Library: Restoration Book: Introduction

By Peter Friederici

It is the largest ponderosa pine forest in the world – a swath of trees that extends from west-central New Mexico into northern Arizona, cloaking plateaus, canyons, and ridges with dark green foliage that provides a welcome respite from the arid, lower lands that surround it. And on June 18, 2002, it caught fire.

Driven by drought and high winds, what became known as the Rodeo-Chediski Fire exploded to 125,000 acres (50,000 hectares) within two days. Flames leaped hundreds of feet into the air. The smoke plume was visible from space. By the time the smoke cleared, two weeks later, the Rodeo-Chediski fire had burned more than 460,000 acres (186,000 hectares) of ponderosa pine forest, piñon-juniper woodland, and mixed conifer forest. It was the largest fire recorded in Arizona state history. Over 400 buildings had been destroyed, more than 30,000 people been evacuated from their homes.

The fire was erratic; some areas within its perimeter retained living trees. But others – perhaps half the entire acreage – were devastated, shorn of all living vegetation. When the summer rains arrived in July, they eroded away ash and soil and washed this sediment into creeks and rivers. The areas most severely burned would not again support large, old-growth pine trees for centuries. For people living in or near the burned area, or downstream, it was a bitter reminder that human beings could not fully manage the forest to their liking.

Long needles in clumps of three, a sweet smell of vanilla and pine resin on the wind, the soughing of wind in limber branches, orange-yellow bark that flakes off in puzzle-piece shapes: ponderosa pine trees are a hallmark of the American West. They grow on millions of acres from the cordillera of central Mexico to southern British Columbia, from the Sierra Nevada and the Cascade Range to the Black Hills. Nowhere do they more typify a region than in the southwestern states, where they grow sometimes in monotypic stands, sometimes mixed with other trees, across wide plateaus, in sheltered canyons, on steep slopes, isolated

in sandstone pockets. They tower over grasses, wildflowers, and shrubs, or persevere in gnarled and stunted form on lava flows or cinder fields. Much of the material here will be of relevance to readers elsewhere in the species' broad range, or to readers seeking to restore other ecosystems, but this book focuses on the ponderosa pine forests of the Southwest.

Fire has always shaped these forests – but not fires like the Rodeo-Chediski Fire. Detailed scientific evidence in the form of tree-ring records, studies of relict sites, and reconstructions of past forest conditions shows that fires in southwestern ponderosa pine forests were very common in the centuries and millennia before European-American settlers arrived, but generally not intense. They could be large, especially during years of drought, but they burned primarily on the ground and left large trees standing. What, then, has gone wrong?

Large fires that leap from crown to crown and consume entire stands of trees certainly are a natural phenomenon in parts of the American West – in lodgepole pine forests, for example, and in many montane mixed conifer and spruce-fir forests, and perhaps in some piñon-juniper woodlands. In ponderosa pine forests, though, they are an artifact of the modern era and of human intervention. Prior to the 1960s a 50-acre (20-hectare) crown fire in a southwestern ponderosa pine forest was considered large; in the 1970s, fires of hundreds of acres grew more common; by the 1990s, some fires killed ponderosa pine stands across tens of thousands of acres. The Rodeo-Chediski Fire was a degree of magnitude larger still. It could only have become as large and as severe as it did when it did. It could only become so damaging because thousands of people had built houses in forested terrain that previously had been undeveloped. It could only become so intense because decades of human-caused changes in forest conditions had disrupted the natural recycling and population control functions of low-intensity fire by filling the forest with a heavy load of dry woody fuels.

The fire underlined the increasingly stark choice faced by those who live and work in southwestern ponderosa pine forests: we can experience numerous small fires, or few but very damaging large ones. The fire-management strategy chosen by most forest managers during most of the twentieth century – attempting to effectively eradicate fire from the forest – is untenable. There is simply too much fuel in the forests, too much dry weather, and too many ignition sources in the form of lighting or careless or malicious people, to get rid of fire. These forests will burn whether we want them to or not. In 2002 extensive restrictions on forest access, sophisticated firefighting technology, and armies of firefighters were not enough to control the Rodeo-Chediski Fire.

We must choose, then, what sort of fire we want to have, and what sort of ecological role we want it to play. It is clear that frequent low-level fires are preferable according to virtually every indicator: they are less dangerous, preserve and maintain wildlife habitat and aesthetic values better, produce less smoke in the aggregate, result in far less erosion, and maintain ecological functioning and forest structure in ways that are less harmful to the forest as a whole. Even where they have not burned in high-intensity fires, most contemporary forests that have not experienced low-intensity fires for many

decades are severely stressed. Their old trees are dying due to insect attack or competition with large numbers of young pines; their understory plant communities are impoverished due to lack of light, nutrients, and water; their faunal communities are altered.

Restoration of these forests, then, revolves around reintroducing such fires and re-establishing natural ecosystem patterns and processes. If we allow them, these fires can once again play the role they historically played in these forests by thinning out underbrush and trees, cycling nutrients, and stimulating the growth of grasses, wildflowers, and shrubs. In most circumstances, the goal of restoration is not, and cannot be, to return forests to precisely the condition they were in prior to Euro-American settlement, since some of the ecological changes that have taken place – such as species extinctions, climate change, and the introduction of noxious or invasive species – are essentially irreversible. It is, rather, to nudge their ecological trajectory so that they can return to a condition that is self-sustaining and compatible with the conditions under which their constituent organisms evolved.

Restoration acknowledges that these forests are dynamic, ever-changing places. It does not seek to turn them into museum pieces, but it does have a value system: namely, restoration is the putting into practice of the belief that most contemporary southwestern ponderosa pine forests are not healthy because they have departed too far from natural conditions, and that this lack of health has serious negative consequences for ecological functioning, for biodiversity, and for human values. Restoration lies at the heart of both good forest management and a healthy human role in the region's forests. Though it focuses on much more than prevention of severe wildfires, it aligns well with the interest southwestern residents and decision-makers have shown in reducing fire danger in and around forest communities, as well as in the backcountry.

Restoration of these forests has extraordinary potential. Unlike many other ecosystems in need of restoration, southwestern ponderosa pine forests still cover vast acreage. Most have not undergone a type conversion to some other form of vegetation: they still are ponderosa pine forests, however altered. Most of their acreage is in public hands, and is prized for recreation, aesthetics, wildlife habitat, and other values. Restoration of these forests matters deeply, and not just to ecologists.

The management of these public lands is also shaped by public desires and funded largely by public monies – and profoundly affected by a long history of contention between competing desires for resources. For these reasons, restoration can also be extraordinarily controversial. Reintroducing fire is difficult. At some level, many people still cling to Smokey Bear's blanket condemnation of all fire. Residents regularly complain about smoke when management agencies conduct prescribed burns. The forests are so full of fuel that, during dry periods, almost any fire can become a conflagration. Research has also shown that simply reintroducing fire can have effects exactly opposite those desired by restorationists, as it can kill large, old pines while leaving young ones unscathed. As a result, it is often necessary to thin forests of woody fuels by cutting younger trees that have become overly dense before fire can be safely returned – that is,

to mechanically alter stand structure so that fire can play its natural role in maintaining ecosystem patterns and processes.

Mechanical treatments can be controversial. Cutting trees leaves scars that many people do not like to see; alters wildlife habitat; can cause soil compaction and erosion; and can provide an entrée for invasive species. It is labor-intensive and often expensive, and has the potential to confound ecological with economic incentives. It is the proposed cutting of trees, above all, that has made restoration extremely controversial in many places. Forest restoration, then, is not simply a matter of understanding ecology. The authors of this volume explore both the ecological reasons for and effects of restoration and the controversies attending it. Managers should be aware of both.

Restoration seeks to treat the causes of declining ecosystem health, rather than the symptoms. But it is no panacea. It cannot fix all the problems of our forests, and restoration in its strictest sense may not be compatible with desired resource conditions and uses in many circumstances. It is not a one-time solution. Initial thinning and prescribed fire treatments will need to be followed by other prescribed fires, perhaps further thinning, and perhaps seeding or replanting of native vegetation or eradication of nonnative plants.

In the backcountry it may be possible to restore something like a natural fire regime, in which lightning-caused fires will be free to burn where they will at low intensities. Fragmentation and heavy development will make that impossible in many places, though. Near developed areas restoration cannot result in a hands-off management strategy, as it will likely be necessary to conduct ongoing forest maintenance through prescribed burning. Perhaps we may be able to gauge the growing maturity of our land management techniques by the extent to which we are able to align restoration practice with our other requirements of the land, keeping in mind that “cultural practices and ecological processes can be mutually reinforcing” (SER 2002).

We should also be careful about terminology. Fueled by intensive political interest and high levels of funding for fire protection and prevention, the rhetoric of forest management is rife today with jingoistic talk of “restoration” that is not ecological restoration. The revegetation of severely burned areas, for example, is not restoration; it is more akin to reclamation – an attempt to avert severe erosion of soil and ensuing degradation of the land. Such treatments do not seek to rapidly restore the structure and function of the original forest. Thinning treatments that seek only to remove some small-diameter trees in order to reduce fire danger are not restoration, for they fail to give sufficient attention to the restoration of grass and wildflower understories, the foundation of most of the biological diversity in these ecosystems. Treatments that are not linked with frequent, low-intensity burning will fail to restore what is certainly a keystone process in these ecosystems. Further, the lack of frequent fire may result in a renewed need for thinning in the future, without any of the benefits of restoration of understory vegetation. The removal of old-growth pines is emphatically not restoration, for numbers of old trees have declined throughout ponderosa pine forests. These old-growth trees are the very trees that restoration seeks to protect and reinvigorate.

Forest restoration focuses on returning low-level fire to its core role, and on protecting the oldest trees and promoting the growth and development of new generations of old trees. It also must consider other native plant species besides pine trees; it must consider restoration of native wildlife composition and densities; it must consider nutrient cycling and hydrology; it must address concerns about invasive species. For it to succeed at meaningful landscape scales it must also be linked to work such as the removal of roads and the restoration of springs, wet meadows, and open, grassy parklands, most of which are severely degraded throughout the Southwest. Finally, if it is to become a lasting part of the social landscape, restoration must benefit and sustain human communities.

Given this complexity, it is no wonder that there has been and will continue to be a tension between those who focus on the dangers from large-scale fire and hence advocate for large-scale restoration, implemented swiftly, and those who would take a slower approach. The brakes on restoration are many. If restoration presents all the promise of a broad, interdisciplinary endeavor that uses a wide range of human capabilities, it is also – for many of the same reasons – fraught with difficulty. Residents often oppose prescribed burns. Some environmentalists, concerned about potential profiteering by a re-established wood products industry, oppose commercial thinning treatments. Land managers face bureaucratic inertia, red tape, and litigation that can delay projects for years, sometimes for so long that conditions change sufficiently so that the entire inventory, project planning, and environmental review process becomes outdated and must be begun again, causing a lack of follow-through to implementation that stifles the creativity and flexibility needed to conduct restoration. Congress continues to appropriate far more funding for fire suppression than for restoration treatments that will ultimately (but often not immediately) reduce suppression costs. Many rural communities and workers lack the capital, equipment, and skills needed to carry out the needed work. Markets for the small-diameter timber removed from thinned forests often do not exist, necessitating public funding for thinning. This volume, by synthesizing much of what is known about key aspects of ecological restoration in ponderosa pine, may begin to address some of these problems.

How might we measure the success of restoration treatments? In addition to general guidelines given elsewhere (SER 2002), we might consider some specific criteria. In the short term, success will be measured largely by a reduced risk of large-scale high-intensity fires. In the long term, it will be measured by answers to more complex questions such as these:

- Do restoration treatments restore natural patterns and processes?
- Do they create a self-sustaining matrix?
- Do they facilitate sustainable regeneration of ponderosa pine and other plants?
- Does the resulting habitat matrix support diverse plants and wildlife within the natural range of variability?
- Do they accommodate climate shifts and changes, whether cyclical or not?

In the end, the success of forest restoration will depend on the degree to which human beings over many decades agree to work with, rather than against, the natural processes that have created these forests.

Restoration entails difficult choices, but working toward it should itself not be a difficult choice. Not implementing restoration is an option, but not a good one. As a recent book puts it, “Simply leaving today’s forests alone after a century of fire suppression and forestry focused on extraction of big trees is not caring for them; it is abandonment” (Arno and Allison-Bunnell 2002). To abandon our forests in this way will result in burned-out and depauperate landscapes that will support a less diverse array of plants and animals, and a more limited range of human uses, than today’s. To carefully conduct restoration treatments on a large scale, on the other hand, and to do so not just around human settlements but across the broader landscape, will protect ecologically important areas and help ensure that our forests provide a broad range of habitats and ecological values for generations to come. Only that management choice will be equitable to future human generations and to our forest surroundings themselves.

To read more about *Ecological Restoration of Southwestern Ponderosa Pine Forests*, or to order a copy, click on ISLAND PRESS LINK.