Bog and Burn: the paradoxes of the New Jersey Pinelands

The wild cranberry is a wetland species, found naturally along creeks and the edges of bogs. Growing it on the commercial scale practiced by Lee Brothers, Inc. requires field irrigation on the model of wet rice cultivation. The plots are flooded over the winter to protect the vines and again during harvest, as berries float and are swooped along and scooped up. The system runs on water. In the New Jersey Pinelands the rule of thumb is 10 acres of watershed for each acre of cranberries. Those watershed acres are forested with one of the most combustible biotas in North America. Bogs abut burns. The regimen of managed water has its parallel in a regimen of managed fire.[1]

Cranberry cultivation is the Pinelands in cameo. Bog and burn are only the simplest of the region's antitheses. But what defines the scene is not simply the starkness of its contrasts but their intensity. The water seasonally loosed or sprayed onto bogs is a trivial surface expression of the Kirkwood-Cohansey aquifer - at 17.7 trillion gallons, among the nation's largest. The surface litter and shrubs that carry fire across the forest floor are a fraction of a fuel reservoir that not only replenishes but grows deeper with each passing year. The visual wind sheer of cranberry bog adjacent to burning woods is a tiny tile from a regional mosaic of land uses that places shopping malls next to feral pitch pine, blueberry row crops against Atlantic white cedar wetland and upland mixed oak, and reserved wildlands against conurbation. A 1.1 million acre reserve, of which 660,629 acres are forested uplands and wetlands, lies within a few hours' drive of 35 million people; extend that range to Boston and back from the coast, and add another 10 million. The most densely populated of the American states has more than a third of its landed estate in nature protection; 22% of New Jersey lies in the Pinelands reserve. There are few gradations: developed suburb brushes cheek-to-jowl against nature reserve.[2]

What really astonishes is that the Pinelands are among the most flammable landscapes in America. Their recorded fire history dates from the earliest European contact. With the rougher contact of settlement came rougher fires. Each new wave of exploitation slashed and reburned the Pinelands, each pass seemingly selecting for greater pyrophilia. The extensive urban development that surrounds the contemporary woods lies next to the biotic equivalent of a munitions depot or an abandoned tenement rotting into combustibles. The Pinelands are perhaps the most famous unknown firescape in America.[3]

§ The earliest explorers to New Jersey smelled its smoke before they saw its shore, and they viewed its smoke plumes before they knew what those fires were combusting. The land burned. A century of modern records identifies, on average, one lightning-kindled fire a year; some years have none, some a handful. During droughty summers that spark may have lingered in the peat of drained bogs for weeks, sending out tendrils of flame from time to time. But not long after the Pleistocene ice departed, there were people, who undoubtedly burned, and kindled far more starts than nature. Torch and lightning together put fire onto what evolved into the Pinelands. Human ignitions have overwhelmed natural sources ever since.

Either ignition could only propagate if environmental conditions allowed: neither can force fire through a landscape covered in snow or swampy or flush with summer growth. Resting atop an immense aquifer whose surface is checkered with bogs, creeks, and surface seeping, and bordered by floodplains, deltas, and salt marshes. The early landscape was a complex matrix of wet and dry sites – wetlands still comprise some 35% of the surface geography. Fires could be set unceasingly, but whether or not they spread depended on the capacity of the land to carry them. For more fire, or a different regimen of burning, people would have to manipulate fuels as they did ignition.

By the time of European contact, the Leni-Lenape practiced swidden cultivation in the floodplains and on patches of better soil, and likely used the upland forests for hunting and foraging. While few explicit records exist of their fire practices – an observer wrote in 1765 that

they regularly burned the countryside to assist hunting - analogies with comparable economies throughout the world suggest they burned routinely along regular routes of travel and on sites used for seasonal hunting and gathering. In dry years or when high winds blustered, those confined lines of fire and fields of fire could bolt across the landscape. And if history is any guide, fire littering would have been common. There were almost always sparks on the land; and when that scene was ready, they would fly with the wind. The outcome would have been a dappled landscape of wet and dry patches, with the dry patches burned frequently and the wet ones occasionally slow-combusted, scouring out the basins and keeping them from filling with peat. The resulting landscape was probably one of "small scattered pines and oaks, low shrubs such as blueberries and huckleberries, and some sedges, legumes, and other herbaceous plants." In brief, it resembled hundreds of presettlement ecotones maintained "by frequent and relatively light fires."[4]

That dynamic changed when European settlement introduced felling axes, cereal grains, livestock, swidden not restricted to floodplains, and new markets, all of which allowed the colonists to convert forests into fuels. Settlers could now shift the times and places for fire - its patches and pulses; they could change the reasons for burning; they could add to fire as a means to hunt deer, trap muskrat, and promote waterfowl the use of fire to promote pasture, from pine savannas to salt marsh grasses burned and harvested for hay. The landscape commenced its chronicle as a fire palimpsest as over and again most of the old practices remained and new ones were added.

What made this region of the Atlantic shore special was that the point of contact, the posts of New Sweden along the Delaware River, put Finns accustomed to first-contact clearing around the boreal forests of Scandinavia into proximity with the Leni-Lenape. Out of their exchanges came a peculiar hybrid, a fire fusion, that evolved into the exemplar of backwoods American pioneering. Its distinctive material culture included such traits as the rude log cabin and worm fence; its economy, practices like the long hunt; and its fire culture, an alloy of new-land slash-and-burn cultivation with broadcast burning for hunting, foraging, and herding. The model, like the frontier, moved west, but some surely slopped eastward into the Pinelands.[5]

It was, however, a frontier fire regimen, not one for sedentary settlement. The lumpy lobe that became south New Jersey defied the rooted landscapes favored by the English, Dutch, and Germans. Too many of its soils were sandy and starved of organics. In places a lustier loam could support traditional European crops, or the rotation favored by the agricultural revolution, and so the villages that created them. But mostly the land resisted. It became, in the common parlance of the time, a *barrens*. The best one could hope for agronomically in the interior was to domesticate and propagate the indigenous fruits - huckleberry, blueberry, and cranberry. What the barrens had was water, bog iron, and wood, mostly pine and oak in various mixtures. The wetlands had Atlantic white cedar. Along the margins, and in pockets of better soils, flourished such hardwoods as red maple, black gum, and hickory.

Those woods were cleared as rapidly as the technologies of transportation made possible. The axe cut a wide swath first along rivers, then it rode the rails, and more recently it has driven over paved roads. For that first era the forest was felled for sawtimber and fuel. The timber went to shipbuilding, local construction, and export. The firewood fed virtually every industry. Powered by pitch and shortleaf pine, it distilled sap and pitch into tar and turpentine; combined with bog iron, it powered forges and furnaces; combined with sand, it sustained a major glass industry. Perhaps the most interesting fire technology was the thrice-burned charcoal. It was said that the woods would be burned to discourage other uses of the trees, then cut bolts would be stacked and slow-cooked in special hives to leach away the volatiles and leave blocks of char that could burn by glowing combustion. There was no effort to conserve the woods. When one area was exhausted, another would be felled and burned. The industries were migratory, or were at least migratory in their demand for fuel.[6]

The process quickened when railroads punched into the Pinelands. Its woods furnished ties and fed the engines, which opened up yet more forest to exploitation and scattered sparks like iron from a spinning whetstone. Logging shattered the structure of the forest, and promiscuous burning broke the rhythms of its processes. The rails became the Pineland's new lines of fire, replacing colliers as primary ignition sources. The legacy forest was no longer adapted to the kinds of fires lavished upon it. What had been a barrens, biologically lush but largely impermeable to sedentary agriculture, save for cranberry bogs and blueberry fields, increasingly became a wasteland, fit only for fire or a fire-catalyzed folk economy. (Even the harvesting of pine cones as ornamentals relied on kilns to open the oft-closed cones.)

By the latter half of the 19th century written accounts speak of widespread burning and occasional conflagrations. In his 1878 *Report Upon Forestry* Franklin Hough observed that the region, "comprising a million or more of acres," had been "stripped of wood for charcoal" and "repeatedly been the scene of destructive fires, increasing within the past few years in extent of damage." An 1866 fire burned 10,000 acres. In 1870-71 "nearly the whole wooded portion of Bass Township, Burlington County, was burnt over." Two fires in Ocean County burned over 30,000 acres. The next year 15-20 square miles went up in flames. Hough estimated that the "whole country is overrun about once in 20 years by fire." Understandably, wood stocks had plummeted, organic soils had vaporized, ship-building had collapsed, and "while nearly nine-tenths of the surface is wooded," residents were "obliged to import nearly all the lumber required for use." In 1894 a single wildfire burned 125,000 acres. A 1915 fire burned 102,000 acres. The estimated annual average burned exceeded 100,000 acres a year. The only use left to the burned forests was to reburn them as fuelwood or charcoal. It was as though the central Pinelands had become a collier's oven that residents no longer bothered to cover.[7]

Gradually, the scene calmed. Scientists and foresters issued reports and forecast damnation unless the fires could be contained. No less a personage than Gifford Pinchot, assisted by Henry Graves, after surveying the riotous fire scene in the Pinelands, thundered with abolitionist zeal that "like the question of slavery, the question of forest fires may be shelved for a time, at enormous cost in the end, but sooner or later it must be faced." Soon afterwards he became head of the U.S. Bureau of Forestry, which morphed into the U.S. Forest Service when it acquired the nation's forest reserves in 1905. The next year New Jersey created a Forest Fire Service, staffed with a Pinchot protégé, A.G. Gaskill. Success came grudgingly: much of the landscape was not cultivated, had gone feral, and so had the fires. In 1910 the Service began erecting fire towers. The 1924 Clarke-McNary program brought federal assistance. The Forest Fire Service experimented with aircraft in 1927 and with protective burning in 1928. In 1930 eight wildfires rampaged across 172,000 acres. In 1933 with CCC labor and funding from the Roosevelt Administration the national and state forest services established the Lebanon Experimental Forest. By 1935 the station was sponsoring experiments into fire. In 1936 Silas Little, along with E.B. Moore, both students of H.H. Chapman at the Yale School of Forestry, began classic investigations into fire regimes and prescribed burning. The CCC and NJFFS were successfully holding the line, both by creating an infrastructure complete with roads, guard stations, and fire towers, and by fighting fires; in May, 1936 three enrollees and two NJFFS firefighters died in a fire near Chatsworth.[8]

The fire community soon appreciated that their best counterforce to fire was fire. It was an old folk art, though one that often went wrong. "The means chiefly employed for stopping the progress" of a wildfire was "by backfiring on the line of the roads; those nearest the fire being used first, and if that failed, the next." If the weather favored bad fires, it also easily loosed set fires, so many backburns were lost. Worse, everyone scrambled to save his own property "without regard to the interests of neighbors or the interest of the whole" and the landscape was soon saturated with burns. By the middle of the 19th century cranberry growers practiced it around their bogs, and a 1909 law (later declared unconstitutional) required railroads to abate fuels along their rights-of-way, which they typically did by early-season strip burning. In 1928

the NJFFS adapted the practice to reduce hazard around state forests. That was presuppression; for suppression it relied on backfires set from roads and trails. Little's research gave empirical heft and scientific stiffening to the practice, which the Forest Fire Service adopted publicly in 1948. By 1940 average annual burning had dropped from 50,000 acres to 20,000 acres. But because early-season protective burning had ramped up, the amount of fire on the land overall remained high. It had to.[9]

By now Little reckoned, based on his studies, that most of the Pinelands had been cleared and burned over four or five times. That anything still grew is testimony to the jumbled texture of wet lowlands and dry uplands, and to the unfathomable tenacity of the indigenous biota. Yet however savage the land scalping, after it had ceased, the woods, the shrubs, and the fauna returned. Perhaps the wetlands had served as refugia for many species, while others tempered themselves to the remorseless burning. Except in enclaves where a village rose or fields were cultivated, no permanent land conversion had been possible. The human population had crashed from a high in 1859.

When the postwar era replaced rails with modern roads, however, that prospect changed. A new wave of settlement by suburb gathered momentum. It paved over the middle of the state, from Newark to Camden, then spilled to each side like a scree field off a high ridge. A crust of development crept down the shore. Then the Atlantic City Expressway between Philadelphia and the coast split the Pinelands as rails had a century before. In 1976 approval for casino-style gambling in Atlantic City created another apex of urbanization and placed the Pinelands within a shrinking triangle of development that like a concrete boa constrictor threatened to gradually choke the life out of the woods. If allowed to proceed, that process would obliterate the Pinelands as a quasi-natural landscape. Its previously indestructible woods would be reduced to little more than decorative landscaping for sidewalks and patios.

Urban sprawl was, for the Pinelands, an existential threat. But then the Pinelands, through their extraordinary capacity to combust, posed an existential threat to sprawl where the two met. On April 20, 1963 a complex of six wildfires ripped through 162,000-183,000 acres of the pine barrens, killed seven people, incinerated 458 buildings, and forced thousands of residents to evacuate. The Black Saturday fire came two years after the Bel Air-Brentwood conflagration in Southern California that effectively announced a new avatar of settlement fire, the reincarnation of rural fire into what became clumsily labeled the wildland/urban interface. Burning in Hollywood's back lot, Bel Air-Brentwood became a celebrity event. Chatsworth had the worst fire.[10]

§ Nothing so distills the essence of the Pinelands as a firescape as its primary denizen, the pitch pine (*Pinus rigida*). Give it good soil and a sunny site, hold competitors in check, keep its fires on the ground, and pitch pine will flourish. It will grow tall, fat, and straight. Likely it had, in the distant past, assumed for the northeast the character and habits that the longleaf enjoyed in the southeast and the ponderosa in the west. Historic accounts speak of grassy expanses useful for pasture. What was labeled as pine barrens may have been a glade-like upland pine savanna, stocked with large trees, woven amid lowland bogs. Heath hens abounded until, with overhunting and loss of habitat, they went extinct.

But few pitch pine would have known landscapes not burned often if not hard. Its adaptations to fire are many and ancient. Like most pines it comes with thick bark, it self-prunes its lower branches, and it reseeds nicely into ash. Like a handful of pines it can carry serotinous cones that open when a flash of flame passes through the crowns. Like a few Mexican pines it can refoliate after fire strips branches. But alone it can sprout new trunks from the root collar when the main one has been seared insentient by fire and can sprout epicormically from branches and trunk into fuzzy pockets of green growth from which new leaders will emerge. If repeatedly burned while young, it may shed its taproot and send out a web of lateral roots as scrub oak does. It can thrive amid repeated, even annual burnings; it can survive serial crown fires.[11]

What form it assumes depends on the fire regime under which it lives. If mild, with frequent surface fire, it will reseed with nonserotinous cones. If severe, with consuming crown fires every decade or two, it will sprout from trunk and branch and favor serotiny. It does not, in brief, display a single trait that adapts it to fire but many traits, a suite ready to be released depending on circumstances. Almost certainly it is the most robustly fire-adapted tree in North America. Only the longleaf can approximate its durability. In extreme forms, hammered by a wave-train of high-intensity fires, it can become bent, twisted, dwarfish, more like a shrub than a tree. What chamise is to Southern California, pitch pine is to the northeast. It is the ultimate fire survivor.

And perhaps the Pinelands's principle cipher. No one doubts that fire has figured hugely in the Pineland's history, or that, so long as the land remains populated with its original flora, fire is both inevitable and necessary. The issue is what that fire means and how to manage it. Any such contemplation leads to the pine plains, a 15,000-acre pastiche of the Pinelands that stands to the complexity of the biota as the pitch pine does to its flora. High-intensity fires sweep over a patch roughly every 8-10 years, abrading and pummeling the biota into a dwarfish tangle of pitch pine, scrub oak, and collateral pyrophytes, so selecting for fire traits that seeds from plains pines will assume plains habits even when planted in loam. On the plains concentrate the ecology, concepts, practice, politics, and narrative of Pinelands fire.[12]

The plains invite two perspectives. One views it as a hearth, where fire is purified into dominance and other pressures on the ecosystem have shrunken. It sees fire as a core process, as informing for the surface biology as the Kirkwood-Cohansey aquifer is to the subsurface geology. Outside the plains fire's presence fractures as flames filter through wet and dry patches and the sieves of less fire-hardy species. The plains are the pineland's fire purified. They are the fire counterpart to formerly vast wetlands, where the aquifer seeps through the surface and floods.

The second perspective sees the pine plains as the dregs of all that make the Pinelands peculiar, as though its extraordinary fire history had boiled down the most grotesque features of the regional scene into a pithy distillate. The plains are the 2% of what remain after stripping away the specifics, the variety, and the ecological delicacy of the Pinelands. Even fire sheds its subtleties: it becomes singular and monstrous. It no longer wends its way through bog and woods, poking and probing, seizing combustibles and shunning quagmires, killing young oak and gum and promoting pine, but teeters on a knife-edge of blowing up.

New Jersey consists of two crudely equivalent lobes, a northern one drawn by political decisions and a southern one defined by natural processes. The northern belongs with the continental land mass, grading into the foothills of the Appalachians. The southern aligns with other islands and peninsulas that jut into or drop down to the Atlantic. Its ecology depends on how deep its waters and how frequent its fire. That's the same formula of bog and burn that characterizes Florida. From a pyrogeographic perspective New Jersey is a scrunched up, chilled down Florida. The pine plains are to its peninsula what the Everglades and Big Cypress are to Florida's. For each the choice is not whether to have fire or not, but what kind of fire will come. For interior Florida, long given to open-range ranching, the historic solution was to deliberately burn – twice a year, as the adage went. For the Pinelands, violently scalped every century, the fires came as conflagrations every decade or two.

§ Even amid the Gilded Age, what V.L. Parrington famously characterized as the Great Barbecue, the Pinelands fire scene was outrageous and denounced. Unlike western fires, its plumes could be seen from new high-rises in Philadelphia and New York. Incendiarism was commonplace. Odd as it might seem to modern experience, the national fire crisis resided in the northeast and around the Great Lakes. North Woods-Michigan, upstate New York, and the New Jersey Pinelands inscribed the zone of catastrophic fire.

In 1906 New Jersey established a Forest Fire Service (and Forest, Park, and Reservation Commission) to bring some degree of protection, if not order, to the countryside. The New Deal used the WPA and CCC to erect an infrastructure of fire roads, camps, and lookout towers; the

CCC supplied crews; and the U.S. Forest Service funded research. The evolved solution pointed to a mixture of protective burning and aggressive suppression. The land, once again, began to recover. Open burning declined, tamed fire replaced feral, and controlled burning for hazard reduction substituted for laissez-faire arson. Then internal combustion began redefining the dominant fire regime. It laid down an asphalt exoskeleton that thickened inward. It gnawed at the interior Pinelands like glowing combustion through a drained bog. Something needed to contain it as the NJFFS had free-burning flames.

The outcome was the Pinelands Protection Act. In 1978 Congress authorized the Pinelands National Reserve, a gerrymandered region of 1.1 million acres that encompassed most of southern New Jersey and was nominally placed under the National Park Service. The idea of a "reserve" was novel: it was not a park, nor a recreation area, nor a preserve like Big Cypress (enacted in 1974). It more resembled the model of a biosphere reserve, which the Pinelands became in 1983 (and internationally, in 1988). In 1979 New Jersey authorized the Pinelands Protection Act, which established a Pinelands Commission, which subsequently led to a comprehensive management plan over 938,000 of the reserve's acres to stymie sprawl from consuming the Pinelands.

One of the few tests on Benton MacKaye's vision of a regional planning authority capable of coping with multiple use and scores of jurisdictions, the national legislation includes 1.1 million acres across 7 counties, 56 municipalities, and a handful of federal installations, and the state legislation, 938,000 acres, 53 municipalities, and 7 counties. Two military bases, a bombing range, seven large state forests, two major coastal wildlife refuges, two wild and scenic rivers, a national estuary research reserve, a legal wilderness, a handful of endemic species, a rash of entries under the National Register of Historic Places, an international airport, and 312,000 people organized into historic villages, retirement enclaves, and mall-centered exurbs. Today, the Pinelands produce most of the state's blueberry and cranberry crop, protect 43 threatened or endangered animals and 92 plants, and oversee 245,000 acres of forest. Two-thirds of the Pinelands are privately owned.

Under the CMP the land use that existed at the time of the Pinelands Protection Act could continue: old houses could be rebuilt on existing sites but new ones could not be erected elsewhere; farmers could still farm but not sell to subdividers; already developed areas could redevelop further and fill in but not expand; forestry could work over woods but not clearcut into new territory. The upshot is that the historical dappling of wet and dry sites has expanded to include developed and undeveloped. Each has a complex texture. The wildlands have bogs and rises; pitch, shortleaf, Virginia, and loblolly pines; scarlet, chestnut, black, white, and post oaks; blueberry, huckleberry, sphagnum moss, greenbriar, warm-season grasses; hardwoods like hickory, red maple, and gum. Wind, drought, flood, gypsy moth, bark beetle, and fire churn them in various compositions. Only in a few places do pressures push toward dominance by a single species or process. So, too, with the developed sites. They have shopping malls, golf courses, sand mines, trailer courts, Walmarts, churches, billboards, cemeteries, business parks, highway strip malls, retirement communities, farm houses, convenience stores and gas stations, banks, garages, fast food franchises, sewage treatment plants, and nurseries. But while each realm can rework its parts, neither will drive out the other.

The CMP has worked. It has survived court challenges, economic pressures, and political maneuvering. It helped that the main corridor of development lay between New York and Philadelphia to the north, and that the two primary turnpikes lay to either side of the reserve. The Pinelands remained relatively isolated. With that founding legislation the asset stripping that had characterized its former history ceased. The Pinelands Protection Act stopped a ruinous, likely irreversible conversion. For a while internal combustion had propagated as promiscuously as open burning, and threatened to replace one fire realm with another. With the Pinelands Commission, however, controlled burning came to internal combustion as it had earlier through the NJFFS for wildland burning.

But stopping sprawl did not stop wildland fire. There was no effort to control the regrowth of the woods as there was to control the spread and intensity of development. Rather, the land, once again, was abandoned, though in the name of nature protection. Deliberate neglect replaced the indifferent abuses of the past. And, as it has so often, the Pinelands renewed itself to burn. Every year the pressure builds. For four hundred years the land had reconstituted itself with fire as a critical, constant feature. Now that eternal flame was becoming more episodic; surface burning hovered at a tipping point for conflagration. There was less wildfire – the NJ Forest Fire Service excelled at aggressive initial attack. The acres blacked by wildfire dropped to a fraction of their level a century before, less than 3,000 acres a year.

But there was also less controlled burning. Fire officers were restricted by law to burn only for hazard reduction, and they returned to the same traditional sites to fire off strips and occasional blocks to dampen the volatility of the resident combustibles. In a few places burning expanded somewhat, in part due to interest by private landowners; in most, it receded. Air quality, fear of escapes, general liability – what held prescribed fire back across the country retarded it in the Pinelands. Here prescribed burning was justified because it helped suppression. Yet at 11,000 acres a year, and these the same sites burned over and again, it was not keeping pace with the fuel loads piled up by a surging woods. Si Little had estimated that, under 1963 conditions, any woods burned less than two years previously would carry fire.[13]

Nor was suppression. The NJFFS operates on a tradition cultivated for over a century and developed in relative isolation. Firefighting is handed down through generations and across clans. It has its own specially evolved equipment like brush trucks, its own presuppression programs of protective burning, its own tactics of pump-and-roll while crashing through the woods. It fills its drip torches with straight gasoline. It builds much of its equipment, and relies on the federal excess equipment program for many vehicles and most aircraft. It has Huey helicopters handed down as discards from the Maine Forest Service, which originally got them as surplus from the military; it cannibalizes enough parts from its cache to keep one ship flying. It's a scenario for holding the line. The problem, however, is that the past is only prologue to a worsening future. The Pineland's capacity to burn is ratcheting up faster than the NJFFS's ability to suppress. Still, even a fully modern system will fail during the worst case, and it is the worst case that will likely define the future narrative of Pineland's fire.

Outside certain growth zones, the only movement of land usage the Pinelands CMP allows is from the developed to the undeveloped. Sites can revert from farm to forest, or from house to field, but not the reverse. Similarly, lands can transfer from private to public ownership, but not vice versa. It's a formula to resist industrial encroachment. It's not a formula to manage the land so transferred. What the Pinelands crave is the equivalent of the CMP for its wildlands. It may need to manage unrestricted regrowth as it has sprawl. That would mean a stronger hand in the woods, and drip torches applied for ecological purposes not just to flash off surface combustibles. All this would require a surer sense of what the reserve is about and how it relates to its sustaining society beyond the provision of open space.

As with the pine plains, there are two visions of the recovered forests, both based on nonanthropocentric values. One looks to the National Wilderness Preservation Act, to the wild in its untrammeled transcendent wonder, and is prepared to let nature take whatever course it chooses. If casino gambling proposed one future for an unprotected Pinelands, the simultaneous fight over Alaskan wilderness offered an alternative for a protected Pinelands. It points to eruptive fires that sooner or later swipe landscapes clean in a recurring *Götterdämmerung*. The other vision looks to biodiversity, as encoded in the Endangered Species Act, and recognizes that the nonanthropocentric can only thrive in an anthropogenic world if people intervene. It points to routine burning, not only for fuel reduction but for ecological engineering. Under the existing program, ecological benefits are a welcome collateral outcome to prescribed burning. Ideally, that relationship could be reversed, such that fuel reduction would be a side-product of burning aimed at delivering ecological goods and services. The prevailing assumption is that land use

should determine fire regimes. Given the long history of landscape-scale burning, however, it might make more sense to assume that the fire history of the Pinelands will, over the long term, determine land use even if fire does not occupy a chair at the Pinelands Commission.

The New Jersey Forest Fire Service is clear-sighted about what it can and can't do. It simply seeks to boost the odds it faces. But the house odds favor the big fire. The hazards have increased, on both sides of the wildland/urban divide; ignitions have remained constant, with a dark cast from arson; only ceaseless vigilance keeps the scene from exploding. Sooner or later a monster fire will clear the table. The catastrophic fire of the future may not, however, resemble those of the past; not the 2007 Greenwood burn that spared the village of Whiting through a providential wind shift, not the 1995 Warren Grove fire that brushed against Stafford Forge, not the 1963 complex, not the 1930 rampage, not the fires that almost annually in the late 19th century swept back and forth across the Pinelands like sea and land breezes. The catastrophe may more closely follow the 2011 outbreak that blasted through Bastrop County, Texas, its smoke plume within sight of the Texas Capitol, which fed on a similar tangle of wildland and exurb, state parks and private holdings, a unique pinery overgrown by houses, oak, and understory, unhinged by drought and pummeled by a blistering wind.

The Pineland woods continue to recover – that's the good news. The bad news is that it will likely assume forms unlike those of the past. Gypsy moths have stripped oaks, bark beetles are killing pine, drought is upsetting the water regime, climate change is unhinging the tempo of fire weather, feral greenbriar and mountain laurel are overrunning unburned forests, the woods are choked with hydrocarbons like a toxic dump – sooner or later southern New Jersey will know the fire equivalent of a Hurricane Sandy, or worse. A Category 3 or 4 wildfire would radically restructure not only its physical geography but its political landscape. A revolution would only take one such event.

§ The narrative of Pinelands exploitation and abandonment has its doppelganger in a narrative of attention and forgetting. Over the past century its fires have commanded significance, even national concern, only to sink in the bogs and sugar sands.

Gifford Pinchot and Henry Graves made the pine barrens into an exemplar of bad burning, a miniaturization of what was wrong with land use across the country, and then reasoned that fire was their best bet for galvanizing public opinion in favor of protecting the forested estate of the public domain. They immediately made the issue a national one. New Jersey became a test case for installing modern forestry founded on fire control. Then attention wandered north to the Lake States and west to the nation's vast forest reserves.

In the 1930s, building on the protective burning begun by the NJFFS in 1928, Silas Little and E.M. Moore of the Lebanon Experimental Forest undertook a series of meticulous field experiments unprecedented in American experience. Little began his trials a year after the U.S. Forest Service adopted the 10 AM policy for universal suppression, and argued that prescribed fire was useful – this some 7 years before the USFS allowed the practice on the Florida National Forest. He published his results nationally – in the *Journal of Forestry*, no less - in the 1940s, a northeastern version of what Harold Weaver was doing, with far less methodological rigor, on Indian reservations in Arizona and Oregon. He spoke to the third Tall Timbers Fire Ecology Conference, giving the Pinelands and prescribed fire in the northeast a voice in the national discourse that would result in a revolution of fire policy. In 1974 he contributed one of six regional chapters in the first fire ecology text published in the U.S., speaking on the same podium as C.E. Ahlgren, E.V. Komarek, Harold Weaver, Harold Biswell, and Robert Humphrey.[14]

Silas Little was in fact a contemporary of Ed Komarek; the Lebanon Experimental Forest was a counterpart to the Cooperative Quail Study and its successor, the Tall Timbers Research Station; both men and institutions were founded out of a concern with fire applied on the land, and both supplied an empirical and conceptual foundation for its use. Yet Tall Timbers became an international clearing house for fire science and a megaphone for policy reform, while the

Lebanon Forest sank into obscurity. After the Pinelands Protection Act passed, Little retired and the forest was dissolved. The obscurity of the pine barrens within the American fire community has its counterpart in the lost legacy of Si Little.[15]

Now fire and the Pinelands are back on the table. With funding from the National Fire Plan, the experimental forest resuscitated its fire program in 2002 with research by the U.S. Forest Service and Rutgers University. There are discussions about reforming the New Jersey Forest Service, perhaps crafting a new prescribed fire law, and devising forest plans for the public estate of the Pinelands. Over it all, like a pall from the past, hangs the horror of another breakout fire, this time devouring an entire community. It's a good occasion to reconsider the place of fire in the Pinelands, and the Pinelands in the national fire narrative. This time, if the right people chose, it could become a regional hearth for fire science and a national firepower. The nation's fire triangle – Florida, California, and the Northern Rockies – could become a more balanced rectangle.

All the necessary pieces are present. The Pinelands have an indisputably fire-prone ecosystem, one for which fire can only be excluded by forcibly stripping off the biota. They have an unbroken fire culture, passed through generations, rooted in the land and the pineys who live there. Its fire agencies are adept at both suppressing and prescribe-burning. The NJFFS's skills at crafting gear argue for a northeastern companion to the Lake State's Roscommon equipment center. In the pitch pine they have an emblematic species, a northeast equivalent to the longleaf, ponderosa, or sequoia, and in the pine plains, a landscape as iconic as the Everglades or Southern California chaparral. A research capability, complete with its own field station and legacy, has revived; the Pinelands could become the field station for prescribed fire throughout the coastal barrens and its backcountry. The region has breadth and variety – big enough to tolerate considerable experiments, diverse enough to be interesting, close enough to major population centers to be visible and politically compelling. The Pinelands are among a handful of places that have the right constituents, even if they rest together like marbles in a bag rather than valencing into a new entity.

Critically, it has the Pinelands Commission. What most prospective hearths lack is an institutional infrastructure. They can imagine, for purposes of fire management, cutting the fences that divide a common landscape into separate political jurisdictions. They can't herd the many constituencies into a common corral, have no mechanism to encourage or compel discussion, can appeal to no mechanism to bring discourse to a collective decision. The Pinelands Commission does. With some clever tweaking it could provide what most other regional campaigns lack: it could create an institutional landscape to overlay its geographic one. In most places efforts stumble and stagger from project to project, stepping in place rather than striding down the road. A Pinelands fire consortium could begin where most regions strive to end. It could do for the northeast what Tall Timbers has done for the southeast.

The region deserves a focus. Without federal lands, the national contribution gets funneled through such means as sporadic research, grants in aid to states and volunteer fire departments, and excess equipment transfers. The Pinelands could reach well beyond the Jersey shore. The pine barrens extend north and south; they support fires on Staten Island and Long Island, along Cape Cod, and even into southern Maine. Since 1949 the northeastern states have formed a compact for mutual assistance in fire suppression; they need a comparable one for prescribed burning. Some controlled burning occurs sporadically along the coast, and thanks to The Nature Conservancy on Martha's Vineyard and outside Albany for the Karner's blue butterfly. The big states, New York and Pennsylvania, have lagged (Pennsylvania only conducted its first legal prescribed fire in 2010.) The region lacks a strong-force nucleus, one grounded in field science, to roughly hold its electron swarm of institutions. Moreover, the Pinelands offer a complexity of intermixed wild and urban sites that make western equivalents seem cartoonish. Yet this is the characteristic landscape of the eastern U.S., and if climate change models are anywhere near accurate, damaging fires will become more prevalent. The Pinelands could host the scene for

alternative experiments in Firewise and for institutional arrangements that do not depend on federal agencies for the gravitational attraction needed to hold them together.

The national fire scene, too, could use another anchor point. The National Cohesive Strategy divides the country into three regions. The southeast and west have fire clusters like pyric Silicon Valleys of research, equipment development, and high-volume fire activity that create synergy and suffuse a characteristic style throughout the larger region. The northeast does not. From time to time an effort to create a northeastern fire presence flares, then fades. Yet the idea is a sound one. Like urban parks that seek to bring parklands and their agencies to the public, a northeastern fire cluster could carry fire issues close to where more a major fraction of the American population lives.

§ A northeastern center would have its own peculiar flavor, bolted to enduring themes in the region. In the West, fire bonds to wilderness and public land; in the southeast, to working landscapes and private practitioners as well. In the northeast much of the public land belongs to the states, and many working landscapes have converted to sprawl or recreational usage. While the National Fire Plan, and its successor, the National Cohesive Strategy, attempt to unify all three regions through an emphasis on fuel treatments, the effort has faltered both conceptually and practically because a dissonance exists between a formal emphasis on fuel treatments and what society wants from those lands in terms of ecological goods and services and such cultural values as wilderness. Here and there restoration forestry has combined a fuels-informed thinning with burning to enhance landscape health. In the northeast, however, fuels may be where fire science, social expectations, and ecological needs converge.

Certainly from the time of European contact, the Pinelands have repeatedly been assessed as and reduced to fuel, whether burned on open plains or in ovens, furnaces, and steam engines. That history selected for the pitch pine not only as a survivor of serial conflagration but as itself an energy-rich combustible for home and factory. Even the tradition of prescribed burning was framed in terms of hazard reduction: it burned under controlled conditions what would otherwise combust as wildfire. Such attention only shifted when alternative combustibles, in the form of fossil fuels, could power the human economy. For the first time in four centuries the Pinelands are not primarily a woodlot: they can be valued for social amenities and ecological goods and services, and burned for biological benefits, not just hazard reduction.

Such an outcome seems unlikely any time soon. What the Pinelands could do is to show how, through fuels management, it might be possible to achieve those other collateral values of the land. Getting the fuel array right, by reducing the danger of devouring fires, would grant space for other purposes. It could also allow for the systematic study of the two realms of fire that define the pyrogeography of the Earth today – the open burning of living biomass and the internal burning of fossil biomass. Rarely have they been linked conceptually, much less had their interaction formally scrutinized, yet that dynamic is what drives the national fire scene. In most places fuel makes a crummy metric by which to describe ecosystems; yet in the Pinelands it has a historical logic. Since European contact its forest has always been defined as fuel. A fuel-centric research could show, for example, how to expand the opportunities for burning, now limited to 15-20 days between January and mid-March, by shifting the focus from seasonal calendars to days of fuel availability. The pitch pine, and its associates, could supply the needles and windfall combustibles to permit fire to perform its ecological duties. They could fuel a biota.[16]

If the fire ecology isn't exactly right, that's also because the forests are still rebounding and sorting themselves out, and because they exist within a matrix no longer simply inscribed by wet bog and dry woods but by open-burning wildland and internal-combusting city. The former threatens to blast landscapes with a flaming front; the latter, to pave over the countryside and slow-cook the planet. The grand task before fire management is to bring them into alignment so that they enhance, not eliminate, the landscapes on which they flourish. If their fuels run amok, so will their fires, and whether they burn fast or slow, the consuming flames will devour them all.

Steve Pyne
21 May 2013

Acknowledgements: I have long known about New Jersey's pyric Pinelands, but not until Bob Williams, a consulting forester, offered his services as a guide did I have the opportunity to see for myself. Over the course of a day and a half, he provided a crash tutorial. Other who contributed to the conversation include Bill Edwards, Shawn Judy, Steven Lee (father and son), Horace Somes, Jim Dusha, Bill Zipse, Ken Clark, Mike Gallagher, and Nick Skowronski. My thanks to them all, and absolution for any errors, which are wholly mine. Anyone familiar with the literature will recognize that my contribution lies not in any new information but in my attempt to devise a usable, national context for that existing knowledge.

---

[1] Lees Brothers, Inc. have 217 acres of cranberry bogs, and 1,650 acres of forest, a little under an 8:1 ratio rather than the ideal 10:1.

[2] The Pinelands have a rich literature, most of which was summarized shortly after passage of the Pinelands Protection Act (1979). I found three books particularly relevant: Richard T.T. Forman, ed., *Pine Barrens. Ecosystem and Landscape* (Rutgers University Press, 1979); Jonathan Berger and John W. Sinton, *Water, Earth, and Fire. Land Use and Environmental Planning in the New Jersey Pine Barrens* (Johns Hopkins University Press, 1985); and John McPhee, *The Pine Barrens* (Farrar, Straus, & Giroux, 1967). For terrific distillations of fire history and research, see James A. Cumming, "Prescribed Burning on Recreation Areas in New Jersey: History, Objectives, Influence, and Technique," in *Proceedings, Tall Timbers Fire Ecology Conference* 9 (Tall Timbers Research Station, 1969), pp. 251-269, and Kenneth L. Clark, Nicholas Skowronski, and Michael Gallagher, "The Fire Research Program at he Silas Little Experimental Forest, New Lisbon, New Jersey," in press with U.S. Forest Service. The Pinelands Commission and reserve websites are excellent; see www.state.nj.us/pinelands/cmp/summary/. A box score of basic information is available through the New Jersey Pinelands Commission, "Pinelands Facts," July 30, 2012.

[3] The best summary of fire history remains Silas Little, "Fire and Plant Succession in the New Jersey Pine Barrens," in Forman, ed., *Pine Barrens*, pp. 297-314.

[4] S. Smith quoted in *idem*, p. 297.

[5] See Terry G. Jordan and Matti Kaups, *The American Backwoods Frontier. An Ethnic and Ecological Interpretation* (Johns Hopkins University Press, 1989).

[6] Several excellent summaries exist. See, particularly, Peter O. Wacker, "Human Exploitation of the New Jersey Pine Barrens Before 1900," in Forman, ed., *Pine Barrens*, pp. 3-24, and Berger and Sinton, *Water, Earth, and Fire*, pp. 6-10.

[7] Franklin B. Hough, *Report Upon Forestry* (Government Printing Office, 1878; Nabu Public Domain reprint), p. 156.

[8] Pinchot quote from Gifford Pinchot, "Study of Forest Fires and Wood Protection in Southern New Jersey,"*Annual Report of Geological Survey of New Jersey* (1898), Appendix, p. 11. Chronology from NJFFS website.

[9] Quote from Hough, *Report Upon Forestry, Vol. 3* (Government Printing Office, 1882), p. 160.

[10] Granted the significance of the fire, statistics are oddly out of sync. Area burned varies by as much as 20,000 acres, and the number of structures burned by 200. See, for example, James. A. Cumming, , p. 263; Wayne G. Banks and Silas Little, "The Forest Fires of April 1963 in New Jersey Point the Way to Better Protection and Management," *Forest Fire Notes ;* David Levinsky, "Remembering Black Saturday: 50 years ago, NJ forest fires burned over 183,000 acres," *Burlington County Times* (April 22, 2013): http://www.phillyburbs.com/news/local/burlington_county_times_news/remembering-black-saturday-

years-ago-nj-forest-fires-burned-over/article_194c2432-0cd0-55da-a313-2d403dd935ce.html; Joseph Hughes, "New Jersey, April 1963: Can It Happen Again?," *Fire Management Notes 48*, No. 1 (1987), pp. 3-6.

[11] F. Thomas Ledig and Silas Little, "Pitch Pine (Pinus rigida Mill.): Ecology, Physiology, and Genetics," in Forman, ed., *Pine Barrens*, pp. 347-371.

[12] Ralph E. Good, Norma F. Good, and John W. Andresen, "The Pine Barren Plains," in Forman, ed., *Pine Barrens*, pp. 283-295.

[13] Banks and Little, "Forest Fires of April 1963," p. 6.

[14] Silas Little, "Fire Ecology and Forest Management in the New Jersey Pine Region," *Proceedings, Tall Timbers Fire Ecology Conference 3* (Tall Timbers Research Station, 1964), pp. 35-59; and "Effects of Fire on Temperate Forests: Northeastern United States," in T.T. Kozlowski and C.E. Ahlgren, eds., *Fire and Ecosystems* (Academic Press, 1974). On the timeliness of his publications, see Little and E. B. Moore, "Controlled burning in South Jersey's oak-pine stands," *Journal of Forestry 43* (1945), pp. 499-506,and and S. Little, J.P. Allen, and E. B. Moore, "Controlled burning as a dual-purpose tool of forest management in New Jersey's pine region," *Journal of Forestry 46* (1948), pp. 810-819..

[15] See Clark, Skowronski, and Gallagher, "The Fire Research Program at the Silas Little Experimental Forest," pp. 5-8. In 1985 the Northeastern Research Station (USFS) signed a cooperative agreement with Rutgers University that allowed Rutgers to use the site's buildings for its Pinelands Research Center. There was, apparently, no fire research conducted until the Forest Service reclaimed the facility in 2002.

[16] As an example of this research, see Kenneth L. Clark, et al, "Fuel consumption and particulate emissions during fires in the New Jersey Pinelands," in *Proceedings of 3rd Fire Behavior and Fuels Conference, October 25-29, 2010* (IAWF, 2010).