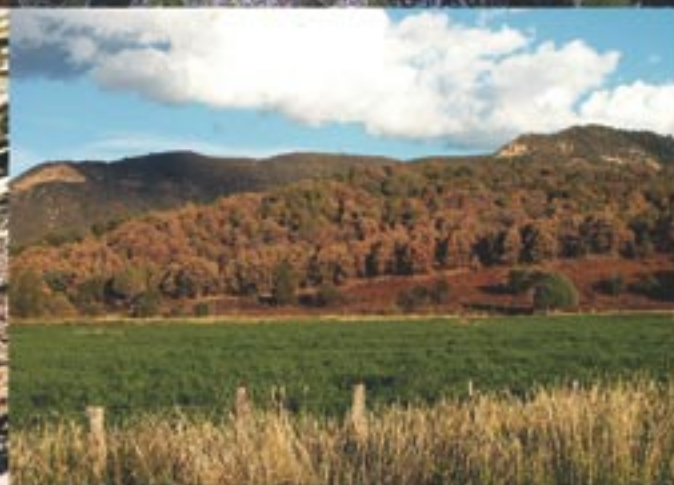


**2003
Report
on the
Health of
Colorado's
Forests**



January 12, 2004

The 2003 *Report on the Health of Colorado's Forests* is the third installment in a series of publications intended to expand Coloradans' knowledge of and interest in our state's forest resources. Beginning in 2001, each of these Reports has presented valuable information on the diversity of our forests and highlighted some of the key issues that shape their current condition.

At the heart of these documents is a challenge: What do we want from our forests and what do they need in order to continue to provide our desired benefits? The members of Colorado's Forestry Advisory Board have presented this question to numerous audiences, ranging from local civic groups to state officials and various professional associations. A number of communities have taken-up our challenge and begun engaging their residents in a dialogue about the condition and stewardship of their forests.

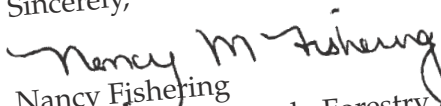
With the passage of the Healthy Forests Restoration Act (H.R. 1904) in Congress, the need for local involvement in forest management becomes even more acute. Provisions in the bill give priority for funding and assistance to communities with a wildfire protection plan in place. While hazardous fuels are only one component of a forest's condition, this new law should give local governments additional incentive to consider and plan for the health of their forest resources.

Beginning in 2004, each annual Report will focus on the status of, research on, and management issues related to a particular forest type or combination of types. This series will commence with an exploration of the pinyon-juniper and ponderosa pine forests that characterize much of the state's high-risk wildland-urban interface.

These focused reports will build on the foundation of previous editions by providing readers with a more detailed look at the particular forests that surround them, that characterize their watersheds, or that sustain important wildlife habitat. With this information we can begin working toward strategies that address the unique needs and opportunities of particular forest ecosystems.

Thank you for taking time to consider these important issues. I hope you will find this Report a valuable resource for stimulating dialogue and promoting action in your own communities.

Sincerely,



Nancy Fishering
Chairperson, Colorado Forestry Advisory Board

Colorado Forestry Advisory Board Members:

Don Ament
Commissioner of Agriculture

Tom Borden
Private Landowner, Fort Collins, Colorado

Nancy Fishering
Colorado Timber Industry Association

Doug Robotham
Director, Trust for Public Land - Colorado

Tom Stone
Commissioner, Eagle County, Colorado

Greg Walcher
Director, Colorado Dept. of Natural Resources

Al Yates
Former President, Colorado State University

2003 Report on the Health of Colorado's Forests

Executive Summary

Mild winters, warm, dry summers, and consecutive years of severe drought continue to place added pressure on Colorado's already stressed forests. The outbreak of pinyon ips beetles that took much of the state by surprise last year expanded and began to reveal its true impact on the pinyon-juniper landscape of southern and southwestern Colorado.

Infestations of mountain pine beetle have reached epidemic proportions in some locations and are dramatically increasing throughout the ponderosa and lodgepole pine forests of the state's central mountains. Spruce beetle activity continues to intensify in the northcentral region affected by the 1997 Routt Divide blowdown, despite nearly two-thirds of the blowdown being consumed by fires in 2002. And the discovery of a previously unknown Eurasian elm bark beetle gave urban foresters new cause for concern.

The summer of 2003 did not bring a repeat of the previous year's dramatic wildfires, but the challenge of addressing fire-related impacts remained. Large fire incidents burned approximately 675,000 acres in 2002, leaving many critical watersheds in need of both emergency and long-term rehabilitation. This year's relatively mild fire season gave landowners and managers some breathing room to strengthen the public and resource protection treatments they initiated in the wake of last year's events.

The Colorado General Assembly expressed their concern for the state's forest resources during their 2003 session by passing legislation that directs state land management agencies to work with the Colorado State Forest Service in actively managing all state-owned forests to meet a range of public values. This legislation facilitates the expansion of several already successful partnerships between the State Forest Service and the Department of Natural Resources. Significant new projects are underway that will set a standard for landscape-scale fuels reduction in the state.

Change is natural in forested ecosystems. Even stand-replacing events can be part of the normal cycle of regeneration for forest types such as lodgepole pine and spruce-fir. But in lower elevation forests such as ponderosa pine and mixed conifer, the impacts of landscape-scale change can be devastating. For Coloradans, the central challenge remains one of information and choice. What do we want from our forests and what do they need in order to continue to provide our desired benefits?

The goal of this and previous Reports on the Health of Colorado's Forests is to inform and promote public dialogue regarding the management of our state's forest resources. Beginning in 2004, the format for these Reports will change to one that focuses on the status of and issues related to a particular forest type or combination of types. This series will begin with an exploration of the lower elevation pinyon-juniper and ponderosa pine forests that characterize much of the state's high-risk wildland-urban interface. These forests have been most affected by previous decades of fire exclusion and changing land management objectives. They also offer the greatest opportunity for diverse stakeholders to work together at the local level on projects that increase community protection while improving forest conditions on the ground.

Insect and Disease Activity

Insect and disease activity during 2003 continued to reflect the heavy hand of long-term drought. Even normally drought-hardy trees such as juniper show signs of extreme distress in several parts of the state. Both native and non-native insects are taking full advantage of this vulnerable forest condition to feed and reproduce at extraordinary levels. Relatively mild weather in recent years has further compounded the situation by allowing bark beetles and other insects to survive in greater numbers through the winter, begin their annual movements earlier in the spring, and continue their activity longer into the fall.

A graphic indicator of the state's abnormally dry conditions occurred in southwestern Colorado where selected aspen forests took the unusual step of producing prolific amounts of seed in mid-summer. Though still alive, these trees redirected their energy toward "emergency" seed production that would provide for continuation of the species. Visible impacts of low water levels are also evident in widespread mortality of cottonwoods throughout the San Luis Valley, on the eastern plains and in the southwestern corner of the state.



1. An aspen forest in southwest Colorado displays extreme drought stress by "going to seed" in midsummer.

Although most of Colorado's insect and disease activity involves native species, the discovery of an exotic elm bark beetle in many parts of the state reveals the far-reaching impacts of international commerce and highlights the importance of vigilant detection and treatment of non-native pests. The observation of white pine blister rust cankers in previously unaffected locations and species also gave Colorado forest managers additional cause for concern.

Natural cycles of insect and disease outbreaks are an important component of a functioning forest ecosystem.¹ The most effective way to reduce large-scale damage in areas of high public value is to reduce stress or alleviate competition, thereby restoring natural forest resilience, *prior* to insect or disease attack. Once infestation has begun, management options are limited.

Pinyon Ips Beetle (*Ips confusus*)

The native pinyon ips beetle continues to decimate pinyon pines throughout the southern Front Range and southwestern Colorado, killing an estimated 1 million trees and causing up to 80 percent mortality in some areas of the state. Although it is not regarded as an aggressive beetle, the insect is taking advantage of ideal conditions created by long-term drought and overly dense pinyon-juniper landscapes.

¹ For additional information on Colorado's forest types, historic conditions, and current forest health issues, see *The 2001 Report on the Condition of Colorado's Forests* and *The 2002 Report on the Health of Colorado's Forests*, available on the Web at <http://forestry.state.co.us>.

For the first time, the United States Forest Service (USFS) is conducting special aerial surveys to delineate the range and severity of this infestation. Although the project is not yet complete, early results from the Cortez area are indicative of the larger problem. Along the Front Range, pinyon ips beetles are now affecting native pinyon stands as far north as Poncha Springs and the Garden of the Gods near Colorado Springs.

The explosion of pinyon ips in areas of the southeastern plains caps a long-term trend in pinyon pine decline that has resulted in forests characterized by mostly dead-standing and deadfall pinyon. Mortality is increasingly evident in Huerfano and Las Animas Counties. La Junta and surrounding communities report that the beetles have moved out of the forest and into town killing up to 80 percent of the pinyon along streets and in neighborhoods. Land managers and volunteers are working at Lathrop State Park near La Veta to harvest and remove heavily infested pinyon stands in an effort to slow the beetle's expansion.

In the southwestern part of the state, mortality now extends in a band from east of Durango, west to the Four Corners area, and north to Dolores Canyon and Grand Junction. Other affected locations include the Montrose area and portions of the San Luis Valley near Crestone. Indications suggest that pinyon ips is also beginning to move into the Upper Arkansas Valley from Poncha Springs to Buena Vista, but damage in this area is not yet as severe.

Because the beetles are proven to produce four generations per year under current Colorado conditions, forest managers are recommending two applications of approved preventive chemicals to protect high-value live trees from attack. But given the tremendous pressure such trees are under from the sheer numbers of beetles, even treated trees may not survive. State and federal forestry agencies continue to provide informational meetings for landowners to help them

address insect problems on their own property. Attendance at these events has averaged up to 100 per session.

Heavy rains in late spring and early summer throughout much of the state seemed to slow the progress of the ips infestation, until hot temperatures resumed in July. This lends credence to the theory that beetle activity will subside if and when Colorado returns to more normal precipitation levels. With the current scale of activity, however, the question remains how much of the host resource will be alive when the rain and snow return.

Other Ips Beetles (several species)

Although their assailants were of different species, lodgepole pine, ponderosa pine and Colorado blue spruce also fell victim to ips beetle attacks during 2003. The combination of drought, damage from dwarf mistletoe and beetle attack caused skyrocketing mortality in many areas of the state. The total number of trees affected by this "complex-caused" damage is unknown, but conservative estimates put it in the tens of thousands of trees. Evaluating the scope of



2. A hillside in southwest Colorado shows significant mortality from pinyon ips beetle activity.



3. A Fort Collins blue spruce with top dieback caused by blue spruce ips beetles.

this problem through aerial survey is complicated because of the similarity in “damage signatures” displayed by ips killed pines versus those infested by mountain pine beetle and related *Dendroctonus* species.

Impacts from ips infestation are particularly evident in southern and southwestern Colorado, but significant activity was also reported in the Black Forest area outside Colorado Springs, in foothills communities of Douglas County, in lodgepole pine near Fraser, and in both ponderosa and lodgepole pine stands in the foothills west of Denver and Boulder. Increased beetle populations are also associated with areas where wildfire mitigation work is producing large amounts of untreated green wood. Removal of logs, branches, bark and other debris created through mitigation and other harvesting is critical. Chipping, burning or otherwise disposing of woody material in a timely manner will help protect healthy trees intended for retention.

Greeley, Fort Collins, Denver, Colorado Springs and other cities up and down the Front Range continue to witness the decimation of urban blue spruce plantings by a drought-induced epidemic of *Ips hunteri*, also known as blue spruce ips beetle. Although

this insect is not considered a problem in native forests, its intrusion into urban habitats has become particularly troubling.

In 2002, the City of Denver removed nearly 245 blue spruce trees due to ips infestation. Arborists in Colorado Springs estimate that they may lose as many as 1000 trees by the close of 2003. As with pinyon ips, forest managers believe the activity in spruce will subside with the return of normal precipitation levels.

Mountain Pine Beetle (*Dendroctonus ponderosae*)

This year marked the first leveling off of statewide mortality due to mountain pine beetle since the current epidemic began in the early 1990s. Aerial surveys reported trees killed in 2002 at approximately 350,000, this is down significantly from 450,000 in 2001 but remains a serious forest health challenge. Heavy mortality in lodgepole pine continues to occur in large portions of Grand, Jackson and Eagle Counties. Infestations are on the increase in the Steamboat Springs area, where mountain pine beetles have compounded an ongoing spruce beetle epidemic in the vicinity of the Routt Divide blowdown.

In ponderosa pine forests, the most serious population expansions continue to occur in Chaffee, Park and northwestern Fremont Counties, with troublesome populations remaining in western Larimer and northeastern Park Counties. Additional areas of concern exist in Boulder, Clear Creek, Jefferson, Douglas, Elbert, El Paso, Pueblo, Custer, Saguache and Huerfano Counties.

Spruce Beetle (*Dendroctonus rufipennis*)

Mild weather conditions throughout Colorado have been highly conducive to increases in existing spruce beetle populations. Activity expanded in the Grouse Creek area of Conejos County, where a later than usual flight period resulted in the infestation of nearly one thousand standing spruce. Beetle infestations also continue to impact areas near Creede where salvage harvests in 2001 failed to stop a new infestation.

The spruce beetle outbreak in the Routt Divide blowdown area also continues to expand, with the main zone of impact ranging from north of Rabbit Ears Pass to the Wyoming border. Aerial surveys in 2002 identified more than 200,000 trees killed by spruce beetle in Routt and Jackson Counties. The present number of standing dead trees associated with the blowdown is considerably higher than this, but actual figures are not available at this time. Additional mortality was reported in Rio Blanco, Garfield and Moffat Counties.



4. Bark beetle galleries.

Western Balsam Bark Beetle (*Dryocoetes confusus*) and Subalpine Fir Decline

Subalpine fir decline is the single greatest cause of forest mortality in Colorado for which land managers have solid figures. Aerial surveys in 2001 recorded 712,400 affected trees covering 258,751 acres. In 2002, those numbers rose to 863,400 trees on 344,600 acres. Caused by a combination of western balsam bark beetle activity and various root disease pathogens, this poorly understood condition attracts less public attention because it generally occurs outside areas of human development and activity. It is considered a natural response to abnormally mild, low snow pack years and indicates that the impacts of drought extend to Colorado's highest elevations.

Banded Elm Bark Beetle (*Scolytus schevyrewi*)

Traps placed throughout the United States by federal researchers revealed a previously unknown Eurasian bark beetle in Colorado and eight surrounding states. The Banded Elm Bark Beetle joins a string of other exotic wood-infesting organisms imported to the United States in solid wood packing material, particularly pallets, and nursery stock.



5. The characteristic shape and deep green color of American elm leaves.

Subsequent trapping and searches by the Colorado State Forest Service (CSFS) and others found this "new" beetle, a native of Russia and China, to be widespread in the state. Because of its current ubiquitous distribution, it is likely this tiny beetle has been present for five or more years and was just overlooked.

Forest health specialists are concerned that the Banded Elm Bark Beetle will become a new avenue for the spread of Dutch Elm Disease (DED), because it breeds in dead trees that could be contaminated with the causal fungus (*Ophiostoma ulmi*) then moves to healthy trees to feed. DED damage during the 1970s decimated at least 60 percent of the American elms in metropolitan areas along Colorado's Front Range.

Damage to date suggests that this beetle is very aggressive, with up to three generations per year and an impressive ability to locate and colonize stressed trees. Its host range includes willows, Russian olive and fruit trees as well as elms. Drought conditions have produced a vast resource of these urban and suburban trees that are vulnerable to attack.

Response to the Banded Elm Bark Beetle must begin with state and federal regulatory agencies finding and closing, to the extent possible, the insect's pathway into Colorado. Urban foresters should then apply proven sanitation practices, including rapid detection of DED-killed trees, removal and disposal of such trees, and the detection and destruction of all dead elm wood that could act as support sites for bark beetle populations. Many Colorado towns already have DED ordinances that call for sanitation. For greatest effect, these ordinances should be modified to include the new beetle and their enforcement reinvigorated.

White Pine Blister Rust

White pine blister rust is a canker-causing disease that is spread by a non-native fungus (*Cronartium ribicola*) and found primarily on whitebark and limber pines. Prior to 2003, its only known occurrence in Colorado was in northern Larimer County, where it spread naturally from a much larger infestation in Wyoming. In 2003, forest workers found evidence of blister rust infection in an entirely new and geographically distinct location on Mosca Pass east of the Great Sand Dunes National Monument. Researchers speculate that the fungus arrived to limber pines in the area on wind-carried spores from known infected areas in New Mexico or

perhaps from infected ornamental currants, which serve as an alternate host of the causal fungus.

Also of concern, and possible ecological significance, is the detection of an infected Rocky Mountain bristlecone pine in the same area. Bristlecone pine is a new host species for the disease in Colorado. Forest managers and scientists are concerned about this discovery because heavily infested areas in the Northern Rockies have experienced almost complete mortality of the white pine component of the forest.

Researchers from the USFS Rocky Mountain Research Station are hoping to avoid similar losses in Colorado's bristlecone pines by



6. A bristlecone pine in south-central Colorado shows impacts from blister rust.

testing and identifying bristlecone pine seedlings with genetic resistance to rust. Once isolated, these resistant genes can be used to inoculate future seedlings. A similar effort with western white and sugar pines has helped to save those species from extinction. To date, the Denver-based USFS Rocky Mountain Region has identified more than 3,100 resistant trees and planted 96,255 acres with rust-resistant white pine seedlings.

Other Incidents of Concern

- **Oak Borers (*Agrilus* spp.)** – Between 2002 and 2003 a large number of ornamental oaks in nurseries and landscape plantings began to show infestation by unidentified woodborers. The primary genus involved is *Agrilus*, but forestry experts believe both native and non-native species could be involved in the attacks. Most ornamental infestation has been found in bur oak, with additional dieback in native Gambel oak. One likely source of this infestation is imported nursery stock from the Midwest – a situation that highlights the need for careful inspection of oak nursery stock at the time of receipt. Native borers could also be spreading from Gambel oak in area foothills to ornamental oaks within flight range. Infested stock beyond recovery should be destroyed through chipping, burning or deep burial. Lightly infested trees may be treatable with external sprays and/or systemics.
- **Douglas-fir Beetle (*Dendroctonus pseudotsugae*)** – Activity by this beetle has been low along the Front Range in recent years but is beginning to increase in areas where the wild-fires of 2002 burned in Douglas-fir forest type. Examples include the Million Fire at South Fork and the Hayman Fire near West Creek. Infestations frequently result from disturbance events that create large volumes of weakened trees near susceptible stands.
- **Fir Engraver Beetle (*Scolytus ventralis*)** – The fir engraver beetle is a key mortality agent for firs under stress. These insects are opportunists and often attack trees affected by root disease, external injury or drought. Significant tree mortality from fir engraver has been reported in white fir and subalpine fir at mid elevations along the southern San Juan Mountains and in the Wet Mountains from Beulah to Rye. An estimated 5,000-10,000 trees died in 2003.
- **Western Cedar Bark Beetles (*Phloeosinus* spp.)** – Although they usually occur at very low population levels, these native insects have reportedly caused significant mortality in all three Colorado native juniper species in areas such as Mesa Verde National Park, along the Arkansas River between Salida and Canon City and across the eastern plains. This increased activity is likely another reflection of widespread drought stress. Cedar bark beetles are relatively non-aggressive and require trees stressed by drought, improper planting, soil compaction, animal damage and other factors resulting in poor growth.
- **Giant Conifer Aphids** – Several species of these large aphids were evident during the summer of 2003 in southwestern Colorado. They produce copious amounts of sugary excrement called “honeydew,” which resembles clear shellac and led to their detection by many homeowners. These aphids are not thought to be particularly serious, but their presence probably adds to stresses from other sources.
- **Chemical Damages** – Ice and dust-control materials containing magnesium chloride are increasingly being applied to both urban and mountain road systems with corresponding increases in tree damage. Symptoms include foliage tip burn and branch and/or top dieback. Species most affected include aspen, ponderosa pine and lodgepole pine. While this is not a landscape level issue, localized tree mortality has caused widespread public concern.



7. Giant conifer aphids at work on a spruce tip.

Post-Fire Rehabilitation and Restoration

Long after the flames are out, Colorado's land managers and community leaders continue to grapple with the impacts of wildfire on people and ecosystems. During the 2002 and 2003 fire seasons, large wildland fires burned more than 700,000 acres of forests, woodlands and grasslands across the state.

In areas that experience low severity burns, fire events can serve to eliminate competition, rejuvenate growth and improve watershed conditions. But in landscapes subjected to high, or even moderate burn severity, the post-fire threats to public safety and natural resources can be extreme.

Public and private entities invest millions of dollars to implement emergency measures that protect people, communities and critical resources from post-fire events such as flooding, erosion, mudslides, hazard trees and related degradation of water supplies and storage facilities. In the wake of the 2002 wildfire season, federal agencies invested more than \$26 million in emergency rehabilitation on federal lands, while at least \$16 million was invested to shore-up non-federal lands.

In addition to these short-term measures, many severely burned forests also need longer-term restoration to stem the invasion of noxious weeds, restore degraded wildlife habitat, re-establish native tree species and otherwise return the area to a healthy functioning watershed.

The process of restoring burned forests differs on federal and non-federal lands, but many of the on-the-ground challenges are the same. The success of emergency rehabilitation techniques is very expensive, difficult to predict and requires monitoring to ensure effectiveness. Funding and support for these efforts often fades with the intensity of fire season and, even with the help of numerous volunteers, land managers on all ownerships struggle to maintain the technical and financial resources necessary to address this growing challenge.



8. Grasses sprouting in a creek impacted by the Hayman Fire are an early sign of post-fire recovery.

Why is Rehabilitation a Concern?

The post-fire condition of a burned landscape directly relates to the type and condition of the forest and the severity of the burn. Fire ecologists use the term *burn severity* to refer to the effects of fire on soil conditions and hydrologic function. In general, the denser the pre-fire vegetation and the longer the fire burns on a particular site, the more severe the effects on soil and its ability to absorb and process water.

High severity wildfires remove virtually all forest vegetation – from trees, shrubs and grasses down to discarded needles, decomposed roots and other elements of ground cover or *duff* that protect forest soils. A severe wildfire may also cause certain types of soil to become *hydrophobic*

by forming a waxy, water-repellent layer that keeps water from penetrating the soil and dramatically amplifies the rate of runoff.

The loss of critical surface vegetation leaves forested slopes extremely vulnerable to large-scale soil erosion and flooding during subsequent storm events. These risks, in turn, threaten the health, safety and integrity of communities and natural resources downstream. The likelihood that such a post-fire event will occur in Colorado is increased by the prevalence of highly-erodible soils in several parts of the state and weather patterns that frequently bring heavy rains on the heels of fire season.



9. Felling of hazard trees is one of several emergency rehabilitation practices intended to protect public safety.

Reservoir, a major water storage and distribution facility for Denver. Between September 1996 and August 1998, about 260,000 cubic yards of coarse sediment were trapped in a delta at the upper end of the reservoir. The Denver Water Board anticipates spending at least \$20 million on continued dredging and clean-up efforts as a result of the original fire.

In the aftermath of the 2002 fire season, the Colorado Department of Health estimated that 26 municipal water storage facilities were shut down due to fire and post-fire impacts. Mud, ash and debris up to five feet in depth washed from the burned hillsides of the Missionary Ridge Fire into Stevens Creek, northeast of Durango. Additional mudslides in late July carried fire debris onto several roads east of Durango, ripping out guardrails and trees and sending cars, concrete barricades and even bystanders into ditches and streams. In September, Division of Wildlife staff found dead fish littering the banks of previously “gold medal” fisheries after mudslides along the Animas River.

Emergency Rehabilitation Programs – Federal Land

The current density and condition of many Colorado forests places them at high-risk for destructive large-scale crown fires that burn at a high intensity and cause severe ecosystem damage. While high-elevation lodgepole pine forests often recover natu-

In September 1994, a rain event following the South Canyon Fire triggered debris flows that poured from the burned area and inundated a 3-mile stretch of Interstate 70 with tons of mud, rock and other debris. The flows also engulfed 30 cars, sweeping two into the Colorado River. Some travelers were seriously injured, but fortunately there were no deaths.

Two years later, a high intensity thunderstorm following the Buffalo Creek Fire resulted in substantial flooding and erosion that severely impacted the Strontia Springs



10. The impacts of high severity fire on a Missionary Ridge hillside.

Common Emergency Rehabilitation Practices

Hillslope Stabilization Treatments

Hillslope treatments are designed to stop or slow post-fire flooding and sediment movement. The objective in using these treatments is to quickly establish ground cover that protects soil from raindrop splash, binds soil particles, increases infiltration and slows surface runoff.

Seeding: The most common treatment involves aerial seeding of annual grasses. This activity has shown limited effectiveness, but remains the only method available to treat large areas in a short period of time and at a reasonably low cost per acre. Hand seeding is often used for smaller, more sensitive areas. In both cases, care must be taken to reduce the risk of introducing noxious weeds.



11. Aerial release of straw mulch and seed.

Mulching: Mulching has proven the most effective at providing immediate ground cover to sensitive areas but is also relatively expensive and difficult to install. Rehabilitation crews following the 2002 fires often applied a mixture of water, wood fiber mulch, seed and sometimes fertilizer known as **hydromulch**. This treatment provides protective benefits during the first year even if seeds are not able to germinate.

Soil and Sediment Traps

Soil and sediment traps are designed to trap and hold soil on the slope and more broadly disperse overland water and sediment flows.

Contour Log Felling: Rehabilitation workers often use burned logs onsite to create a mechanical barrier to water flow that also traps sediment and promotes infiltration. Dead trees are felled, limbed, cut to manageable size and placed on a contour perpendicular to the direction of the slope. Long tubes of plastic netting filled with straw, known as **straw wattles**, are often used in the same way as logs because they are easier and less



12. Erosion barrier created from a burned log.

hazardous to place. Use of weed-free straw is critical to avoid introducing noxious weeds.

Silt Fences: In areas where large-scale surface runoff with significant sedimentation is expected, fences hung with specially designed fabric can be erected. Proper installation of silt fences is critical to preventing blowouts.



13. Silt fence on Hayman Fire site.

Channel Treatments

Channel treatments are used to modify sediment and water movement in stream channels, preventing flooding and debris torrents that threaten downstream communities and resources. These treatments often serve to slow water flow, allowing sediment to settle out, and then release sediments gradually through decay.

Check Dams: Dams made of rocks, logs, straw bales or straw wattles are placed in small drainages to collect sediments and slow the velocity of water traveling down slope. Straw bales are the cheapest and easiest options, but can be short-lived.

Tilling / Scarification

In areas where burn severity has created water repellent or *hydrophobic* soils, rehabilitation often includes breaking up the hardened soil layer to increase infiltration and improve conditions for reseedling. This scarification can be done by hand on steep slopes using hand-rakes known as McLeods or it can be conducted mechanically using all-terrain or other vehicles to drag a harrow across the ground.



14. Straw bale check dams near Cheesman Reservoir.

rally after high-severity fire, lower-elevation forests composed of ponderosa pine, Douglas fir and mixed conifer species do not. High-severity wildfires in these forest types can destroy critical seed banks needed for regeneration and leave seriously compromised landscapes in their wake.

On many incidents, post-fire rehabilitation begins before the fire is even out, with fire crews repairing and mitigating the on-the-ground impacts of suppressing the fire. Once the fire is fully contained, land managers and local communities begin the process of implementing emergency measures needed to protect human lives and property and prevent unacceptable resource damage.

On federal lands, an interdisciplinary **Burned Area Emergency Rehabilitation (BAER) Team** is brought in to rapidly assess the risks to people and resources triggered by the fire and to recommend actions to minimize or mitigate those risks. The members of a BAER Team might include a hydrologist, soil scientist, archaeologist, engineer, botanist, geologist, range specialist, silviculturist, and/or technology specialist. The Team is required to submit their report, along with an associated request for funding, within seven days of a fire's containment.

BAER activities and expenditures have been authorized and funded through annual federal appropriations since 1974. The priorities of the program are to protect downstream life and property from fire related floods and debris flows; protect on-site soil productivity and water quality; minimize establishment of noxious weeds and implement treatments before the first post-fire storm event.

Treatments prescribed in BAER reports typically include a combination of seeding and mulching to promote rapid revegetation, contour felling of burned logs to prevent surface erosion on steep slopes, construction of check dams to control runoff and treatment of roads and culverts to improve distributions of increased flows.²

Treatments that are not allowed under BAER include: rebuilding permanent fences; road obliteration; trail relocation; timber salvage; fish restocking; replacement of interpretive signs; law enforcement and mitigation of prescribed fire impacts.

Since 1996, the United States Forest Service (USFS) has spent close to \$36 million dollars in Colorado on BAER expenditures for 24 large fires, 16 of which occurred in 2002. Emergency measures must generally be completed within one year after the fire's control date.

Emergency Rehabilitation Programs – Non-Federal Land

Private and other non-federal landowners receive post-fire assistance from the Natural Resources Conservation Service (NRCS) through their **Emergency Watershed Protection Program (EWP)**. Lawmakers established the EWP to enable the NRCS to respond to emergencies



15. A rehabilitation worker puts straw bales in place to slow post-fire erosion.

² More information on emergency rehabilitation treatments can be found on the Web page for the Colorado Office of the Natural Resources Conservation Service at www.co.nrcs.usda.gov or from Colorado State University Extension at www.ext.colostate.edu/menudrought.html.

created by natural disasters. The program emphasizes assistance to groups or communities rather than individuals, but is the main technical and financial assistance program available to private landowners impacted by severe wildland fires.

Burned area assessments on private land begin with an individual from the NRCS completing a Damage Survey Report. Depending on the report's content, a team of technical specialists may be sent to the burn site to assess the risks to life and property. Private land assessments are sometimes conducted in conjunction with BAER work on adjacent federal lands.

The EWP program will share up to 75 percent of a landowner's rehabilitation costs on eligible practices, but requires that each project have a local sponsor before applying for assistance. Conservation districts often serve in this capacity, but project sponsors can be from any political subdivision of the State such as a city, county or local improvement district. Sponsors are needed to provide the legal authority to do repair work, obtain necessary permits, contribute funds or in-kind services for the remaining 25 percent of costs, and maintain the completed emergency measures.

Practices eligible under EWP are similar to those described above. EWP does not provide funding for monitoring after practices are installed and allows only 220 days after a contract is signed for sponsors to complete their work. In 2002, NRCS provided \$12.3 million in EWP cost-share funding for rehabilitation of burned areas associated with 11 of Colorado's large wildfires. Local sponsors provided an additional \$4 million in both cash and in-kind contributions. Actions included treatment of 51,683 acres of private land to reduce sediment and erosion and protect downstream resources such as municipal water supplies and sewage treatment facilities.



16. Aspen sprouts on state land burned by the Hayman Fire.



17. The Four Mile State Land Parcel after a salvage sale of commercially viable burned timber.

EWP assistance was particularly critical on the 2002 Iron Mountain Fire near Canon City because nearly all of the 4,436 acres burned were in private ownership. Post-fire assessments warned of the potential for sediment and fire debris to damage both municipal and irrigation water supplies for the area. The NRCS requested nearly \$125,000 in emergency funds, with the Fremont County Commission covering the 25 percent sponsor's share of \$41,600. The NRCS and Colorado State Forest Service worked together to implement erosion protection around 120 unburned homes as well as businesses and utility sites. Additional treatments included hazard tree removal, placement of sandbags, reseeding and water channel adjustment.

Volunteer and State Assistance

Private and other non-federal landowners also receive significant post-fire assistance from the Colorado State Forest Service and numerous volunteers. The 2002 Coal Seam Fire burned 12,229 acres, with more than one-third of the damaged area owned by private landowners and the City of Glenwood Springs. The NRCS requested \$777,000 for emergency rehabilitation, but significant work remained to recover the estimated \$6.6 million in damage to structures, watersheds and community infrastructure.

On April 26-27, 2003, over 400 volunteers from all over Colorado converged on the Glenwood Springs Community Center in preparation for planting nearly 12,000 tree and shrub seedlings on severely burned areas within the city limits. Participants in the replanting effort included Volunteers for Outdoor Colorado, Roaring Fork Volunteers, the City of Glenwood, the CSFS, local boy scouts and Rocky Mountain Native Plants. The project was funded through ReForest Colorado, with major donations from Shell Oil.³ ReForest Colorado funds were also used to support rehabilitation efforts on Denver Water



18. *Ponderosa pine seedlings to be planted by volunteers on the Hayman Fire site.*



19. *Some young volunteers helping to recover Glenwood Springs hillside burned by the Coal Seam Fire.*

Board land severely damaged by the Hayman Fire. State and local volunteers planted 30,260 tree and shrub seedlings in sections of the damaged watershed.

Some of the worst destruction from the record-setting Hayman Fire occurred on the State Land Board's 320 acre Four Mile parcel. The fire intensity on this site claimed nearly all of the previously existing ponderosa pine forest, essentially eliminating the seed source needed for regeneration. Without replanting, it could be hundreds of years before significant tree cover was re-established.

Aerial reseedling occurred on the Four Mile property in October 2002, followed by a salvage sale of commercially viable burned timber in February 2003. In May, staff from the CSFS Franktown District worked with the Division of Wildlife, three local Eagle Scouts and up to 80 other volunteers to begin replanting the area. Major funding for the project came from Plant It 2020, a nonprofit tree-planting foundation established by the late John Denver. During three spring weekends, workers pre-drilled holes in the

³ For more information on the state's ReForest Colorado Fund, please see www.reforestco.state.co.us or contact the Department of Natural Resources at (303) 866-3311 or (800) 536-5380.

hardened soil and planted approximately 3,000 tree and shrub seedlings. By the end of the summer, most of the plants were surviving well, aspen regeneration was abundant and grasses were coming back strong.

The citizen-initiated Coalition for the Upper South Platte (CUSP) responded to requests for assistance from hundreds of landowners impacted by the Hayman Fire and coordinated post-fire rehabilitation efforts involving 3,029 volunteers and over 21,223 hours.⁴ Additional rehabilitation occurred on the Hayman burn site north of Woodland Park when at least 1,000 volunteers joined Governor Bill Owens to stabilize and reseed damaged hillsides for the Fourth Annual Colorado Cares Day.

Long-Term Rehabilitation and Restoration

The objective of long-term restoration is to return healthy ecological function to landscapes unlikely to recover naturally. Implementation of long-term recovery measures is the responsibility of the local land management agency or landowner and generally occurs from three months to six years after the fire. Common practices during this phase of fire recovery include:

replanting of tree species, repair of infrastructure, restoration of wildlife habitat, re-establishment of native species into seeded areas and monitoring and eradication of noxious weeds.



20. *The endangered pawnee montane skipper lost the majority of its habitat to fire events in the upper South Platte watershed.*

The invasion of non-native plant species is of particular concern in burned areas because it can impede or prevent the re-establishment of native vegetation and associated habitats. Weed seeds are carried into burned areas by wind, clothing, vehicles, soil erosion, flooding and sometimes through aerial seeding or failure to use weed-free straw in emergency stabilization treatments. Species of priority concern in Colorado include orange hawkweed, spotted knapweed, yellow toadflax, leafy spurge and cheatgrass.

If not closely monitored and/or controlled, invasives can completely takeover a site and cause negative, long-term ecological impacts on wildlife habitat and watershed health. Early detection and treatment, followed by subsequent monitoring is essential to maintaining the ecological integrity of areas affected by fire.

Federal funding has not historically been available specifically for long-term restoration. But the size and intensity of wildland fires continues to grow in many parts of the country, making significant ecological restoration an increasingly necessary part of post-fire activity. Congress responded to this need in Fiscal Year (FY) 2001 by designating \$142 million in National Fire Plan funding for long-term restoration. This appropriation dropped to \$62 million in FY 2002 and to \$7 million in FY 2003, a trend that reflects the ongoing need to more clearly identify and explain the importance of long-term restoration treatments.

⁴ The Coalition for the Upper South Platte maintains an informative Web site on restoration activities in the South Platte watershed at www.uppERSOUTHPLATTE.net.

Missionary Ridge Case Study (Durango, La Plata County)

The 2002 Missionary Ridge Fire impacted approximately 73,000 acres, including 5,900 acres in the Weminuche Wilderness, 9,082 acres of private land and 255 acres of state land. Suppression costs exceeded \$40 million dollars. A post-fire BAER team classified 61 percent of the area as moderate to high burn severity. Within this area, ten thousand acres were described as having steep slopes and soils with a severe erosion hazard rating.

Key concerns immediately after the fire included: potential storm runoff, flooding and debris flow in the lower portions of the drainage; threats to water supplies for Durango, Ignacio and Bayfield; potential damage to 80 homes, 30 miles of electrical lines, 20 miles of canals and a telephone company; and threats to cultural resources claimed by 27 different Native American tribes.

In a post-fire summary, La Plata County officials observed that, “Even though many home owners had escaped damage from the fire itself, the fire effects had altered storm

water runoff to a point that homes that had never experienced flooding were now in high risk debris and flood zone areas.”⁵



21. An area burned by the 2002 Missionary Ridge Fire.

The initial BAER report for burned federal lands requested \$4.5 million for 18,510 acres of aerial seeding, 5,500 acres of log erosion barriers, 22,540 acres of non-native invasive plant control, installation of 12 early flood warning systems, straw mulch, a stream diversion at the Lemon Dam spillway, debris jam monitoring, culvert replacement and other road and trail improvements, and hazard tree removal. Despite these recommendations, the BAER team also explained that, ultimately, new growth would be most

effective in stemming post-fire floods and debris flows.

The NRCS requested \$1.9 million for similar work on private lands. The La Plata Conservation District paid the associated sponsor’s share of \$619,000. The CSFS Durango District coordinated rehabilitation in the privately owned Knight Canyon drainage where fire damage had the potential to send up to 70,000 cubic yards of sediment into Lemon Reservoir.

⁵ More information on La Plata County’s post-fire assessment and mapping efforts can be found on the County’s Web site at www.co.laplata.co.us/fire_slideshow/maplink.html.

Several landowners in the drainage had been planning to harvest timber on their property to reduce fire hazard. The Missionary Ridge fire turned the harvesting plan into a salvage operation. Early preparation paid off, however, because landowners were already working and planning together, had established a market for the resulting wood products, and found a contractor willing to provide rehabilitation services in addition to harvest. The salvage occurred in November 2002, followed by installation of log erosion barriers and related treatments provided with assistance from the Southwest Youth Corps Association.



22. The same area showing signs of recovery in spring 2003.

Volunteers from the San Juan Mountain Association coordinated several education projects for communities in the burned area and provided at least 700 hours of support to rehabilitation efforts.

Early snows and cool temperatures caused much of the planned rehabilitation work at Missionary Ridge to be postponed until the 2003 field season. Federal agencies in the area have received an additional \$1.9 million to complete this work and begin the next phase of long-term restoration.

Monitoring of both short and long-term actions is underway, with a number of scientists closely watching the land-

scape's response to both natural and artificially created conditions. The USFS and United States Geological Survey (USGS), in partnership with the Southern Ute Tribe, the Southwest Water Conservation District, the Florida Water Conservancy District and the U.S. Bureau of Reclamation, are conducting a cooperative study of wildfire impacts on municipal watersheds in the area and the effectiveness of rehabilitation treatments.

Researchers and land managers are reluctant to predict what kind of landscape will emerge from the burn. Some speculate that aspen groves and oak brush will replace previously pine-dominated hillsides. Bright pink meadows of fireweed and other wildflowers will likely proliferate in newly opened areas, along with both native and non-native grasses and weeds. Because of the fire's intensity, it is not certain that the region's characteristic ponderosa pines will re-appear in this century.

Only one thing *is* for sure – and that's change.

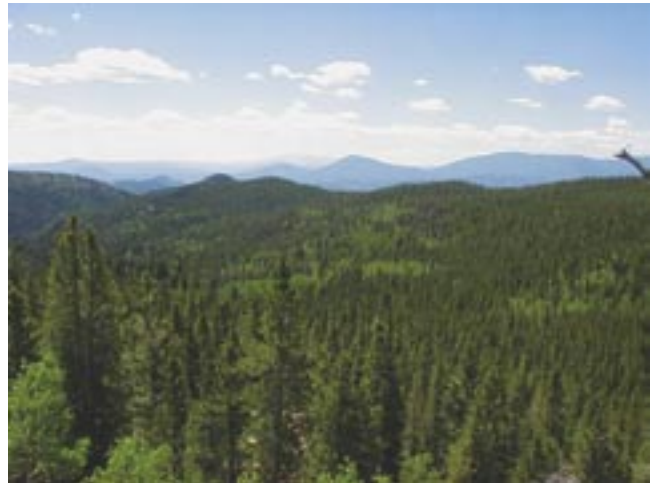
State Land Management

During their 2003 session, the Colorado General Assembly emphasized the importance they place on the state's forest resources by passing legislation making it the state's policy "to encourage the health of forest ecosystems through responsible management of the forest land of the state." The language approved in HB03-1092, further directs the Department of Natural Resources (DNR) to work with the Colorado State Forest Service (CSFS) to actively manage all forested state lands to achieve the following goals:

- Reestablish natural forest conditions.
- Reduce the threat of large, high-intensity wildfires.
- Sustain and promote natural habitat consistent with healthy forest conditions.
- Protect and restore watersheds.

Agencies within the DNR currently own approximately 633,000 acres of forested land in Colorado. Within that ownership, 397,000 acres are managed by the State Land Board; 190,000 acres by the Division of Wildlife and 46,000 acres by the Division of Parks and Outdoor Recreation.

The CSFS has a long history of working cooperatively and successfully with other state agencies to plan for and improve the condition of state-owned forestlands. The General Assembly's action accentuates the need to expand these interagency partnerships so that state-owned forests across Colorado will reflect the kind of management priorities and principles needed on all ownerships to ensure healthy, sustainable forest ecosystems.



23. An aerial view of Staunton State Park.

History

The General Assembly first established the office of State Forester in 1911 when they assigned the position to the State Board of Agriculture – along with the responsibility for providing technical advice to the State Board of Land Commissioners (Land Board) on the management of forested school trust lands.

In 1955 the Colorado General Assembly passed House Bill (HB) 10, formally establishing the Colorado State Forest Service as a division of the Colorado Agriculture and Mining College, the precursor to Colorado State University. Legislators expanded this action in 1965 with the passage of HB 1153, which officially designated the CSFS as the state entity to "provide for the protection of forest resources of the state from fire, insects and disease" and to educate private forest landowners in management techniques.

In 2000 the General Assembly further strengthened the ties between the CSFS and DNR agencies by creating a Division of Forestry within the DNR. Established through HB00-1460, the new Division of Forestry is, by statute, headed by the State Forester and staffed by the State Forest Service. The legislation also created a Forestry Advisory Board to guide and support the efforts of the Division, with emphasis on the annual development of a statewide forest health report.

State Board of Land Commissioners

The CSFS' partnership with the Land Board represents the longest-running effort to collaboratively manage state-owned forestlands. The CSFS has always been, by design, a technical assistance rather than a land-owning agency. The first formal contract for the CSFS to provide professional management assistance on state-owned forestland came in 1967 when the Land Board requested their expertise on several sections of state trust land. According to the resulting contract, the CSFS was to conduct an inventory of state-owned forestlands, develop management plans, set-up and administer timber sales and provide fire and pest protection, with all costs borne by the CSFS.

In 1975 the Land Board formalized its cooperative timber management program with CSFS and obtained program funding from the state legislature. The agencies further solidified their partnership in 1980 when the CSFS entered into the first of many "silvicultural leases" with the Land Board. Beginning with the Black Forest School Section near Colorado Springs, these ten-year leases allowed CSFS to initiate forestry practices as specified in an approved annual work plan. Income from the projects covered CSFS management costs, with a portion of the balance used to implement state land improvement practices such as thinning and reforestation. The remaining balance was returned to the Land Board for deposit in the appropriate trust account.

In 1993 the CSFS and the Land Board negotiated a long-term agreement that authorizes CSFS to represent the Land Board in forestry matters and to provide day-to-day management of all Land Board forest resources. Implementation of the agreement is carried-out through a cooperative annual work plan. Priority projects emphasize forest health, protection and productivity as well as revenue generation. Treatment of hazardous fuels, removal of insect and disease infested stands, improvement of wildlife habitat, and sales of Christmas trees and landscape transplants are commonly incorporated into trust land activities.

Forest management projects slated for implementation in 2003 are expected to generate up to \$938,783 in gross revenue for the state's trust accounts and provide direct improvement of forest conditions on 8735 acres. Indirect improvements to habitat diversity and ecosystem health will benefit thousands of adjacent acres.



24. Colorado loggers receive training in best management practices at the Colorado State Forest.

The Colorado State Forest

Despite earlier partnerships, the largest of the Land Board's forested holdings did not come under CSFS's full-time management until 1985. The Colorado State Forest, located on 71,000 acres in Jackson County, was established in 1939 following a land exchange with the United States Forest Service (USFS).⁶ The State Forest is unique among trust holdings because it was established through individual enabling legislation that specifically calls for management of the parcel to "provide for and extend the practice of forestry."

From 1938 to 1985, foresters hired by the Land Board managed the State Forest for multiple uses including grazing and recreation as well as forestry. The CSFS provided periodic assistance with forest inventory and the design and implementation of management plans. At the Land Board's request, CSFS took over full-time management of the tract's forest resources in 1986 and immediately initiated a new inventory and forest management plan.

The CSFS's current mission on the State Forest includes: implementing sound forest management practices; researching and demonstrating forest practices to improve forest health; and providing the state trusts with direct financial and educational benefits. The goal of the forest management program specifically is to maintain a healthy forest capable of sustaining a flow of values and products in perpetuity.

Current projects on the State Forest include extensive monitoring and employ adaptive management principles that ensure only the most effective and environmentally sound practices are implemented. In addition to timber management, activities on the State Forest include:

- Development of a new comprehensive forest inventory.
- Water quality and wildlife habitat monitoring to assess recreation and forest management influences on forest health.
- Macro-invertebrate sampling to assess ecosystem health.
- Education programs and interpretive signage that explain forest management activities to visitors.
- Insect and disease detection and control.
- Initial attack on wildland fires in cooperation with the North Park Fire Department.

Since 1986, the CSFS has conducted forest management activities on more than 2500 acres, including projects designed to enhance recreational opportunities. Additional accomplishments include leadership in the creation of a multi-agency integrated management plan, development of a comprehensive fire management plan, the establishment of forest road stan-



25. A horse-logging operation at work on the State Forest.

⁶ Additional information on the Colorado State Forest can be found on their Web site at <http://lamar.colostate.edu/~statefor/>.

dards that address Best Management Practices, and the initiation of a Geographic Information Systems (GIS) database for the Forest.

Division of Wildlife

The first large-scale cooperative effort between the CSFS and the Division of Wildlife (DOW) occurred in 1982 when the CSFS Grand Junction District conducted a 3,000-acre prescribed burn on DOW land outside of Meeker. This West Slope partnership expanded in 1993 with the initiation of annual, large-scale tree and shrub planting on the Horsethief Canyon State Wildlife Area to improve habitat for game birds.

The longest -running partnership between the two agencies centers on the Mt. Evans State Wildlife Area, west of Evergreen, in Clear Creek County. The Mt. Evans project began nearly 20 years ago with the planning and implementation of a management strategy for dealing with mountain pine beetle. The CSFS Golden District has since worked with the DOW on several cooperative forest management, wildfire hazard reduction and big-game habitat improvement projects across the Wildlife Area's 3,438 acres.

This CSFS-DOW partnership eventually became the centerpiece of the Mt. Evans Collaborative Stewardship Project involving federal, state, county, municipal and private lands in the Upper Bear Creek Basin. The participants in this larger effort aimed to protect the municipal water supply for Evergreen, popular recreation areas, critical big game habitat, and more than 500 homes through landscape scale management across ownership boundaries.



27. A prescribed burn on the Mt. Evans State Wildlife Area.

cies have been critical to the project's success. Future plans call for continued development of fuel breaks on state and private lands, prescribed burning, ponderosa pine restoration and aspen stand enhancement.



26. A big horn sheep takes advantage of an opening on the State Forest.

Since 1999, activities at Mt. Evans have continued to focus on reducing hazardous fuels and improving elk winter range. Recent accomplishments include nearly 1,000 acres treated with prescribed fire, 205 acres of mechanical fuels reduction on both state and adjacent private lands, and the initiation of wildlife habitat enhancement for Merriam's turkey. Twenty-four local fire protection districts reaped additional benefits from these projects through much-needed prescribed fire training opportunities.

Current funding sources for project implementation at Mt. Evans include National Fire Plan grants as well as regular appropriations from the DOW. Volunteers from both agen-

The positive results achieved at Mt. Evans led DOW managers at the Bosque del Oso State Wildlife Area in Las Animas County to pursue a similar forest management partnership with the CSFS and other area land managers. The DOW acquired the 30,000-acre parcel in 1997 with assistance from the Rocky Mountain Elk Foundation. Forests on the property range from pinyon-juniper stands on the lower elevations to mixed conifer on higher-elevation north aspects and ponderosa pine on the ridge tops and flat benches.

Most forests on the site are dense, small-diameter re-growth, with stocking levels from 200-600 trees per acre in places. Dwarf mistletoe, mountain pine beetle and ips beetles are problematic in selected stands, but none are widespread. The 2002 Spring Fire burned 2,700 acres within the wildlife area, causing significant watershed damage and leading to subsequent heavy fish kill from runoff in the Purgatoire River.

A thirteen-member Management Advisory Committee, including private, non-profit, industry and governmental representatives, oversees current land management projects. Forestry activities are primarily focused on improving the quality of elk winter range, increasing habitat for deer, bear and turkey and reducing risks of damaging wildland fire. Approximately 200 acres in the area have been mechanically thinned to open up the forest crown, improve elk habitat and enhance forest health conditions. A prescribed burn plan covering up to 2000 acres has been developed by the CSFS and is scheduled for implementation during winter of 2004.



28. Smoke from a prescribed burn in the Bosque del Oso State Wildlife Area.

Division of Parks and Outdoor Recreation

In the wake of several dramatic wildfire seasons, the Division of Parks and Outdoor Recreation (DPOR) launched a multi-year initiative, in cooperation with the Colorado State Forest Service, to reduce hazardous fuels and improve ecological conditions on several parks throughout the state. Although CSFS Districts have provided technical assistance to area parks in previous years, this effort marks the first large-scale cooperative venture between the two agencies. It also provides a valuable opportunity to showcase forest management techniques and convey related messages to a wide variety of visitors.

The DPOR identified eight parks as high-priority for treatment based on resource stewardship and fuel load assessments, risk of wildfire to park infrastructure and surrounding communities, and opportunities to extend management activities onto adjacent federal and/or private lands.

Each project will be an estimated 3-6 years in duration and will involve the development of a fuels inventory and detailed fuel-mitigation planning document. Funding for the initiative comes from a combination of DPOR, CSFS, Great Outdoors Colorado (GOCO) and U.S. Forest Service dollars. Efforts are underway to obtain additional financial support from private foundations.

Active implementation of the new fuels reduction plan began in 2002 with Staunton State Park, located on 3,700 acres along Highway 285 at the western edge of Jefferson County. The park lies deep in Colorado's high-risk Red Zone and is not yet open to the public, giving land managers the ability to efficiently conduct mitigation treatments without disturbing visitors.

An inventory conducted in the summer of 2002 revealed that past logging and years of fire suppression had affected the park's forests. Dense stands of ponderosa pine showed heavy impacts from mountain pine beetle and dwarf mistletoe. "Dog hair" stands of lodgepole pine presented a serious fire danger on steep hillsides, and mixed conifers were suppressing the growth of aspen stands in several areas.

Work at Staunton began during the winter of 2002 with the establishment of a 237-acre fuel break to protect both the park and neighboring private residences from wildfire. During the following summer, members of the Colorado Southwest Youth Corps Fuels Crew thinned mixed-conifer stands throughout the park to promote aspen growth and maintain selected open montane meadows. The Pike National Forest has complimentary treatments planned for adjacent federal lands, and the CSFS is actively working with private landowners in the area to encourage their participation as well.

Future phases of the project at Staunton State Park will promote the DPOR's strategic objectives:

- Reduce risk to communities, adjacent private property, and National Forest lands;
- Improve wildlife habitat and sustainability of resources;
- Protect and enhance scenic qualities of park resources;
- Protect watershed values; and
- Ensure future visitor and firefighter safety.

Golden Gate State Park, located on 10,911 acres in Gilpin and Jefferson Counties, is the next area slated for active management. A 21-acre fuel break around the Reverend's Ridge campground is already underway, along with the installation of interpretive signs to inform campground visitors and area hikers about the initiative.

CSFS and DPOR staffs have also begun fuel inventories and treatment strategies for Cheyenne Mountain, Trinidad Lake and Mueller State Parks and have initiated planning for Eldorado Canyon, Lone Mesa and Lory State Parks.



29. A pre-treatment site in Staunton State Park.



30. The same site after treatment to improve forest health conditions.

Looking Ahead

Change occurs slowly across forested landscapes. During 2003, Colorado's forests moved a little further down a trajectory of change shaped by long-term drought, a history of fire exclusion, increased human development and shifting attitudes about forest management. Insect and disease activity continued to expand, both in size and intensity. Land managers on all ownerships continued to grapple with the impacts of 2002's severe wildfires. New efforts to reduce hazardous fuels and improve forest vitality began on state lands.

Foresters track these incremental changes in forest condition through a variety of inventory, monitoring and analysis programs conducted cooperatively by state and federal agencies. In 2002, Colorado began a new annualized approach to forest inventory that will provide a vastly improved database of current forest conditions. Researchers can begin drawing conclusions from this information in approximately three more years, when crews have covered enough of the state to make the accumulated data statistically significant.

The importance of up-to-date information will be further revealed as the focus for these annual reports moves from a survey of current issues to a more in-depth look at individual forest types. Beginning in 2004, each of the next three reports will concentrate on the status of, research on and management issues unique to a particular forest type or ecosystem.

The first in this series will feature the pinyon-juniper and ponderosa pine forests of Colorado's lower to middle elevations. These forested landscapes characterize much of the state's high-



31. A small herd of elk enjoy the fall beauty of Rocky Mountain National Park.

risk wildland-urban interface and have been most affected by previous decades of fire exclusion. They also offer the greatest opportunity for diverse stakeholders to work together at the local level to simultaneously increase community protection and improve forest conditions. Subsequent reports will focus on aspen and mixed conifer forests, followed by high elevation lodgepole pine and spruce-fir forests.

Ownership of Colorado's 22.6 million acres of forestland lies in the hands of federal, state, local tribal, private and non-profit entities. But in a larger sense, we are all accountable for promoting the responsible stewardship of this valuable natural resource. In order to redeem this responsibility, land managers, government leaders

and the public must better understand the variety of interactions that led to our current forest conditions and will influence the effectiveness of our future actions.

Accurate, reliable and timely information provides the foundation for developing solid management decisions. As we collectively consider the actions needed to improve and sustain Colorado's forest resources, strengthening the body of knowledge on which our decisions are built should be at the top of the list.

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Acknowledgements

The *2003 Report on the Health of Colorado's Forests* was prepared by Paige Lewis of the Colorado Division of Forestry in conjunction with Colorado State University Publications and Printing.

Valuable information and assistance was also provided by: Ralph Campbell, Jennifer Chase, Skip Edel, Kristin Garrison, Vaughn Jones, Dave Leatherman, Clarence Morey, Tom Ostermann, John Twitchell, Scott Woods and the seventeen District Offices of the Colorado State Forest Service; David Baker, Jan Beyers, Brent Botts, Jerry Freeouf, Bruce Wilson, and Kirk Wolff of the U.S. Forest Service; Rob Billerbeck with Colorado State Parks; Bill Martin with the State Land Board; the Coalition for the Upper South Platte; and others.





**Colorado Department of
Natural Resources
Division of Forestry**

1313 Sherman Street
Room 718
Denver, Colorado 80203
(303) 866-3311
www.dnr.state.co.us

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