

IN THE LINE OF FIRE

AN OVERVIEW OF WILDFIRE IN KOREA

Between April 5 and 7, 2005, some 20 fires burned 250 hectares and 246 buildings, forced more than 2,000 people to evacuate, and ruined cultural heritage sites. The firefight lasted three days as *foehn* winds drove over mountains and officials mustered and coordinated resources at all scales of government:

10,000 firefighters and soldiers, 38 helitankers, 184 engines. The National Emergency Management Agency declared the affected regions special disaster zones, promising aid to assist victims, rebuild houses, and compensate for destroyed crops and livestock. Not an unusual event, not even a large one by international standards, but it was a fire outbreak that rang brazenly throughout South Korea.¹

And its locale is what moves the outbreak from a news item to something like an apologue. The fires kindled from votive candles, military training sites, and brush burning across the Demilitarized Zone (DMZ). They flashed through woods that did not exist 60 years ago. They blasted large patches in the Naksansa Temple complex, established 1,300 years ago. They burned through a landscape organized on fundamentally different principles from what most wildland fire agencies consider normative. This is a country where wildland is a bonsai garden planted at a landscape scale. It's a country where routine ignition comes from live-fire exercises on military bases. It's a forested country whose only fire-maintained landscape is the DMZ that separates North and South Korea.

It is a scene that challenges typical notions of what "wildland fire" means and what options exist to manage it.

THE *LONGUE DURÉE* FIRE HISTORY OF KOREA

At 38,000 square miles, South Korea has a land area a little larger than Indiana and a little smaller than Kentucky. Its 50 million people give it a population a little more than California and Florida

combined and a little less than California and Texas. Most of the country is mountainous. Much of its forest coverage began changing when Korea reluctantly signed the Khangwa Treaty in 1876 that commenced its trek into modernity. The transformation accelerated during Japanese colonization, which formally began in 1910. But World War II and the Korean War devastated its forests. The last war left the peninsula severed into North and South roughly along the 38th parallel. In 1955, forest cover in South Korea was only 35 percent of national land area. Over the past 60 years South Korea has reconstructed both its society and its landed estate, and did both along similar principles.²

The *longue durée* fire history of Korea is not known in any detail. The modern climate arrived about 6,000 years ago, mostly temperate but within the rhythms of the Asian monsoon, which encouraged dry winters, strong northwesterly winds during the spring, and summer rains. Within another 2,000 years pines began to replace broadleaves. The woods, or at least parts, enjoyed official protection; the Chosun Dynasty (1392–1886), for example, controlled logging and fuelwood gathering. Mostly, the small landholdings argued for close cultivation, particularly wet rice cultivation in the valleys, but also in the mountains, even when swiddened, which made Korea another of Asia's garden societies. Instead of practicing free-ranging livestock husbandry, which typically invites broadcast burning, farmers had a goat or cow they would tether for grazing. A plausible picture is one of routine, small-plot burning for shifting cultivation and stubble, and maybe

BY STEPHEN J. PYNE

patch burning for pasture, with few occasions for far-ranging fires. Yet the chronically unsettled politics of the peninsula led to coups, wars, and unrest that from time to time removed the tending hand and created opportunities for more explosive fires.³

All this changed with Japanese colonization. Japan saw Korea's old forests as industrial material; that pattern of consumption quickened during World War II. The Korean War widened the destruction, not least through firebombing; then crash programs for economic modernization completed the degradation. By 1960 forest stock was estimated at 9.6 m³/ha, mostly Korean red pine, a hardy pioneer. Construction timber was scarce. Fuelwood shortages caused acute hardship. Hillsides eroded. Mountain villages were beggared. The reconstruction of South Korea would involve nature's economy as well as society's.⁴

It started with state-driven investments in infrastructure. Replanting began in the 1960s with President Park Chung Hee himself planting seedlings. Often, temporary terraces had to be created and soil carried up hillsides. Systematic programs began in 1973 with the First 10-year Forest Rehabilitation Plan, which aimed to establish fuelwood plantations and prevent erosion with fast-growing larch, birch, and pine. The program completed its goals in six years with the reforestation of 1.08 million ha. The adage in emergency medicine is to stabilize, then transport. For emergency forestry, this translates into stabilize, then evolve.⁵

A series of successor plans followed, each adding some complexity to the scene. The Second National Forest Plan laid out 80 large-scale commercial plantation forests with a mix of species over 1.06 million ha. The third plan moved into "multifunctional forests" in an effort to reconcile production with public amenities. It empowered the Korean Forest Service (KFS) to oversee 32,000 ha of commercial forest and more than 3 million ha of forestland for watershed, wildlife, and recreation. To preserve its new woods, the Republic of Korea planted woodlots overseas and maneuvered to import timber that it would process and then resell (often back to the source nation). The fourth plan, which ended in 2007, transitioned to a more sustainable forest that mixed commercial products with public amenities. The mix of species expanded, with afforestation by birch and Mongolian oak, often organized into strips and dappled patches, creating green fuelbreaks and rudely crafting mosaics, culminating over the years in a greater reliance on natural reseedling. Meanwhile, economic growth helped fragment forests with croplands, ski resorts, mines, quarries, and golf courses. The fifth plan envisioned a "green nation with sustainable welfare and growth." Production forests would balance with recreation forests, and Korean usage would be offset by overseas plantings. Along with the plans unrolled a series of forest laws to harden the changes in South Korean society, if not its land.

It was a formula for fast yet staged development, a compound of the urgent with the logical, a kind of Asian fusion of landscape as South Korea raced into modernity at breakneck speed. The practices and discipline that made South Korea a developed country in a handful of decades equally transformed its mountain forests. In 50 years South Korea's forest stocking skyrocketed more than an order of magnitude, from 9.6 m³/ha to 125.6. Forests now cover 65 percent of the national estate.

With the return of forests came the prospect for the return of forest fire, particularly with the transfer from silvicultural plantations to multipurpose and amenities landscapes. On April 23, 1996, serious fires roared back. The largest fire since the Korean War broke out in Goseong when the military disposed of TNT



This photo is a panel on an information board at the Nakasansa temple showing some of the damage done to the complex by wildfire in 2005. The structures have been rebuilt or restored since then.

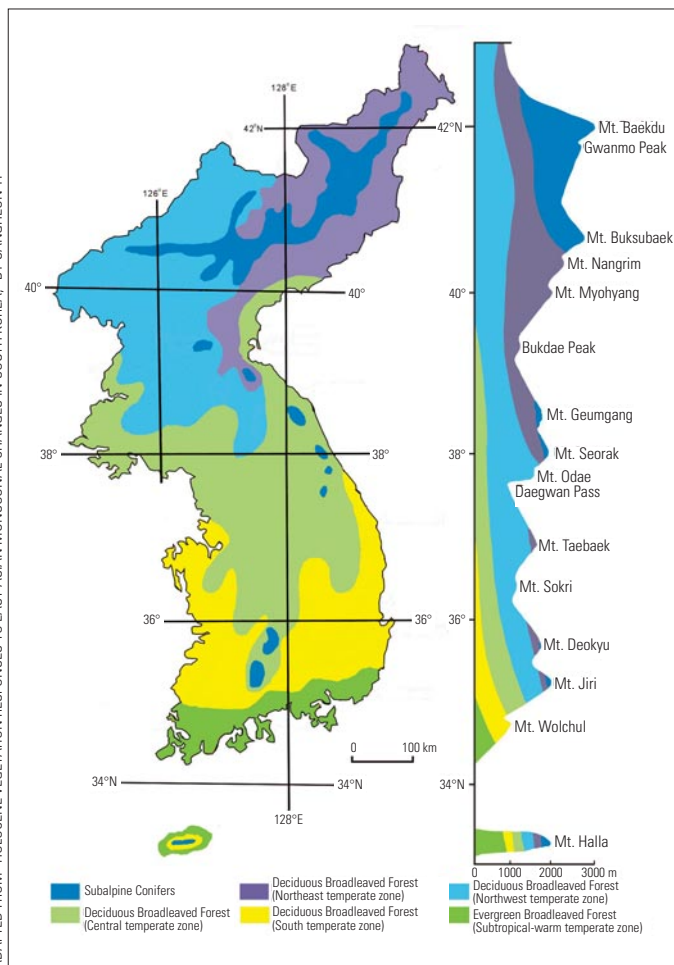
on a firing range and the resulting flames ran over 3,762 ha, 227 buildings, and 55,423 "agricultural machines." Others, less savage, flared along the east coast. These are not large fires by the standards of Russia, Australia, Canada, or the United States, but they are big on the scale of South Korea, and they burn with heavy symbolism. The scorched lands were restored by the familiar techniques developed over the previous 25 years. The outbreaks also prompted a national discussion about what threats the maturing fire scene might hold.⁶

The primary emphases were to restore and protect. Korea invested heavily in firefighting technologies, not only in pumps and helicopters but also in research projects and fire danger rating software. There was little sense that restoring fire to the landscape might also be a part of restoring fire-adapted forests. Korea had its own logic of needs, and it turned instinctively to security forces for rapid detection and attack. Then in 2000, fires rambled over 24,000 ha along the east coast and forced the Uljin nuclear plant to shut down. Restoration followed, though the strategy favored more natural regeneration and this time appealed more to indigenous species rather than exotics. KFS relied on fire suppression apparatus, along with fire prevention programs, to hold fire to acceptable limits. Research emphasized fire control.⁷

What was clear, however, was that the further maturation of the Korean mountain landscape would trigger yet more fires and might, at some stage, even point to a more nuanced agenda of fire management.

TWO KOREAS, TWO POLICIES

The Korean War climaxed a half-century of trauma. The DMZ that froze the line of conflict has inscribed a chasm through time as well as space. The contrasts have become more extreme with each decade. Today the differences are visible from satellites. Look at evening lights and the North is a dark patch amid the bustling lights of northeastern Asia. Look at daily hot spots and the North holds nearly all of them, fenced within its eremitic state. South Korea made what fire historians are beginning to call the pyric transition, the shift from a reliance on biomass fuels and landscape



Vertical and latitudinal modern vegetation map showing the forests distributed across the peninsula with elevation.

fire to the burning of fossil fuels and lithic landscapes. North Korea did not. The South has the abundance of combustion of all kinds. The North has fires.

The transition is a natural trend that accompanies industrialization. But it has peculiarities according to place, time, and culture. It depends on sources of fossil fuel, a capacity to distribute its power widely through society, and the removal, forced or voluntary, of those peoples who are living in traditional ways in the countryside. In the usual scenario the transition begins with something like a fire orgy as new fuels and ignitions mingle promiscuously with traditional landscapes and kindlings before technological substitution and outright suppression lead to a dearth of open flame, an ecological fire famine.

South Korea made a deliberate decision to speed that process along. The postwar fuelwood shortage pushed it to find alternative sources of energy. Interest in quickening industrialization led the state to encourage the depopulation of the mountains by removing people to large cities through its "New Village Movement" (*Saemaul Undong*) program, begun in 1970 or later.⁸ When people left, so did the traditional sources of ignition and the purposes of burning. Agricultural fire of all kinds was legally banned in 1980. Fuels built up; fires did not. The population explosion of abusive burning that typically characterizes the pyric transition came during the war. What remains is a landscape whose population of fires now falls below ecological replacement values.

Some traditional sources of ignition persist in the guise of

candles lit in temples and lanterns on gravesites and the occasional debris burned on the outskirts of towns, and when the spring winds blow, those pilot flames can rise up and blast over the countryside. But most ignitions come from modern conditions. In Korea this means the military. Live-fire training leads to fires. Ordnance disposal leads to fires. Even the use of incinerators on bases has led to fires.

In the pyric transition the most dangerous time is that phase when old and new mingle without regard to environmental logic. Yet this is exactly the geopolitical and ecological circumstance frozen by the DMZ. To maintain an open field of fire, North Koreans routinely set burns when the spring winds howl from the northwest and then let those flames rush south. When they strike the southern border, they trigger firefights as South Koreans try to contain them before they spill over the border and do damage. The upshot is that, paradoxically, the DMZ features the only fire-sustained biota on the peninsula and is probably the closest approximation to the pre-twentieth-century landscape.

To Western eyes the Korean fire scene can appear otherworldly, as though transported to a planet organized on different principles. There is little pertinence to fire-dependent biotas when the nominal wildlands are planted; when wilderness is a socially meaningless term; when ecological integrity refers to an ecosystem that is built by human labor devoted to creating terraces, hauling soil, and planting mature trees; when traditional burning refers to such relic practices as lighting lanterns in small graveyards; when there are almost no natural ignitions; when the closest approximation to the wildland-urban interface is a Buddhist temple embedded in the hills. Deliberately setting fires, even if prescribed, can seem suspicious in a security state that is still technically at war. Natural fires, managed wildfires—these are existentially blank concepts. A fire-renewed ecosystem means one replanted after burning.

The only reasonable response for the foreseeable future is to suppress fire, and to do so with massive, quasi-military force. At the VI International Wildland Fire Conference held in Pyeongyang, KFS staged a demonstration of its firepower by flying phalanxes of heavy helicopters to douse a simulated blaze. In time, as a more syncretic biota emerges, if tensions across the DMZ dissolve, if that other imposed divide between Korean nature and culture—between storks and Samsung—fades, there may be a place for patches of traditional burning, but it will come with a modern version of cultivation, of landscaping for purposes and according to aesthetics probably alien to the notions of the Big Four nations whose fire establishments have evolved to handle free-burning fires on vast bushlands and big backcountries.

For now, the North Koreans burn. And when they periodically declare their bellicosity by threatening to subject Seoul to a "sea of fire," that metaphor can have an unsettlingly literal referent.

ASIAN FUSION

For now, too, the emblem of South Korea's fire scene is the Naksansa Temple overseen by the Jogye Order of Korean Buddhism. Part of the postwar reconstruction of the Korean landscape involved cultural sites, of which Buddhist temples constitute probably a third. Nearly all lie in the mountains. The villages are gone or modernized, no longer a routine source of ignition. The wood-construction temples and the ancestral graveyards remain, still reliant on candles and lanterns, and so occasionally prone to fire. The temples also suffer from landscape fires that crowd into their surrounding woods. Today, roughly 53 such fires occur each

Multiple fires burned in North Korea in April 2014, sending a plume of smoke over the Sea of Japan. North Koreans use fire to clear debris from last year's crops and to help fertilize the soil for the coming season. However, some of the fires were burning in heavily forested areas, suggesting that they might be wildfires.

year. Here is the Korean equivalent of America's wildland-urban interface, and like the DMZ, the uneasy border cannot be relocated or erased. The friction between temple ground and surrounding woods is fundamental to the setting. The border will persist.

The Korean solution shows the kind of synthesis that has become a hallmark of, say, K-pop, which fuses several subgenres of pop music into a modern, distinctively Korean style of music. Koreans rebuild damaged temples with more modern, less fire-prone materials. They restore the woods with less fire-prone species, and where pines remain a cultural preference, they plant mature trees and meticulously clean up the surface fuels. They devise technological solutions to the problem of artifacts like the Naksansa bronze bell, such as an elevator triggered by heat and smoke that will automatically lower the treasure below ground when fire threatens. They rely on rapid, massive response to quench flames.

New and old, an Asian architectural fusion. The substances differ. The form endures. The operative aesthetic is not untrammelled naturalness. Famously, the Buddha himself had a fire sermon in which he appealed to landscape fire as the very emblem of a chaotic world driven by fiery passions that had to be quelled to achieve nirvana. That is not a bad approximation of what the Land of Morning Calm aspires to not only for its temples but for its future. For the coming decades South Koreans will actively quell such outbreaks by whatever technological power they have. So long as they remain in the line of fire, that formula is unlikely to change. □

Stephen J. Pyne is a professor in the School of Life Sciences, Arizona State University. His most recent book is *Between Two Fires: A Fire History of Contemporary America* (University of Arizona Press, 2015).

NOTES

1. Reports from Global Fire Monitoring Center, which aggregated news reports and satellite imagery. See "Forest Fires in South and North Korea, 08 April 2005," Global Fire Monitoring Center: http://www.fire.uni-freiburg.de/GFMCnew/2005/04/0408/20050408_korea.htm, accessed October 22, 2015.
2. For summary histories of Korea's forest history, see K. Tak, Y. Chun, and P. M. Wood, "The South Korean Forest Dilemma," *International Forestry Review* 9, no. 1 (2007): 548–57; and Jae Soo Bae, Rin Won Joo, and Yeon-Su. Kim, "Forest Transition in South Korea: Reality, Path, and Drivers," *Land Use Policy* 9, no. 1 (2012): 198–207.

3. Background on agriculture is from Michael J. Seth, *A History of Korea: From Antiquity to the Present* (Lanham, Md.: Rowman and Littlefield, 2011), and Michael E. Robinson, *Korea's Twentieth-Century Odyssey: A Short History* (University of Hawaii Press, 2007).
4. A concise survey of Korea's environmental evolution played against modern politics is Lisa M. Brady, "Life in the DMZ: Turning a Diplomatic Failure into an Environmental Success," *Diplomatic History* 32(4) (2008): 585–611.
5. An excellent summary of these developments, and the source of my figures, is Jino Kwon, et al., *Forest Landscape Restoration Success, Emerging Challenges, and Future Direction in the Republic of Korea* (Korean Forest Research Institute, 2014). The fire essence is distilled into a brochure, also published by the Korean Forest Research Institute, *Forest Ecosystem Change Since 1996 Wildfire in Korea* (n.d.).
6. Korean Forest Research Institute, *Lost Landscape in Forest Wildfire: 20 Years Changes at Eastern Coast of Korea* (Korean Forest Research Institute, n.d.).
8. A nice pocket-sized summary is available in Soung-Ryoul Ryu (English ed.), *Post-Fire Restoration to Establish a Healthy and Sustainable Forest Ecosystem* (Korea Forest Research Institute, 2010).
7. On the 2000 fires, see Kwon et al., *Forest Landscape Restoration Success*, 67–68, and Global Fire Monitoring Center, http://www.fire.uni-freiburg.de/current/archive/kr/2000/04/kr_04172000.htm, accessed October 21, 2015.
8. For a summary history of the New Village Movement, see Tracy Li, "Saemaul Undong: South Korea's Mark on International Development," Institute for Advanced Development Studies, "Development Roast," <http://inesad.edu.bo/developmentroast/2013/03/saemaul-undong-south-koreas-mark-on-international-development/>, accessed November 13, 2015.



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