WATER BEARER
A scooper aircraft picks up lake water to drop on a fire in Montana's Glacier National Park

SHOULD THE FOREST SERVICE, TO PROTECT COMMUNITIES AND RESTORE

Fireproofing the FORESTS

Logging doesn't work. Neither, in the long run, does fire fighting. Now, as flames envelop Western forests, the debate over a radical form of tree surgery is heating up

By J. MADELEINE NASH FLAGSTAFF

ON THE OUTSKIRTS OF FLAGSTAFF, Ariz., Wally Covington drives his pickup truck through a forest choked with nearly impenetrable thickets of ponderosa pines. At last he arrives at the spot where, 10 years ago, he and his colleagues took chain saws to hundreds of trees no bigger than telephone poles, carted off the trunks and branches, and then set fires to clear away the understory. Today the result of these Bunyanesque labors is a marvel to behold, a sun-dappled woodland arched over by the branches of 300-year-old trees and, in the spaces between them, a profusion of grasses and wildflowers.

This is the way the ponderosa pine forests of the American Southwest used to look, says Covington, director of the Ecological Restoration Institute at Northern Arizona University, and it is the way they could look again if thinned of an unnatural density of trees. But time is running out, he fears, for owing to more than a century of mismanagement, these once magnificent forests—along with the communities expanding around their fringes—are threatened by the elemental force that at one time sustained them—fire.

Every year, it seems, the threat posed by fire looms larger. Three years ago, for example, the Cerro Grande fire in New Mexico, driven by winds that gusted up to 50 m.p.h., burned out of control over an area that totaled nearly 50,000 acres, forcing the evacuation of some 18,000 people and the closure of the Los Alamos National Laboratory. Last year brought some of the largest, most intense wildfires in U.S. history, including the Hayman fire, which overran nearly 138,000 forested acres near Denver, and the Rodeo-Chediski fire, not far from Flagstaff, which blazed for weeks across 466,000 acres. These epic conflagrations helped make 2002 the third worst fire year on record (after 1988 and 2000) with nearly 7 million acres burned, 21 fire fighters dead and 2,000 structures destroyed.

DOUGLAS C. PIZAC—AP

This summer, with blazes erupting once again across the West—from Arizona to Montana, Idaho, the Pacific Northwest and Canada—the concerns long raised by Covington and others are fueling an intense debate. Should the U.S. Forest Service, in the name of protecting communities and restoring ecological balance, authorize tree thinning on a massive scale? If it does, what size trees ought to be thinned and in what sorts of forests? And if it does not, what are the alternatives?

These questions are currently smoldering in the U.S. Senate, the U.S. House having stampeded through a bill last May that seemed aimed more at currying favor with the timber industry than at establishing a broadly acceptable framework for action. Fearful that thinning might become Orwellspeak for logging, environmental groups have taken the position that cutting down small trees is appropriate only as a protective measure in the forested strips that abut human settlements. Uncomfortably wedged in the middle are Covington and his allies, who see thinning, undertaken responsibly, as perhaps our last chance to restore ecological health to an increasingly dysfunctional landscape.

And yet, as Covington acknowledges, the science that undergirds thinning is still evolving, and the danger of inaction is counterbalanced by the danger of inappropriate action. That's because dense stands of young trees are not necessarily signs of poor forest health, and intense fires

WILLIAM CAMPBELL FOR TIME

TREE TRIMMER: Covington in the Arizona woods he cleared for fire

ECOLOGICAL BALANCE, AUTHORIZE TREE THINNING ON A MASSIVE SCALE?

that kill off big, forested tracts are not necessarily ecological catastrophes. Thanks to variations in climate, topography and elevation, different types of forests have evolved under different fire regimes. Prior to embarking on thinning on a massive scale, it is necessary to distinguish between forests in which fire continues to play a positive role and those in which it does not.

THE CASE FOR THINNING

FOR CENTURIES FIRES SWEPT THROUGH the ponderosa pine forests of Arizona and New Mexico on average once or twice a decade, killing off saplings but not larger trees. Scientists know this because these fires left a succession of healed-over burn scars in the trees' cambium, the living tissue that lies just beneath the bark. By dating the scars left in tree rings, University of Arizona dendrochronologist Tom Swetnam and his colleagues have reconstructed a fire history of Southwestern forests that extends back to the 14th century. And the most striking feature in the graphs they have produced is a marked drop-off in the number of fires beginning in the late 1800s.

What happened? First, sheep and cattle were allowed to overgraze the grasses and broad-leafed plants that used to carry low-intensity ground fires through the understory, consuming litter, releasing nutrients and thinning out saplings. Then came decades of logging, coupled with increasingly effective fire suppression. The structure of the forest changed so that hundreds of small trees now crowd into acre-size plots that used to support a few dozen large ones. The result: millions of acres of Southwestern forest land are packed with enough woody tinder to power wildfires of unprecedented severity.

Indeed, the situation has reached the point at which some experts are convinced that even low-intensity fires—including so-called prescribed fires set to clear out the understory—pose grave dangers to large, mature trees. A quarter-century ago, in fact, Covington and two Forest Service researchers experimented with the use of prescribed fire in the Coconino National Forest. Their reasoning seemed sound: since fire exclusion had created the problem, the solution must lie in bringing fire back. Alas, the results were contrary to expectations. The dog-hair thickets of young trees the scientists hoped to kill survived, and the old-growth trees they hoped to save died.

Why? In the absence of fire, too much fuel, in the form of dropped needles and branches, had accumulated at the bases of the largest trees. Yet not enough time had elapsed to allow a similar buildup of fuel beneath the crowns of the smaller trees. As a consequence, flames traveled quickly through the thickets of new growth but smoldered long enough at the feet of the giant trees to girdle and kill them.

For Covington the unexpected loss of so many old-growth specimens was a wake-up call. Before setting fire loose in the forest again, he concluded that the forest had to be made more fire tolerant, and that meant restoring it to its original structure. For guidance, he and his colleagues turned to old photographs and historic texts, all of which confirmed that prior to European settlement, the ponderosa pine forests of the Southwest looked very different, with "every foot … covered with the finest grass," wrote a traveler who passed through the area in the mid-1800s, "and unencumbered with brush wood."

An even more detailed guide to what these forests originally looked like came from records kept by early foresters, who in 1909 established a series of experimental plots across the Southwest. Among these was an

SEEING THE FOREST THROUGH THE TREES

More than a century of human interference has left the ponderosa pine forests of the American Southwest overly dense and prone to devastating fires. Careful thinning may be the answer

TIME Graphic by Lon Tweeten

1 GRAZING, LOGGING Early logging removed the largest trees from the forest. Grazing destroyed grasses and small plants that burned periodically, cleaning the forest floor

2 FIRE SUPPRESSION Decades of aggressive fire control resulted in a densely packed forest with an abundance of needles and brush on the ground, waiting for a spark

3 RESTORATION Clearing the understory of small trees would remove the tinder, enable grasses to grow back and protect large, older trees when fires do occur

2002 WAS THE THIRD WORST FIRE YEAR ON RECORD: 7 MILLION ACRES

BACK BURNER: In Arizona, a weary fire fighter walks away from a blaze he just set

WILLIAM CAMPBELL FOR TIME

unlogged eight-acre plot in the Coconino that was set aside as a long-term control. Covington and his colleagues made 1876 the reference year for this plot—it was the year the last fire occurred—and then proceeded to reconstruct the way the forest had looked at the time. The difference between then and now, they found, was dramatic. In 1876 the plot boasted just more than 20 trees an acre, compared with 1,250 some 120 years later.

This was the plot that Covington's team experimentally thinned in 1993 and 1994, taking care to preserve all old-growth trees. The area now boasts some 60 trees an acre, and as individual trees, they seem far healthier than before. For one thing, the outer coating of their needles has increased in toughness, which helps discourage foliage-eating insects. For another, their nonwoody tissues are producing greater quantities of resin, which affords protection against bark beetles. Best of all, there is no longer any need for mechanical thinning, as low-intensity prescribed fires can safely do the job.

Indeed, says Covington, thinning should not be viewed as a substitute for prescribed fire but as its prerequisite. Otherwise, the nation could spend as much as $700 an acre on it and, a decade or so later, wind up back where it started.

THE VALUE OF PATCHINESS

HOW A WILDFIRE BEHAVES IS DETERMINED BY many variables, but among the most important are wind speed, topography, air temperature, humidity and, last but not least, fuel load. Variations in fuel load create the equivalent of speed bumps in the landscape that serve to slow fire down, and the problem we have now is that this patchiness in many places has all but disappeared—replaced by vast tracts of forest that are uniformly dense with unburned kindling.

Restoring this lost patchiness is critical. Unfortunately, there is no easy equation for doing so, as the optimal distribution of fuel varies widely from forest to forest.

The frequent-fire regime that prevailed in the ponderosa pine forests of Arizona and New Mexico, for example, kept fuels low over widespread areas. In the ponderosa pine forests of Colorado's Front Range, however, big burns were spaced farther apart, allowing flammable material to accumulate. These fires rolled through every few decades or so and occasionally burned extremely hot. Their legacy, says Merrill Kaufmann, a senior scientist with the U.S. Forest Service's Rocky Mountain Research Station, was a mosaic of forested areas that alternated with clearings ranging from 5 acres to 100 acres in size.

It was this scale of patchiness in the landscape that once minimized the danger of horrific conflagrations like the infamous Hayman fire of 2002. In a single day, it is sobering to recall, the Hayman fire flared across some 60,000 acres in Denver's watershed, torching the crowns of trees and cooking the soil. Among the casualties were most of the 300-to-600-year-old ponderosa pines on a 7,500-acre site that Kaufmann has closely studied. It was a beautiful site, he says, ungrazed and unlogged. The only problem was that fuel loads were off-scale because a good fire had not moved through in more than 120 years.

To many forest ecologists, manipulating fuel loads—whether by thinning, prescribed burning or a combination of the two—constitutes the best strategy we have for ensuring that the ponderosa pine forests of the present survive into the future. And the good news, says Mark Finney, a researcher with the U.S. Forest Service's Fire Sciences Laboratory in Missoula, Mont., is that it's probably not going

BURNED, 21 FIRE FIGHTERS DEAD AND 2,000 STRUCTURES DESTROYED to be necessary to thin or prescribe-burn every acre of forest at risk. According to mathematical models that Finney has developed, reducing fuels in a strategic pattern across a more manageable 20% of the landscape may well be sufficient.

To date, most fuels-reduction measures have had fairly narrow goals, such as protecting valuable stands of trees. The logical next step, as Finney sees it, is to implement these measures across hundreds of thousands of acres. It is already clear, he notes, that prescribed burns have the power to modulate the behavior of big fires. One branch of the Hayman fire, for example, stopped at the edge of an area where a large prescribed burn had been conducted the year before, and the Rodeo-Chediski fire, for its part, was forced to detour around prescribed burns on forest lands managed by the White Mountain Apache tribe.

In many ways, prescribed burns are preferable to mechanical thinning, which is labor intensive and therefore time-consuming and costly. But prescribed burns are not risk free, especially in areas that have been deprived of fire for long periods of time. Three years ago, for example, a prescribed fire at the Bandelier National Monument in New Mexico went off the reservation, igniting the blaze that swept into Los Alamos. Lost in the finger pointing that followed was the fact that the fire would probably not have proved so dangerous had fuel loads in the adjacent forest been lower. And this is precisely why thinning can be useful. As Arizona State University environmental historian Stephen Pyne sees it, thinning is just a tool for "re-creating a habitat for fire."

DO NO HARM

NOT ALL FORESTS ARE GOOD CANDIDATES for thinning. Among the prime examples are the lodgepole pine forests that occupy higher elevations across the mountain West. Lodgepole pines, which are thin-barked, flourish only in areas where sufficient moisture and cool temperatures keep fires at bay for long periods of time. There they grow quite densely together—so densely, in fact, that numerous trees are shaded out by more vigorous competitors. These dead and dying trees, intermingled with low-limbed spruce and fir, add a vertical dimension to the fuels structure that one day will carry fire into the canopy—as happened across a third of Yellowstone National Park in 1988.

Yet attempting to thin lodgepole pine forests to prevent such blowups would be ludicrous, say scientists, for these seemingly catastrophic blazes serve important ecological functions. Among other things, lodgepole pine saplings do not flourish beneath the shade of mature trees and thus are dependent on fires to clear sun-filled openings. Moreover, many lodgepole pines package their seeds in resin-sealed cones that can be opened only by intense heat. "What you have to keep asking yourself is what range of fire frequency and severity a particular forest has experienced," says Tania Schoennagel, a University of Colorado researcher who studies postfire recovery. "Using forestry practices to mimic these fires is O.K., but if you mimic fires outside that forest's experience, then I think you're doing the forest harm."

Thinning also seems of dubious merit in many mixed-severity fire regimes, except as a protective measure around the perimeter of communities. Consider, for example, the Biscuit fire that hopped and skipped across 500,000 acres in southern Oregon's Siskiyou National Forest last year. Slightly more than 15% of this rugged, geologically complex region was so seriously burned that virtually all the trees died. Around 65%, however, experienced fires of light and moderate severity, while some 20% escaped unscathed. Seed from areas where vegetation survived is already drifting into areas where vegetation was lost, and many important species—knobcone pine trees, flowering kalmiopsis bushes and carnivorous cobra lilies—are taking root in the ashes. "This is not a catastrophe," says World Wildlife Fund ecologist Dominick DellaSala, "but a process that drives biodiversity."

Even in forests where frequent, low-severity fires are the rule, the possibility that thinning may have unintended consequences merits careful consideration. Among other things, thinning can open forests to drying winds, making branches and needles even more flammable. It can expose pristine areas to vehicle and foot traffic that compacts soil and facilitates the spread of exotic grasses and weeds. And then there are all the other considerations, ranging from the aesthetic (what a forest should look like after it's thinned) to the practical (what to do with all the small-diameter trees a massive thinning program would generate).

No one questions the value of thinning for fire control around houses and other structures. What is much harder to weigh is the balance of risks and benefits of thinning that has ecological goals. Also troubling is the fact that thinning has come to the fore at a time when neither the White House nor Congress seems inclined to take environmental protection seriously. Indeed, unless great care is exercised, thinning could degenerate into a form of irresponsible surgery that injures the very forests it is supposed to heal. ■

WILLIAM CAMPBELL FOR TIME

RING COUNTER: Swetnam's pine has fire scars dating from 1583

BURNING A FOREST MAY ACTUALLY PROMOTE BIOLOGICAL DIVERSITY