Active landscapes, Kyoto Prefecture. Satoyama forest in December. Sometimes the life of the forest is most evident as it bursts through obstacles. Farmers chop; winter chills: life still breaks through.

11
The Life of the Forest

To walk attentively through a forest, even a damaged one, is to be caught by the abundance of life: ancient and new; underfoot and reaching into the light. But how does one tell the life of the forest? We might begin by looking for drama and adventure beyond the activities of humans. Yet we are not used to reading stories without human heroes. This is the puzzle that informs this section of the book. Can I show landscape as the protagonist of an adventure in which humans are only one kind of participant?

Over the past few decades, many kinds of scholars have shown that allowing only human protagonists into our stories is not just ordinary human bias; it is a cultural agenda tied to dreams of progress through modernization.[1] There are other ways of making worlds. Anthropologists have become interested, for example, in how subsistence hunters recognize other living beings as "persons," that is, protagonists of stories.[2] Indeed, how could it be otherwise? Yet expectations of progress block this insight: talking animals are for children and primitives. Their voices silent, we imagine well-being without them. We trample over them for our advancement; we forget that collaborative survival requires

cross-species coordinations. To enlarge what is possible, we need other kinds of stories—including adventures of landscapes.[3]

One place to begin is a nematode—and a thesis on livability.

"Call me *Bursaphelenchus xylophilus*. I'm a tiny, wormlike creature, a nematode, and I spend most of my time crunching the insides of pine trees. But my kin are as well-traveled as any whaler sailing the seven seas. Stick with me, and I'll tell you about some curious voyages."

But wait: who would want to hear about the world from a worm? That was, in effect, the question addressed by Jakob von Uexküll in 1934, when he described the world experienced by a tick.[4] Working with the tick's sensory abilities, such as its ability to detect the heat of a mammal, and thus a potential blood meal, Uexküll showed that a tick knows and makes worlds. His approach brought landscapes to life as scenes of sensuous activity; creatures were not to be treated as inert objects but as knowing subjects.

And yet: Uexküll's idea of affordances limited his tick to the bubble-like world of its few senses. Caught in a small frame of space and time, it was not a participant in the wider rhythms and histories of the landscape.[5] This is not enough—as the voyages of *Bursaphelenchus xylophilus*, the pine wilt nematode, attest. Consider one of the most colorful:

Pine wilt nematodes are unable to move from tree to tree without the help of pine sawyer beetles, who carry them without benefit to themselves. At a particular stage in a nematode's life, it may take advantage of a beetle's journey to hop on as a stowaway. But this is not a casual transaction. Nematodes must approach beetles in a particular stage of the beetles' life cycle, just as they are about to emerge from their piney cavities to move to a new tree. The nematodes ride in the beetles' tracheae. When the beetles move to a new tree to lay their eggs, the nematodes slip into the new tree's wound. This is an extraordinary feat of coordination, in which nematodes tap into beetles' life rhythms.[6] To immerse oneself in such webs of coordination, Uexküll's bubble worlds are not enough.

Despite this sojourn with a nematode, I have not abandoned matsutake. A major reason for the current rarity of matsutake in Japan is the demise of pines that results from the habits of pine wilt nematodes. Just as whalers catch whales, pine wilt nematodes catch pines and kill

them and their fungal companions. Still, nematodes were not always involved in this way of making a living. Just as for whalers and whales, nematodes become killers of pines only through the contingencies of circumstance and history. Their voyage into Japanese history is as extraordinary as the webs of coordination they weave.

Pine wilt nematodes are only minor pests for American pines, which evolved with them. These nematodes became tree killers only when they traveled to Asia, where pines were unprepared and vulnerable. Amazingly, ecologists have traced this process rather precisely. The first nematodes disembarked at Japan's Nagasaki harbor from the United States in the first decade of the twentieth century, riding in American pine.[7] Timber was a resource for industrializing Japan, where elites were hungry for resources from around the world. Many uninvited guests arrived with those resources, including the pine wilt nematode. Soon after its arrival, it traveled with local pine sawyer beetles; its moves can be traced concentrically out from Nagasaki. Together, the local beetle and the foreign nematode changed Japan's forest landscapes.

Still, an infected pine might not die if it is living in good conditions, and this indeterminate threat thus holds matsutake, implicated as collateral damage, in suspense. Pines stressed by forest crowding, lack of light, and too much soil enrichment are easy prey to nematodes. Evergreen broadleaf trees crowd and shade Japanese pine. Blue-stain fungus sometimes grows in pine's wounds, feeding the nematodes.[8] The warmer temperatures of anthropogenic climate change help the nematodes to spread.[9] Many histories come together here; they draw us beyond bubble worlds into shifting cascades of collaboration and complexity. The livelihoods of the nematode—and the pine it attacks and the fungus that tries to save it—are honed within unstable assemblages as opportunities arise and old talents gain new purchase. Japan's matsutake enters the fray of all this history: its fate depends on the enhancement or debilitation of the Uexküllian agilities of pine wilt nematodes.

Tracking matsutake through the journeys of nematodes allows me to return to my questions about telling the adventures of landscapes, this time with a thesis. First, rather than limit our analyses to one creature at a time (including humans), or even one relationship, if we want to know what makes places livable we should be studying polyphonic assemblages, gatherings of ways of being. Assemblages are performances of

livability. Matsutake stories draw us into pine stories and nematode stories; in their moments of coordination with each other they create livable—or killing—situations.

Second, species-specific agilities are honed in the coordinations of assemblages. Uexküll gets us on the right track by noticing how even humble creatures participate in making worlds. To extend his insights, we must follow multispecies attunements in which each organism comes into its own. Matsutake is nothing without the rhythms of the matsutake forest.

Third, coordinations come in and out of existence through the contingencies of historical change. Whether matsutake and pine in Japan can continue to collaborate depends a great deal on other collaborations set in motion by the arrival of pine wilt nematodes.

To put all this together it may be useful to recall the polyphonic music mentioned briefly in chapter 1. In contrast to the unified harmonies and rhythms of rock, pop, or classical music, to appreciate polyphony one must listen both to the separate melody lines and their coming together in unexpected moments of harmony or dissonance. In just this way, to appreciate the assemblage, one must attend to its separate ways of being at the same time as watching how they come together in sporadic but consequential coordinations. Furthermore, in contrast to the predictability of a written piece of music that can be repeated over and over, the polyphony of the assemblage shifts as conditions change. This is the listening practice that this section of the book attempts to instill.

By taking landscape-based assemblages as my object, it is possible to attend to the interplay of many organisms' actions. I am not limited to tracking human relations with their favored allies, as in most animal studies. Organisms don't have to show their human equivalence (as conscious agents, intentional communicators, or ethical subjects) to count. If we are interested in livability, impermanence, and emergence, we should be watching the action of landscape assemblages. Assemblages coalesce, change, and dissolve: this *is* the story.

The story of landscapes is both easy and hard to tell. Sometimes it relaxes readers into somnolence, making us think we are not learning anything new. This is a result of the unfortunate wall we have built be-

tween concepts and stories. We can see this, for example, in the gap between environmental history and science studies. Science studies scholars, unpracticed in reading concepts through stories, don't bother with environmental history. Consider, for example, Stephen Pyne's fine work on fire in the making of landscapes; because his concepts are embedded in his histories, science studies scholars remain uninfluenced by his radical suggestions on geochemical agency.[10] Pauline Peters's trenchant analysis of how the logic of the British enclosure system came to Botswana range management—or Kate Showers's surprising findings about erosion control in Lesotho—could revolutionize our notions of normal science, but they have not.[11] Such refusals impoverish science studies, encouraging the play of concepts in a reified space. Distilling general principles, theorists expect that others will fill in the particulars—but "filling in" is never so simple. This is an intellectual apparatus that shores up the wall between concepts and stories, thus, indeed, draining the significance of the sensitivities science studies scholars try to refine. In what follows, then, I challenge readers to notice concepts and methods within the landscape histories I present.

Telling stories of landscape requires getting to know the inhabitants of the landscape, human and not human. This is not easy, and it makes sense to me to use all the learning practices I can think of, including our combined forms of mindfulness, myths and tales, livelihood practices, archives, scientific reports, and experiments. But this hodgepodge creates suspicions—particularly, indeed, with the allies I hailed in reaching out to anthropologists of alternative world makings. For many cultural anthropologists, science is best regarded as a straw man against which to explore alternatives, such as indigenous practices.[12] To mix scientific and vernacular forms of evidence invites accusations of bowing down to science. Yet this assumes a monolithic science that digests all practices into a single agenda. Instead, I offer stories built through layered and disparate practices of knowing and being. If the components clash with each other, this only enlarges what such stories can do.

At the heart of the practices I am advocating are arts of ethnography and natural history. The new alliance I propose is based on commitments

to observation and fieldwork—and what I call noticing.[13] Human-disturbed landscapes are ideal spaces for humanist and naturalist noticing. We need to know the histories humans have made in these places *and* the histories of nonhuman participants. Satoyama restoration advocates were exceptional teachers here; they revitalized my understanding of "disturbance" as both coordination and history. They showed me how disturbance might initiate a story of the life of the forest.[14]

Disturbance is a change in environmental conditions that causes a pronounced change in an ecosystem. Floods and fires are forms of disturbance; humans and other living things can also cause disturbance. Disturbance can renew ecologies as well as destroy them. How terrible a disturbance is depends on many things, including scale. Some disturbances are small: a tree falls in the forest, creating a light gap. Some are huge: a tsunami knocks open a nuclear power plant. Scales of time also matter: short-term damage may be followed by exuberant regrowth. Disturbance opens the terrain for transformative encounters, making new landscape assemblages possible.[15]

Humanists, not used to thinking with disturbance, connect the term with damage. But disturbance, as used by ecologists, is not always bad—and not always human. Human disturbance is not unique in its ability to stir up ecological relations. Furthermore, as a beginning, disturbance is always in the middle of things: the term does not refer us to a harmonious state before disturbance. Disturbances follow other disturbances. Thus all landscapes are disturbed; disturbance is ordinary. But this does not limit the term. Raising the question of disturbance does not cut off discussion but opens it, allowing us to explore landscape dynamics. Whether a disturbance is bearable or unbearable is a question worked out through what follows it: the reformation of assemblages.

Disturbance emerged as a key concept in ecology at the very same time that scholars in the humanities and social sciences were beginning to worry about instability and change.[16] On both sides of the humanist/naturalist line, concerns about instability followed after the post–World War II American enthusiasm for self-regulating systems: a form of stability in the midst of progress. In the 1950s and 1960s, the idea of ecosystem equilibrium seemed promising; through natural succession, ecological formations were thought to reach a comparatively stable balance point. In the 1970s, however, attention turned to disruption and change,

which generate the heterogeneity of the landscape. In the 1970s, too, humanists and social scientists began worrying about the transformative encounters of history, inequality, and conflict. Looking back, such coordinated changes in scholarly fashion might have been early warning of our common slide into precarity.

As an analytic tool, disturbance requires awareness of the observer's perspective—just as with the best tools in social theory. Deciding what counts as disturbance is always a matter of point of view. From a human's vantage, the disturbance that destroys an anthill is vastly different from that obliterating a human city. From an ant's perspective, the stakes are different. Points of view also vary *within* species. Rosalind Shaw has elegantly shown how men and women, urban and rural, and rich and poor each conceptualize "floods" differently in Bangladesh, because they are differentially affected by rising waters; for each group, the rise exceeds what is bearable—and thus becomes a flood—at a different point.[17] No single standard for assessing disturbance is possible; disturbance matters in relation to how we live. This means we need to pay attention to the assessments through which we know disturbance. Disturbance is never a matter of "yes" or "no"; disturbance refers to an open-ended range of unsettling phenomena. Where is the line that marks off too much? With disturbance, this is always a problem of perspective, based, in turn, on ways of life.

Since it is already infused with attention to perspective, I am unapologetic about my use of the term "disturbance" to refer to the distinctive ways the concept is used in varied places. I learned this layered usage from Japanese forest managers and scientists, who constantly stretch European and American conventions, even as they use them. Disturbance is a good tool with which to begin the inconsistent layering of global-and-local, expert-and-vernacular knowledge layers I have promised.

Disturbance brings us into heterogeneity, a key lens for landscapes. Disturbance creates patches, each shaped by diverse conjunctures. Conjunctures may be initiated by nonliving disturbance (e.g., floods and fires) or by living creatures' disturbances. As organisms make intergenerational living spaces, they redesign the environment. Ecologists call the effects that organisms create on their environments "ecosystems engineering."[18] A tree holds boulders in its roots that otherwise might be swept away by a stream; an earthworm enriches the soil. Each of these

is an example of ecosystems engineering. If we look at the interactions across many acts of ecosystems engineering, patterns emerge, organizing assemblages: unintentional design. This is the sum of the biotic and abiotic ecosystems engineering—intended and unintended; beneficial, harmful, and of no account—within a patch.


Species are not always the right units for telling the life of the forest. The term "multispecies" is only a stand-in for moving beyond human exceptionalism. Sometimes individual organisms make drastic interventions. And sometimes much larger units are more able to show us historical action. This is the case, I find, for oaks and pines as well as matsutake. Oaks, which interbreed readily and with fertile results across species lines, confuse our dedication to species. But of course what units one uses depends on the story one wants to tell. To tell the story of matsutake forests forming and dissolving across continental shifts and glaciation events, I need "pines" as a protagonist—in all their marvelous diversity. *Pinus* is the most common matsutake host. When it comes to oaks, I stretch even farther, embracing *Lithocarpus* (tanoaks) and *Castanopsis* (chinquapin) as well as *Quercus* (oaks). These closely related genera are the most common broadleaf hosts for matsutake. My oaks, pines, and matsutake are thus not identical within their group; they spread and transform their storylines, like humans, in diaspora.[19] This helps me see action in the story of assemblage. I follow their spread, noticing the worlds they make. Rather than forming an assemblage because they are a certain "type," my oaks, pines, and matsutake become themselves in assemblage.[20]

Traveling with this in mind, I investigated matsutake forests in four places: central Japan, Oregon (U.S.A.), Yunnan (southwest China), and Lapland (northern Finland). My small immersion in satoyama restoration helped me see that foresters in each place had different ways of "doing" forests. In contrast to satoyama, humans were *not* part of forest assemblages in matsutake management in the United States and China; managers there leaped to anxieties about too much human disturbance, not too little. In contrast, too, to satoyama work, forestry elsewhere was measured on a yardstick of rational advancement: could the forest make

futures of scientific and industrial productivity? In distinction, a Japanese satoyama aims for a livable here and now.[21]

But, more than comparison, I seek histories through which humans, matsutake, and pine create forests. I work the conjunctures to raise unanswered research questions rather than to create boxes. I look for the same forest in different guises. Each appears through the shadows of the others. Exploring this simultaneously single and multiple formation, the next four chapters take me into pines. Each illustrates how ways of life develop through coordination in disturbance. As ways of life come together, patch-based assemblages are formed. Assemblages, I show, are scenes for considering livability—the possibility of common life on a human-disturbed earth.

Precarious living is always an adventure.

Active landscapes, Lapland. When they saw me photograph these reindeer among pines, my hosts apologized that the ground was messy. This forest had recently been thinned, they said, and no one had time yet to pick up all the wood. Through such cleanup, forests come to resemble plantations. Thus managers dream of stopping history.

12
History

It was September when I first saw the pine forests of northern Finland. I rode the night train from Helsinki, past the Arctic Circle with its signs for Santa Claus's home, through smaller and smaller birches, until I found myself surrounded by pines. I was surprised. I had thought of natural forests as packed with tall and tiny trees, all jumbled together, of many species and ages. Here all the trees were just the same: one species, one age, neat and evenly spaced. Even the ground was clean and clear without a snag or a piece of downed wood. It looked exactly like an industrial tree plantation. "Ah," I thought, "How the lines have blurred." This was modern discipline, both natural and artificial. And there was contrast: I was near the border with Russia, and people told me that across the border the forest was a mess. I asked what a mess looked like, and they told me the trees were uneven and the ground full of dead wood; no one cleared it up. This Finnish forest was clean. Even lichen was cropped close by the reindeer. On the Russian side, people said, great balls of lichen grew as high as your knees.

The lines have blurred. A natural forest in northern Finland looks a lot like an industrial tree plantation. The trees have become a modern

resource, and the way to manage a resource is to stop its autonomous historical action. As long as trees make history, they threaten industrial governance. Cleaning the forest is part of the work of stopping this history. But since when do trees make history?

"History" is both a human storytelling practice and that set of remainders from the past that we turn into stories. Conventionally, historians look only at human remainders, such as archives and diaries, but there is no reason not to spread our attention to the tracks and traces of nonhumans, as these contribute to our common landscapes. Such tracks and traces speak to cross-species entanglements in contingency and conjuncture, the components of "historical" time. To participate in such entanglement, one does not have to make history in just one way.[1] Whether or not other organisms "tell stories," they contribute to the overlapping tracks and traces that we grasp as history.[2] History, then, is the record of many trajectories of world making, human and not human.

Yet modern forestry has been based on the reduction of trees—and particularly pines—to self-contained, equivalent, and unchanging objects.[3] Modern forestry manages pines as a potentially constant and unchanging resource, the source of sustainable yields of timber. Its goal is to remove pines from their indeterminate encounters, and thus their ability to make history. With modern forestry, we forget that trees are historical actors. How might we remove the blinders of modern resource management to regain a feel for the dynamism so central to the life of the forest?

In what follows, I offer two strategies. First, I delve into the abilities of pines, across many times and places, to change the scene with their presence and transform the trajectories of others—that is, to make history. In this, my guide is a book, the kind of heavy tome that when it slips off your bicycle on a turn makes a great clatter and smash, stopping traffic. That book is David Richardson's edited volume, *Ecology and Biogeography of Pinus*.[4] Despite its heft and reserved title, it is an adventure story. Richardson's authors animate the variety and agility of *Pinus*, making it a lively subject across space and time, a historical subject. This provocation convinced me that all of *Pinus*, rather than a particular kind of pine, would be my subject. Following pines through their challenges is a form of history.

Second, I return to northern Finland to follow pines into interspecies encounters, and thus the assemblages of which they are architects. Industrial forestry comes back, but so too do those aggravations that reduce its success in stopping history. Matsutake helps me with this story, for, without the efforts of foresters, they help pines survive. Pine flourishes only in the encounter. Modern forest management can grasp a moment in pine's history, but it cannot stop the indeterminacy of encounter-based time.

If you ever wanted to be impressed by the historical force of plants, you might do well to start with pines. Pines are among the most active trees on earth. If you bulldoze a road through a forest, pine seedlings will likely spring up on its raw shoulders. If you abandon a field, pines will be the first trees to colonize it. When a volcano erupts, or a glacier moves back, or the wind and sea pile sand, pines may be among the first to find a foothold. Until people moved things around, pine grew only in the northern hemisphere. People carried pine and grew it in plantations in the global south. But pine jumped over the plantation fence and spread out across the landscape.[5] In Australia, pines have become a major fire hazard. In South Africa, they threaten the rare endemics of the fynbos. In open and disturbed landscapes, it's hard to keep pine down.

Pines need light. In the open they can be aggressive invaders, but they decline in the shade. Furthermore, pines are poor competitors in what are usually considered the best places for plants: places with fertile soil, adequate moisture, and warm temperatures. There, pine seedlings lose out to broadleafs, whose seedlings quickly develop the broad leaves through which we name them, shading out the pines.[6] As a result, pines have become specialists in places without those ideal conditions. Pines grow in extreme environments: cold high places; almost-deserts; sand and rock.

Pines also grow with fire. Fire shows off their diversity; there are many and varied pine adaptations to fire. Some pines go through a "grass stage," spending several years looking like tufts of grass while their root systems grow strong, and only then shooting up like crazy

things until their buds might get above the coming flames. Some pines develop such thick bark and high crowns that everything can burn around them without giving them more than a scar. Other pines burn like matches—but have ways of ensuring that their seeds will be first to sprout on the burned earth. Some store seeds for years in cones that open only in fire: Those seeds will be first to hit the ashes.[7]

Pines live in extreme environments because of the help they get from mycorrhizal fungi. Fossils have been found from 50 million years ago that show root associations between pines and fungi; pines have evolved with fungi.[8] Where no organic soil is available, fungi mobilize nutrients from rocks and sand, making it possible for pines to grow. Besides providing nutrients, mycorrhizas protect pines from harmful metals and other, root-eating, fungi. In return, pines support mycorrhizal fungi. Even the anatomy of pine roots has been formed in association with fungi. Pines put out "short roots," which become the site of mycorrhizal association. If no fungi encounter them, the short roots abort. (In contrast, fungi do not cover at least the tips of anatomically different "long roots," specialized for exploration.) By moving across disturbed landscapes, pines make history, but only through their association with mycorrhizal companions.

Pines have made alliances with animals as well as fungi. Some pines are completely dependent on birds to spread their seeds—just as some birds are completely dependent on pine seeds for their food. Across the northern hemisphere, jays, crows, magpies, and nutcrackers have a close association with pines. Sometimes the relationship is specific: the seeds of high-altitude whitebark pines are the key food of Clark's Nutcrackers; in turn, the uneaten seed caches of the nutcrackers are the only way the pines spread their seeds.[9] Caches of small mammals such as chipmunks and squirrels also play an important role in spreading pine seeds, even for those pines whose seeds are also spread by wind.[10] But no mammal has spread pine seeds more widely than human beings.

Humans spread pines in two different ways: by planting them, and by creating the kinds of disturbances in which they take hold. The latter generally occurs without any conscious intent; pines like some of the kinds of messes humans make without trying. Pines colonize abandoned fields and eroded hillsides. When humans cut down the other trees, pines move in. Sometimes planting and disturbance go together.

People plant pines to remediate the disturbances they have created. Alternatively, they may keep things radically disturbed to advantage pine. This last alternative has been the strategy of industrial growers, whether they plant or merely manage self-seeded pine: clear-cutting and soil breaking are justified as strategies to promote pine.

In some of its most extreme environments, pine wants not just any fungal partner, but matsutake. Matsutake secretes strong acids that break down rock and sand, releasing nutrients for the mutual growth of pine and fungus.[11] In the harsh landscapes where matsutake and pine grow together, there are often few other fungi to be found. Besides, matsutake forms a dense mat of fungal filaments, excluding other fungi and many soil bacteria. Japanese farmers and, following them, scientists call this mat *shiro*, a "castle," and thinking of matsutake's castle allows us to imagine its wards and guards.[12] Its defense is also offense. The mat is water-repellent, allowing the fungus to concentrate the acids it needs to break down rock.[13] Together turning rock into food, matsutake-pine alliances stake out places with little organic soil.

Yet in the ordinary course of events, organic soil piles up over time, through the growth and death of plant and animal life. Dead organisms rot, becoming organic soil, which in turn becomes the ground for new life. In places without organic soil, this cycle of life and death has been broken by some contingent action; such action signals irreversible time, that is, history. By colonizing disturbed landscapes, matsutake and pine make history together—and they show us how history-making extends beyond what humans do. At the same time, humans create a great deal of forest disturbance. Matsutake, pines, and humans together shape the trajectories of these landscapes.

Two kinds of human-disturbed landscapes produce most of the matsutake that enters world trade. First, there are industrial pines—and some other conifers—in wood-producing forests. Second, there are peasant landscapes, where farmers have cut back broadleaf trees, sometimes denuding hillsides completely, advantaging pine. In peasant forests, pine often grows together with oak and oak relatives, and these are matsutake hosts in some places. This chapter goes on to tell of an industrial forest, where pine grows without other trees; here histories in the making involve all the apparatus of capitalist wood production, not only property but also the booms and busts of the logging industry, and of labor, as well as the

state apparatus of regulation, including fire suppression. The next chapter moves to interactions between pines and oaks in peasant forests. Together, they show histories made in concert by humans, plants, and fungi.

Humans and pines (with their mycorrhizal allies) have about the same length of history in Finland: as soon as the glaciers retreated, some nine thousand years ago, both humans and pines started coming.[14] From a human point of view, that was a long time ago, hardly worth remembering. Thinking in terms of forests, however, the time line from the end of the Ice Age is still short. In this clash of perspectives, we see the contradictions of forest management: Finnish foresters have come to relate to forests as stable, cyclical, and renewable, yet the forests are open-ended and historically dynamic.

Birch was the first tree to arrive after the glaciers; but pine was close behind. Pine—with its fungi—knew how to handle the piles of rock and sand the glaciers left behind. Only one pine came, Scots pine, *Pinus sylvestris*, with short, bristly needles and red-brown bark. Behind birch and pine straggled other broadleafs, but most never made it to the far north. Finally, Norway spruce arrived, the latecomer. For those of us used to temperate or tropical forests, this is a very small number of trees. In Lapland, among forest-forming trees, there is one pine, one spruce, and two kinds of birch.[15] That's all. It's from the perspective of this small species count that the time of the glaciers seems so near. Other trees have not yet arrived. The forest might seem predestined for an industrial monocrop: Many stands were just one kind before they were managed.

Yet people in Finland have not always valued the sameness of the forest. Through the beginning of the twentieth century, swidden (fire-based shifting cultivation) was a common practice; through it farmers converted forests into ashes for their crops.[16] Swidden created pastures and uneven-aged broadleaf copses; it stimulated forest heterogeneity. This uneven peasant forest was one of the admired forms of nature-loving nineteenth-century artists.[17] Meanwhile, masses of pines had been cut to produce tar for a maritime capitalism that sourced its products from all over the world.[18] The story of a micromanaged Finnish for-

estry begins not with the long-durée of forest form but with the anxieties of an emerging crop of nineteenth-century experts. A German forester's 1858 report is downright belligerent:

> The destruction of forests, in which the Finns have become adept, is furthered by the careless and uncontrolled grazing of cattle, swidden practices, and destructive forest fires. In other words, these three means are used for the same main aim, namely the destruction of the forests.[19] . . . The Finns live in and from the forest, but out of stupidity and greed—like the old woman in the fairy tale—they kill the goose that lays the golden eggs.[20]

In 1866, a comprehensive forestry law was passed, and forest management began.[21]

It was not until after World War II, however, that Finland became a vast terrain of modern silviculture. Two developments turned all attention to timber. First, more than four hundred thousand Karelians came over the border from the Soviet Union after Finland ceded Karelia after the war. They needed houses and amenities, and the government built roads and opened up the forests to settle them. The roads made logging possible in new areas. Second, Finland agreed to pay U.S.$300 million to the Soviet Union in reparations for the war. Timber seemed just the way to raise the money—and jump-start Finland's postwar economy.[22] Big companies got involved in managing timberlands. But most of Finland's forests continue to be owned by small holders, and the commitment of the populace to timber as the quintessential Finnish product has helped make scientific forestry a national cause. Forestry associations came to be ruled by national standards.[23] Those standards enshrined the forest as a constant cycle of renewable timber—a static and ever-sustainable resource. History making would be for humans, alone.

But how does one stop a forest in its tracks? Consider the pines. As fungi mobilize more nutrients and organic matter accumulates, the northern soils compact and sometimes become waterlogged. Spruce are likely to come in under pine, and as the pines die, succeed them. Forest management has determined to stop this process. First, there is clear-cutting, which foresters call even-aged management. In Finland, clear-cutting aims to mimic the effects of forest fires that replaced whole stands of trees every century or so in the boreal forests before humans stopped

them. Pines come back after big fires because they know how to use bright open spaces and bare soils; similarly, pines colonize clear-cuts. Between clear-cuts, there are several rounds of thinning, which weed out other species as well as ensuring an open forest for fast pine growth. Decaying wood advantages spruce seedlings, so dead wood is cleared away. Finally, after the harvest, stumps are removed and the ground is harrowed to break up the soil, advantaging a new generation of pine. Through these techniques, foresters aim to create a cycle of renewal in which only pine participates, even when it isn't planted.

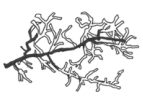
Such techniques are gaining critics in Finland, as elsewhere. Even pine forests, critics remind us, were not so homogeneous in the past.[24] Foresters respond defensively, touting the biodiversity they foster. *Gyromitra* "brain mushrooms," a popular edible in Finland (although considered poisonous in the United States), pop up in brochure after brochure as an icon of this biodiversity; *Gyromitra* often fruits in the disturbed soil that follows clear-cuts.[25] What might matsutake add to this conversation?

The most curious thing about matsutake in northern Finland is its boom-and-bust habit of fruiting. Some years, the ground is covered with matsutake mushrooms. Then, in following years, no matsutake will fruit at all. In 2007, a nature guide in Rovaniemi, on the Arctic Circle, claims to have personally found one thousand kilograms of matsutake. He heaped it up in great pyramids or left it lying on the ground. The next year, he found nothing, and the following year only one or two caps. This fruiting habit resembles what for trees is called "masting," in which trees allocate resources for fruiting only sporadically—but then, triggered by long-term cycles and environmental cues, fruit massively and all together across an area.[26] Masting refers to more than tracking weather changes from year to year; it requires multiyear strategic planning so that carbohydrates stored up one year might be expended in later fruiting. Furthermore, mast fruiting occurs in trees with mycorrhizal partners; the storage and expenditure necessary for masting appears to be coordinated between trees and their fungi. Fungi store carbohydrates for the future fruiting of trees. Might trees also accommodate the uneven fruiting of fungi? I know of no research that tracks how fungal fruiting is coordinated with tree masting, but there

is an enticing mystery here. Might the boom-and-bust fruiting of matsutake tell us about the historicity of pine forests in northern Finland?

Pines in northern Finland do not produce seed every year. Foresters recognize this as a problem for forest regeneration; it is not always possible to expect clear-cuts to bounce back immediately into forests, despite the fact that when pines do produce seed, they produce a great deal. In northern Sweden, researchers have noted "wavelike" and "episodic" regeneration in pine forests even without fire; seed production histories become forest histories through scarce or abundant seedlings.[27] Surely mycorrhizal partners must have a hand in the timing of pine seed production. Fungal fruiting may be one indication of such complex rhythms of coordination, in which pine and fungus share resources for phased, periodic reproduction.

This is a time scale humans can understand. Certainly, we might say, pines have covered new territory since the retreat of the glaciers, but that is too slow to make a difference to us. But the historical patterns of forest regeneration are another matter: We know this kind of time. It does not follow the predictable cycles desired by forest managers. It is evidence of the strain between the eternal, cyclical forests desired by managers, and actually existing historical forests. Irregular fruiting offers a not-so-cyclical rhythm, responding to cross-year environmental differences and multiyear coordination between fungi and trees. To specify these rhythms, we find ourselves speaking in dates, not cycles: 2007 was a good year for matsutake in northern Finland. In the coordination between fungal and host tree fruiting, we might begin to appreciate the history making of the forest, that is, its tracking of irreversible as well as cyclical time. Irregular rhythms produce irregular forests. Patches develop on different trajectories, creating uneven forest landscapes. And while forceful management against irregularity can drive some species to extinction, it can never succeed in transforming trees into creatures without history.



Most mushrooms in Finland are picked in privately owned forests. However, many people besides the owners have access to those mushrooms. Pickers are allowed access to private forests under ancient common law,

jokamiehenoikeus, translated into English as "everyman's rights." As long as one does not disturb residents, the forest is open for hiking and picking. Similarly, state forests are open to pickers. This expands the terrain in which foragers get to know mushrooms.

One day, my hosts took me to a forest reserve, where we looked at pines with three-hundred-year-old fire scars. The trees were perhaps five hundred years old. New research suggests that there were many areas in the boreal forest where stand-replacing fires were rare, and old trees flourished. Under the trees, we picked mushrooms and spoke of those that do not flourish with the younger forests of modern timber management. But matsutake is lucky. Japanese researchers suggest that matsutake fruits best—at least in central Japan—with forty- to eighty-year-old pines.[28] There is no reason that Finnish Lapland's managed pines, planned for hundred-year harvest, would not be thick with matsutake.[29] The fact that in many years they are not is itself a gift: an opening to the temporal irregularity of the histories forests make. Intermittent, spasmodic fruiting reminds us of the precarity of coordination—and the curious conjunctures of collaborative survival.

In the dilemmas generated by modern forestry's stop-history efforts, conservationists have come to believe that forests need refugia from management. But these refugia will have to be managed if they are to survive. Perhaps one skill for the Zen arts of managed nonmanagement will be to watch pine's partners rather than pine.

Active landscapes, Yunnan. The mushroom pickers painted on this market-town wall search in oak-and-pine woodlands, depicted with the disarming charm of a fairy tale. But where is the uncanny force of the forest, which regenerates even from devastation? In celebrations of sustainability, the forest's persistent resurgence is hidden in plain sight.

13
Resurgence

One of the most miraculous things about forests is that they sometimes grow back after they have been destroyed. We might think of this as resilience, or as ecological remediation, and I find these concepts useful. But what if we pushed even further by thinking through resurgence? Resurgence is the force of the life of the forest, its ability to spread its seeds and roots and runners to reclaim places that have been deforested. Glaciers, volcanoes, and fires have been some of the challenges forests have answered with resurgence. Human insults too have been met with resurgence. For several millennia now, human deforestation and forest resurgence have responded to each other. In the contemporary world, we know how to block resurgence. But this hardly seems a good enough reason to stop noticing its possibilities.

Several practical habits are obstructions. First, expectations of progress: the past seems far away. Woodlands, where forests grow with human disturbance, retreat into shadows because the peasants who work them, as so many authors tell us, are figures from archaic times.[1] It is an embarrassment to bring them up; we've moved on to barcoding life and big data. (Yet how could any catalog match the force of the forest?) Thus,

second, we imagine that—in contrast to peasants—modern Man is in control of all his work. Wilderness is the only place where nature remains sovereign; on human-disturbed landscapes, we see only the effects of that modernist caricature Man. We have stopped believing that the life of forest is strong enough to make itself felt around humans. Perhaps the best way to reverse this tide is to reclaim peasant woodlands as a figure for the here and now—not just the past.

For me to reclaim this figure, I had to visit Japan, where satoyama revitalization projects make human disturbance look good in allowing for the continual resurgence of ever-young forest. Satoyama projects reconstitute peasant disturbance to teach modern citizens to live within an active nature. This is not the only kind of forest I want to see on earth, but it is an important kind: a forest within which human household-scale livelihoods thrive. Satoyama revitalization is the subject of chapter 18. Here I follow the life of the forest, as this leads into more-than-human sociality, in and beyond Japan. The trail passes through pines and oaks. Where peasant farmers have created enclaves of tentative stability in the domains of states and empires, pines and oaks (in a broad sense) are often companions.[2] Here resurgence follows blasting: The resilience of pine-and-oak woodlands remediates the excesses of human-caused deforestation, regenerating the more-than-human peasant landscape.

Oaks and peasants have long histories in many parts of the world. Oak is useful. Above and beyond its strength as a building material, oak (unlike pine) takes its smooth time in burning; it makes some of the best firewood and charcoal. Better yet, felled oaks (unlike pines) tend not to die; they sprout back from roots and stumps to form new trees. The peasant practice of felling trees in the expectation that they will grow back from their stumps is called "coppicing," and coppiced oak woodlands are exemplary peasant forests.[3] Coppiced trees are ever young and quick growing even as they live for a long time. They outcompete new seedlings, thus stabilizing the forest's composition. Since coppice woods are open and bright, they sometimes find room for pines. Pines (with their fungi) colonize denuded spaces, and thus they also take up other parts of the continuum of peasant disturbance. Yet without human disturbance, pine may give way to oak and other broadleaf trees. It is this pine-oak-human interaction that gives the peasant

forest its integrity: As the quick growth of pine on repeatedly human-denuded hillsides yields to long-living stands of coppiced oak, forest ecosystems are regenerated and sustained.

Associations of oak and pine define and anchor peasant forest diversity. The long life of coppiced oaks, together with the quick colonization of empty spaces by pines, creates a tentative stability in which many species thrive, not just humans and their domesticates, but also familiar peasant companions such as rabbits, songbirds, hawks, grasses, berries, ants, frogs, and edible fungi.[4] Like the lives in a terrarium, in which one creature produces oxygen so that another may breathe, the diversity of peasant landscapes can be self-sustaining.

Yet history is always at work, both generating the terrarium and undermining it. Might the imagined stability of peasant landscapes follow upon great cataclysms—and the devastation I call "blasted landscapes"—that bring them into existence? Yes, I think. Peasant communities are defined by their subordination within states and empires; it takes power and violence to hold them in place. The multispecies assemblages they form are creatures too of the play of imperial power, with its property forms, its taxes, and its wars. Yet this is no reason to disparage the rhythms that develop around peasant life. Peasant forests tame blasted landscapes to make them sites of multispecies life—and peasant income. Peasant living channels and taps a forest resurgence it cannot fully control. But thus it recuperates larger-scale destructive projects, bringing life to damaged landscapes.

In Japan, one place to begin is not with humans but with the Grey-faced Buzzard (*Butastur indicus*), a lover of satoyama. These buzzards are migratory, mating in Siberia, then coming to Japan for the spring and summer to raise their young before flying off to Southeast Asia. Male buzzards feed nesting females during egg incubation. They sit atop pine trees, surveying the landscape, looking for reptiles, amphibians, and insects. In May, paddy fields are flooded, and the buzzards look for frogs. When grown rice blocks hunting, the buzzards look into the peasant woodlands for insects. One study found that male buzzards are unwilling to

sit on a given tree for more than fourteen minutes if they spot no food.[5] The peasant landscape must be laid out as a larder, with frogs and insects appropriately arrayed, for these birds to thrive.

Grey-faced Buzzards have adapted their migration patterns to the Japanese peasant landscape. Meanwhile, all their foods are equally dependent on this disturbance regime. Without maintenance of the irrigation system, the frog population declines.[6] And so many insects have evolved just to live with peasant trees! *Konara* oak (*Quercus serrata*) has at least eighty-five specialist butterflies that depend on it as food. One colorful butterfly, *Sasakia charonda*, requires the sap of young oaks—kept young by peasant coppicing; when coppicing is not maintained, the oaks grow old, and the butterfly declines.[7]

How is it that the ecological relations of peasant forests have come to be the subject of so much research—especially now that Japan's woodlands have been largely abandoned, as fossil fuels have replaced firewood and as the younger generation has moved to the city? Some researchers are clear: future sustainability is best modeled with the help of nostalgia. At least that was the view of Professor K, an environmental economist in Kyoto.

Professor K told me he had become an economist because he thought he could help poor people. But ten years into a successful career, he realized his research was helping no one. Worse yet, he saw the glazed eyes of his students. He spoke to them and knew it wasn't just his lectures; his students too had lost touch with questions that mattered. Professor K reconsidered his life trajectory. He remembered his visits as a boy to his grandparents' village: how alive he felt as he explored the countryside! That landscape sustained people rather than sapping their strength. So he turned his professional work toward restoring Japan's peasant landscape. He argued and pushed until his university obtained access to an area of abandoned fields and forests, and he took his students there, not just to look but also to study the skills of peasant life. Together, they learned: they re-cleared the irrigation channels, planted rice, opened up the forests, built a kiln to make charcoal, and found their way into taking care of the forest with the eyes and ears of peasants. How enthusiastic his seminars were now!

He showed me the overgrown, abandoned forest that still crowded around their reclaimed fields. There was so much work to do to make a

sustainable peasant forest emerge from the tangled brush. *Moso* bamboo, he explained, had gone wild here. Brought from China some three hundred years ago for the excellence of its bamboo shoots, plantings had always been carefully trimmed around peasant households. But as peasant forests and fields have been neglected, the bamboo has become an aggressive invader, taking over the forest. He showed me how it was suffocating the remaining pines, cloaking them in the deep shade that made them vulnerable to pine wilt. But his students were cutting back bamboo and learning too to make it into charcoal.

The coppiced oaks were also in trouble. We admired the ancient stools that had regrown over and over into trees. But a wilderness of other plants now surrounded them, and since they had not been coppiced for many years, they no longer retained the always-youthful qualities that shaped the architecture of the forest. He and his students, he explained, would have to learn the art of coppice again. Only then, he said, could they attract the plants and animals of the peasant landscape: the birds, shrubs, and flowers that made Japan's four seasons so fruitful and inspiring. Because of the work they had already done, he said, these life forms were beginning to come back. But all this was an ongoing labor of love. The sustainability of nature, he said, never just falls into place; it must be brought out through that human work that also brings out our humanity. Peasant landscapes, he explained, are the proving grounds for remaking sustainable relations between humans and nature.

Peasant forests have only recently come into focus in Japan. Before the past thirty years, foresters and forest historians were obsessed with the aristocrats among trees: Japanese cedar and cypress. When they wrote about Japan's "forests," they were usually thinking about just these two trees.[8] There is good reason: these are beautiful and useful trees. *Sugi*, called "cedar" but actually a distinctive *Cryptomeria*, grows straight and tall like a California redwood, producing a glorious, decay-resistant wood for boards, paneling, posts, and pillars. *Hinoki*, Japanese cypress (*Chamaecyparis obtusa*), is even more impressive. The wood is sweetly scented and can be planed to a beautiful texture. It resists rot. It is the perfect wood for temples. Both hinoki and sugi can grow to enormous

sizes, allowing awe-inspiring posts and boards. No wonder that Japan's early rulers did their best to cut down all the sugi and hinoki in the forest for their palaces and shrines.

Early aristocratic fixation on sugi and hinoki opened possibilities for peasant claims on other trees—particularly oaks.[9] In the twelfth century, wars fractured the unity of aristocrats, allowing peasants to institutionalize claims to village forests. *Iriai* rights are common-land rights shared by villagers, allowing enrolled households to gather firewood, make charcoal, and use all the products of village lands. In contrast to common forest rights in many other places, iriai rights in Japan were codified and enforceable in courts of law. Yet it was unlikely to find a sugi or hinoki in Japan's premodern iriai forests; those trees were claimed by aristocrats, even if they grew on village lands. But sometimes peasants could claim oaks even on the lord's land; iriai can operate as a layer of use rights on land owned by others. Lords, provided for by others, didn't need oak.[10] Still, it is not surprising that elites have tried very hard to cut back on iriai rights. After the nineteenth-century Meiji Restoration, many commonly held lands were privatized or claimed by the state. Amazingly, despite all odds, some iriai forest rights have been maintained through to the present—to fall into difficulty from the late-twentieth-century abandonment of village forests as rural people flocked into cities.

What trees defined the iriai village forest? Japanese are proud of their location at the crossroads of temperate and subtropical suites of plants and animals: Japan has four seasons *and* is green all year round. Subtropical plants and insects are shared with Japan's southern neighbors in Taiwan; a cold-weather flora and fauna are shared with the northeast Asian mainland. Oaks stretch across this divide. Deciduous oaks, with large, translucent leaves that turn color and fall off in winter, form part of the northeastern flora. Evergreen oaks, with smaller and thicker leaves that are green all year, come from the southwest. Both kinds of oaks are useful for fuel and charcoal. But in some important, tradition-setting parts of central Japan, deciduous oaks are preferred to evergreens. Peasants weeded out evergreen oak seedlings, along with the rest of the underbrush and grass that grew under the trees, privileging the deciduous species. This choice made a difference for the oak-pine relationship—and the architecture of the forest: unlike evergreen oaks,

which offer constant shade, deciduous oaks leave bright spaces in the winter and spring where pines, as well as temperate herbaceous plants, might have a chance. Furthermore, peasants continually opened up and cleaned out the forest, letting pines and other temperate species in among the oaks.[11]

Unlike premodern European peasants, premodern peasants in Japan did not raise milk or meat animals, and so they could not fertilize their fields with manure as Europeans did. Gathering plants and forest duff for green manure was a major occupation of peasant life. Everything on the forest floor was taken, leaving it cleared to the bare mineral soils favored by pine. Some areas were opened up to favor grass. The pillars of this disturbed forest were coppiced oaks; the most common was *Quercus serrata*, known as *konara*. Oak wood was useful for all kinds of things, from firewood to growing cultivated *shiitake* mushrooms. Periodic coppicing kept the oak trunk and branches young, allowing oaks to dominate the forest, as they grew back faster than other species could become established. On ridges, in open meadows, and on denuded hillsides grew *akamatsu* red pine, *Pinus densiflora*, with its partner matsutake.

Japanese red pine is a creature of peasant disturbance. It cannot compete with broadleaf trees, which both shade it out and create rich and deep humus layers that only add to their advantage. Paleobotanists have found that several thousand years ago, when humans first began to deforest the Japanese landscape, red pine pollen increased dramatically, from previous levels of almost nothing.[12] Pine thrives with peasant disturbance: the bright sunshine of clearing and coppicing; the bare, raked mineral soils. Oak can drive out pine on peasant hillsides. But the practices of coppicing and the gathering of green manure created complementary spaces for konara oak and akamatsu pine. Matsutake grew with the pine, helping it to find a footing on ridges and eroded slopes. In particularly denuded areas, flush with pine, matsutake was the most common forest mushroom.

In the nineteenth and twentieth centuries, members of Japan's burgeoning urban middle class began to visit the countryside on outings associated with the search for matsutake. This had once been an aristocratic prerogative, but now many could participate. Villagers designated areas of pine and matsutake as "guest mountains" and charged urban visitors for the privilege of a morning's mushroom picking followed by

a sukiyaki lunch in the refreshing outdoors. This practice wove an affective bundle in which matsutake hunting wraps all the pleasures of rural biodiversity into the escape from ordinary cares. Like childhood visits to one's grandparents' farm, matsutake outings scent the rural with nostalgia, and this scent has continued to influence present-day appreciation of rural landscapes.

Contemporary advocates of the restoration of Japanese peasant landscapes may aestheticize the peasant forest as the planned result of traditional knowledge, creating nature and human needs in harmony. Yet many scholars suggest that these harmonious forms developed out of moments of deforestation and environmental destruction. Kazuhiko Takeuchi, an environmental historian, stresses the extensive deforestation associated with Japan's industrialization in the mid-nineteenth century.[13] He argues that historical changes have been key to the peasant forests that today's advocates have come to imagine, the forests of the first half of the twentieth century. In the late nineteenth century, Japan's modernization put pressure on peasant forests, leading to massive deforestation in central Japan. Visitors noted the array of "bald mountains" visible along the roads. By the turn of the century, these bare hillsides were growing back in akamatsu pine. In some cases, pine was planted, for example, for watershed management; but akamatsu seeds spread everywhere, and the pine, with the help of matsutake, came up by itself. In the first part of the twentieth century, matsutake was as common and abundant as the pine forests. With growing demands for firewood and charcoal, oak coppicing was also active. The pine-oak woodlands of contemporary nostalgic views were in full flower.

Fumihiko Yoshimura, a mycologist and pine-forest advocate, emphasizes a later deforestation: the disturbance of the forests leading up to and during World War II.[14] Trees were cut down not only for peasant uses but also as fuel and building supplies for the military buildup. The peasant landscape was significantly denuded. After the war, these landscapes experienced regreening: Pines grew up on bare landscapes. Dr. Yoshimura would like to restore the pine forests to a 1955 baseline, a time of regrowth. After that, instead of renewal, the forests deteriorated.

I save the story of the post-1950s transformations that changed the forest for later chapters. Here I want to spotlight the question of how great historical disturbances may open possibilities for the compara-

tively stable ecosystem of the ever-young and open peasant forest. It is ironic that these episodes of deforestation gave rise to the forests that have become the very image of stability and sustainability in much contemporary Japanese thought. This irony does not make the peasant forest less useful or desirable, but it shifts our appreciation of the work of living with forest resurgence: everyday peasant efforts are often responses to historical shifts far out of their control. Small disturbances eddy within the currents of big disturbances. To appreciate this point, it seems useful to turn away from the nostalgia-driven reconstructions of Japanese advocates and volunteers, which lull us out of history by their aesthetic perfection.

In central Yunnan, in southwest China, peasant forests are not nostalgic reconstructions but are actively used by peasants. They are not considered objects of ideal beauty but disasters that need to be cleaned up. They do not look like reconstructions. They are messy at best, and sometimes provocatively so. This is the peasant landscape in motion, not recreated through nostalgia. Despite its offending disorder, in many ways this ever-young and open forest has a striking resemblance to central Japan's peasant woods. Although the species are different, coppiced oak and pine form the forest's architecture.[15] Yunnan matsutake has different proclivities than its Japanese sibling: it grows with oaks as well as pines. But this makes the peasant-oak-pine-matsutake complex even more evident. Perhaps here, too, it is great cataclysms rather than only peasant ingenuity that allowed this forest resurgence.

In central Japan, I was offered attractively potted peasant forest histories not just by scholars but also by foresters and rural residents. Once trained inside this discourse, my work was easy; all I had to do was look and listen. Thus trained, I was surprised in Yunnan when the very idea of a peasant forest history provoked confusion and defensiveness. Everyone wanted peasants to be good forest managers, but it was through their skills as modern entrepreneurs, not traditional stewards, that they would know how to manage. Peasant forests were a modern object—a result of decentralization—not an old one, and the goal of forest experts was to make modern rationality possible. If the forests were in bad

shape, it was because mistakes were made in the past. History was the story of those mistakes.[16]

Michael Hathaway and I spoke to foresters and even forest historians. They explained how the state had enclosed forests, and how, in this time of reform, they had passed them back to the peasants via household contracts. They spoke of the 1998 logging ban, which was meant to stop the damage, and of the model projects through which new forms of forest management were tried. When I turned the conversation to forest histories, they spoke again of the state, and its mistakes. Individually contracted household forests were the new way to organize forests, and they would have to grow in places damaged by earlier collective management. The key, they thought, was to sort out tenure and incentives, allowing entrepreneurs, not bureaucrats, to manage. In these new times, the forests would be remade with the market. We spoke of laws, incentives, and model projects. I hadn't yet touched the trees. I missed the aesthetic objects I had come to know in Japan, even as I now saw their strangeness.

When I arrived in rural Chuxiong Prefecture, people were equally unhappy with my Japan-taught questions. Village officials recapitulated national stories of changing administrative categories; but ordinary residents didn't know what to do with those categories. Finally, one elderly man made a comment that started a more productive comparison moving in my mind. During China's Great Leap Forward, he said, the landscape was deforested by the need for "green steel." Wasn't Japan's Meiji-era deforestation also about green steel?

The forest in central Yunnan is mainly sparse and young. It *looks* disturbed. Tracks run through the eroded hillsides. Despite the ban on commercial timber, everything is used, from the ground to the treetops. Evergreen oaks dominate the landscape, ranging from shrubs to coppiced trees. Yet the forest is open; pines mix with the oaks. Pine, like oak, has many uses. Pine resin is sometimes tapped. Pine pollen is gathered to sell to the cosmetics industry; some pines also produce commercially valuable edible seeds. Pine needles are gathered for bedding for the pigs each household raises; pig feces held together by pine needles

are a major fertilizer for crops. Herbaceous plants are gathered for food for the pigs—as well as for food and medicine for people. Pig food is cooked every day with firewood on an outdoor stove; thus, even where households have other fuel sources for human cooking, every household gathers great stacks of firewood. Shepherds bring cattle and goats to browse wherever land is not obviously under crops. Commercial picking of wild mushrooms, not just matsutake but many species, creates foot traffic in the forest. In some places, groves of serious trees are still available for a vigorous if illegal timber trade, but in most areas the trees are thin and small. Exotic eucalyptus, first planted for a village-based oil industry, spreads along the roads. This is a hard forest to promote as timeless peasant wisdom, although brave Chinese scholars have tried.[17]

The messy peasant forest does little to satisfy foreign conservationists, who have flocked to Yunnan to save endangered nature, and they are quick to blame the excesses of communism for deviations from their wilderness dreams. Young Chinese scholars and students follow the foreign lead. More than one young city person told me that Yunnan's hills were deforested by Red Guards during China's Cultural Revolution, although this story seems unlikely. The Cultural Revolution is an easy scapegoat for everything that seems wrong. To attribute forest damage to this period mainly indicates that the faults of this young and open forest are easy for everyone to see. It is in this context that it seems striking to note similarities between peasant forests in central Yunnan and central Honshu, Japan. Perhaps Japan's oak-pine forests, in their prime, were less aesthetically and ecologically perfect than they are imagined by advocates now. Perhaps Yunnan's oak-pine forests are better than critics imagine. Those eroded hillsides are the site of a lively regeneration in which oak, pine, and matsutake have a good thing going—not just for peasants but also for many kinds of life.

The time delays are eerily similar. Central Yunnan's forests suffered during China's Great Leap Forward of the late 1950s and early 1960s, when China mustered its resources for rapid industrialization. The "green steel" to which the old villager referred was used in part to fuel backyard furnaces in which peasants melted down their pots to contribute the metal to China's development.[18] Some forests were protected, but in the next decade, the central government cut lumber from these

forests for export to raise foreign currency. Forty to fifty years later, pines had colonized bare spaces, and oak stools had sprouted into trees. The peasant forest was in full flower, and matsutake mushrooms were one sign of its success.

Similarly, central Japan's forests suffered during Japan's rapid industrialization in the decades after the Meiji Restoration of 1868. Forty to fifty years later, peasant oak-pine forests achieved the perfection for which they are remembered today. After the initial disturbance, as in China, peasants learned to make the regrowing trees work for them. The interlocking uses of the forest fit together; the landscape became recognizable and seemed increasingly stable and thus harmonious. Oak supplied building materials, firewood, and charcoal; pine supplied matsutake mushrooms as well as wood, turpentine, needles, and fast-burning fuel. Perhaps the living peasant forests of early-twentieth-century Japan looked a little like today's forests in central Yunnan. Although historians rush to differentiate the modernization achieved by Japan's Meiji Restoration and the failures of China's Great Leap Forward, from the perspective of a tree, there may not have been much difference. If peasant forests are viewed differently in each context, it may be in part be contrast between close and distant, and forward- and backward-looking views.

People and trees are caught in irreversible histories of disturbance. But some kinds of disturbance have been followed by regrowth of a sort that nurtures many lives. Peasant oak-pine forests have been eddies of stability and cohabitation. Yet they are often put into motion by great cataclysms, such as the deforestation that accompanies national industrialization. Small eddies of interlocking lives within great rivers of disturbance: these are surely sites for thinking about human talents for remediation. But there is also the forest's point of view. Despite all insults, resurgence has not yet ceased.

Active landscapes, Oregon. Critics describe the eastern Cascades forest as "festering sores on the back of a mangy old dog," and even its foresters admit that management has been a series of mistakes. Yet for pickers, this forest is "ground zero." In the contingency of error, sometimes mushrooms pop.

14
Serendipity

When old timers explained that Oregon's eastern Cascades had once been a center for industrial logging, I could hardly believe them. All I saw was the highway, flanked by unhealthy-looking trees—although a few roadside signs said "Industrial Forest." People showed me where towns and mills had once flourished, but now there was nothing but brush.[1] They took me to now-vanished homes, hotels, and hobo camps. The hobos had left piles of rusting cans, but the towns were gone to scruffy stands of overcrowded pines, neither wilderness nor civilization. The folks who remained made do with this and that. On the highway, shut-down stores sagged with broken windows. Businesses mixed gun and liquor sales. Signs on driveways said uninvited guests would be shot. When a new truck stop opened, they said, no one showed up for the preemployment open meeting because they had heard about the company's drug testing and personal surveillance. "Anyone who lives out here wants to be left alone," someone explained.[2]

Resource management does not always lead to the effects it expects. One place to look for life in the forest is in those plans' undoing. Mistakes were made . . . but mushrooms popped up.

The eastern Cascades is managed for industrial pine, but it does not look like Finnish Lapland. The forest is messy. Dead wood lies and leans everywhere. Trees are often scraggly and either sparse or densely packed. Dwarf mistletoe and root rot sap their strength. In contrast to Finland, where smallholders jointly manage most of the forest, Cascades matsutake grows on national forest—or else timber company—land. There are few small forest owners to coordinate management. This is just as well for forest management dreams, because white residents and visitors tend to resent the idea of forest regulation as iconic of an overreaching federal government. They shoot holes in Forest Service signs and boast about the rules they flaunt. The Forest Service works to appeal to them, but it is an uphill battle.

Social scientists often stress the bureaucratic assertiveness of the U.S. Forest Service. Yet the foresters I met in the eastern Cascades were humble in their explanations of forest management. Their programs, they said, were a series of experiments, and most all of them had failed. How, for example, should they deal with the lodgepoles that just kept coming back in denser thickets? They tried clear-cutting, which created those dense thickets. They tried saving seed trees and shelterwood, but lone trees were blown down by the wind and snow. Should they try to save jobs at the one remaining logging mill even when it means clashing with environmentalists in court?[3] Although environmental goals have changed Forest Service rhetoric, district offices are still evaluated by the board feet of timber they generate. There was nothing to do, they said, but deal with each dilemma as it arose. Since there was no good alternative, they just kept trying.

The landscape has not made forest management easy. While, as in Finland, there were glaciers in the U.S. Pacific Northwest, pines occupy the eastern Cascades for a different reason. A volcanic eruption some 7,500 years ago covered the region with lava, ash, and pumice (the air-filled stone that results when ejected lava cools). If there was organic soil there before, it was buried. There are still blocks of lava and pumice beds where almost nothing grows. That pines grow at all on this unfriendly ground seems a miracle—and one for which matsutake can claim some credit.

Matsutake grows with many host trees in Oregon. In the wet, mixed conifer forests found at high altitudes, matsutake is abundant with Shasta red fir, mountain hemlock, and sugar pine. On western Cascade slopes, it is sometimes found with Douglas fir; on the Oregon coast, matsutake grows with tanoak. On the dry eastern slopes of the Cascades, matsutake lives with ponderosa pines. In each of these sites, there are other fungi. Where the relationship between tree and fungus starts to get exclusive is the lodgepole pine forests. Foraging in lodgepole, one only occasionally spots another mushroom species. This is not a sure sign of lack of underground diversity: many fungi rarely send up fruiting bodies. Still, it seems clear that an especially intimate companionship has formed between matsutake and lodgepole in the eastern Cascades.

Like most friendships, this one depends on chance meetings and small beginnings that later surge into significance. Both protagonists were once neglected; if now they dominate regional news, there must be a story. Deploying their own blasted-landscapes metaphor, foragers call this area "ground zero" of the American matsutake scene. What brought fungus and root together with such spectacular results?

When whites first came to the eastern Cascades in the nineteenth century, they did not notice lodgepoles. Instead, they stood in awe of the giant ponderosas that dominated the forest. According to historian William Robbins, these pine forests once were "the most impressive and spectacular" of Oregon's interior forests.[4] The trees were huge, and they were surrounded by parklike open country with little underbrush. U.S. Army Captain John Charles Fremont came through in 1834: "Today the country was all pine forest. . . . The timber was uniformly large, some of the pines measuring 22 feet in circumference, and 12 to 13 feet at six above."[5] A turn-of-the-century U.S.G.S. surveyor added, "The forest floor is often as clean as if it had been cleared, and one may ride or drive without hindrance."[6] A 1910 newspaper made the obvious connection: "No timber in the world can be logged more easily."[7]

Ponderosa timber attracted both government and industry. In 1893, President Grover Cleveland created the Cascade Forest Reserve; soon, a race was on to construct railroads to bring out the timber, and by the early twentieth century, lumbermen had obtained title to huge lots.[8] By the 1930s, Oregon timber dominated the U.S. wood industry; eastern

Cascade ponderosas, in heavy demand, were logged as fast as fellers could get to them.[9] The mix of public and private land shaped the timing of logging. Before World War II, timber companies pressured the government to keep national forests closed, to keep prices high. By the end of the war, private lands were depleted, and the same voices then called for opening the national forests. Only this, they said, could keep the mills open, preventing unemployment and national wood shortages. Afterward, national forests increasingly bore the brunt of logging.[10]

The impact of logging changed with postwar practices of industrial forestry. Foresters, buoyed by the optimism of new technologies as well as the boom economy, had an idea for how national forests could be opened without depleting their timber. All they had to do was replace "decadent," "overmature" old growth forests with fast-growing and vigorous young trees, which would be harvestable in predictable eighty- to one-hundred-year year intervals.[11] They might even plant superior stock, making the new forests faster-growing and more resistant to pests and diseases. New technologies were making it practical to remove all the trees, not just the most desirable ones; thus foresters turned to clear-cutting.[12] Clear-cutting would lead to renewal even as it made the forest into units of expansion. The faster the forest was cut, according to this logic, the more productive it would become. Some local foresters were not convinced, but the force of national opinion swept them along. In the 1970s, replanting after cutting became standard practice. Aerial spraying against "weeds" was also used in some areas.[13] As one eastern Cascade forester recalled, in the vision of that period, "Forests of the future would be dominated by a mosaic of 25 to 40 acre even-aged stands of healthy and intensively managed young-growth."[14]

What went wrong with the postwar vision? Ponderosa was increasingly logged out, and it did not grow back, at least not readily. It was missing fire. The great ponderosas in their open parks had emerged together with Native American fire regimes, in which frequent burning of the underbrush encouraged browse for deer and berries for fall picking. Fire burned out competing conifer species while allowing the ponderosas to thrive. But whites drove out Native Americans in a series of wars and relocations. The Forest Service stopped not only their fires but all fires. Without fire, flammable species such as white fir and lodgepole grew up under the ponderosas. When the ponderosas were removed

through logging, these other species took over. The open character of the landscape disappeared as small trees grew in. Pure stands of ponderosa became rare. The landscape looked less and less like the open ponderosa forests of the early twentieth century—and less and less like a landscape of interest to the timber industry.

In dispossessing Native peoples from the lands they had made so inviting, white loggers, soldiers, and foresters destroyed the parklike forests they had wanted so badly. To pause in recollection, it seems useful to tell of the last great Native dispossession by fiat: the 1954 "termination," or ending of all treaty obligations to the Klamath Tribes. As a result of termination, a chunk of ponderosa land became national forest, ready to be logged by private interests. A few decades later, what was left? The quotations that follow, from the tribe's website, help tell the story.[15]

> The prosperous and powerful Klamath, Modoc and the Yahooskin Band of Snake Paiute people (hereinafter "the Klamaths") once controlled 22 million acres of territory in south central Oregon and Northern California. Their lifestyles and economies provided abundantly for their needs and their cultural ways for over 14,000 years. Contact with invading Europeans, however, quickly decimated their numbers through disease and war and resulted in a treaty reserving to the tribes a diminished land base of 2.2 million acres. Once traditional rivals, the three tribes were forced to live in close proximity to one another on these drastically reduced reserved lands.

In the 1950s, scalability was a matter for citizenship as well as resource use. America was the melting pot, where immigrants could be homogenized to face the future as productive citizens. Homogenization allowed progress: the advance of scalability in business and in civic life. This was the climate in which legislation was passed to unilaterally abrogate U.S. treaty obligations to selected Indian tribes. In the language of the day, members of these tribes were said to be ready to assimilate into American society without special status; their difference would be erased by law.[16]

The rights of the Klamath Tribes looked ripe for termination, to lawmakers, because the tribes were well off. The railroad and the logging

of adjacent forests had changed the value of the reservation; by the 1950s, the Klamath Reservation encompassed a large swath of the ponderosa pine that loggers wanted so badly. Klamath Indians were doing well from revenues from timber. They were not a burden on the government. But loggers and officials wanted what they had.

> The Klamath Tribes were by every measure not only no burden, but a significant contributor to the local economy. Their strength and wealth were, however, no match for determined efforts of the federal government to eradicate their culture and acquire their most valuable natural resources—a million acres of land and ponderosa pine. The stage was set for the dispossession of the Klamaths in the early 1950s when the Tribe was subjected to the worst of many disastrous experiments in federal-Indian policy—termination.

As termination proceeded, private companies and public agencies circled. In the end, the federal government took precedence, taking the land as national forest.[17] Klamath Tribes members were paid off.

> Much of the wealth derived from the sale of the Klamath's heritage was lost to sharp dealings by merchants; unscrupulous attorneys that mishandled, embezzled or engaged in self-dealing from trust accounts of those determined to be incompetent; to poorly considered investments—sometimes by attorneys lending themselves money from the accounts; or to exorbitant fees charged by local attorneys or banks for the handling of the beneficiaries[']affairs—which hardly ever got more sophisticated than handing out checks to the beneficiaries—a process usually handled in the most paternalistic of ways.

The dreams of progress imagined by termination advocates did not make Klamath "standard Americans" with capital and privilege. Social and personal problems followed.

> Data compiled for the years from 1966 through 1980 showed the following:
> - 28 percent died by age 25.
> - 52 percent died by age 40.
> - 40 percent of all deaths were alcohol related.
> - Infant mortality was two and one-half times the statewide average.

- 70 percent of the adults had less than a high-school education.
- Poverty levels were three times that of non-Indians in Klamath County—the poorest county in Oregon.

Finally, in 1986, U.S. recognition was restored. Since then, the tribes have pursued water rights and the return of at least some of their reservation land. The tribes have forest management plans for this now logged-over land.[18]

> The Klamaths seek return of these [lands and resources] primarily for the purpose of healing the land and its resources and restoring them to some semblance of the abundance they once reflected. They also seek to restore the spiritual integrity of the land. . . . They want their way of life back.

For the moment, some are picking matsutake mushrooms.

And what of the cut-over forest? On the landscape once known for its ponderosa, fir and lodgepole emerged in crowds. Lodgepole has many fine piney characteristics, and, by the 1960s, foresters and loggers did their best to work with it. Mills began processing lodgepole along with ponderosa.[19] In 1970s replanting schemes, lodgepole rather than ponderosa was often used, owing to its easy establishment on disturbed ground. If you look at the forest from above today on Google Earth, you see mainly swaths of lodgepole growing on old clear-cuts. It's not a pretty sight. Turn-of-the-century critics—taking foresters by surprise—described eastern Cascade timber areas as "festering sores on the back of a mangy old dog" and complained that they were "visible from outer space."[20] Lodgepole had become noticeable. It is time to make it a protagonist of the story.

Lodgepole, *Pinus contorta*, is an old resident in the eastern Cascades. It may have been the first tree to arrive after the glaciers melted.[21] After the eruption of Mt. Mazama, lodgepole was one of the few trees that could grow on pumice flats. It also flourished in cold pockets on the hillside, which were affected by summer frosts that killed other trees, even ponderosa. In the western Cascades, it gathers in old mudslides, where organic soil was swept away. Working with matsutake, lodgepole is hardy.

Selective logging advantaged lodgepole. In mixed conifer forests, loggers picked the best timber and left the rest. Stumps of sugar pines litter the high mountains, although living sugar pine has become rare. Lodgepole was one of the trees not taken. It didn't mind the disturbance. Abandoned logging roads are thick with young lodgepole.

On dry ponderosa slopes, it was the exclusion of fire that most advantaged lodgepole. Lodgepole and ponderosa have opposite piney strategies for dealing with fire. Ponderosa has thick bark and tall crowns; most ground fires won't touch it. Fire thins ponderosa stands, removing small trees and allowing survivors to dominate hillsides uncrowded by the demands of others. In contrast, lodgepole burns readily; its thick groves, live and dead trees intermingled, spread fire. But it generates more seeds than most other trees, and it is often the first to reseed burned areas. In the Rocky Mountains, lodgepoles have closed cones, releasing their seeds only in fires. In the Cascades, lodgepole release seeds every year. There are so many of them that they are quick to colonize new lands.[22]

In the open, bright clearings that follow clear-cut logging, Cascades' lodgepole seedlings colonize in thick packs, which sometimes grow into stands so dense that foresters call them "dog-hair regeneration." One old timer showed me a patch so tightly intertwined that it seemed a welded solid; he joked that we should call it "frog-hair regeneration." Thick groves are places for diseases and pests. As the trees grow up, some start to die. Dead and live wood intermix; dead trees lean across live ones. Straining under the weight, whole groups blow down. Meanwhile, a single spark can burn the whole grove—and with it the rest of the landscape, including private houses, horse camps, timber holdings, and Forest Service offices. Although a few entertain fantasies of cleaning things up this way, most foresters think this is a bad idea.

From lodgepole's perspective, burning is not so terrible, since a new crop of seedlings come up after the fire. Over the long history of the Cascades, fire is one way lodgepole kept its place on the landscape. But Forest Service fire exclusion has given lodgepole forests a new experience: living into old age. Instead of a rapid cycling of generations, together with fire, lodgepoles in the eastern Cascades are maturing. And as they mature, they have increasingly met with matsutake mushrooms.

Fungi are choosy about forest succession. Some are quick to establish themselves with new trees, while others let the forest mature before they take hold. Matsutake seems to be a mid-successional fungus. In Japan, research suggests that matsutake first begin to produce fruiting bodies in pine forests after forty years.[23] Fruiting continues for more than forty years thereafter.[24] No one has gathered clear data on this issue in Oregon, but foragers and foresters agree: matsutake does not fruit with young trees. In the first decade of the twenty-first century, pine plantations established in the 1970s and 1980s did not yet produce matsutake. In naturally regenerating forest, perhaps only forty-to-fifty-year-old trees begin to support matsutake fruiting.[25]

But forty-to-fifty-year-old lodgepole might not even exist except for Forest Service fire exclusion. The budding presence of matsutake mushrooms, their mycelia entwined with lodgepole roots, is an unintended consequence of the most famous Forest Service mistake in the interior forests of the American West: the exclusion of fire.

Meanwhile, the biggest challenge for foresters today is how to keep densely packed and aging lodgepoles from burning the forest down. This is complicated by changes in the Forest Service over the past few decades. First, environmental goals had begun to influence the Forest Service by the 1980s. As the Forest Service entered into dialogue with environmentalists, varied new experiments were tried, such as uneven-aged management. Second, timber companies moved on, and fewer federal funds were made available (see chapter 15). It became impossible for foresters to propose any initiative that was not both specifically mandated by law and incredibly cheap. All forest management would have to be subcontracted to loggers in exchange for the best remaining trees. Labor-intensive treatments were no longer an option. Without the dominance of big timber money, foresters have increasingly seen their job as one of balancing various interests—among different forest users (e.g., wildlife vs. loggers), among different forestry approaches (e.g., sustainable yield vs. sustainable ecosystem services), and among different patch ecologies (e.g., even- vs. uneven-aged management). Missing a singular path to progress, they juggle alternatives.

Foresters would like to thin the lodgepoles.[26] But here they run into the sensibilities of matsutake pickers, who have seen their favorite patches

disappear as a result of Forest Service interference. Foresters appeal to pickers with Japanese research, which argues that opening up the forests is good for matsutake. But forests in Japan are different: pines suffer from shading by broadleafs; forest thinning is almost always done by hand. Pines have no broadleaf competition in the eastern Cascades, and foresters there cannot imagine thinning without heavy mechanical equipment. Pickers in the Cascades argue that the equipment breaks and compacts the soil, destroying the fungus. They showed me once-productive patches now marked only with the deep and persistent tracks of heavy equipment. Pickers say that fungi destroyed by soil compaction take many years to reestablish themselves, even when mature tree roots are available.

Given that a major government bureaucracy faces off here with rather powerless forest foragers, it is amazing to me that foresters listen to such complaints at all. Perhaps it is a sign of the newly equivocal Forest Service. In any case, something extraordinary happened during the matsutake season of 2008: one Forest District decided to officially experiment with lodgepole management for matsutake. What this meant was not thinning, even where other Forest Service mandates, such as fire protection, would warrant thinning. At least for a moment, matsutake had entered the Forest Service imagination, and its pact with lodgepole was noticed. To appreciate how strange this is, consider that no other nontimber forest product has attained the status of a management objective, at least in this part of the country. In a bureaucracy that sees only trees, a mushroom companion has made a splash appearance.

Mistakes were made . . . and mushrooms popped up.

Active landscapes, Kyoto Prefecture. In the 1950s and 1960s, wood-producing plantations of sugi and hinoki replaced oak-pine woodlands across central Japan, yet today these plantations are only harvested in favored regions, such as that shown here. Elsewhere, pests and weeds suffuse the close-planted industrial stands. Yet satoyama revitalization is possible because of this decline.

15
Ruin

The matsutake forests of Japan and Oregon are different in almost every possible way except one: they would probably be converted to more profitable industrial forests if the price of timber were higher. This small convergence is a reminder of structures explored in part 2: the globe-spanning supply chains through which commodities are procured and the state-and-industry pacts through which capitalists gain leverage. Forests are shaped not only in local livelihood practices and state management policies but also by transnational opportunities for the concentration of wealth. Global history is at play—but sometimes with unexpected results.

This chapter asks, how are ruined industrial forests produced separately and in tandem? How do transnational conjunctures make forests? Instead of showing us one overarching frame, conjunctures show us how to follow connections snaking in and out of nations, regions, and local landscapes. These arise from common histories—but also from unexpected convergences and moments of uncanny coordination. Precarity is a globally coordinated phenomenon, and yet it does not follow

unified global force fields. To know the world that progress has left to us, we must track shifting patches of ruination.

To taste the surprising force of unexpected concurrences, I begin off track, with falling timber in Southeast Asia in the last third of the twentieth century. Southeast Asian tropical wood supplied the Japanese construction boom between the 1960s and the 1990s. Deforestation was sponsored by Japanese trading companies and put in place through Southeast Asian military force. Because of these supply-chain arrangements, the wood was incredibly cheap. It depressed the global price of timber—and particularly timber used by Japanese consumers. The tropical forests of Southeast Asia were devastated.[1] So far, I imagine you are not surprised. But consider the effects on two still-standing forests: the interior pine forests of the U.S. Pacific Northwest, and the sugi "cedar" and hinoki "cypress" forests of central Japan. Both were potential sources of industrial timber for Japan's development. Both lost their ability to compete. Both fell into neglect. Both are exemplars of ruined industrial forests.[2] Each holds a separate ironic relation to the production of matsutake. Their connected difference invites me to explore global coordination in its multiple forms.

How can we peer into the history of ruination without positing just *one* forest history in which all forests are merely stops along the way? My experiment pulls threads from the contrasting histories of forests in Oregon and central Japan.[3] Since distinctive forests and management are involved, I assume their difference. What calls out for explanation, then, is when they happen to converge. In these moments of unexpected coordination, global connections are at work. But rather than homogenizing forest dynamics, distinctive forests are produced despite the convergences. It is this process of patchy emergence within global connection that a history of convergences can show. Matsutake allows my story to reflect on life in global histories of industrial ruin. In what follows, I pair convergent moments, explaining them in my own words.

Sometimes conjunctures are the result of international "winds," the term Michael Hathaway uses to describe the force of traveling ideas, terms, models, and project goals that prove charismatic or forceful and thus are

able to reshape human relations to the environment.[4] This was the case with the nineteenth-century German forestry I mentioned as having changed Finland's forests. One characteristic feature of this traveling expertise was categorical opposition to forest burning. This opposition became a keystone of "modern" forest management in many countries.

1929 central Japan. National law prohibits burning in national forests.[5]

1933 Oregon. At the start of America's New Deal, the Tillamook fire places fire control at the center of public-private forest cooperation. When the fire, starting in a private logging operation, blows up, the Civilian Conservation Corps is called to fight it. Afterwards, state foresters facilitate private "salvage" logging and call for "concerted private and public action." The U.S. Forest Service begins an ambitious program of fire exclusion—unintentionally changing Oregon's forests.[6]

Because its goals were to manage forests for states, modern forestry took hold in relation to peculiarities of state making. Early-twentieth-century Japan and the United States had different state-making styles. Yet in both countries, for different reasons, state foresters were concerned with how to work with private interests. In the United States, corporations were already then more powerful than any state bureaucracy; foresters could only propose rules with which at least some timber barons agreed.[7] In Japan, Meiji-era reforms deeded more than half of the forest to small private owners. State standards of forestry were relayed and negotiated with forest owners through forest associations.[8] Despite these differences, in both countries, fire exclusion became the connecting point between public and private interests in the forest. Within divergent forest histories, common ground emerged.

A few years after, forest bureaucracies developed governance traction through mobilization for war—with each other. Coordination arose in their mutual opposition.

1939 central Japan. Municipality-level forest associations are listed with other forms of mobilization for war and become mandatory under the Amended Forest Law.[9]

1942 Oregon. A Japanese floatplane launched from a submarine unsuccessfully attempts to start a forest fire in the mountains of southern

Oregon. This small incident begins an intensification of U.S. Forest Service governance in which the campaign against forest fires is pursued with military-like discipline and zeal. In 1944, as fears of Japanese fire bombs over Oregon forests circulate, Smokey Bear becomes a symbol of fire protection as homeland security.[10]

To manufacture industrial forest ruins first requires an apparatus of governance for imposing public-private dreams—to the detriment of ecological processes. In both Japan and the United States, the bureaucracies of modern forestry played this role.

After Japan's surrender, U.S. occupation tied the countries together, including in their forestry policies. For a few years, their forests could not be imagined separately; convergence derived from a common structure of authority. Postwar U.S. political culture pushed the optimism of growth, public and private, as the route to American-style democracy. In the United States, this meant opening the national forests to private loggers. In Japan, this meant converting natural forests to tree plantations. In each case, policymakers looked forward to a future of expanded business opportunities.

1950 Oregon. Oregon's timber production leads the nation at 5,239 million board feet.[11] In one mill complex on the Deschutes River, loggers cut an average of 350,000 board feet of ponderosa pine every day.[12]

1951 central Japan. A forest law sponsored by the U.S. occupation expands the business role of forest associations. New activities include the remaking of private persons, as forest associations invest to improve forest owners' socio-economic position.[13] The new entrepreneurial persons promoted by the law can then be groomed to make forest plantations.

This is the period in which forests designed for modern industry were promoted in both places. The new Japan that arose after American occupation was just as devoted to growth as Americans advised, but national interests were to shape growth, including a plan for self-sufficiency in wood. In both Japan and the United States, old forests were cut down and new dreams of industrially rationalized resources took their place.[14] The past would not rule the future. New forests would be scalable and rationally managed for industry; their production could be calculated, adjusted, and maintained. Still, the timing of such fantasies differed in

each case. In central Japan, planting and intensive management began in the 1950s. Intensive management on private land also took off in Oregon, but in the national forests, the 1950s were devoted to cutting. Great trees were still there for the taking.

1953 central Japan. Loans and tax advantages are offered for converting forests to sugi and hinoki plantations. Japan will be self-sufficient and meet rising demand for wood. Village loggers remember the call to cut timber. Even during the war they had taken out expensive woods first; now all kinds of trees are cut together. In their place, plantations are established, even on steep slopes.[15] Both sugi and hinoki are planted densely, with the government recommending 3,500 to 4,500 seedlings per hectare.[16] Labor is cheap. The trees can be hand-weeded, thinned, pruned, and harvested later. The government subsidizes half the cost and agrees to tax just one fifth of the income.[17]

1953 Oregon. *Newsweek* writes, "The sweetest smell to the Oregonian is that of sawdust. Roughly 65 cents of every dollar in incomes derives from wood and wood products."[18]

Reminders occasionally popped up of other ways of making forests. Another convergence: in both regions, the value of forest land to elites owed a debt to earlier residents—and to the violence of the state. Earlier forms of forest management had *made* the forests that states and corporations now claimed.

1954 Oregon. The U.S. federal government grabs the Klamath Reservation for the national forest system.

1954 central Japan. The newly organized Japanese Self-Defense Forces take over village forests on Mt. Fuji's north slope as practice grounds. But these forests are the common-access satoyama woodlands of eleven villages. Villagers say military practice disrupts the ecosystem and damages the trees. In the mid-1980s, perhaps even as the Klamath Tribes are being reinstated, villagers win a lawsuit for compensation to their commons.[19]

Optimism over industrial forestry did not last long. In Japan, the problem began as early as the 1960s, when enthusiasm over tree plantations ended. Wood imports had begun. Between the end of the war and 1960, the Japanese government had prohibited the importation of timber

to save foreign currency in order to buy oil, which was imagined as a strategic resource. But by 1960, oil had become cheap, and the construction industry had pressured the government to open the gates to foreign wood. The first breath of coming domestic difficulties came with a new disparity between the prices of sugi and hinoki, which until the 1960s had been similar. In 1965, the entry of U.S. Pacific Northwest timber into the Japanese market changed this. Hemlock, Douglas fir, and pine competed with sugi, a softwood, but not hinoki, which could be reserved for finer uses.[20] In addition, the wage rate for forest workers rose, thus discouraging forest maintenance.[21] By 1969, Japan's measure of self-sufficiency in timber had fallen for the first time to less than 50 percent.[22]

The 1960s were, in contrast, a time of optimism in Oregon—in part because of the Japanese market for Oregon's wood. Here is how historian William Robbins described that period: "When I arrived in Oregon in the early 1960s, loggers cut trees to water's edge, 'cat skinners' drove bulldozers through streambeds, and some of the largest timberland owners were indifferent to reforesting cutover land. Willamette Valley farmers plowed from fence row to riverbank, removed hedgerows, and drained sloughs to create ever larger fields, all in the interest of economies of scale."[23] Expansion still seemed to answer all problems.

Robbins's description prefigured the concerns of the next decade: By the 1970s, environmental activists were complaining about Pacific Northwest forests. In 1970, the National Environmental Policy Act required environmental impact statements. Voices were raised against herbicide spraying of forests, which had been linked to miscarriages. Critics opposed clear-cutting. Public forest managers were pressed to attend to environmental goals. So, too, in Japan: in 1973, new national policy called for environmental goals in national forests.

But perhaps the most important events of the 1970s for both forests were happening elsewhere. In the 1960s, Philippine wood imports to Japan had increased, but easily logged Philippine wood was already running out. In 1967, Indonesia passed a new forest law that assigned all forests to the state, which then used timber to court foreign investment. In the 1970s and 1980s, logs for Japan came flooding out of Indonesia, and later out of other parts of Asia.[24] Domestic industrial timber competed with easy pickings elsewhere. By 1980, the prices of Japanese do-

mestic wood had fallen so low that almost no one could afford to harvest trees. Although intensive management was still strongly promoted in Oregon, the end was coming. By the 1990s, the timber companies had left, the Forest Service was broke, and the dream of intensive public management was in ruin.

I wrote of Oregonian ruin in the previous chapter. What of Japanese forests? As mentioned above, sugi and hinoki were planted densely on steep slopes, with the expectation of manual weeding, thinning, and pruning, followed by manual harvesting. The fact that everyone's trees were the same age did not help prices. It became too expensive to weed, thin, and prune, and even too expensive to harvest these forests. Crowding led to pests and diseases; the timber became less and less saleable.

Many Japanese came to dislike these forests. The pollen of sugi drifted over the countryside in clouds, causing allergies and stopping some families from leaving the city for fear of affecting their children. Hikers avoided these dark and monotonous places. The young plantings had encouraged herbaceous weeds, which in turn had encouraged a spike in the deer population; as the trees grew up and shaded out undergrowth, the deer had nothing to eat and became pests in villages and towns. The quest for controlled abundance that once had foreigners calling Japan "the green archipelago" had led to ruined forests.[25]

As Mitsuo Fujiwara put it: "[M]ost forests will remain uncut and will progress from middle to old age because forest owners have lost interest in silviculture. . . . If forests are simply left to age without being tended, they will not produce good-quality timber, nor will they perform the environmental function expected of well-maintained, mature forests."[26]

The effect of industrial ruins on living things depends on which living things we follow. For some insects and parasites, ruined industrial forests proved a bonanza. For other species, the rationalization of the forest itself—before ruination—proved disastrous. Somewhere between these extremes lie the world-building proclivities of matsutake.

The decline in matsutake in Japan resulted from the loss of actively maintained village woodlands since the 1950s, particularly owing to their conversion to sugi and hinoki plantations. After the 1970s, it was

too expensive for owners to maintain them; the making of new plantations stopped. That there are significant patches of pine and broadleaf forest left at all, then, derives from this change in prices and resulting forestry practices. If there is still matsutake forest, it is because not all that forest was felled to make way for sugi and hinoki. In this sense, the matsutake forest is in debt to the violent deforestation of Southeast Asia—at least if one takes for granted Japan's inflamed pursuit of plantations beforehand. Although matsutake do not grow in Japan's ruined plantations, they grow because of their ruin, which saved other forests from conversion.

This is the spot of common ground with Oregon forests where matsutake flourish. At the height of the postwar logging boom in Oregon, in the 1960s and 1970s, the most important market for Oregon's timber was Japan. But emerging Southeast Asian wood was so cheap that Oregon eventually could not compete. It was this problem as much as the more-heralded rise of environmental lawsuits that drove the timber companies out of Oregon. With prices low, the companies wanted cheaper wood, and they saw it first in the regrowing pines of the U.S. South and then, with the continuing mobility of capital, in supply-chain timber around the world, wherever local strongmen make deforestation cheap. With the departure of the timber companies, the Forest Service lost both goals and resources. Intensive management for timber was no longer either necessary or possible. Replanting with superior stock, systematic thinning and selection, spraying poisons to kill insects and weeds: none of these were worth discussing. Had such programs been put into place, matsutake would have suffered. Intensively managed plantations have not suited matsutake. Besides, foragers might not have been welcome among expensive timber; certainly, no one would have devised management plans to suit them. Oregon's matsutake forests, then, also owe their flourishing to the low price of global timber. Matsutake forests in Oregon and central Japan are joined in their common dependence on the making of industrial forest ruin.

Perhaps you imagine that I am trying to dress up this ruin or to make lemonade from lemons. Not at all. What engages me is the wholesale, interconnected, and seemingly unstoppable ruination of forests across the world such that even the most geographically, biologically, and culturally disparate forests are still linked in a chain of destruction.

It is not just forests that disappear that are affected, as in Southeast Asia, but also the forests that manage to remain standing. If all our forests are buffeted by such winds of destruction, whether capitalists find them desirable or throw them aside, we have the challenge of living in that ruin, ugly and impossible as it is.

And yet heterogeneity remains important; it is impossible to explain the situation through the actions of a single hammer striking every nail with the same stroke. The difference between disappearing forests, forests plagued by overcrowding and pests, and forests left to grow when conversions to plantations prove uneconomic, matters. Intersecting historical processes produced forest ruins in Oregon and Japan, but it would be preposterous to argue that forest-making forces and reactions are therefore everywhere the same. The singularity of interspecies gatherings matters; that's why the world remains ecologically heterogeneous despite globe-spanning powers. The intricacies of global coordination also matter; not all connections have the same effects. To write a history of ruin, we need to follow broken bits of many stories and to move in and out of many patches. In the play of global power, indeterminate encounters are still important.