ecologists trying to define climax and succession for a region like New England were faced with an environment massively altered by human beings, yet their research program demanded that they determine what that environment would have been like without a human presence. By peeling away the corrupting influences of

man and woman, they could discover the original ideal community of the climax. One detects here a certain resemblance to Thoreau's reading of William Wood: historical change was defined as an aberration rather than the norm.¹¹

In time, the analogy comparing biotic communities to organisms came to be criticized for being both too monolithic and too teleological. The model forced one to assume that any given community was gradually working either to become or to remain a climax, with the result that the dynamics of nonclimax communities were too easily ignored. For this reason, ecology by the mid-twentieth century had abandoned the organism metaphor in favor of a less teleological "ecosystem." Now individual species could simply be described in terms of their associations with other species along a continuous range of environments; there was no longer any need to resort to functional analysis in describing such associations. Actual relationships rather than mystical superorganisms could become the focus of study, although an infusion of theory from cybernetics encouraged ecologists to continue their interest in the self-regulating, equilibrating characteristics of plant and animal populations.¹²

With the imperatives of the climax concept no longer so strong, ecology was prepared to become at least in part a historical science, for which change was less the result of "disturbance" than of the ordinary processes whereby communities maintained and transformed themselves. Ecologists began to express a stronger interest in the effects of human beings on their environment. What investigators had earlier seen as an inconvenient block to the discovery of ideal climax communities could become an object of research in its own right. But accepting the effects of human beings was only part of this shift toward a more historical ecology. Just as ecosystems have been changed by the historical activities of human beings, so too have they had their own less-recorded history: forests have been transformed by disease, drought, and fire, species have become extinct, and landscapes have been drastically altered by climatic change without any human intervention at all. As we shall see, the period of human occupation in postglacial New England has seen environmental changes on an enormous scale, many of them wholly apart from human influence. There has been no timeless wilderness in a state of perfect changelessness, no climax forest in permanent stasis.

But admitting that ecosystems have histories of their own still leaves us with the problem of how to view the people who inhabit them. Are human beings inside or outside their systems? In trying to answer this question, appeal is too often made to the myth of a golden age, as Thoreau sometimes seemed inclined to do. If the nature of Concord in the 1850s—a nature which many Americans now romanticize as the idyllic world of Thoreau's own Walden—was as "maimed" and "imperfect" as he said, what are we to make of the wholeness and perfection which he thought preceded it? It is tempting to believe that when the Europeans arrived in the New World they confronted Virgin Land, the Forest Primeval, a wilderness which had existed for eons uninfluenced by human hands. Nothing could be further from the truth. In Francis Jennings's telling phrase, the land was less virgin than it was widowed. Indians had lived on the continent for thousands of years, and had to a significant extent modified its environment to their purposes. The destruction of Indian communities in fact brought some of the most important ecological changes which followed the Europeans' arrival in America. The choice is not between two landscapes, one with and one without a human influence; it is between two human ways of living, two ways of belonging to an ecosystem.¹¹

The riddle of this book is to explore why these different ways of living had such different effects on New England ecosystems. A group of ecological anthropologists has tried to argue that for many non-Western societies, like those of the New England Indians, various ritual practices have served to stabilize people's relationships with their ecosystems. In effect, culture in this anthropological model becomes a homeostatic, self-regulating system much like the larger ecosystem itself. Thus have come the now famous analyses designed to show that the slaughter of pigs in New Guinea, the keeping of sacred cows in India, and any number of other ritual activities, all function to keep human populations in balance with their ecosystems. Such a view would describe precolonial New England not as a virgin landscape of natural harmony but as a landscape whose essential characteristics were kept in equilibrium by the cultural practices of its human community.¹⁴

Unfortunately, this functional approach to culture has the same penchant for teleology as does the organism model of eco-

logical climax. Saying that a community's rituals and social institutions "function" unconsciously to stabilize its ecological relationships can lead all too quickly into a static and ahistorical view of both cultural agency and ecological change. If we assume *a priori* that cultures are systems which tend toward ecological stability, we may overlook the evidence from many cultures—even preindustrial ones—that human groups often have significantly *unstable* interactions with their environments. When we say, for instance, that the New England Indians burned forests to clear land for agriculture and to improve hunting, we describe only what they themselves thought the purpose of burning to be. But to go further than this and assert its unconscious "function" in stabilizing Indian relationships with the ecosystem is to deny the evidence from places like Boston and Narragansett Bay that the practice could sometimes go so far as to remove the forest altogether, with deleterious effects for trees and Indians alike.¹⁵

All human groups consciously change their environments to some extent—one might even argue that this, in combination with language, is the crucial trait distinguishing people from other animals—and the best measure of a culture's ecological stability may well be how successfully its environmental changes maintain its ability to reproduce itself. But if we avoid assumptions about environmental equilibrium, the *instability* of human relations with the environment can be used to explain both cultural and ecological transformations. An ecological history begins by assuming a dynamic and changing relationship between environment and culture, one as apt to produce contradictions as continuities. Moreover, it assumes that the interactions of the two are dialectical. Environment may initially shape the range of choices available to a people at a given moment, but then culture reshapes environment in responding to those choices. The reshaped environment presents a new set of possibilities for cultural reproduction, thus setting up a new cycle of mutual determination. Changes in the way people create and re-create their livelihood must be analyzed in terms of changes not only in their *social* relations but in their *ecological* ones as well.

Doing away with functionalism does not mean abandoning the system-oriented perspective which an ecological approach allows. In addition to assuming that relations between people and

their environment are not constant, but rather historical and dialectical, it sees those relations as being connected within an interacting system. Efforts to describe ecological history simply in terms of the transfer of individual species between segregated ecosystems, as Alfred Crosby and William H. McNeill have done, are thus bound to be incomplete.¹⁶ Important as organisms like smallpox, the horse, and the pig were in their direct impact on American ecosystems, their full effect becomes visible only when they are treated as integral elements in a complex system of environmental and cultural relationships. The pig was not merely a pig but a creature bound among other things to the fence, the dandelion, and a very special definition of property. It is these kinds of relationships, the contradictions arising from them, and their changes in time, that will constitute an ecological approach to history.

The study of such relations is usually best done at the local level, where they become most visible; the best ecological histories to date have all examined relatively small systems as cases. I have opted for a similar approach, albeit for a somewhat larger region. But despite its strengths, the choice of a small region has one crucial problem: how do we locate its boundaries? Traditionally in anthropology, this has simply involved the area within which people conduct their subsistence activities, often described using "ethno-ecological" techniques which analyze the way the inhabitants themselves conceive of their territory.¹⁷ Yet anthropologists are increasingly aware, as historians have long known, that the development of a world capitalist system has brought more and more people into trade and market relations which lie well beyond the boundaries of their local ecosystems. Explaining environmental changes under these circumstances—as in the shift from Indian to European populations in colonial New England—becomes even more complex than explaining changes internal to a local ecosystem. In an important sense, a distant world and its inhabitants gradually become part of another people's ecosystem, so that it is increasingly difficult to know which ecosystem is interacting with which culture. This erasure of boundaries may itself be the most important issue of all.

In colonial New England, two sets of human communities which were also two sets of ecological relationships confronted

each other, one Indian and one European. They rapidly came to inhabit a single world, but in the process the landscape of New England was so transformed that the Indians' earlier way of interacting with their environment became impossible. The task before us is not only to describe the ecological changes that took place in New England but to determine what it was about Indians and colonists—in their relations both to nature and to each other—that brought those changes about. Only thus can we understand why the Indian landscape of precolonial times had become the much altered place Thoreau described in the nineteenth century.

The view from Walden in reality contained far more than Thoreau saw that January morning in 1855. Its relationships stretched beyond the horizons of Concord to include vistas of towns and markets and landscapes that were not in Thoreau's field of vision. If only for this reason, we must beware of following him too closely as our guide in these matters. However we may respect his passion, we must also recognize its limits:

I take infinite pains to know all the phenomena of the spring, for instance, thinking that I have here the entire poem, and then, to my chagrin, I hear that it is but an imperfect copy that I possess and have read, that my ancestors have torn out many of the first leaves and grandest passages, and mutilated it in many places. I should not like to think that some demigod had come before me and picked out some of the best of the stars. I wish to know an entire heaven and an entire earth.

We may or may not finally agree with Thoreau in regretting the changes which European settlers wrought in the New World, but we can never share his certainty about the possibility of knowing an entire heaven and an entire earth. Human and natural worlds are too entangled for us, and our historical landscape does not allow us to guess what the "entire poem" of which he spoke might look like. To search for that poem would in fact be a mistake. Our project must be to locate a nature which is within rather than without history, for only by so doing can we find human communities which are inside rather than outside nature.¹⁸

PART II

*The Ecological
Transformation of
Colonial New England*

LANDSCAPE AND PATCHWORK

The land as the Europeans found it differed in key ways from the one they had left behind, but their understanding of *how* it differed only emerged gradually. Their image of the area that came to be called New England was shaped by a variety of circumstances that had little to do with the ecology of the region itself. The first European visitors, for instance, saw only areas within easy reach of the coast. For the entirety of the sixteenth century, maps of New England consisted of a single line separating ocean from land, accompanied by a string of place-names to indicate landmarks along the shore; the interior remained blank. Verbal descriptions were not even this thorough. At a handful of coastal points, explorers like Verrazzano, Gosnold, Pring, and Champlain made landfalls that were eventually written up in a paragraph or two, but such accounts were few and far between. Only when settlement began in the 1620s did fuller descriptions start to appear, and even then they were limited to areas within a few miles of the coast or along a few major rivers. For many years, the only New England known to Europe was near salt water.¹

Once European visitors had arrived, their preconceptions and expectations led them to emphasize some elements of the landscape and to filter out certain others. Most of the early explorers sought to discover what Richard Hakluyt had called "merchantable commodities" in his classic *Discourse Concerning Western Planting* in 1584. These were the natural products which could be shipped to Europe and sold at a profit in order to provide a steady income for colonial settlements. Theoreticians of colonialism like Hakluyt had furnished a ready list of such commodities by the time Europeans began to visit New England regularly: fish for salting, furs for clothing, timber for ships, sassafras for curing syphilis, and so on. Visitors inevitably observed and recorded greater numbers of "commodities" than other things which had not been labeled in this way. It was no accident that James Rosier referred to the coastal vegetation of Maine as "the profits and fruits which are naturally on these Ilands." His word "profits" may not have connoted the marginal gain from a mercantile transaction, but it did identify those natural products which were of potential use to a European way of life. Descriptions framed on such a basis were bound to say as much about the markets of Europe as they did about the ecology of New England.²

Distorting as this emphasis on commodities might be to an accurate understanding of the New England environment, it helps explain one reason why Europeans found the American landscape so different from the one they had left behind. What was a "merchantable commodity" in America was what was scarce in Europe. Only if this was true would it make sense to pay the cost of transporting it across the ocean. Beaver, cod, and sassafras all satisfied this economic requirement and so were often the chief goals of an exploring expedition. But even something like firewood, which was too bulky to justify trans-Atlantic shipment and could thus only be used by settlers in America itself, might be perceived as a commodity because of its scarcity value in England. England had been experiencing a near crisis in its wood supply since at least the time of Columbus, with the result that this single most important source of heating and building materials became increasingly costly throughout the century preceding the English revolution. Parliament began to restrict the cutting of English timber as early as 1543. By the time

settlement began in New England, coal production had started to rise in the fields of Durham and Northumberland, and London was beginning its dependence on the fuel that would soon make it renowned for its terrible fogs. Even if explorers and settlers could not initially ship American timber back home, their awareness of the English wood scarcity colored the way they reacted to New England forests. As often as not, their descriptions of New England contained implicit comparisons with England.³

Seeing landscapes in terms of commodities meant something else as well: it treated members of an ecosystem as isolated and extractable units. Explorers describing a new countryside with an eye to its mercantile possibilities all too easily fell into this way of looking at things, so that their descriptions often degenerated into little more than lists. Martin Pring's account of the trees of Martha's Vineyard illustrates this tendency:

As for Trees the Country yeeldeth Sassafras a plant of soveraigne vertue for the French Poxe, and as some of late have learnedly written good against the Plague and many other Maladies; Vines, Cedars, Okes, Ashes, Beeches, Birch trees, Cherie trees bearing fruit whereof wee did eate, Hasels, Wichhasels, the best wood of all other to make Sope-ashes withall, walnut-trees, Maples, holy to make Bird lime with, and a kinde of tree bearing a fruit like a small red Peare-plum.

Little sense of ecological relationships emerges from such a list. One could not use it to describe what the forest actually looked like or how these trees interacted with one another. Instead, its purpose was to detail resources for the interest of future undertakings.⁴

How these resources were perceived depended a great deal on whether one contemplated an expedition that would simply gather the "profits" of a countryside or one that would settle a new plantation. Settlers who had actually to live in a New World environment were less likely than their merchant companions to view it as a linear list of commodities. Their very survival required that they manipulate the environment, and so it is from their writings that a sense of ecological relationships begins to emerge. Settlers had first to survive and prosper before they

could sell commodities across the sea, and that meant understanding the land they lived in. By the time they did this, however, the land was already changing in response to that new understanding, creating a landscape different from the one that had been there before.⁵

All these things—the limited areas visited by Europeans, their tendency to view the landscape in terms of their own cultural concepts, their selective emphasis on commodities, the ecological changes they themselves wrought—meant that their record of precolonial New England ecosystems was inevitably incomplete. The fragments they have left us testify as much to their own cultural preconceptions as to the actual environments they encountered. But there was one European perception that was undoubtedly accurate, and about it all visitors were agreed—the incredible abundance of New England plant and animal life, an abundance which, when compared with Europe, left more than one visitor dumbfounded. Many found themselves protesting to correspondents on the other side of the Atlantic that, however hard it was to believe, they were not exaggerating their reports of what they had discovered there.

The experience of New England's plenty began with the fish of the coastal waters, which had been the original reason that Breton, Portuguese, and Bristol fishermen had started visiting the area in the fifteenth century. "The abundance of Sea-Fish," wrote the Reverend Francis Higginson in 1630, "are almost beyond beleiving, and sure I should scarce have beleived it except I had seene it with mine owne eyes." John Brereton described how, in a few hours of fishing, he and his companions "had pestered our ship so with Cod fish, that we threw numbers of them over-boord againe." Cape Cod came to be named as a result of such experiences, which nearly all of the early explorers mention. But the real statements of wonder came from visitors to the settlements, who saw the spring spawning runs of smelt, alewives, sturgeon, and other ocean fish which migrated to fresh water to deposit their eggs. William Wood described the arrival of the alewives "in such multitudes as is almost incredible, pressing up such shallow waters as will scarce permit them to swim." So thick did the fish become in some streams that at least one inhabitant fancied he might have walked on their backs without getting his feet wet. John Josselyn had no illusions about crossing

streams on the backs of fish, but he was sure that he could have walked knee-deep through stranded herring across a quarter mile of beach. Nothing in their English experience prepared these men for the sight of such prodigious quantities of fish.⁶

The same was true of the region's birds. Wood hesitated to describe how easy it was to hunt waterfowl in New England. "If I should tell you," he wrote, "how some have killed a hundred geese in a week, fifty ducks at a shot, forty teals at another, it may be counted impossible though nothing more certain." Such birds were present in greatest numbers during the spring and fall migrations, but others, like the turkey, could be hunted year-round. Not only did the wild turkeys seem fatter and sweeter than the domesticated turkeys of Europe—which few colonists even remembered had once been imported from the New World—but their behavior could hardly have been better suited to those who sought to hunt them. As Thomas Morton described it, they were easily shot "because, the one being killed, the other sit fast nevertheless; and this is no bad commodity." A man could kill a dozen turkeys in half a day.⁷

For sheer abundance, though, only one bird could match the alewives. Nothing so astonished Europeans about New England as the semiannual flights of the passenger pigeons. John Josselyn measured their numbers in the "millions of millions," and spoke of flocks "that to my thinking had neither beginning nor ending, length nor breadth, and so thick that I could see no Sun." Thomas Dudley told of a March day in 1631 when "there flew over all the towns in our plantations . . . many flocks of doves, each flock containing many thousands and some so many that they obscured the light." Again settlers felt the need to protest their honesty as they wrote descriptions of this kind. "Those that did not see them," said one, "might think it was not true, but it is very true."⁸

None of the mammals reproduced themselves in such concentrated numbers, but they too impressed English visitors accustomed to a landscape in which much of the available hunting was reserved to large landowners and the Crown. "For Beasts," wrote Higginson, "there are some Beares . . . Also here are severall sorts of Deere . . . Also Wolves, Foxes, Beavers, Otters, Martins, great wild Cats, and a great Beast called a Molke [moose] as bigge as an Oxe." Thomas Morton found New England's deer—among

which he included elk—to be larger than English fallow deer, and regarded them as “the most usefull and most beneficiall beast” of the region. In spring, one could see as many as a hundred of them in the space of a mile, and they were numerous enough at other times to supply meat year-round. Still, one of the earliest ecological relationships of which the colonists were aware led them to believe that the numbers of deer might be increased if only wolves could be eliminated. “Here is good store of deer,” wrote William Hammond; “were it not for the wolves here would be abound, for the does have most two fawns at once, and some have three, but the wolves destroy them.”

Visitors and colonists were as impressed by the animals that were absent from New England as by those that were present. Some were familiar wild species, many closely associated with human settlements, whose ranges did not reach to the New World: magpies, cuckoos, nightingales, larks, and sparrows were all missed by the colonists. More striking was the absence of the domesticated animals—horses, sheep, goats, swine, cats, and cattle—which arrived only after 1620. The only indigenous dogs were near kin of the wolf, and although mice were common, there were no rats. “But for Rats,” wrote Morton, “the Country by Nature is troubled with none.” A number of microscopic organisms were absent as well, but these were commented on mainly in terms of the colonists’ remarkable healthiness. Several inhabitants agreed with the observation: “For the common diseases of England, they be strangers to the English now in that strange land. To my knowledge I never knew any that had the pox, measles, green-sickness, headaches, stone, or consumptions, etc.” Disease was by no means absent from New England, as deaths from “seasoning” and epidemics both showed, but the colonial population nevertheless remained for a while relatively isolated from the European disease environment. Large numbers of deaths in the occasional epidemics which did occur should not obscure the fact that New England mortality rates—for Europeans—were on average much lower than comparable rates in Europe.¹⁰

New England’s abundance was not confined to its animal inhabitants. Indeed, English settlers accustomed to scarcities of wood were perhaps most delighted by the forests they found there. Here, wrote one visitor to Plymouth, was “good ground

in abundance, with excellent good timber.” William Wood, whose description of the woods around Boston would later so intrigue Thoreau, furnished a more precise picture of the Massachusetts forest. “The timber of the country,” he wrote, “grows straight and tall, some trees being twenty, some thirty foot high, before they spread forth their branches.” The most common species in southern New England were oaks, hickories, chestnuts, and pines. If anyone doubted what such trees meant to an Englishman, Francis Higginson made the matter clear: they meant being warm in winter, warmer even than the nobility of England could hope to be.

Though it bee here somewhat cold in the winter, yet here we have plenty of Fire to warme us, and that a great deale cheaper then they sel Billets and Faggots in *London*: nay, all *Europe* is not able to afford so great Fires as *New-England*. A poor servant here that is to possesse but 50 Acres of land, may afford to give more wood for Timber and Fire as good as the world yeelds, then many Noble men in *England* can afford to do.

Higginson’s conclusion said as much about the English fuel crisis as it did about New England’s forests: “Here is good living for those that love good Fires.”¹¹

One must not visualize the New England forest at the time of settlement as a dense tangle of huge trees and nearly impenetrable underbrush covering the entire landscape. Along the southern coast, from the Saco River in Maine all the way to the Hudson, the woods were remarkably open, almost parklike at times. When Verrazzano visited Narragansett Bay in 1524, he found extensive open areas and forests that could be traversed easily “even by a large army.” A century later, William Wood made similar observations about Massachusetts Bay. “Whereas it is generally conceived that the woods grow so thick that there is no more clear ground than is hewed out by labor of man,” he wrote, “it is nothing so, in many places diverse acres being clear so that one may ride ahunting in most places of the land if he will venture himself for being lost.” At a number of sites, trees were entirely absent. Higginson spoke of a hill near Boston from which one could see “thousands of acres” with “not a Tree in the

same." Boston itself was in fact nearly barren, and colonists were forced to seek wood from nearby islands.¹²

In coastal areas north of the Saco, and in the mountainous interior of present-day New Hampshire and Vermont, the forest became less open and its composition changed. When Verrazano made landfall in Maine, he found "high country full of very dense forests, composed of pines, cypresses, and similar trees which grow in cold regions." Later visitors concurred that the forests of northern New England were denser, often more coniferous, and, for all of their magnificence, generally less hospitable than those of the south. Thomas Morton described spruce trees in these cold northern woods that measured as much as twenty feet around, and Josselyn mentioned some that were so big that no ship could carry them. The farther north one traveled in New England, the colder the climate became: snow stayed on the ground a month or two longer in the interior of Maine than it did in Massachusetts, and the frost-free growing season fell from about 200 days in southern Connecticut to just over 150 days on the coast of Maine. The failure of the Popham colony at Sagadahoc in 1608 helped create an unfavorable image for much of northern New England. By 1624, John Smith could describe the coast north of the Penobscot River as "a Countrey rather to affright then delight one, and how to describe a more plaine spectacle of desolation, or more barren, I know not." By way of contrast, Smith regarded Massachusetts Bay as "the Paradiice of all those parts," suggesting that, however fragmentary their knowledge, he and other colonial observers were well aware of the diversity of New England environments.¹³

Ecologists have traditionally divided New England into several vegetational zones which reflect these broad differences between northern and southern forests. Thus, the south, including all of Connecticut, Rhode Island, and the eastern fourth of Massachusetts, was known as the "oak-chestnut" region before the chestnut was destroyed by blight in the early part of the twentieth century. In colonial times, the area was dominated by a variety of "central hardwoods"—black, red, and white oaks, chestnut, and the hickories—in addition to hemlock and scattered stands of white pine. In much of the north, on the other hand, including most of Vermont, the northern two-thirds of New Hampshire, and almost all of Maine, "northern hard-

woods" such as beech, yellow birch, and the maples predominated, with red spruce and balsam fir occurring at higher elevations and in swamps. Between the north and the south—in western Massachusetts, southeastern New Hampshire, and along the Connecticut River north of Springfield—there was a zone of transition that contained significant mixtures of both northern and southern New England species, where the full range of hardwoods joined with white pine and hemlock to create a dense, moist forest.¹⁴

The trouble with such zones is that although they demarcate large-scale regions, they obscure as much as they reveal. The precolonial forest was a mosaic of tree stands with widely varying compositions. Each individual tree species had its own unique range and ecological characteristics, so that many different combinations of species could be found within a single vegetational zone or even within a few square miles. In 1605, James Rosier told of walking up a river in Maine—in the "northern hardwood zone"—and finding a forest which nevertheless consisted of great old oaks growing widely scattered in open fields, with occasional birches, hazels, and strawberries mixed in. From time to time, his company passed through "lowe Thicks" of dense young shrubs and saplings, made up of still other species. On the three hills they climbed, they found "high timber trees," presumably spruce or pine, which were fit to serve as "masts for ships of 400 tun." As Rosier described the place, "It did all resemble a stately Parke, wherein appeare some old trees with high withered tops, and other flourishing with living green boughs." In the space of a mere four miles, Rosier and his men had encountered several very different forests arranged in a complex patchwork upon the landscape.¹⁵

This kind of diversity was typical of the New England landscape, and is at least as important as larger vegetational zones to the way we should understand the ecology of that landscape. Drainage patterns, the hilliness of the ground, the range of soils, the nature of the bedrock, the location of Indian settlements—all played important roles in determining what vegetation and animal life existed where. These influences applied to more than just the precolonial forest: Francis Higginson's interest was not merely academic when he described the different soils of Massachusetts Bay. "It is a land," he wrote, "of divers and sundry sorts

all about *Masathulets Bay*, and at *Charles River* is as fat blacke Earth as can be seene anywhere: and in other places you have a clay soyle, in other gravell, in other sandy, as it is all about our Plantation at *Salem*." The nature and diversity of an area's soils might be crucial to the future prosperity of a new settlement, determining the success or failure of its agriculture. As we shall see, colonists studied the native trees carefully for indications of soil fertility.¹⁶

Even in a relatively small area like eastern Massachusetts, it was possible to find a remarkable range of different habitats. Although colonists generally described the forest as an open oak woodland, there were many poorly drained sites in lowland places, whether along streams or in swamps, where red maple, swamp white oak, alders, and willows were the principal vegetation. William Wood described some of these areas as being twenty or thirty miles in extent. He noted that their water-courses often preserved large areas from the fires—many of them set by Indians—that cleared the underbrush elsewhere, leaving thickets through which it was nearly impossible for a traveler to pass. The thickets offered excellent refuge for deer, and surrounding areas were often prime hunting places. The Indians referred to such lowlands as "abodes of owls," and used them as hiding places during times of war.¹⁷

An entirely different wetland habitat occasionally occurred where a dense mat of sphagnum moss, leatherleaf, and various sedges grew out from the edges of a pond. Usually the mat was underlaid by water, so that people jumping up and down on it could feel the earth move beneath them like a giant waterbed. Indians referred to such areas as places "where the earth shakes and trembles"; the English called them "quaking bogs." Plants that could grow in these highly acidic environments had to be adapted to a water world of few nutrients and little oxygen. Many such plants grew nowhere else: cranberries, which the colonists eventually came to appreciate, the parasitic orchids, and the insect-consuming sundews and pitcher plants. From the colonists' initial point of view, the most attractive feature of the bogs was the Atlantic white cedars that grew around their edges. As Morton wrote, "If any man be desirous to finde out in what part of the Country the best Cedars are, he must get into the bottom grounds, and in vallies that are wet at the spring of the year."

When a bog was finally overgrown by vegetation, a dense stand of white cedar and red maple might be the only visible sign of its passing. Many of the places Morton described were probably of this sort, a particularly ephemeral habitat that was easily subject to human influence.¹⁸

At the opposite end of the spectrum were soils which were so well drained that they created very dry conditions for the trees living on them. The sandy soils and glacial tills of Cape Cod were the most extensive examples of this, but smaller ones occurred on the sandy outwash plains of some rivers and in rare sand barrens like those of North Haven, Connecticut. Although Cape Cod possesses the mildest and most temperate climate in New England, with 44 inches of rain and over 210 frost-free days annually, its typical forest is made up of scrubby trees adapted to extreme dryness. Chief among these are the pitch pines, deeply rooted trees which serve as ecological indicators of the sand plain community, along with bear and post oaks, the holly, bearberry, and, occasionally, New England's only cactus, the prickly pear. It was not a forest upon which many colonists looked with favor. John Smith described the Cape as "onely a headland of high hills, over-growne with shrubby Pines, hurts and such trash." The Pilgrims spoke more favorably of both the Cape's forest and its soil—"excellent black earth" a spade's depth in thickness—but they eventually chose not to settle there. Those colonists who finally did establish settlements on the Cape encountered special problems.¹⁹

The pitch pine's most important adaptation to Cape Cod's dryness has to do with a phenomenon that might seem the scourge of a dry forest: fire. Natural and humanly induced forest fires have long been typical of the area. Driven by the Cape's strong southwestern summer winds, they have regularly destroyed species not adapted to their heat, and eliminated the humus layer of the soil so as to make the ground even drier than it already was. Although pitch pine is a highly flammable wood—the colonists used it for turpentine and preferred it for firewood—the tree possesses a dormant bud at the base of its trunk that allows it to sprout from its roots after the trunk has been destroyed, something few other conifers can do. Regular burning has thus guaranteed the maintenance of the pitch pine forest. In areas of the Cape protected from fire—lowland swamps, ponds,

and the sheltered forests which the Pilgrims saw on the Provincetown tip—the pitch pine could be replaced by moister forests containing large white oaks, white pine, an occasional hemlock, and the fire-sensitive beech.²⁰

The effects of fire were by no means limited to Cape Cod; as we shall see, Indians made sure that they were very wide indeed. Throughout New England, fires which destroyed substantial portions of a hardwood forest created the conditions of full sunlight which species such as birch, white pine, and various shrubs needed in order to flourish. When Thomas Morton wrote of riding for ten miles through a forest in which there was “little or no other wood growing” but pine, he was probably describing the site of an old forest fire. Few forests so impressed the colonists as these old-burn stands of white pine, which contained what were easily the tallest trees in New England. The average height of a mature grove might be well over a hundred feet, with a few trees as much as five feet in diameter and 250 feet in height. The importance of the white pine to ship construction, especially for masts, made it one of the most sought after of colonial trees. “Of these,” wrote Morton, “may be made rosin, pitch and tarre, which are such usefull commodities that if wee had them not from other Countries in Amity with England, our Navigation would decline.” The effects of the English wood shortage led colonists to overemphasize the significance of pine in New England forests, thus obscuring the fact that the tree’s chief habitats, other than old burned-over areas, were limited to dry ridge tops and sandy flood plains where it did not need to compete with other species for light. There was never the “infinite store” of it that Morton asserted.²¹

Not all the habitats of precolonial New England were forests. Some of the most important to both Indians and Europeans had no trees at all: whether rocky or sandy, the seashore was a zone of abundance from which both groups obtained food. Morton spoke of seeing oyster banks on Massachusetts Bay that were a mile in length. Wood declared that individual oysters could be as much as a foot long: once the animal was removed from its shell, it was so large “that it must admit of a division before you can well get it into your mouth.” The movement of the tides brought thousands of lobsters into the shallow waters offshore, and exposed an “infinite store” of mussels and other shellfish. One

observer described how a person running over exposed clam banks was soon “made all wet by their spouting of water,” and said he had seen clams “as big as a penny white loaf” of English bread.²²

As important as the shore itself were the salt marshes. Here the tides regularly flooded extensive inland areas with salt water, so that only two grasses—*Spartina patens* and *Spartina alterniflora*—were able to grow there. Because the grasses helped accumulate soil and so created a series of microenvironments from dry land to marsh to protected pools of water, they furnished a home for a wide variety of insects, fish, and birds. It was often in the salt marshes that the huge flocks of migratory waterfowl made their brief stops in Massachusetts Bay, creating those opportunities Wood spoke of to kill fifty “at a shot.” But for the colonists the most striking thing about the marshes were the grasses themselves, which created the most extensive meadows to be found near the early settlements. All agreed with John Smith that the marshes contained “grasse plenty, though very long and thicke stalked, which being neither mowne nor eaten, is very ranke.” The *Spartinas* had little of the sweetness of English grasses, and many colonists were dubious about their adequacy for hay—but they were often the only grass available. Wood warned prospective settlers that “hay ground is not in all places in New England,” and suggested that those planning to keep cattle “choose the grassy valleys before the woody mountains.” Inland, along the banks of rivers, colonists occasionally found rich grassy areas—called “intervals”—which served them well for hay, but all coastal settlements had to make sure of their access to the salt marshes.²³

The precolonial landscape of New England was thus a patchwork. Even if one avoided exceptional areas like salt marshes or sand plains, one encountered tremendous variety even within the compass of a few square miles. The descent of a single hillside in southern New England, for instance, could easily carry one from a dry sunny forest of white and black oaks, white pine, and an occasional huckleberry or lowbush blueberry to a shaded valley buzzing with mosquitoes and containing red oak, tulip poplar, hemlock, and beech. In between might be chestnut and black birch, with the ubiquitous red maple appearing up and down the entire hillside.

Why a tree of a given species grew where it did was the result not only of ecological factors, such as climate, soil, and slope, but of history as well. A fire might shift a forest's composition from one group of species to another. A windstorm might blow over the mature trees of an entire tract of forest and allow the saplings growing beneath them to form a new canopy. Even a minor catastrophe, like the toppling of a single large tree, might create a microenvironment in the shadow of its uprooted base or in the sunlight of the newly broken canopy into which new species might move. Which species grew where in any particular place was thus the result of a cumulative sequence of ecological processes and historical events. The complexity of the precolonial ecosystem was one not merely of space but of time.²⁴

The depth of that time was very great. The period during which Indians had inhabited the area had seen climatic warming transform southern New England from the glacial tundra of 12,500 years ago to a series of forests composed in turn of spruce, white pine, and finally, by about 7,000 years ago, the oaks and other hardwoods typical of the forest today. Because climatic trends involved such important overall shifts in forest composition, we tend to think of past forests in terms of the same generalized "vegetation zones" which supposedly existed at the coming of the Europeans. But such generalizations obscure too many details. In fact, the shifting composition of postglacial forests involved the complicated migrations not of homogeneous forest communities but of many individual species, each arriving by different routes and at different rates. At the same time that the supposed "spruce forest" dominated Connecticut, *Spartina* grasses were colonizing salt marshes. When "hardwood forests" burned several thousand years ago, they were replaced as they are today with stands of white pine, and these were replaced in turn when they aged and experienced windfall by a still different hardwood forest. Catastrophes—whether of fire, wind, or disease—continued to create drastic alterations of specific habitats even as general climatic trends were continuing. Just under 5,000 years ago, the region's hemlocks experienced an attack by some pathogenic organism that nearly destroyed them; it took over half a millennium for the population to recover. Events of this kind were not merely cyclical or self-equilibrating. They constitute a history of the ecosystem in which a unique linear sequence was

imposed on the regularly recurring processes which ecology as a science seeks to describe.²⁵

When human beings, Indian or European, inhabited and altered New England environments, they were a part of that linear history. Their activities often mimicked certain ecological processes that occurred in nature, but with a crucial difference. Whereas the natural ecosystem tended toward a patchwork of diverse communities arranged almost randomly on the landscape—its very continuity depending on that disorder—the human tendency was to systematize the patchwork and impose a more regular pattern on it. People sought to give their landscape a new purposefulness, often by simplifying its seemingly chaotic tangle.

Different peoples of course did this in different ways. Moreover, they chose different sets of habitats, different parts of the patchwork, to live in and reorder. When the Europeans first came to New England, they found a world which had been home to Indian peoples for over 10,000 years. But the way Indians had chosen to inhabit that world posed a paradox almost from the start for Europeans accustomed to other ways of interacting with the environment. Many European visitors were struck by what seemed to them the poverty of Indians who lived in the midst of a landscape endowed so astonishingly with abundance. As Thomas Morton wrote, "If this Land be not rich, then is the whole world poore." Here was a riddle: how could a land be so rich and its people so poor? At least in the eyes of many colonists, the Indians, blessed with such great natural wealth, nevertheless lived "like to our Beggars in England." To explain why this was so—or, alternatively, why the colonists perceived New England's earlier inhabitants in this way—we must turn to the Indians and their reasons for living as they did.²⁶

3

SEASONS OF WANT AND PLENTY

In describing New England's natural abundance so enthusiastically, the colonists were misleading in two ways; in the process, they revealed the assumptions by which they misconstrued the supposed "poverty" of the Indians. Those who sought to promote colonial enterprises tended to put the best possible face on everything they encountered in the New World. Selective reporting, exaggeration, and outright lies could all be useful tools in accomplishing this task. Captain Christopher Levett felt it necessary to inform readers of his 1628 account of New England that he would not "as some have done to my knowledge, speak more than is true." English readers must not be taken in by descriptions which made New England out to be a veritable paradise of milk and honey. "I will not tell you," Levett wrote,

that you may smell the corn fields before you see the land; neither must men think that corn doth grow naturally, (or on trees,) nor will the deer come when they are called, or stand still and look on a man until he shoot him, not knowing a man from a beast; nor the fish leap into the kettle, nor

on the dry land, neither are they so plentiful, that you may dip them up in baskets, nor take cod in nets to make a voyage, which is no truer than that the fowls will present themselves to you with spits through them.

If the myths which Levett criticized had anything in common, it was their vision of a landscape in which wealth and sustenance could be achieved with little labor. Hopes for great windfall profits had fueled New World enterprises ever since the triumphs of Cortes, and were reinforced by traditions as old as the Garden of Eden. When English immigrants exaggerated the wealth of New England, they dreamed of a world in which returns to human labor were far greater than in England.¹

Because their hopes led them to expect a land of plenty, early visitors introduced a second distortion into their accounts. Even when what they wrote was literally true, they often failed to note that it was not *always* true. Just as the habitats of New England formed a patchwork quilt on the landscape, the plenty of one being matched by the poverty of another, so too did those habitats change from month to month, the abundance of one season giving few clues to what a place might be like at other times of the year. Most early descriptions were written by spring and summer visitors, who naturally saw only the times when fish, fruit, and fowl were all too numerous to count. Would-be English settlers thus formed their vision of New England from accounts that concentrated the summer's seasonal wealth into an image of perpetual abundance. If the result was not disaster, it was at least disappointment. "When I remember the high commendations some have given of the place," wrote one chastened colonist, "I have thought the reason thereof to be this, that they wrote surely in strawberry time."²

New England's seasonal cycles were little different from those of Europe. If anything, its summers were hotter and its winters colder. Colonists were prevented from realizing this only by their own high expectations of laborless wealth: many initially seemed to believe that strawberry time would last all year. Captain Levett wrote of one early attempt at settlement in which the colonists "neither applied themselves to planting of corn nor taking of fish, more than for their present use, but went about to build castles in the air, and making of forts, neglecting the plenti-

ful time of fishing." They did so because their myths told them that the plentiful times would never end, but their refusal to lay up stores for the winter meant that many starved to death. The pattern occurred repeatedly, whether at Sagadahoc, Plymouth, or Massachusetts Bay: colonists came without adequate food supplies and died. At Plymouth alone, half the Pilgrims were dead before the first winter was over. Those who had experienced the New England cold knew better, and warned that new arrivals who hoped to survive must bring provisions to last the year and a half before settlements could become self-sustaining. "Trust not too much on us for Corne at this time," wrote a spokesman for the Pilgrims, "for by reason of this last company that came, depending wholly upon us, we shall have little enough till harvest." This was hardly the advice one would send from a land of infinite plenty. The problem was perhaps stated most plaintively by the Massachusetts colonist John Pond, who in 1631 wrote his parents, "I pray you remember me as your child . . . we do not know how long we may subsist, for we cannot live here without provisions from ould eingland."³

In New England, most colonists anticipated that they would be able to live much as they had done in England, in an artisanal and farming community with work rhythms, class relations, and a social order similar to the one they had left behind—the only difference being their own improved stature in society. There were many misconceptions involved in this vision, but the one most threatening to survival was the simple fact that establishing European relations of production in the New World was a far more complicated task than most colonists realized. Even to set up farms was a struggle. Once colonists had done this, adjusting to the New England ecosystem by re-creating the annual agricultural cycles which had sustained them in England, starving times became relatively rare. But for the first year or two, before European subsistence patterns had been reproduced, colonists found themselves forced to rely either on what little they had brought with them or on what New England's inhabitants—whether English or Indian—were willing to provide. Few colonists expected that they would have to go abegging like this. At most, they contemplated supplementing their food stores by trading with the Indians; and as one promoter argued, should the Indians be reluctant to trade, it would be easy enough "to bring them all in

subjection, and make this provision." Many colonists arrived believing that they could survive until their first harvest simply by living as the Indians supposedly did, off the unplanted bounties of nature. Colonists were assured by some that Indian men got their livelihood with "small labour but great pleasure." Thomas Morton spoke of Indians for whom "the beasts of the forrest there doe serve to furnish them at any time when they please." If this were true, then surely Englishmen could do no worse. John Smith told his readers that, in New England, "nature and liberty affords us that freely which in *England* we want, or it costeth us deerly." The willingness of colonists to believe such arguments, and hazard their lives upon them, was testimony to how little they understood both the New England environment and the ways Indians actually lived in it.⁴

A central fact of temperate ecosystems like those of New England is their periodicity: they are tied to overlapping cycles of light and dark, high and low tides, waxing and waning moons, and especially the long and short days which mean hot and cold seasons. Each plant and animal species makes its adjustments to these various cycles, so that the flowing of sap in trees, the migration of birds, the spawning of fish, the rutting of deer, and the fruiting of plants all have their special times of the year. A plant that stores most of its food energy in its roots during the winter will transfer much of that energy first to its leaves and then to its seeds as the warmer months progress. Such patterns of energy concentration are crucial to any creature which seeks to eat that plant. Because animals, including people, feed on plants and other animals, the ways they obtain their food are largely determined by the cycles in which other species lead their lives. Just as a fox's summer diet of fruit and insects shifts to rodents and birds during the winter, so too did the New England Indians seek to obtain their food wherever it was seasonally most concentrated in the New England ecosystem. Doing so required an intimate understanding of the habits and ecology of other species, and it was this knowledge that the English discovered they lacked.⁵

Indian communities had learned to exploit the seasonal diversity of their environment by practicing mobility: their communities characteristically refused to stay put. The principal social and economic grouping for precolonial New England Indians

was the village, a small settlement with perhaps a few hundred inhabitants organized into extended kin networks. Villages, rather than the larger and better-known units called tribes or confederacies, were the centers around which Indian interactions with the environment revolved. But villages were not fixed geographical entities: their size and location changed on a seasonal basis, communities breaking up and reassembling as social and ecological needs required. Wherever villagers expected to find the greatest natural food supplies, there they went. When fish were spawning, many Indian families might gather at a single waterfall to create a dense temporary settlement in which feasting and celebration were the order of the day; when it was time to hunt in the fall, the same families might be found scattered over many square miles of land. All aspects of Indian life hinged on this mobility. Houses, consisting of wooden frames covered by grass mats or bark, were designed to be taken apart and moved in a few hours. For some groups, the shape of houses changed from season to season to accommodate different densities of population: small wigwams housing one or two families in the summer became in the winter extended longhouses holding many families. When food had to be stored while a village moved elsewhere, it was left in carefully constructed underground pit-barns, where it could be retrieved when needed. Tools and other property were either light and easily carried or just as readily abandoned and remade when needed in a new location. As Thomas Morton observed, "They love not to be cumbered with many utensils."⁶

The seasonal cycles within which a village moved depended on the habitats available to it: Indians who had access to the seashore, for instance, could lead rather different lives than their inland counterparts. Important as habitat differences were, however, the crucial distinction between Indian communities was whether or not they had adopted agriculture. In general, Indians south of the Kennebec River in Maine raised crops as part of their annual subsistence cycles; more northern Indians, on the other hand, as Verrazzano noted in 1524, showed "no sign of cultivation." Verrazzano quite reasonably attributed the absence of agriculture in the north to soil which would produce neither fruit nor grain "on account of its sterility": climatic conditions in fact made grain raising an increasingly risky business the farther

north an Indian people lived. Because the ability to grow crops had drastic implications for the way a village conducted the rest of its food-gathering activities, it is best to begin our description of Indian subsistence strategies in the north, where Indians were entirely dependent on the natural abundance of the ecosystem. Only in the north did Indians live entirely as hunter-gatherers, people who bore at least superficial resemblance to the creatures of English fantasy who captured nature's bounties with "small labor but great pleasure."⁷

In the north, spring commenced "when the leaves begin to sprout, when the wild geese appear, when the fawns of moose attain to a certain size in the bellies of their mothers, and when the seals bear their young." Most especially, the northern spring began when the ice broke up; then inland populations moved to coastal sites where they repaired fishing gear—nets, tackle, weirs, birchbark canoes—in anticipation of the spawning runs. For Maine Indians who had access to the coast, probably well over half the yearly food supply came from the rivers and seashore. In late March, the smelt arrived in streams and rivers in such quantities that one could not put a "hand into the water, without encountering them." They were followed in April by the alewives, sturgeon, and salmon, so that spawning runs furnished a major share of the food supply from March through May. By early May, nonspawning fish were also providing food. Offshore were cod which had to be caught with hook and line. Closer to land were tidewater and ground fish, such as brook trout, smelt, striped bass, and flounder, all of which could be caught with weirs and nets, and the larger sturgeon and salmon, which were usually harpooned. In the tidal zone were the scallops, clams, mussels, and crabs which women and children gathered as a steady base for the village diet. As described by the Jesuit Pierre Biard, this phase of the northern Indians' subsistence cycle was especially flush: "From the month of May up to the middle of September, they are free from all anxiety about their food; for the cod are upon the coast, and all kinds of fish and shellfish."⁸

The arrival of the alewives also heralded the coming of the migratory birds, including the large ducks which Biard called bustards, whose eggs were over twice as large as ordinary European hens' eggs. Not only could women and children gather

birds' eggs while men fished; they could capture the birds themselves with snares or clubs. Bird migrations made their biggest contribution to Indian food supplies in April, May, September, and October, when Canada geese, brants, mourning doves, and miscellaneous ducks passed through; other birds, albeit in fewer numbers, could be caught during the summer as well. By July and August, strawberries, raspberries, and blueberries were ripening, providing food not only for Indians but for flocks of passenger pigeons and other birds which nested in the area. In addition to birds, various coastal mammals—whales, porpoises, walruses, and seals—were hunted and eaten. Nuts, berries, and other wild plants were gathered as they became available. In all ways, the summer was a time of plenty.

Things changed in September. Toward the middle of the month, Indian populations moved inland to the smaller creeks, where eels could be caught as they returned from their spawning in the sea. From October through March, villages broke into small family bands that subsisted on beaver, caribou, moose, deer, and bear. Men were responsible for killing these animals, while women maintained the campsite and did all hauling and processing of the slaughtered meat. If snows were heavy and animals could be easily tracked, hunting provided an adequate food supply; if the snow failed to stay on the ground, on the other hand, it was easy to starve. Northern Indians accepted as a matter of course that the months of February and March, when the animals they hunted were lean and relatively scarce, would be times of little food.⁹

European visitors had trouble comprehending this Indian willingness to go hungry in the late winter months. They were struck by the northern Indians' apparent refusal to store more than a small amount of the summer's plenty for winter use. As the Jesuit Chrétien Le Clercq remarked:

They are convinced that fifteen to twenty lumps of meat, or of fish dried or cured in the smoke, are more than enough to support them for the space of five to six months. Since, however, they are a people of good appetite, they consume their provisions very much sooner than they expect. This exposes them often to the danger of dying from hunger, through lack of the provision which they could easily pos-

sess in abundance if they would only take the trouble to gather it.

Here again was the paradox of want in a land of plenty. To a European sensibility, it made no sense to go hungry if one knew in advance that there would be little food in winter. Colonists who starved did so because they learned too late how ill informed they had been about the New World's perpetual abundance. Although the myth died hard, those who survived it were reasonably quick to revise their expectations. When Europeans inquired why nonagricultural Indians did not do the same, the Indians replied, "It is all the same to us, we shall stand it well enough; we spend seven and eight days, even ten sometimes, without eating anything, yet we do not die." What they said was true: Indians died from starvation much less frequently than did early colonists, so there was a certain irony in European criticisms of Indians on this score. Whatever the contradictions of their own position, however, the colonists could not understand Indian attitudes toward winter food shortages. Consciously choosing hunger, rather than working harder in the leisurely times of summer, seemed a fool's decision.¹⁰

One effect of that choice, however, was to hold northern Indians to low population densities. The ecological principle known as Liebig's Law states that biological populations are limited not by the total annual resources available to them but by the minimum amount that can be found at the scarcest time of the year. Different species meet this restriction in different ways, and the mechanism—conscious or unconscious—whereby northern Indians restrained their fertility is not clear. However they accomplished this feat, its effects were self-evident: the low Indian populations of the precolonial northern forests had relatively little impact on the ecosystems they inhabited. The very abundance which so impressed the Europeans was testimony to this fact. By keeping population densities low, the food scarcities of winter guaranteed the abundance of spring, and contributed to the overall stability of human relationships to the ecosystem. In this, northern New England Indians were typical of hunting and gathering peoples around the world.¹¹

The farming Indians of southern New England, among whom the earliest English colonists made their settlements, also en-

gaged in hunting and gathering, but their ability to raise crops put them in a fundamentally different relationship with their environment. The very decision to engage in agriculture requires the creation of at least enough seed surplus to assure that planting can be done the following year, and opens the possibility of growing and storing enough food to carry a population through the winter with much less dependence on the vagaries of the hunt. Grain made up perhaps one-half to two-thirds of the southern New England diet, thereby reducing southern reliance on other foodstuffs; in comparison, northern Indians who raised no grain at all had to obtain two to three times more food energy from hunting and fishing. More importantly, nothing in the northern diet could be stored through the scarce times of winter as effectively as grain, making starvation a much less serious threat in the south than in the north.¹²

The ability of agriculture to smooth out the seasonal scarcities of wild foodstuffs had major consequences for the sizes of Indian populations in New England. The nonagricultural Indians of Maine sustained population densities, on average, of perhaps 41 persons per hundred square miles. The crop-raising Indians of southern New England, on the other hand, probably maintained 287 persons on an identical amount of land, a sevenfold difference. When these two broad groups were combined, the total Indian population of New England probably numbered somewhere between 70,000 and 100,000 people in 1600. (Lest this seem unimpressive, one should remember that the *English* population of New England was smaller than this even at the beginning of the eighteenth century, having reached only 93,000 people by 1700.) The crucial role of agriculture in maintaining so large an Indian population in precolonial New England is clear: although agricultural and nonagricultural peoples inhabited roughly equal areas of southern and northern New England respectively, those who raised crops contributed over 80 percent of the total population.¹³

Although southern Indians engaged in many of the same annual hunting and fishing activities as northern ones, their concentration on the raising of crops can be seen even in the names they gave their months. Northern Indians named their lunar months in terms of seasonal changes in animal populations, referring to the egg laying of birds, the running of salmon, the molting of geese, the hibernation of bears, and so on. By contrast,

southern Indians chose the names of their months with an entirely different emphasis. The fur trader John Pynchon recorded that the Agawam Indian village near Springfield, Massachusetts, began its year with the month of Squannikesos, which included part of April and part of May, and whose name meant "when they set Indian corn." This was followed by various months whose names indicated the weeding of corn, the hilling of corn, the ripening of corn, the coming of the frost, the middle of winter, the thawing of ice, and the catching of fish. The southern cycle of months was thus remarkable in having only a single reference to the animals which so dominated the northern calendar, an indication of how much agriculture had transformed Indian lives there.¹⁴

As the Agawam calendar shows, southern Indians began their annual subsistence cycles by moving to their summer fields and preparing the ground by working it with clamshell hoes. According to the Dutch traveler Isaack de Rasieres, the Indians "make heaps like molehills, each about two and a half feet from the others, which they sow or plant in April with maize, in each heap five or six grains." Because the earth was not stirred deeply by this method, much of the soil was left intact and erosion was thereby held to a minimum. As the young plants grew, soil was raised around them to create low mounds which strengthened their roots against the attacks of birds. Maize was not an easy crop to raise: as de Rasieres noted, it was "a grain to which much labor must be given, with weeding and earthing-up, or it does not thrive." Perhaps partly for this reason, Indian farmers, unlike European ones, used their cornfields to raise more than just corn. When Champlain observed Indian fields near the mouth of the Saco River, he noted that

with the corn they put in each hill three or four Brazilian beans [kidney beans], which are of different colors. When they grow up, they interlace with the corn, which reaches to the height of from five to six feet; and they keep the ground very free from weeds. We saw there many squashes, and pumpkins, and tobacco, which they likewise cultivate.

It was not an agriculture that looked very orderly to a European eye accustomed to monocultural fields. Cornstalks served as

beanpoles, squashes sent their tendrils everywhere, and the entire surface of the field became a dense tangle of food plants. But, orderly or not, such gardens had the effect, as John Winthrop, Jr. said, of "loading the Ground with as much as it will beare," creating very high yields per acre, discouraging weed growth, and preserving soil moisture. Moreover, although Indians may or may not have realized it, the resulting harvest of beans and corn provided the amino acids necessary for a balanced diet of vegetable protein.¹⁵

Except for tobacco, crops were primarily the responsibility of women. Roger Williams wrote that Indian women "constantly beat all their corne with hand: they plant it, dresse it, gather it, barne it, beat it, and take as much paines as any people in the world" with it. As with the hunting Indians of northern New England, the sexual division of labor for the agricultural peoples of southern New England was very well defined, women performing those jobs which were most compatible with simultaneous child-care. This meant tasks which were generally repetitive, which could be easily interrupted, which did not require travel too far from home, and which did not suffer if one performed them while giving most of one's attention to the children. In the nonagricultural north, women's work involved gathering shellfish and birds on the shore, collecting wild plants, trapping small rodents, making garments, keeping camp, and the whole range of food-processing activities; but meat gathered by men probably supplied half or more of a village's food. In the south, on the other hand, agriculture changed this sexual division and made women much more important than men in providing food. A single Indian woman could raise anywhere from twenty-five to sixty bushels of corn by working an acre or two, enough to provide half or more of the annual caloric requirements for a family of five. When corn was combined with the other foods for which they were responsible, women may have contributed as much as three-fourths of a family's total subsistence needs.¹⁶

Crops were planted between March and late June, the event often being timed by the leafing of certain trees or the arrival of the alewives. While women worked the fields, men erected weirs on the rivers and fished the spring spawning runs. By March, most beans and corn remaining from the previous harvest were probably needed as seed for planting, so that fish and migratory

birds became the chief sources of food from late winter through midsummer. Contrary to what American myth has long held, it is quite unlikely that alewives or other fish were used as fertilizer in Indian fields, notwithstanding the legendary role of the Pilgrims' friend Squanto in teaching colonists this practice. Squanto probably learned the technique while being held captive in Europe, and if any Indians used it in New England, they did so in an extremely limited area. Having no easy way to transport large quantities of fish from river to field, and preferring quite sensibly to avoid such back-breaking work, Indians simply abandoned their fields when the soil lost its fertility. As William Wood wrote, "The Indians who are too lazy to catch fish plant corn eight or ten years in one place without it, having very good crops." Fertilizing fields with fish, as the English eventually did, seemed to Indians a wholly unnecessary labor.¹⁷

Once crops were planted and weeded, they needed less attention for two or three months, until the ripening corn had to be guarded against marauding birds before being harvested. (De Rasieres explained how some birds, probably passenger pigeons, were known as "maize thieves" because "they flatten the corn in any place where they alight, just as if cattle had lain there.") During these months, villages tended to disperse and families moved their individual wigwams to other planting and gathering sites. Women, who owned the wigwams and most household goods, moved their camps from field to field as necessary, and then to points along the coast where they gathered seafood and the cattails used in making mats for wigwams. Camps occasionally had to be moved in the summer simply to escape the fleas which tended to breed around human habitations. Wigwams were also moved if a death occurred in one, or if a settlement was threatened by war.¹⁸

Men fanned out from these bases for extended fishing and hunting trips. They might disappear into the woods for ten days at a time to build a dugout canoe that would allow them to fish deep water with harpoon or hook and line. Southern New England boats were made from decay-resistant chestnut and were heavy enough to require several hands to launch; in the north, paper birch, which did not grow in southeastern New England, was used to create the much lighter and more familiar birchbark canoes. Whether birch or chestnut, these tippy boats might be

taken a mile or more offshore at night to hunt sturgeon by torchlight, or be run down the rapids of rivers in search of salmon or eels. Used for these purposes, canoes could be very dangerous indeed. Roger Williams spoke from personal experience when he said, "It is wonderfull to see how they will venture in those Canoes, and how (being oft overset as I have myself been with them) they will swim a mile, yea two or more safe to Land." Such danger was typical of male work. Whereas the relatively steady labor of agriculture and gathering allowed women to provide the largest share of a village's food without moving far from home, the hunting and fishing of animal protein had much different requirements. These activities took men far from the main camp for many days at a time, and exposed them to much greater risk of injury or death. Hunting and fishing both had irregular work rhythms which sometimes required many intense hours of labor under hard conditions, and sometimes long hours of idleness. Times in camp were often periods of relative leisure and recuperation for men.¹⁹

As summer drew to a close, female food production reached a climax and male hunting activities began to contribute a greater share of the village's food. Autumn saw the harvesting of corn in addition to the gathering of acorns, chestnuts, groundnuts, and other wild plants. It was a time of extensive festivals when many hundreds of people gathered in dense settlements and consumed much of this surplus food. Gambling, dancing, and eating were combined with rituals—similar to the potlatch ceremonies of the Pacific Northwest—in which wealthy individuals gave away much of what they owned to establish reciprocal relations of obligation with potential followers or allies. The harvest saw greater surplus than any other time of year, and so was often the preferred season for going to war, when food stores both at home and in enemy territory would be at their peak. But once the harvest celebrations were over, Indian households struck their wigwams, stored the bulk of their corn and beans, and moved to campsites to conduct the fall hunt.²⁰

From October to December, when animals like bear and deer were at their fattest, southern villages, much like their counterparts in the north, broke into small bands to assure maximum coverage of the hunting territory. Again the sexual division of labor came into play. Men hunted steadily, using a variety of

techniques. Game might be stalked with bow and arrow by a lone hunter or by groups of two or three hundred men working together. It might be snared with traps specially designed to capture a single species; William Bradford, for instance, accidentally walked into a trap strong enough to hold a full-grown deer. Or game might be run between specially planted hedges more than a mile in length until it was finally driven onto the weapons of waiting hunters. Nothing required a greater knowledge of animal behavior than the winter hunt. While men remained in the field, women hauled dead game back to camp. There they butchered and processed it, preparing the hides for clothing, cooking the meat, and smoking some of it for use later in the winter.²¹

By late December, when the snows finally came, the village had probably reassembled in heavily wooded valleys well protected from the weather, where fuel for campfires was easy to obtain. For the rest of the winter, men continued to hunt and fish the surrounding area on snowshoes, while women remained in camp making garments and living on meat and stored grain. Especially for men away from camp, winter was a time of occasional hunger between kills; most carried only a small store of parched corn flour called *nocake* as traveling fare. Like their hunting kindred to the north, they accepted such hunger as inevitable and bore it with stoicism. As Samuel Lee reported, the Indians were "very patient in fasting, & will gird in their bellies till they meet with food; but then none more gluttons or drunk on occasion. Theyle eat 10 times in 24 houres, when they have a beare or a deere."²²

The hunt provided a crucial source of protein and vitamins during the winter. A single season's catch for a southern New England village of about 400 inhabitants might bring in over 8,500 pounds of edible deer meat and over 7,000 pounds of bear, the two animals which together contributed more than three-fourths of an inland village's winter meat supply. (Coastal Indians who relied more heavily on seafood killed smaller amounts of large game.) Whether or not this meat was essential to a community's survival—given the availability of stored beans and grain—the skins of these and other furbearing animals would furnish the village's clothing for the following year. Simple measurements of caloric content thus tend to undervalue the importance of the fall and winter hunt to an agricultural village's

subsistence cycle. Hundreds of square miles had to be stalked to obtain skins for the skirts, leggings, shirts, moccasins, and other articles of clothing Indians would need in the months ahead.¹¹

The relationship of the southern New England Indians to their environment was thus, if anything, even more complicated than that of the northern Indians. To the seasons of hunting and fishing shared by both groups were added the agricultural cycles which increased the available food surplus and so enabled denser populations to sustain themselves. In both areas, the mobility of village sites and the shift between various subsistence bases reduced potential strains on any particular segment of the ecosystem, keeping the overall human burden low. But in clearing land for planting and thus concentrating the food base, southern Indians were taking a most important step in reshaping and manipulating the ecosystem.

Clearing fields was relatively easy. By setting fire to wood piled around the base of standing trees, Indian women destroyed the bark and so killed the trees; the women could then plant corn amid the leafless skeletons that were left. During the next several years, many of the trees would topple and could be entirely removed by burning. As one Indian remembered, "An industrious woman, when great many dry logs are fallen, could burn off as many logs in one day as a smart man can chop in two or three days time with an axe." However efficient they were at such clearing, Indian women were frugal with their own labor, and sought to avoid even this much work for as long as they could. That meant returning to the same field site for as long as possible, usually eight to ten years. In time, the soil gradually lost its fertility and eventually necessitated movement to a new field. (Soil exhaustion was to some extent delayed by the action of the nitrogen-fixing beans which Indian women planted with the corn; whether they were aware of it or not, this was one of the side benefits of planting multicrop fields.)¹²

The annual reoccupation of fixed village and planting sites meant that the area around field and camp experienced heavy human use: intensive food gathering, the accumulation of garbage, and, most importantly, the consumption of firewood. One of the main reasons Indians moved to winter camps was that their summer sites had been stripped of the fuel essential for winter fires. Indians believed in big fires—one colonist said that

"their Fire is instead of our bed cloaths"—and burned wood heavily all night long, both summer and winter. Such practices could not long be maintained on a single site. As Morton said, "They use not to winter and summer in one place, for that would be a reason to make fuell scarce." The Indians were thus no strangers to the fuel shortages so familiar to the English, even if Indian scarcities were more local. When Verrazzano found twenty-five to thirty leagues of treeless land in Narragansett Bay, or Higginson spoke of thousands of acres in a similar state near Boston, they were observing the effects of agricultural Indians returning to fixed village sites and so consuming their forest energy supply. Indeed, when the Indians wondered why English colonists were coming to their land, the first explanation that occurred to them was a fuel shortage. Roger Williams recounted:

This question they oft put to me: Why come the *Englishmen* hither? and measuring others by themselves; they say, It is because you want *firing*: for they, having burnt up the *wood* in one place, (wanting draughts [animals] to bring *wood* to them) they are faine to follow the *wood*; and so to remove to a fresh new place for the *woods* sake.

Williams regarded this merely as a quaint instance of Indian provincialism, but in one ironic sense, given what we know of the English forests of the seventeenth century, the Indians were perhaps shrewder than he knew.¹³

The effect of southern New England Indian villages on their environment was not limited to clearing fields or stripping forests for firewood. What most impressed English visitors was the Indians' burning of extensive sections of the surrounding forest once or twice a year. "The Salvages," wrote Thomas Morton, "are accustomed to set fire of the Country in all places where they come, and to burne it twize a yeare, viz: at the Spring, and the fall of the leafe." Here was the reason that the southern forests were so open and parklike; not because the trees naturally grew thus, but because the Indians preferred them so. As William Wood observed, the fire "consumes all the underwood and rubbish which otherwise would overgrow the country, making it unpassable, and spoil their much affected hunting." The result was a forest of large, widely spaced trees, few shrubs, and much grass and herb-

age. "In those places where the Indians inhabit," said Wood, "there is scarce a bush or bramble or any cumbersome underwood to be seen in the more champion ground." By removing underwood and fallen trees, the Indians reduced the total accumulated fuel at ground level. With only small nonwoody plants to consume, the annual fires moved quickly, burned with relatively low temperatures, and soon extinguished themselves. They were more ground fires than forest fires, not usually involving larger trees, and so they rarely grew out of control. Fires of this kind could be used to drive game for hunting, to clear fields for planting, and, on at least one occasion, to fend off European invaders.²⁶

Northern Indians do not appear to have engaged in such burning. Because they did not practice agriculture and so were less tied to particular sites, they had less incentive to alter the environment of a given spot. Their chief mode of transportation was the canoe, so that they had less need of an open forest for traveling. Moreover, many of the northern tree species were not well adapted to repeated burning, and northern forests tended to accumulate enough fuel at ground level that, once a fire got started, it usually reached the canopy and burned out of control. Conditions in southern New England were quite different. Denser, fixed settlements encouraged heavy use of more limited forest areas, and most inland travel was by land. The trees of the southern forest, once fully grown, suffered little more than charred bark if subjected to ground fires of short duration. If destroyed, they regenerated themselves by sprouting from their roots: chestnuts, oaks, and hickories, the chief constituents of the southern upland forests, are in fact sometimes known as "sprout hardwoods." Repeated fires tended to destroy trees and shrubs which lacked this ability, including hemlock, beech, and juniper. Even the white pine, which often sprang up after large forest fires, tended to be killed off if subjected to regular burning because of its inability to sprout, and so was uncommon in the vicinity of active Indian settlements.²⁷

Colonial observers understood burning as being part of Indian efforts to simplify hunting and facilitate travel; most failed to see its subtler ecological effects. In the first place, it increased the rate at which forest nutrients were recycled into the soil, so that grasses, shrubs, and nonwoody plants tended to grow more luxuriantly following a fire than they had before. Especially on old

Indian fields, fire created conditions favorable to strawberries, blackberries, raspberries, and other gatherable foods. Grasses like the little bluestem were rare in a mature forest, but in a forest burned by Indians they became abundant. The thinning of the forest canopy, which resulted from the elimination of smaller trees, allowed more light to reach the forest floor and further aided such growth. The soil became warmer and drier, discouraging tree species which preferred moister conditions—beech, sugar maple, red maple, black birch—and favoring drier species like oaks when regular burning was allowed to lapse. Burning also tended to destroy plant diseases and pests, not to mention the fleas which inevitably became abundant around Indian settlements. Roger Williams summed up these effects by commenting that "this burning of the Wood to them they count a Benefit, both for destroying of vermin, and keeping downe the Weeds and thickets."²⁸

Selective Indian burning thus promoted the mosaic quality of New England ecosystems, creating forests in many different states of ecological succession. In particular, regular fires promoted what ecologists call the "edge effect." By encouraging the growth of extensive regions which resembled the boundary areas between forests and grasslands, Indians created ideal habitats for a host of wildlife species. Of all early American observers, only the astute Timothy Dwight seems to have commented on this phenomenon. "The object of these conflagrations," he wrote, "was to produce fresh and sweet pasture for the purpose of alluring the deer to the spots on which they had been kindled." The effect was even subtler than Dwight realized: because the enlarged edge areas actually raised the total herbivorous food supply, they not merely attracted game but helped create much larger populations of it. Indian burning promoted the increase of exactly those species whose abundance so impressed English colonists: elk, deer, beaver, hare, porcupine, turkey, quail, ruffed grouse, and so on. When these populations increased, so did the carnivorous eagles, hawks, lynxes, foxes, and wolves. In short, Indians who hunted game animals were not just taking the "unplanted bounties of nature"; in an important sense, they were harvesting a foodstuff which they had consciously been instrumental in creating.²⁹

Few English observers could have realized this. People accus-

tomed to keeping domesticated animals lacked the conceptual tools to realize that Indians were practicing a more distant kind of husbandry of their own. To the colonists, only Indian women appeared to do legitimate work; the men idled away their time in hunting, fishing, and wantonly burning the woods, none of which seemed like genuinely productive activities to Europeans. English observers often commented about how hard Indian women worked. "It is almost incredible," Williams wrote, "what burthens the poore women carry of *Corne*, of *Fish*, of *Beans*, of *Mats*, and a childe besides." The criticism of Indian males in such remarks was usually explicit. "Their wives are their slaves," wrote Christopher Levett, "and do all the work; the men will do nothing but kill beasts, fish, etc." For their part, Indian men seemed to acknowledge that their wives were a principal source of wealth and mocked Englishmen for not working their wives harder. According to the lawyer Thomas Lechford, "They say, *Englishman* much foole, for spoiling good working creatures, meaning women: And when they see any of our *English* women sewing with their needles, or working coifes, or such things, they will cry out, Lazie squaes."¹⁰

Part of the problem with these cross-cultural criticisms was the inability or refusal by either side to observe fully how much each sex was contributing to the total food supply. Indian men, seeing Englishmen working in the fields, could not understand why English women were not doing such work. At the same time, they failed to see the contributions colonial women were actually making: gardening, cooking, spinning and weaving textiles, sewing clothing, tending milch cows, making butter and cheese, caring for children, and so on. The English, for their part, had trouble seeing hunting and fishing—which most regarded as leisure activities—as involving real labor, and so tended to brand Indian men as lazy. "The Men," wrote Francis Higginson, "for the most part live idely, they doe nothing but hunt and fish: their wives set their *Corne* and doe all their other worke." It is quite possible that Indian women—like women in many cultures—did indeed bear a disproportionate share of the work burden. But even if the advent of agriculture in southern New England had shifted the balance between meat and vegetables in the Indian diet—lowering the importance of meat and incidentally changing the significance of each sex's role in acquiring food—the annual subsistence cycle still saw Indian communities giving

considerable attention to hunting meat, the traditionally more masculine activity. As we shall see, the English used this Indian reliance on hunting not only to condemn Indian men as lazy savages but to deny that Indians had a rightful claim to the land they hunted. European perceptions of what constituted a proper use of the environment thus reinforced what became a European ideology of conquest.¹¹

The relationships of the New England Indians to their environment, whether in the north or the south, revolved around the wheel of the seasons: throughout New England, Indians held their demands on the ecosystem to a minimum by moving their settlements from habitat to habitat. As one of the earliest European visitors noted, "They move . . . from one place to another according to the richness of the site and the season." By using other species when they were most plentiful, Indians made sure that no single species became overused. It was a way of life to match the patchwork of the landscape. On the coast were fish and shellfish, and in the salt marshes were migratory birds. In the forests and lowland thickets were deer and beaver; in cleared upland fields were corn and beans; and everywhere were the wild plants whose uses were too numerous to catalog. For New England Indians, ecological diversity, whether natural or artificial, meant abundance, stability, and a regular supply of the things that kept them alive.¹²

The ecological relationships which the English sought to reproduce in New England were no less cyclical than those of the Indians; they were only simpler and more concentrated. The English too had their seasons of want and plenty, and rapidly adjusted their false expectations of perpetual natural wealth to match New World realities. But whereas Indian villages moved from habitat to habitat to find maximum abundance through minimal work, and so reduce their impact on the land, the English believed in and required permanent settlements. Once a village was established, its improvements—cleared fields, pastures, buildings, fences, and so on—were regarded as more or less fixed features of the landscape. English fixity sought to replace Indian mobility; here was the central conflict in the ways Indians and colonists interacted with their environments. The struggle was over two ways of living and using the seasons of the year, and it expressed itself in how two peoples conceived of property, wealth, and boundaries on the landscape.

NOTES

1. *The View from Walden*

1. Henry David Thoreau, *The Journal of Henry D. Thoreau*, Bradford Torrey and Francis H. Allen, eds., 2 vols. (original edition, 1906, New York, 1962), VII, pp. 132-7 (January 24, 1855).
2. *Ibid.*, VIII, pp. 220-1 (March 23, 1856).
3. Edward Johnson, *Johnson's Wonder-Working Providence*, J. Franklin Jameson, ed. (New York, 1910), p. 210; Benjamin Rush, *Essays, Literary, Moral and Philosophical*, 2nd ed. (Philadelphia, 1806), p. 221.
4. Timothy Dwight, *Travels in New England and New York* (1821), Barbara Miller Solomon, ed. (Cambridge, MA, 1969), IV, p. 186.
5. H. I. Winer, *History of the Great Mountain Forest, Litchfield County, Connecticut*, Ph.D. Thesis, Yale University, 1955, pp. 98-9; Thomas G. Siccama, "Presettlement and Present Forest Vegetation in Northern Vermont with Special Reference to Chittenden County," *American Midland Naturalist*, 85 (1971), pp. 153-72.
6. For a review of the literature using these techniques, see the bibliographical essay.
7. Marquis de Chastellux, *Travels in North America in the Years 1780, 1781 and 1782* (1786), Howard C. Rice, Jr., ed. (Chapel Hill, 1963), I, p. 78.
8. Winer, *Great Mountain Forest*, p. 78; Thoreau, *Journal*, VII, p. 133 (January 24, 1855); Chastellux, *Travels*, I, p. 78; Peter Kalm, *Travels in North America* (1753-61, 1770), Adolph B. Benson, ed., 2 vols. (New York, 1964), p. 50; J. Gordon Ogden III, "Forest History of Martha's Vineyard, Massachusetts: I. Modern and Pre-Colonial Forests," *American Midland Naturalist*, 66 (1961), p. 426; Stanley W. Bromley, "The Original Forest Types of Southern New England," *Ecological Monographs*, 5 (1935), pp. 72-6; Austin F. Hawes, "New England Forests in Retrospect," *Journal of Forestry*, 21 (March 1923), p. 209. On problems of animal nomenclature, see Frederick W. Warner, "The Foods of the Connecticut Indians," *Bulletin of the Archaeological Society of Connecticut*, 37 (1972), pp. 27-9.
9. Literally, "after this, therefore because of this." For a discussion, see David Hackett Fischer, *Historians' Fallacies* (New York, 1970), pp. 166-7.

10. Donald Worster, *Nature's Economy* (San Francisco, 1977), Part IV, Ronald C. Tobey, *Saving the Prairies* (Berkeley, 1981).
11. For examples, see Hugh M. Raup and Reynold E. Carlson, "The History of Land Use in the Harvard Forest," *Harvard Forest Bulletin*, 20 (1941), p. 59; George E. Nichols, "The Vegetation of Connecticut. II. Virgin Forests," *Torreya*, 13 (1913), pp. 199-215; for a critique, see Margaret B. Davis, "Phytogeography and Palynology of Northeastern United States," in H. E. Wright and David G. Frey, eds., *The Quaternary of the United States* (Princeton, 1965), pp. 382-5, 397.
12. The crucial essay in promoting the ecosystem concept was A. G. Tansley, "The Use and Abuse of Vegetational Concepts and Terms," *Ecology*, 16 (1935), pp. 284-307, which is well discussed in Tobey, *Saving the Prairies*, Chapter 6; see also H. A. Gleason, "The Individualistic Concept of Plant Association," *Bulletin of the Torrey Botanical Club*, 53 (1926-27), pp. 7-26.
13. Francis Jennings, *The Invasion of America* (Chapel Hill, 1975), p. 15.
14. For sources on ecological anthropology, which has engaged in some of the most interesting discussions of this nature/culture problem, see the bibliographical essay. The two analyses referred to in the text are Roy A. Rappaport, *Pigs for the Ancestors* (New Haven, 1968); and Marvin Harris, "The Cultural Ecology of India's Sacred Cattle," *Current Anthropology*, 7 (1966), pp. 51-9. For a historian who has tried to apply similar notions to an American Indian case study, see Calvin Martin, *Keepers of the Game* (Berkeley, 1978).
15. A critique of functionalism comparable to the one I offer here can be found in Jonathan Friedman, "Marxism, Structuralism and Vulgar Materialism," *Man*, N.S., 9 (1974), pp. 444-69. Rappaport's response to such criticisms is "Ecology, Adaptation and the Ills of Functionalism," *Michigan Discussions in Anthropology*, 2 (Winter 1977), pp. 138-90; Friedman's counter-response is quite suggestive for historians: "Hegelian Ecology: Between Rousseau and the World Spirit," in P. C. Burnham and R. F. Ellen, eds., *Social and Ecological Systems* (New York, 1979), pp. 253-70. See also Maurice Godelier, "Anthropology and Economics," in Godelier, *Perspectives in Marxist Anthropology* (Cambridge, England, 1977), pp. 15-62.
16. Alfred W. Crosby, Jr., *The Columbian Exchange* (Westport, CT, 1972); W. H. McNeill, *Plagues and Peoples* (New York, 1976).
17. See Catherine S. Fowler, "Ethnoecology," in Donald L. Hardesty, *Ecological Anthropology* (New York, 1977), pp. 215-43, for an introduction to such methods.
18. Thoreau, *Journal*, VIII, p. 221 (March 23, 1856).

2. Landscape and Patchwork

1. My initial sentence notwithstanding, the geographer Carl Sauer makes the important point that, for all of the differences, there were

- many similarities between New England and England: "It would be impossible, indeed, to cross an ocean anywhere else and find as little unfamiliar in nature on the opposite side." ("The Settlement of the Humid East," in *USDA Yearbook, Climate and Man* [Washington, D.C., 1941], p. 159.) Sauer refers primarily to the individual species that were present in New England, whereas my argument speaks most directly to the populations of those species and the ecological relationships they bore to one another.
2. James Rosier, "A True Relation of the Voyage of Captaine George Waymouth, 1605," in Henry S. Burrage, ed., *Early English and French Voyages* (New York, 1906), p. 366; Richard Hakluyt, *Discourse Concerning Western Planting* (1584), in E. G. R. Taylor, ed., *Original Writings and Correspondences of the Two Richard Hakluyts* (Hakluyt Society, 1935), II, pp. 211-327. For problems of how to interpret words like "commodities" and "profits," see the *Oxford English Dictionary*, and the fuller discussion of these issues in Chapters 4 and 5.
 3. John U. Nef, "An Early Energy Crisis and Its Consequences," *Scientific American*, 237:5 (November 1977), pp. 140-51; Nef, *The Rise of the British Coal Industry* (London, 1932); Carl Bridenbaugh, *Vexed and Troubled Englishmen* (New York, 1968), pp. 64, 98-101, 149; Charles F. Carroll, *The Timber Economy of Puritan New England* (Providence, 1973), pp. 3-21.
 4. Martin Pring, "A Voyage Set Out from the Citie of Bristoll, 1603," in Burrage, *Early Voyages*, p. 349.
 5. Douglas R. McManis, *European Impressions of the New England Coast, 1497-1620*, University of Chicago Department of Geography Research Paper No. 139 (Chicago, 1972), pp. 116-33, is good on this theme.
 6. Francis Higginson, *New-Englands Plantation* (1630), *Massachusetts Historical Society Proceedings*, 62 (1929), p. 311; John Brereton, "Briefe and True Relation of the Discoverie of the North Part of Virginia, 1602," in Burrage, *Early Voyages*, p. 331; William Wood, *New England's Prospect* (1634), Alden T. Vaughan, ed. (Amherst, 1977), p. 56; Thomas Morton, *New English Canaan* (1632), Charles F. Adams, ed., *Pubs. of the Prince Society*, XIV (Boston, 1883), p. 222; John Josselyn, *An Account of Two Voyages to New England* (1675), in *Massachusetts Historical Society Collections*, 3rd ser., 3 (1833), p. 273.
 7. Wood, *Prospect*, pp. 50-2; Morton, *Canaan*, p. 193; Higginson, *Plantation*, pp. 313-14; Josselyn, *Two Voyages*, p. 277; A. W. Schorger, *The Wild Turkey: Its History and Domestication* (Norman, OK, 1966), pp. 3-18. Wood's statement that some had killed fifty birds "at a shot" does not mean with a single gunshot but in a single hunting location. He and other seventeenth-century writers used "shot" in analogy with fishing, where the word means not only the single cast of a net but also the place from which nets are cast. See the *Oxford English Dictionary*.
 8. Josselyn, *Two Voyages*, p. 278; Wood, *Prospect*, p. 50; William Hammond to Sir Simonds D'Ewes, September 26, 1633, in Everett Emer-

- son, ed., *Letters from New England* (Amherst, 1976), p. 111; Thomas Dudley to Lady Bridget, Countess of Lincoln, March 12 and 18, 1631/3, *Emerson, Letters*, p. 81; A. W. Schorger, *The Passenger Pigeon: Its Natural History and Extinction* (Madison, 1955), pp. 3-13.
9. Higginson, *Plantation*, p. 310; Morton, *Canaan*, p. 199; Hammond to D'Ewes, in *Emerson, Letters*, p. 111.
10. John Josselyn, *New-Englands Rarities Discovered* (1672), in *Transactions and Collections of the American Antiquarian Society*, 4 (1860), pp. 147-8; Wood, *Prospect*, pp. 32, 51; Morton, *Canaan*, p. 214; Higginson, pp. 312-13; Hammond to D'Ewes, in *Emerson, Letters*, p. 110; Philip J. Greven, Jr., *Four Generations* (Ithaca, 1970), pp. 24-26; James A. Henretta, *The Evolution of American Society, 1700-1815* (Lexington, MA, 1973), pp. 9-15; but on epidemics, see also John Duffy, *Epidemics in Colonial America* (Baton Rouge, 1953), and Thomas Dudley, in *Emerson, Letters*, pp. 72, 76.
11. Emmanuel Altham to Sir Edward Altham, March 1623/24, in Sidney V. James, Jr., ed., *Three Visitors to Early Plymouth* (Plymouth Plantation, 1963), p. 36; Wood, *Prospect*, p. 38; Higginson, *Plantation*, p. 114.
12. Lawrence C. Wroth, ed., *The Voyages of Giovanni de Verrazzano, 1522-1528* (New Haven, 1970), p. 139; Wood, *Prospect*, pp. 38, 59; Higginson, *Plantation*, p. 308; John Winthrop, *Winthrop's Journal*, James Kendall Hosmer, ed. (New York, 1908), I, p. 258.
13. Wroth, *Verrazzano*, p. 140; McManis, *European Impressions*, pp. 49-67, 90-115; Josselyn, *Two Voyages*, p. 256; Morton, *Canaan*, p. 185; Howard W. Lull, *A Forest Atlas of the Northeast* (Upper Darby, PA, Northeastern Forest Experiment Station, 1968), pp. 23, 33; John Smith, *The Generall Historie of Virginia* (1624), facsimile reprint, Readex Microprint (1966), pp. 214-15. Note Verrazzano's poor identification of species; and note too that even Smith thought the forbidding Maine coastal forest might be obscuring more fertile country inland.
14. Maps of New England vegetation zones can be found in Lull, *Forest Atlas*, p. 7; Marinus Westveld, et al., "Natural Forest Vegetation Zones of New England," *Journal of Forestry*, 54 (1956), pp. 332-8; and A. W. Kuchler's "Potential Natural Vegetation of the Conterminous United States," *American Geographical Society Special Publications*, 36 (1964), of which the most convenient copy is the one in the *National Atlas*. For a critique of such maps, see Margaret B. Davis, "Phytogeography and Palynology of Northeastern United States," in H. E. Wright and David G. Frey, eds., *The Quaternary of the United States* (Princeton, 1965), p. 381.
15. Rosier, "Voyage of George Waymouth," in Burrage, *Early Voyages*, pp. 384-5. Burrage believed that the river from which Rosier marched was the St. George's.
16. Higginson, *Plantation*, pp. 307-8.
17. Wood, pp. 38-9; John C. Huden, "Indian Place Names of New England," *Contributions from the Museum of the American Indian*, Heye Foundation, New York, 18 (1962)—see, for instance, entries for

- Ohomowauke Swamp in Rhode Island and for Copecut, Massachusetts. Cf. Roger Williams, *A Key into the Language of America* (1643), John J. Teunissen and Evelyn J. Hinz, eds. (Detroit, 1973), p. 150.
18. Huden, "Indian Place Names," entries for Quawawehunk and Tatomuck; Morton, *Canaan*, pp. 184-5. I have avoided cluttering the text with alternative interpretations, but should note that I may be misreading Morton here. He makes an explicit distinction between cedar and cypress which sounds to me like the one between red and white cedars. I have chosen to read his "cedar" as "white cedar" because doing so creates no real distortions in my characterization of the tree's habitat, but he may well have meant something else. There are no true cedars in North America, so the problem of nomenclature here is a vexing one.
19. Lull, *Forest Atlas*, pp. 19, 33; Smith, *Generall Historie*, p. 215; Alexander Young, ed., *Chronicles of the Pilgrim Fathers* (Boston, 1841), pp. 123-4.
20. Neil Jorgensen, *A Sierra Club Naturalist's Guide to Southern New England* (San Francisco, 1978), pp. 238-48; Silas Little, "Effects of Fire on Temperate Forests: Northeastern United States," in T. T. Kozlowski and C. E. Ahlgren, eds., *Fire and Ecosystems* (New York, 1974), esp. pp. 237-42.
21. Morton, *Canaan*, p. 184; Timothy Dwight, *Travels in New England and New York* (1821), Barbara Miller Solomon, ed. (Cambridge, MA, 1969), I, p. 21; IV, p. 151; Stanley W. Bromley, "The Original Forest Types of Southern New England," *Ecological Monographs*, 5 (1935), pp. 72-6. Note the nomenclature problem again: Morton could have been describing either a pitch pine forest or a tract of white pine on an outwash plain. The general argument I make here is nevertheless sound. For further details on fire ecology, see the discussion in Chapter 3.
22. Morton, *Canaan*, p. 227; Wood, *Prospect*, pp. 56-7; *Emerson, Letters*, p. 106.
23. Wood, *Prospect*, pp. 34, 51-2; John Smith, "Advertisements for the Unexperienced Planters of New-England," *Massachusetts Historical Society Collections*, 3rd series, 3 (1833), p. 37; Higginson, *Plantation*, p. 308; *Emerson, Letters*, p. 214. On the ecology of salt marshes, see Alfred C. Redfield, "Development of a New England Salt Marsh," *Ecological Monographs*, 42 (1972), pp. 201-37; and John and Mildred Teal's beautifully written *Life and Death of the Salt Marsh* (New York, 1969), esp. Part I.
24. On slope diversity and forest types, see Jorgensen, *Sierra Club Guide*, pp. 122-203, esp. 126-7; Bromley, "Original Forest Types"; George E. Nichols, "The Vegetation of Connecticut: II. Virgin Forests," *Torreyana*, 13 (1913), pp. 199-215; and on northern hardwood forests, which I ignore here, A. C. Cline and S. H. Spurr, "The Virgin Upland Forest of Central New England," *Harvard Forest Bulletin*, 21 (1942), pp. 1-58. On the role of historical catastrophes in determining forest composition, see J. D. Henry and J. M. A. Swan, "Reconstructing

- Forest History from Live and Dead Plant Material," *Ecology*, 55 (1974), pp. 772-83; C. D. Oliver and E. P. Stephens, "Reconstruction of a Mixed-Species Forest in Central New England," *Ecology*, 58 (1977), pp. 562-72, which is based on the data in E. P. Stephens, *The Historical-Developmental Method of Determining Forest Trends*, Ph.D. Thesis, Harvard University, 1955; and F. Herbert Bormann and Gene E. Likens, *Pattern and Process in a Forested Ecosystem* (New York, 1979). The technical debate here is whether forest succession is principally *autogenic* (driven by continuous processes internal to the forest ecosystem) or *allogenic* (driven by essentially stochastic processes external to the forest, such as fires or storms).
25. This paragraph is based on my reading of the fossil pollen studies which I describe in the bibliographical essay. On hemlock destruction, see Gene E. Likens and Margaret B. Davis, "Post-Glacial History of Mirror Lake and Its Watershed in New Hampshire," *Verhandlungen der Internationale Vereinigung für Theoretische und Angewandte Limnologie*, 19 (1975), p. 989; and Davis, "Phytogeography and Palynology," p. 394.
 26. Morton, *Canaan*, pp. 175, 180.

3. Seasons of Want and Plenty

1. Christopher Levett, "Voyage into New England" (1628), *Massachusetts Historical Society Collections*, 3rd ser., 3 (1843), p. 179. Virginia probably suffered most from this kind of exaggeration, but see Thomas Morton, *New English Canaan* (1632), Charles F. Adams, ed., *Pubs. of the Prince Society*, XIV (Boston, 1883), pp. 231-3, for tendencies in the same direction. William Morrell's "Poem on New-England" (ca. 1623), *Massachusetts Historical Society Collections*, 1st ser., 1 (1792), pp. 125-39, is also a good example.
2. Quoted by Thomas Hutchinson, *The History of the Colony and Province of Massachusetts-Bay* (1765), Lawrence Shaw Mayo, ed. (Cambridge, MA, 1936), I, p. 405.
3. Levett, "Voyage," p. 182; *A Relation of the English Plantation at Plimoth* (1622), facsimile edition, Readex Microprint (1966) (henceforth cited as *Mourt's Relation*), p. 63; John [?] Pond to William Pond, March 15, 1630/1, in Everett Emerson, ed., *Letters from New England* (Amherst, MA, 1976), p. 65. See Neil Salisbury, *Manitou and Providence* (New York, 1982), pp. 81-2, 111-18, for evidence that Indian refusal to trade also lay at the root of the Sagadahoc and Wessagusset failures. On differences between American and European climates, see Karen Ordahl Kupperman, "The Puzzle of American Climate in the Early Colonial Period," *American Historical Review*, 87 (1982), pp. 1262-89.
4. John Smith, *The Generall Historie of Virginia* (1624), facsimile edition, Readex Microprint (1966), pp. 211, 219; Morrell, "New England," p.

- 13; Morton, *Canaan*, p. 177; James A. Henretta, *The Evolution of American Society, 1700-1815* (Lexington, MA, 1973), pp. 31-9. Exaggerated expectations were not limited to the English. Pierre Biard's *Relation* (in Reuben Gold Thwaites, ed., *Jesuit Relations, III, Acadia, 1611-1616* [Cleveland, 1897], pp. 65-7) supplies a wonderful French example: "... we Frenchmen are so willing to go there with our eyes shut and our heads down; believing, for example, that in Canada, when we are hungry, all we will have to do is go to an Island, and there by the skillful use of a club, right and left, we can bring down birds each as big as a duck, with every blow. This is well said, as our people have done this more than once and in more than one place. It is all very well, if you are never hungry except when these birds are on the Islands, and if even then you happen to be near them. But if you are fifty or sixty leagues away, what are you going to do?" Good discussions of these colonial assumptions about the New World can be found in Karen O. Kupperman, *Settling with the Indians* (Totowa, NJ, 1980); in Edmund S. Morgan's classic, "The Labor Problem at Jamestown, 1607-18," *American Historical Review*, 76 (1971), pp. 595-611; and his *American Slavery, American Freedom* (New York, 1975).
5. For general introductions to photoperiodism, see Robert L. Smith, *Ecology and Field Biology* (New York, 1966), pp. 98-126; Robert E. Ricklefs, *Ecology*, 2nd ed. (New York, 1979), pp. 280-306; and Edward J. Kormondy, *Concepts of Ecology* (Englewood Cliffs, NJ, 1969), pp. 140-54.
6. Roger Williams, *A Key into the Language of America* (1643), John J. Teunissen and Evelyn J. Hinz, eds. (Detroit, 1973), pp. 127-8; Morton, *Canaan*, p. 177. On the changing shape of wigwams, see William Wood, *New England's Prospect* (1634), Alden T. Vaughan, ed. (Amherst, MA, 1977), p. 113; H. P. Biggar, ed., *The Works of Samuel de Champlain*, 6 vols. (Toronto, 1922-36), maps; Daniel Gookin, "Historical Collections of the Indians in New England," *Massachusetts Historical Society Collections*, 1st ser., 1 (1792), p. 150; William C. Sturtevant, "Two 1761 Wigwams at Niantic, Connecticut," *American Antiquity*, 40 (1975), pp. 437-44; and Bernard G. Hoffman, *The Historical Ethnography of the Micmac in the Sixteenth and Seventeenth Centuries*, Ph.D. Thesis, UCLA, 1955, p. 135.
7. Lawrence C. Wroth, ed., *The Voyages of Giovanni de Verrazzano, 1524-1528* (New Haven, 1970), p. 140.
8. Hoffman, *Micmac Ethnography*, is superb on northern subsistence cycles; his diagram of these has been published in "Ancient Tribes Revisited," *Ethnohistory*, 14 (1967), p. 21. The northern documents of the French Jesuits are exceptionally fine: these include Biard, *Relation*, pp. 79-85; Nicolas Denys, *The Description and Natural History of the Coasts of North America (Acadia)* (1672), William F. Ganong, ed. (Toronto, Champlain Society Publications, II, 1908); and Chrestien Le Clercq, *New Relations of Gaspesia* (1691), William F. Ganong, ed.,

- (Toronto, Champlain Society Publications, V, 1910). I have used them extensively in the discussion which follows, even though they fall outside the regional boundaries of New England, because documentary coverage of the Maine Indians is poor and northern New England Indians were much more like their Canadian neighbors than the Indians to the south. The best modern account of the Maine Indians is Frank G. Speck, *Penobscot Man* (Philadelphia, 1940). Quotations in this paragraph are from LeClercq, *Gaspesia*, p. 137; and Biard, *Relation*, p. 81. Hoffman, *Micmac Ethnography*, p. 160, argues that cod was not a major component of the northern coastal diet, despite Biard's claims to the contrary.
9. Biard, *Relation*, pp. 83, 101-3; Denys, *Acadia*, pp. 405, 422-3; Bruce J. Bourque, "Aboriginal Settlement and Subsistence on the Maine Coast," *Man in the Northeast*, 6 (Fall 1973), pp. 3-20; John Gyles, "Memoirs of Odd Adventures, Strange Deliverances, etc." (1736), in Alden T. Vaughan and Edward W. Clark, eds., *Puritans among the Indians* (Cambridge, MA, 1981), p. 103. Note again the nomenclature problem here: there are no bustards (Biard's *outardes*) in North America. We cannot be sure to which species he was referring.
 10. Le Clercq, *Gaspesia*, p. 110; James Sullivan, "The History of the Penobscott Indians," *Massachusetts Historical Society Collections*, 1st ser., 9 (1804), p. 228; Biard, *Relation*, p. 107.
 11. Eugene P. Odum, *Fundamentals of Ecology*, 3rd ed. (Philadelphia, 1971), pp. 106-39, explicates Liebig's Law and other environmental constraints on populations. It is unclear whether the starvation periods which French Jesuits observed among northern Indian populations at the beginning of the seventeenth century were typical of precolonial times. There is at least some reason to believe that the famines may have been the result of Indians having shifted their subsistence patterns to include trade with Europeans along the coast of Maine and Nova Scotia. Hoffman, *Micmac Ethnography*, pp. 229-33, gives the arguments against viewing the seventeenth-century starvations as normal; see also Bourque, "Aboriginal Settlement." On general hunter-gatherer behavior, see Richard B. Lee and Irven DeVore, eds., *Man the Hunter* (New York, 1968); and Marshall Sahlins, *Stone Age Economics* (Chicago, 1972).
 12. M. K. Bennett, "The Food Economy of the New England Indians, 1605-75," *Journal of Political Economy*, 63 (1955), pp. 391-3. (Historians generally use Bennett's figures fairly uncritically, but there are many problems with them. See notes 16 and 20 below.)
 13. The debate over pre-Columbian Indian population figures has generated an extensive literature, and my text conveys only the roughest outlines of its conclusions. See the bibliographical essay for a survey of this material. My own argument follows the discussions in Francis Jennings, *The Invasion of America* (Chapel Hill, 1975), pp. 15-31; S. F. Cook, *The Indian Populations of New England in the Seventeenth Century* (Berkeley, 1976); and especially Dean R. Snow, *The*

- Archaeology of New England* (New York, 1980), pp. 31-42, whose density figures I have converted from square kilometers to square miles. Colonial population figures are from U. S. Bureau of the Census, *Historical Statistics of the United States* (Washington, 1975), Table Z-1-19, p. 1168.
14. Northern month names can be found in Le Clercq, *Gaspesia*, pp. 137-9; Hoffman, *Micmac Ethnography*, p. 246; Biard, *Relation*, pp. 79-83; and Philip K. Bock, "Micmac," in Trigger, *Northeast*, p. 111. Southern calendars are in Eva L. Butler, "Algonkian Culture and Use of Maize in Southern New England," *Bulletin of the Archaeological Society of Connecticut*, 22 (December 1948), pp. 10-11; "Indian Names of the Months," *New England Historical and Genealogical Register*, 10 (1856), p. 166; and Gordon M. Day, "An Agawam Fragment," *International Journal of American Linguistics*, 33 (1967), pp. 244-7. See also the discussion in Peter A. Thomas, "Contrastive Subsistence Strategies and Land Use as Factors for Understanding Indian-White Relations in New England," *Ethnohistory*, 23 (1976), pp. 1-18. The Abenaki calendar given by Sebastian Rasles in *Dictionary of the Abnaki Language in North America* (Cambridge, MA, 1833), p. 478, includes two or three months referring to maize cultivation.
 15. Isaack de Rasieres to Samuel Blommaert, ca. 1628, in Sydney V. James, Jr., ed., *Three Visitors to Early Plymouth* (Plymouth Plantation, 1963), p. 71; Samuel de Champlain, *Voyages of Samuel de Champlain*, W. L. Grant, ed. (New York, 1907), p. 62. On multiple crop farming, see Fulmer Mood, "John Winthrop, Jr., on Indian Corn," *New England Quarterly*, 10 (1937), pp. 128-9; Williams, *Key*, pp. 170-1; Carl Sauer, "The Agency of Man on the Earth," in William L. Thomas, ed., *Man's Role in Changing the Face of the Earth* (Chicago, 1956), pp. 56-7; Harold C. Conklin, "An Ethnoecological Approach to Shifting Agriculture," *Transactions of the New York Academy of Science*, 2nd ser., 17 (1954), pp. 133-42; Conklin, "The Study of Shifting Cultivation," *Current Anthropology*, 2 (1961), pp. 27-61; and Howard S. Russell, "New England Indian Agriculture," *Bulletin of the Massachusetts Archaeological Society*, 22 (1961), pp. 58-61.
 16. Williams, *Key*, p. 121; Judith K. Brown, "A Note on the Division of Labor by Sex," *American Anthropologist*, 72 (1970), pp. 1073-8. Note that I refer here only to the sexual division of food-producing activities; I make no effort to consider the total allocation of physical or non-physical work. On the productivity of maize agriculture, see Peter A. Thomas, *In the Maelstrom of Change: The Indian Trade and Cultural Process in the Middle Connecticut River Valley, 1635-1665*, Ph.D. Thesis, University of Massachusetts, 1979, p. 109; Williams, *Key*, p. 171; Bennett, "Food Economy," pp. 391-3. Bennett's figures for corn's contribution to the Indian diet are probably exaggerated: he derived them by estimating total caloric requirements for an average person, subtracting Williams's corn yield estimates as distributed on a per capita basis, and allocating the remainder to noncorn foods. Such

- an algorithm obviously privileges corn at the expense of other foods, fails to consider waste, and assumes that corn was consumed at a constant level all year long. My discussion in the text shows why I think this unlikely; see also note 20 below.
17. Mood, "Winthrop on Corn," p. 126; Wood, *Prospect*, p. 35; James, *Plymouth Visitors*, pp. 7-9. The case against Indian fish fertilizer was first made by Erhard Rostlund, "The Evidence for the Use of Fish as Fertilizer in Aboriginal North America," *Journal of Geography*, 36 (1957), pp. 222-8; and Lynn Ceci has put forward the strongest collection of arguments in "Fish Fertilizer: A Native North American Practice?" *Science*, 188 (1975), pp. 26-30. She replies to critics in *Science*, 189 (1975), pp. 946-50. On the exhaustion of grain stores by late winter, see Lorraine E. Williams, *Ft. Shantok and Ft. Corchaug: A Comparative Study of Seventeenth Century Culture Contact in the Long Island Sound Area*, Ph.D. Thesis, New York University, 1972, p. 232, which confirms my critique of Bennett with the help of archaeological evidence.
 18. James, *Plymouth Visitors*, p. 79; Williams, *Key*, pp. 128, 163; Wood, *Prospect*, p. 114; Butler, "Maize," pp. 18-19; Mood, "Winthrop on Corn," p. 126; John Josselyn, "An Account of Two Voyages to New-England" (1675), *Massachusetts Historical Society Collections*, 3rd ser., 3 (1833), p. 296.
 19. Williams, *Key*, pp. 176, 178; Denys, *Acadia*, pp. 407, 420-2; Biard, *Relation*, p. 83; Josselyn, *Two Voyages*, pp. 305-6.
 20. Butler, "Maize," pp. 24-6; Williams, *Key*, p. 231; Wood, *Prospect*, pp. 103-5; Gookin, "Historical Collections," p. 153. Thomas, *Maelstrom of Change*, p. 348, gives archaeological evidence that there was a greater fall consumption of berries than historical sources note. On the range of foods gathered, see Lucia S. Chamberlain, "Plants Used by the Indians of Eastern North America," *American Naturalist*, 35 (1901), pp. 1-10; Gretchen Beardsley, "The Groundnut as Used by the Indians of Eastern North America," *Papers of the Michigan Academy of Sciences, Arts, and Letters*, 25 (1940), pp. 507-15; and Frederic W. Warner, "The Foods of the Connecticut Indians," *Bulletin of the Archaeological Society of Connecticut*, 37 (1972), pp. 27-47. The massive fall consumption of corn in these festivals argues against the assumption in Bennett's overly aggregated statistics that corn was eaten at a constant level year round.
 21. Williams, *Key*, pp. 128, 224; Wood, *Prospect*, p. 106; Mourt's *Relation*, p. 8; Thomas, *Maelstrom of Change*, pp. 106-8.
 22. Josselyn, *Two Voyages*, pp. 302-4; Morton, *Canaan*, p. 138; Butler, "Maize," pp. 28-30; Gookin, "Historical Collections," p. 150; George Lyman Kittredge, ed., "Letters of Samuel Lee and Samuel Sewall Relating to New England and the Indians," *Publications of the Colonial Society of Massachusetts*, 14 (1912), p. 148.
 23. Thomas, *Maelstrom of Change*, pp. 355-7; Josselyn, *Two Voyages*, p. 107. My arguments about the relationship between hunting, meat, and

- clothing are derived from Harold Hickerson, "The Virginia Deer and Intertribal Buffer Zones in the Upper Mississippi Valley," in Anthony Leeds and Andrew P. Vayda, eds., *Men, Culture and Animals*, AAAS, Publication No. 78 (1965), pp. 43-65; and Richard Michael Gramly, "Deerskins and Hunting Territories: Competition for a Scarce Resource of the Northeastern Woodlands," *American Antiquity*, 42 (1977), pp. 601-5. Gramly overstates the importance of deer, but his arguments are otherwise sound.
24. "Extract from an Indian History," *Massachusetts Historical Society Collections*, 1st ser., 9 (1804), p. 101; a paraphrased version of this can be found in Hedrick Aupaumut, *First Annual Report of the American Society for Promoting the Civilization and General Improvement of the Indian Tribes of the United States* (New Haven, 1824), pp. 41-2.
 25. Morton, *Canaan*, p. 138; Williams, *Key*, pp. 107, 138; see also William Christie MacLeod, "Fuel and Early Civilization," *American Anthropologist*, N.S., 27 (1925), pp. 344-6; Wroth, *Verrazzano*, p. 139; Higginson, *Plantation*, p. 308. Le Clerq gives us a nice portrait of the garbage problems which also led Indians to move their campsites: "They are filthy and vile in their wigwams, of which the approaches are filled with excrements, feathers, chips, shreds of skins, and very often with entrails of the animals or the fishes which they take in hunting or fishing" (*Gaspesia*, p. 253).
 26. Quotations are from Morton, *Canaan*, p. 172; Wood, *Prospect*, p. 38; and, on fending off invaders, Martin Pring, "A Voyage Set Out from the Citie of Bristoll, 1603," in Henry S. Burrage, ed., *Early English and French Voyages* (New York, 1906), p. 351. Other primary documents on burning are Higginson, p. 308; Edward Johnson, *Johnson's Wonder-Working Providence*, J. Franklin Jameson, ed. (New York, 1910), p. 85; Benjamin Trumbull, *A Complete History of Connecticut* (Hartford, 1797), p. 23. The classic essay on Indian burning is Gordon M. Day, "The Indian as an Ecological Factor in the Northeastern Forest," *Ecology*, 34 (1953), pp. 329-46; see also the various articles cited in the bibliographical essay. The chief critique of this interpretation of Indian burning is Hugh M. Raup, "Recent Changes of Climate and Vegetation in Southern New England and Adjacent New York," *Journal of the Arnold Arboretum*, 18 (1937), pp. 79-117. Raup believed that "to picture a wholesale conflagration in Massachusetts, Rhode Island, Connecticut, and southern New York State as would involve most of the inflammable woods every year, or even every 10 to 20 years, is inconceivable" (p. 84). In this, he failed to take account of the reduced fuel burden at ground level in forests which are repeatedly burned; the very fact of regular burning kept ground fires from reaching the canopy. But Raup was no doubt right that the entirety of southern New England was never regularly burned; I have limited the claims of my argument to the local vicinity of village sites. A recent article defends Raup but basically confirms my emphasis on local burning: Emily W. B.

- Russell, "Indian-Set Fires in the Forests of the Northeastern United States," *Ecology*, 64 (1983), pp. 78-88.
27. Regina Flannery, "An Analysis of Coastal Algonquian Culture," *Catholic University Anthropological Series*, 7 (1939), pp. 14, 167; Day, "Indian as Ecological Factor," pp. 338-9. Northern hardwood forests in the Midwest were probably burned completely by lightning and man-made fires on a hundred-year cycle, but the same was apparently not true of the northern New England forest. See Orrie L. Loucks, "Evolution of Diversity, Efficiency and Community Stability," *American Zoologist*, 10 (1970), pp. 17-25; Sidney S. Frissell, Jr., "The Importance of Fire as a Natural Ecological Factor in Itasca State Park, Minnesota," *Quaternary Research*, 3 (1973), pp. 397-407; Craig C. Lorimer, "The Presettlement Forest and Natural Disturbance Cycle of Northeastern Maine," *Ecology*, 58 (1977), pp. 130-48; and F. Herbert Bormann and Gene E. Likens, "Catastrophic Disturbance and the Steady State in Northern Hardwood Forests," *American Scientist*, 67 (1979), pp. 660-9.
 28. Williams, *Key*, pp. 165, 168, 191. On fire effects discussed in this and the subsequent paragraph, see William A. Niering, et al., "Prescribed Burning in Southern New England: Introduction to Long-Range Studies," *Proceedings of the Annual Tall Timbers Fire Ecology Conference*, 10 (1970), pp. 267-86; Silas Little, "Effects of Fire on Temperate Forests: Northeastern United States," in T. T. Kozlowski and C. E. Ahlgren, eds., *Fire and Ecosystems* (New York, 1974), pp. 225-50; and the articles in the special October 1973 issue of *Quaternary Research*, especially the superb summary in the Introduction by H. E. Wright, Jr., and M. L. Heinselman, pp. 319-28.
 29. Odum, *Fundamentals of Ecology*, pp. 157-9; Timothy Dwight, *Travels in New England and New York* (1821), Barbara Miller Solomon, ed. (Cambridge, MA, 1969), IV, pp. 38-9; Williams, *Key*, p. 165. E. L. Jones discusses these edge effects in his "Creative Disruptions in American Agriculture, 1620-1820," *Agricultural History*, 48 (1974), pp. 514-15, although I think he becomes confused when he describes burned forests as dense, dark, and deep, with few birds. Exactly the opposite was the case.
 30. Quotations on women's work are from Williams, *Key*, p. 112 (in which he refers specifically to the loads women bear in moving camp); Levett, "Voyage," p. 178; and Thomas Lechford, *Plain Dealing* (1642), *Massachusetts Historical Society Collections*, 3rd ser., 3 (1833), p. 103. See also Morrell, "New England," p. 136; and Wood, *Prospect*, pp. 92, 115-16. Two recent articles assert a much more egalitarian relationship between Indian men and women: Robert Steven Grumet, "Sunksquaws, Shamans, and Tradeswomen: Middle Atlantic Coastal Algonkian Women During the 17th and 18th Centuries," in Mona Etienne and Eleanor Leacock, eds., *Women and Colonization* (New York, 1980), pp. 43-62; and Trudie Lamb, "Squaw Sachems: Women Who Rule," *Artifacts*, 9:2 (Winter/Spring 1981), pp. 1-11.

- These both argue from the experience of elite women in leadership roles, and Grumet seems to me unsuccessful in proving his claim that the sexual division of labor was not fairly strict.
31. Francis Higginson, *New-Englands Plantation* (1630), *Massachusetts Historical Society Proceedings*, 62 (1929), p. 316. For further materials on sexual work roles, see James Axtell, ed., *The Indian Peoples of Eastern America: A Documentary History of the Sexes* (New York, 1981), pp. 103-39.
 32. Wroth, *Verrazzano*, p. 139. In areas where a diversity of habitats was lacking, like central Vermont, Indian populations were very low or absent. See William A. Bayreuther, "Environmental Diversity as a Factor in Modeling Prehistoric Settlement Patterns: Southeastern Vermont's Black River Valley," *Man in the Northeast*, 19 (1980), pp. 83-93. But see also Gordon M. Day, "The Indian Occupation of Vermont," *Vermont History*, 33 (1965), pp. 365-74.

4. Bounding the Land

1. Thomas Morton, *New English Canaan* (1632), Charles F. Adams, ed., *Pubs. of the Prince Society*, XIV (Boston, 1883), pp. 175-7.
2. Francis Higginson, *New-Englands Plantation* (1630), in *Massachusetts Historical Society Proceedings*, 62 (1929), p. 316; William Wood, *New England's Prospect* (1634), Alden T. Vaughan, ed. (Amherst, 1977), p. 96; Izaak Walton, *The Compleat Angler* (London, 1653).
3. Robert Cushman, "Reasons and Considerations Touching the Lawfulness of Removing Out of England into the Parts of America" (1621), in Alexander Young, ed., *Chronicles of the Pilgrim Fathers* (Boston, 1841), p. 243; see also James Sullivan, *The History of Land Titles in Massachusetts* (Boston, 1801), pp. 21-27; Charles E. Eisinger, "The Puritans' Justification for Taking the Land," *Essex Institute Historical Collections*, 84 (1948), pp. 131-43; and Ruth Barnes Moynihan, "The Patent and the Indians: The Problem of Jurisdiction in Seventeenth-Century New England," *American Indian Culture and Research*, 2:1 (1977), pp. 8-18.
4. John Winthrop, "Reasons to Be Considered, and Objections with Answers," *Winthrop Papers*, Massachusetts Historical Society, II (1931), pp. 140-1; John Winthrop, *Winthrop's Journal*, James Kendall Hosmer, ed. (New York, 1908), p. 294; John Cotton, "Gods Promise to His Plantations," *Old South Leaflets* (nd), no. 53, p. 6. See also Francis Jennings, *The Invasion of America* (Chapel Hill, 1975), pp. 135-6.
5. John Cotton, "John Cotton's Answer to Roger Williams," in *The Complete Writings of Roger Williams* (New York, 1963), II, pp. 46-7. Williams of course had fully developed theological reasons for his position which I do not mean to discount; but these were not incon-