



2019 REPORT ON THE
HEALTH OF COLORADO'S FORESTS
Celebrating the Diverse Regions of Our State





Storm clouds clear to reveal a dusting of summer hail on the Never Summer Range near Estes Park. The Colorado State Forest Service's deputy state forester took this shot while on an aerial survey to assess the region's forestland. Photo: Joe Duda, CSFS
Photo of Michael B. Lester, below, courtesy of Council of Western State Foresters

Colorado State Forest Service Director's Message



Our Forests Need Us



Michael B. Lester

We live in a state with an international reputation for scenic beauty, outdoor recreation and quality of life as unmatched as our pristine peaks – and our forests lie at the heart of it all. Healthy forests provide habitat for wildlife, sources of clean water and places for us to connect with nature. They protect our climate by sequestering carbon and bolster our economy through outdoor recreation, tourism and wood production.

We need healthy forests in Colorado, and our forests need all of us.

Wildfires, insects and diseases do not recognize legal boundaries as they ravage trees and forests, putting our communities and way of life in jeopardy. For this reason, we must work together as partners in stewardship to ensure our forests remain healthy. As you read this *Report on the Health of Colorado's Forests*, you will see how the Colorado State Forest Service works with partners and all levels of government to make a difference on the ground in forestlands across Colorado.

In the Steamboat Springs area, we co-lead an annual restoration effort with Yampa Valley Sustainability Council to plant trees, provided by our nursery, along rivers and streams in recreation areas. In forests along the Front Range, we collaborate with private landowners, local fire

protection districts, nonprofit agencies, water providers and others to protect watersheds and communities from catastrophic wildfires. Last July, we announced plans with the U.S. Forest Service and Colorado Springs Utilities to invest \$15 million over five years in forest and watershed restoration projects in the Pikes Peak Watershed.

As these and other examples in this report illustrate, we have always been an agency with a bias for action, implementing projects that help us achieve our mission of forest stewardship. The recent signing of a Shared Stewardship Agreement between the State of Colorado and USFS, upcoming projects through the Rocky Mountain Restoration Initiative and the new Statewide Forest Action Plan will help bring us and our partners closer together to get work done. Together, we can make the biggest impact in the areas of greatest need on our forests, while getting the most bang for our buck.

Thank you for supporting and working with the Colorado State Forest Service. Whether you love our forests for their beauty, wildlife, trails, water, wood products or other reasons, we need your help. Please join us as a steward of our forests. Alongside you and all our partners, we will continue to improve the health of our forests and protect the values they provide for generations to come.

Michael B. Lester, State Forester and Director, Colorado State Forest Service

Colorado is Dedicated to Forest Health Goals



Dan Gibbs

The health of Colorado's forests and natural resources impacts our state's economy, wildlife and communities every day. As the director of the Colorado Department of Natural Resources, a certified wildland firefighter and a strong supporter of wildfire preparedness, I know first-hand the critical importance of forest health, fuels and wildfire management.

I am honored to work alongside the Colorado State Forest Service, which staffs the Department's Division of Forestry, to ensure Coloradans have access to resources for forest stewardship, education and wildfire risk reduction. As we have witnessed in many Colorado communities, insects, disease and wildfire impact our forests across land ownership boundaries and pose challenges to public safety, water resources, recreation and many other core Colorado values. Protecting communities and ecosystems requires collaboration across all levels of government.

Colorado has over 24 million acres of forestlands, and innovative approaches to forest management are more important than ever as Colorado's population grows and our climate warms. We are committed to elevating forest restoration in Colorado to match the scale of these challenges. Last October, Gov. Jared Polis signed a Shared Stewardship Agreement with the U.S. Forest Service aimed at strengthening relationships and enhancing natural resource management on forestlands. This agreement also serves as the foundation for future collaboration with tribal partners, local governments, other state and federal agencies, and non-governmental organizations.

Our new Shared Stewardship strategy focuses the resources of all partners where they are most needed, and in areas where action will achieve the greatest benefits. This targeted investment will promote efficiency, economies of scale and increase the effectiveness of restoration activities. Colorado has a long history of effective collaboration on natural resource management issues, and this new strategy leverages that success to achieve forest health goals at landscape scales.

We will share knowledge, tools and resources among Shared Stewardship partners to manage risks from wildfire, insects and disease; improve forest, rangeland and watershed health; protect fish and wildlife; support recreation opportunities; protect critical infrastructure; sequester carbon; and maintain the beauty and prosperity of our communities and landscapes. We will include diverse stakeholders in decision-making on all of these issues to reflect Colorado's rich cultural diversity and changing population.

By changing our forest management strategies to face the scale of current threats, we can enhance the resilience of Colorado's forests and protect people, the environment and our way of life for future generations.

Dan Gibbs, Executive Director,
Colorado Department of Natural Resources

ONLINE ACCESS

bit.ly/COForestHealth2019

- » Interactive map
- » Searchable insect and disease data by county
- » Report PDF

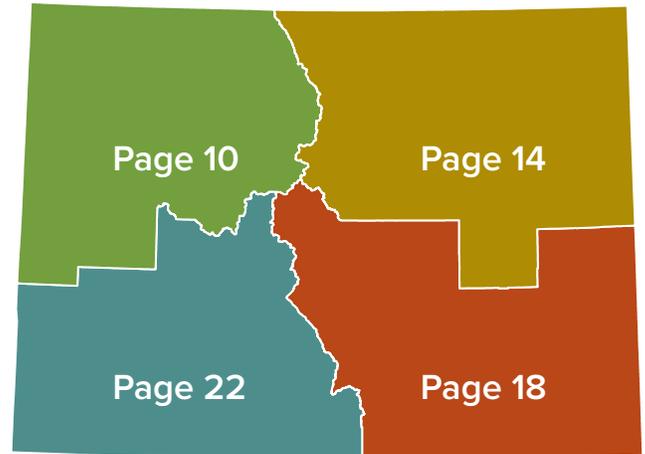


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ON THE COVER: In the Roxborough neighborhood (top), a wildland-urban interface community near Denver, many residents take an active role in fire mitigation. Bottom: Forest Inventory and Analysis crews gather tree data throughout the year (right) to help the CSFS maintain healthy forests, which in turn influence watersheds, wildlife and residents' ability to enjoy recreation (left) in Colorado. Photos (clockwise from top): Meg Halford, CSFS; Danielle Ardrey, CSFS; Joy Jackson



Trees provide many conservation benefits, including windbreaks and living snow fences, wildlife habitat and forest restoration. Photo: CSFS

Can You Imagine Colorado

Our forests impact our economy, wildlife, recreation, water quality and way of life. Without forests, we lose touch with these values and much of what makes our state such an amazing place to live, work and play. As the state's lead forestry agency, the Colorado State Forest Service is at the forefront of ensuring our forests remain healthy and resilient against wildfire, insects and disease. The CSFS and its partners get important work done on the ground so that our forests — and the benefits they provide to us — remain a part of our landscape long into the future.

Since 1955, the CSFS has served Colorado residents with timely, relevant forest management practices, information and education. The agency assists thousands of landowners and hundreds of communities annually across Colorado in managing their trees and forests.

With headquarters in Fort Collins, the CSFS is a service and outreach agency of the Warner College of Natural Resources at Colorado State University and provides staffing for the Division of Forestry within the Colorado Department of Natural Resources.

For fiscal year 2019, CSFS funding was \$14.7 million, with 40 percent of its budget coming from federal grants; 26 percent from the state general fund; 19 percent from self-funded operations and other



A Gunnison Middle School seventh-grader learns from a CSFS forester how to measure a tree during the 2019 Mill Creek Youth Summit. Photo: Sam Liebl, Gunnison Conservation District



Harvesting is an important part of forest management to encourage new growth and promote forest health. The CSFS works with timber contractors in forests across the state. Photo: Damon Lange, CSFS

... Without Any Trees?

revenues; and 15 percent from severance taxes. Without this range of funding, the agency's annual accomplishments would not be possible.

With 17 field offices and over 100 staff, the CSFS works face-to-face with residents and partners to improve forest health, offering:

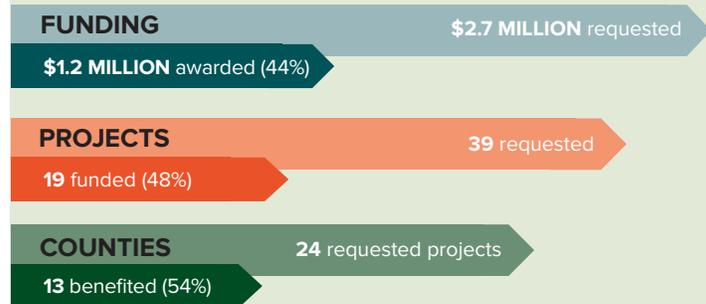
- Leadership, resources and guidance in forest management
- Wildfire risk reduction and community planning
- Wood utilization and marketing support
- Outreach and education to youth and adults
- Insect and disease detection, surveys and response
- Forest monitoring, inventory and data analysis
- Seedling trees and other plants for conservation projects
- Urban and community forestry assistance

Our forests are central to our state and what it means to be a Coloradan, and we must protect, conserve and enhance this critical resource. As a leader in forestry in Colorado, the CSFS will continue to bring partners together on national, state and community levels to address the biggest challenges facing our forests, ensuring our children and grandchildren grow up with healthy trees and forests — and all the wonderful benefits they have to offer.



Forester Mandy Scott conducts a forest inventory in Pitkin County. Inventory data tell CSFS staff about the condition, growth and health of Colorado's forests over time. Photo: Kamie Long, CSFS

2019 Forest Restoration and Wildfire Risk Mitigation Grants



Projections show Colorado's population will increase rapidly over the next 10 years, as will the risk that catastrophic wildfire will affect Colorado's residents and local, regional and state economies.

The Forest Restoration and Wildfire Risk Mitigation grant program uses state severance tax funds, administered by the Colorado State Forest Service, to support on-the-ground forest restoration and wildfire mitigation projects. In 2019, \$1.1 million was awarded for fuels and forest health projects, and almost \$56,000 for capacity building. These projects were matched with \$1.7 million and affect 2,059 acres.

The CSFS has managed the grant program since it began in 2017, when Senate Bill 17-050 combined the agency's Healthy Forests and Vibrant Communities grant program and the Wildfire Risk Mitigation grant program, previously run by the Colorado Department of Natural Resources. Since then, demand for funding has consistently exceeded the amount of funding available from the state.

The CSFS appreciates funding support from the House Committee on Rural Affairs & Agriculture and the Senate Committee on Agriculture & Natural Resources. These funds are dedicated to forest health and wildfire mitigation projects as these programs expand.

Two types of projects can be considered for grant funding assistance: (1) fuels and forest health projects that meet outlined requirements and (2) equipment purchases to work on forest fuel reduction at local levels. Applications are accepted in the fall of each year, announced on the CSFS website.

Work on the 19 projects awarded funds in 2018-2019 began in summer of 2019. The benefits to land and people include:

- Creating defensible space in the wildland-urban interface
- Improving critical evacuation roads in the event of a wildfire
- Reducing post-fire watershed contamination near the Spring Creek Fire, and helping protect endangered fish species
- Developing fuelbreaks to connect previous mitigation work and enhance the City of Trinidad's watershed
- Increasing wildfire resiliency and community wildfire adaptation
- Implementing hazardous fuels reduction and training sawyers
- Reducing the spread of insects and disease
- Reducing the density of trees to create openings to improve important wildlife corridors and conserve wildlife habitat
- Enhancing riparian areas

June 29, 2018



Snowpack was minimal (left) during the 2018 snow season around Snowmass and the surrounding Elk Mountain peaks, as seen in this photo from June 29, 2018. A little over a year later, and one month further into the summer, the snowpack was robust in the inset photo from July 24, 2019. Photos: Dan West, CSFS

July 24, 2019



Weather Helped Tame Wildfires, Strengthen Trees in 2019

There's a connection historically entwined within Colorado's forests — the spread of insects and disease is linked closely to the weather. Specifically, the amount of precipitation and the daily temperature patterns affect how well the trees in the state's forests can ward off pests to remain healthy and resilient.

To this end, it's encouraging that record-breaking snowfall in 2019 helped reduce potential ignitions for fire and bolster tree defenses against bark beetle-caused mortality. However, the state also saw 33 records broken for the highest maximum temperatures and 78 records broken for highest minimum temperatures in 2019, according to the National Oceanic and Atmospheric Administration, National Centers for Environmental Information. These dramatic shifts have serious implications for forest insect and disease activity.

Forest disturbances from catastrophic bark beetle attacks track closely with long-term precipitation levels and temperature patterns. More precipitation in 2019 bolstered tree defenses by helping trees produce

enough sap to resist insects attempting to enter through the bark. Several consecutive years of adequate precipitation are necessary for trees to recover in post-drought conditions.

Colorado experienced near-average temperatures from October 2018 to September 2019, cites NOAA. But on July 19, 2019, the state's all-time record high temperature was broken in Bent County, topping out at 115 degrees, one degree higher than the previous record. Also on the rise, precipitation levels statewide rebounded in 2019 from the previous year, which was the second driest year on records dating back to 1895. The southwest quadrant of the state went from the warmest and driest region in 2018 to one of the wettest areas statewide in 2019. Three areas of the state saw the wettest measures on record last year, and 46 Colorado records for highest precipitation levels were broken. In fact, the 2019 wildfire season burned significantly fewer acres than the 2018 season, due in part to above-average snowpack and plenty of spring precipitation.



COLORADO HAS 24.4 MILLION FORESTED ACRES

(if divided equally, that's more than three football fields of forest for every person living in the state)



29%

of forests are on private land



3.9M

forested acres are in the wildland-urban interface (WUI)



50%

of Colorado residents live in the WUI



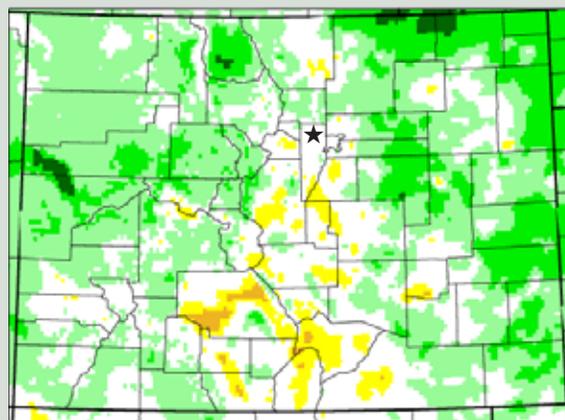
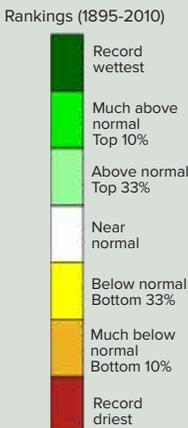
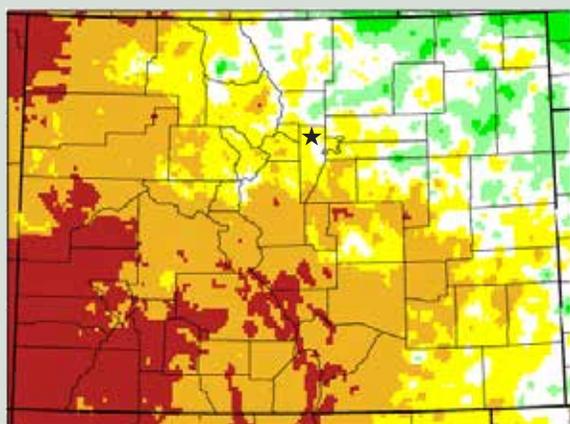
821

active CSFS forest management plans are affecting 426,000 acres

Two-year Review: Colorado Precipitation Increases

October 2017-September 2018

October 2018-September 2019



Due in part to a robust snowpack in 2019, precipitation levels rebounded to mark the 34th wettest year in 125 years, as the state map shows in green areas on the right. Water years are measured from October through September, and 2018, left, was the second driest on record since 1895. Maps: WestWide Drought Tracker, University of Idaho/WRCC. Data from PRISM (Prelim)

Though Declining, Spruce Beetle Remains Damaging Pest in 2019

Warmer temperatures and drought conditions in 2018, followed by a robust snowpack, played a powerful role in shaping forest insect and disease activity in 2019, with the following notable pests impacting locations across the state. Find specific, area-related information in each section of this report.

Spruce Beetle (*Dendroctonus rufipennis*)

Acres affected statewide in 2019: 89,000 of high-elevation Engelmann spruce forests

Total acres since 2000: 1.86 million

For the eighth consecutive year, Colorado's most widespread and destructive forest insect pest was the spruce beetle. It is the most damaging pest of mature spruce forests of North America. Though on the decline now for several years, in 2019 this beetle targeted 25,000 previously uninfested acres in the state, compared to 55,000 new acres in 2018.

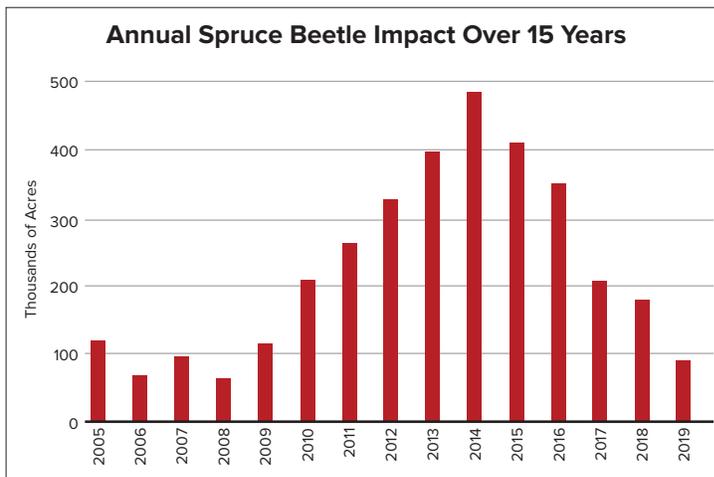
These small, native bark beetles infest high-elevation Engelmann spruce usually growing above 9,000 feet, and occasionally Colorado blue spruce at lower elevations. They live and develop in a thin layer of inner bark, between the thicker sapwood and the outer bark. Developing larvae girdle and eventually kill a tree as they feed, causing spruce needles to fade from green to light yellow, and eventually to a reddish-brown color.

Spruce beetles typically produce a generation every two years. Adults emerge and fly to seek new host trees from late May through July, preferring large-diameter trees until these have been depleted from the forest. As the spruce beetle moves through contiguous stands of Engelmann spruce and these trees are killed, it has resulted in fewer actively affected acres each year since 2014.

Above-average snowpack and cool spring temperatures resulted in delayed fading of spruce needles, making conditions difficult to detect spruce beetle in 2019. Susceptible Engelmann spruce forests exist

in the northern and central portions of the state, which have been unaffected by the epidemic thus far, indicating that this insect has the potential to affect new areas in the upcoming year.

Chaffee, Grand, Hinsdale, La Plata and Park counties were most affected in 2019. For searchable data on all counties, go online to bit.ly/COForestHealth2019.



Douglas-fir Beetle (*Dendroctonus pseudotsugae*)

Acres affected statewide in 2019: 7,400

Total acres since 1996: 450,000

For numerous consecutive years, Douglas-fir beetle has continued to attack and kill mature Douglas-fir trees in the central and southern portions of the state.

This beetle, a close relative of spruce beetle and mountain pine beetle, is a native bark beetle that inhabits mature Douglas-fir forests across most of the West. Outbreaks tend to be associated with overly dense

forests containing mature Douglas-fir, during extended periods of below-normal precipitation. Adults typically seek new trees to attack from May through September. Mortality of large individual trees and groups of trees is typical of early stage infestations. Over years, these groups may coalesce into widespread events where entire landscapes and watersheds are affected.

In 2019, Gunnison, Hinsdale, Mineral and Saguache counties in the south-central portion of the state, as well as Eagle, Garfield, Jefferson and Pitkin counties, were heavily affected.

Approximately 7,400 total acres were impacted statewide in 2019, with 6,000 acres being new. This was down considerably from 2018, when 11,000 new acres were actively affected.

Western Spruce Budworm [*Choristoneura freemani*]

Acres affected statewide in 2019: 147,000 of Douglas-fir, white fir and spruce trees, mostly in central and southern Colorado

Western spruce budworm has been Colorado's most damaging and widespread forest defoliator for a number of consecutive years. It affected slightly more acreage in 2019 than 2018, when it defoliated 131,000 acres.

Adult budworms are typically active in July and August. Larvae feed on the buds and new shoots of Douglas-fir, true firs (*Abies* spp.) and spruce. Feeding causes the needles to turn a reddish-brown color in the branch tips and terminal ends of affected trees. Larval feeding damage occurs from early spring through mid-summer, at which time the insects pupate and emerge as adult moths.

Conejos, Dolores, Fremont, Gunnison, Montezuma, Park, Saguache and San Miguel counties experienced heavy and widespread defoliation in 2019. Pockets of activity also occurred in many other southern Colorado counties. For data on all counties, go to bit.ly/COForestHealth2019.

Roundheaded Pine Beetle [*Dendroctonus adjunctus*]

Acres affected statewide in 2019: 22,000

Total acres since 1996: 31,000

Roundheaded pine beetle and associated native bark beetles — typically western pine beetle, pine engraver beetle and mountain pine beetle — work in conjunction and continue to affect ponderosa pine in Dolores County at a steady rate. These insects affected nearly 26,000 acres in 2018, with similar impacts in 2019.



Roundheaded pine beetle. Photo: Dan West, CSFS

Although not all acres in this type of attack are intensely or equally infested, impacts in affected acres significantly increased from 2014-2018. Still, beetle-caused tree mortality remains low to moderate in Dolores County across the entire pine forests on the Glade, an area northwest of Dolores.

Record-low precipitation levels in the southwest portion of Colorado in 2018 weakened tree defenses, providing an environmental window that allowed beetle populations to increase. Precipitation levels improved in 2019, resulting in a slightly lower number of acres impacted in the San Juan Mountains.

Fir Engraver Beetle [*Scolytus ventralis*]

Acres affected statewide in 2019: 890

White fir mortality diminished across all affected areas of the state and,



Aerial flights showed aspen stands defoliated by fungal leaf pathogens scattered throughout the state. Near Lone Cone in northern Dolores County, above, stands fade from producing new leaves in July. Photo: Dan West, CSFS

for the fifth consecutive year, mortality from the fir engraver beetle declined in and around Ouray. Localized activity occurred in Archuleta County and continues to be at only endemic levels elsewhere. Affected areas have been decreasing since 2016, when beetles impacted 6,300 acres, down to 2,500 acres in 2017 and 1,400 acres in 2018.

Western Balsam Bark Beetle/Root Disease Complex

Acres affected statewide in 2019: over 23,000 of high-elevation subalpine fir

Disturbance caused by western balsam bark beetle (*Dryocoetes confusus*) and several species of fungi that cause root decay remains persistent in Colorado's high-elevation subalpine fir, but it can be difficult to spot because mortality is often not uniform across the landscape. This native bark beetle predominately attacks subalpine fir, though white fir, and even more rarely Engelmann spruce and lodgepole pine, are sometimes attacked. The area affected by this bark beetle may vary from year to year, though it is typically relatively low in intensity in the absence of localized drought conditions.

Defoliating Insects/Leaf Diseases of Aspen

Acres affected statewide in 2019: 73,600

Several species of leaf fungi are responsible in some years for the thinning or discoloration of aspen and cottonwood foliage in Colorado. Discoloration of foliage caused by a combination of Marssonina blight (*Marssonina* spp.) and/or Septoria leaf blight (*Septoria* spp.) caused early leaf drop and spotted, diseased leaves where the environmental conditions were favorable for these fungal pathogens in 2019. Wet springs coupled with early summer precipitation are favorable to leaf fungal pathogens. Damage is variable from year to year, depending on environmental conditions, and these diseases rarely cause significant tree decline.

Dwarf and Leafy Mistletoes

Five species of dwarf mistletoe and one leafy mistletoe occur in Colorado. Dwarf mistletoes are leafless "holoparasites," deriving

carbohydrates and water exclusively from their host trees by sinking roots down into tree branches and stems. Shoots develop and produce flowers and seeds within five to six years. All native pines and Douglas-fir trees in the state are susceptible to dwarf mistletoe.

Dwarf mistletoes cause branches to swell at the infection site, subsequently forming large "witches brooms" that appear as densely clumped twigs, and eventually cause trees to become stunted and deformed. Seeds of these parasites are dispersed locally from shoots starting after five years of infection, while long-range dispersal occurs via animals and birds. A range of infection severity regularly occurs across the state, from localized pockets and stand-level occurrence to severe infections that impact entire drainages and forests. Dwarf mistletoes continue to be a persistent problem for communities and forests statewide.

The only leafy mistletoe in Colorado, commonly known as the juniper mistletoe, occurs in the southwest corner of the state on several juniper varieties. Leafy mistletoes are "hemiparasites," deriving water and only partial carbohydrate needs from their tree hosts. Infection rates are low in southwest Colorado; however, effects are noticeable in areas throughout Dolores, La Plata and Montezuma counties.

Emerald Ash Borer (*Agrilus planipennis*)

This past year, the non-native emerald ash borer was detected for the first time outside of Boulder County (where it was first confirmed in 2013). Early detection of this invasive pest remains challenging. New detections in 2019 occurred in Broomfield and Westminster and within unincorporated Larimer County. Across Colorado, roughly one in five trees in urban communities are ash, susceptible to this deadly insect. More information is in the Northeast Area section of this report.

Japanese Beetle (*Popillia japonica*)

Cooler temperatures delayed the emergence of Japanese beetles last spring in Boulder, Denver and Pueblo. Once beetles emerged, feeding was heavy in most communities along the Front Range, from Fort Collins and Greeley south to Pueblo. Read more in the Northeast Area section of this report.

Why We Monitor Colorado's Forests

Each year, for 12 weeks from the end of June into September, trained aerial observers from the U.S. Forest Service Rocky Mountain Region and the Colorado State Forest Service spend their days in small aircraft, flying over the state's native forests to map the intensity of the current year's pest and disease damage. When necessary, some areas are ground-checked to verify the insect or disease responsible and assess the severity of the damage. Their observations translate into the primary source of information on pest conditions and forest health for the year, and this regular monitoring is a key part of forest management in Colorado.

Forest insects and diseases naturally affect the dynamics of forest ecology. A primary example in Colorado is tree-killing bark beetles that attack trees in mature, often overly dense forests. This disturbance sets the stage for the replacement of older, less healthy trees with younger, more vigorous ones. However, outbreaks also can affect the values humans place on forests, including timber

production, wildlife habitat, recreation and watershed protection.

In addition to flights, information about forest health — which is contained in this report and guides future management decisions — comes from CSFS foresters. These experts conduct field visits to identify and evaluate forest pest activity and advise landowners on how to best manage their forestlands. CSFS foresters also manage state-owned forestlands, including State Trust Lands. Nineteen CSFS Forest Inventory and Analysis employees are dedicated to a multi-million-dollar federal partnership that monitors the growth and number of trees around the state, which contributes to a better understanding of Colorado's forests.

Additionally, in cooperation with other agencies such as the Colorado Department of Agriculture, USDA Animal and Plant Health Inspection Service and USFS, the CSFS is involved in the design and implementation of special surveys to ensure early detection of exotic insect species that threaten both urban and native forests.



Young volunteers plant trees along the Yampa River at Rotary Park in Steamboat Springs during a ReTree Steamboat event last fall. Photo: Carolina Manriquez, CSFS

ReTree Steamboat Marks 10 Years of Community Plantings

Forest restoration efforts are always more successful when local communities get involved. A perfect example is ReTree Steamboat, a partnership that fosters land stewardship in residents through tree plantings that restore riverside forests and improve wildlife habitat.

Now entering its 10th year, ReTree Steamboat has become an annual tradition led by Yampa Valley Sustainability Council and the Colorado State Forest Service. Through annual, volunteer-staffed planting efforts, community members have put more than 26,000 trees in the ground, primarily in recreation areas adjacent to Steamboat Springs, to improve forest health along rivers and streams.

“Our approach has been successful because we were willing to start small and gradually build on our continued success, using an adaptive management approach,” said Carolina Manriquez, forester for the CSFS Steamboat Springs Field Office.

The inaugural event in 2010 was founded under the name ReTree Colorado by resident Tristan Frolich, after he won a grant to reforest areas suffering heavy tree mortality from mountain pine beetle. The huge success of the first year’s planting inspired Sarah Jones, executive director of YVSC, to partner with the CSFS and continue the program’s momentum in the years since. All the trees used for planting efforts are grown by the CSFS Nursery in Fort Collins. Thanks to the use of regionally sourced seeds and long-term seedling care plans, multi-year tree survival rates have typically crested 60 percent. The

CSFS Nursery is now growing trees for the ReTree Steamboat program using even more site-specific seeds and plant cuttings, all sourced from the Yampa Valley.

With a focus on riverside forest restoration for 2019-2021, program partners are currently targeting two areas along the Yampa River: Colorado Parks and Wildlife’s Chuck Lewis State Wildlife Area and the City of Steamboat Springs’ Rotary Park. The program is utilizing native shade trees, including cottonwood, mountain alder and willows, for these long-term restoration efforts that will increase forest resiliency and improve wildlife habitat.

Community members have planted more than 26,000 trees and improved forest health along rivers and streams.

So far, ReTree Steamboat volunteers have planted trees at more than 10 community open spaces throughout Routt and Moffat counties, often in close collaboration with the City of Steamboat Springs. As of 2019, approximately 3,300 ReTree volunteers ages 2 to 72 have assisted with planting, monitoring, mapping and tree care.

“The involvement of young people is key to the success of the ReTree program,” said Jones, executive director for YVSC. “It’s critical we ensure the next generation embraces stewardship of their natural environment.”



8.6 MILLION FORESTED ACRES IN THE NORTHWEST AREA

(almost four times the size of Yellowstone National Park)



24%

of forests are on private land



611K

forested acres are in the wildland-urban interface (WUI)



126

active CSFS forest management plans are affecting **142,000 acres**

CSFS SPECIALTIES: Denver Water Board forest management assistance, Good Neighbor Authority projects, landowner site visits/assistance, state lands forest management, Colorado State Forest, urban and community forestry



Photo: Weston Toll, CSFS

Upper Colorado River Headwaters Watershed Protection

County: Grand

Primary benefit: Watershed protection

Acres to be treated: 350

Before water can flow from the faucets of Denver Metro residents, it first filters through forests as rain and snow. Keeping our forests healthy is critical to ensuring high-quality water enters collection systems.

Since the early 1980s, the Colorado State Forest Service has worked with Denver Water, which provides clean water to 1.4 million Denver area residents, to establish healthy forests in watersheds in the Fraser Valley of Grand County. As part of the From Forests to Faucets II program, the CSFS continues this work in Grand County, with plans to salvage beetle-killed wood and thin timber stands on 350 high-priority acres in the Upper Colorado River Headwaters over the next three years. This project incorporates funds from private residents, the U.S. Forest Service and Denver Water to enhance forest health and reduce the risk of potential wildfire on this watershed and the communities within it.



Photo: Dillon Ranger District, White River National Forest

Summit County Fuels Reduction

County: Summit

Primary benefit: Wildfire fuels reduction

Acres to be treated: 500

Since 1996, mountain pine beetle has affected around 80 percent of Summit County forests, or about 66,000 acres. With more dead trees in the forests, the potential for severe, destructive wildfires increases. To reduce fuels on the ground and protect neighborhoods, the Colorado State Forest Service is working with landowners, Summit County and the U.S. Forest Service on many projects to improve forest health and reduce the risk of high-intensity fires.

For example, with help from voter-approved Summit County 1A Strong Future funds, the CSFS recently began to remove beetle-killed trees on 43 acres of the White River National Forest and Summit County open space adjacent to a neighborhood north of Breckenridge. Located in mountainous terrain, this project will be one of the first in Colorado to use tethered, winch-assist harvesting equipment that can pull logs up slopes to be removed and used instead of piled and burned on-site.



Photo: Carolina Manriquez, CSFS

Steamboat Front Fuels Reduction

County: Routt

Primary benefit: Wildfire fuels reduction

Acres treated: 1,150

Forests blanket the foothills north and east of Steamboat Springs. While these forests offer scenic views and a haven for outdoor recreation, they also pose the threat of wildfire to residents in the wildland-urban interface (WUI). To reduce the risk of fire, the Colorado State Forest Service has worked over the last three years to create fuelbreaks along the city's WUI.

With the ability to work across boundaries through the Good Neighbor Authority program, the CSFS ground trees into mulch on 1,000 acres of U.S. Forest Service land and 150 acres of private forestlands. Targeting aspen, Gambel oak and mountain shrubs, the CSFS reduced the risk of fire for residents while also creating habitat for elk, deer and other wildlife, protecting the Yampa River watershed and improving forest health.

The U.S. Forest Service, Colorado Parks and Wildlife and the City of Steamboat Springs provided funding for this work.

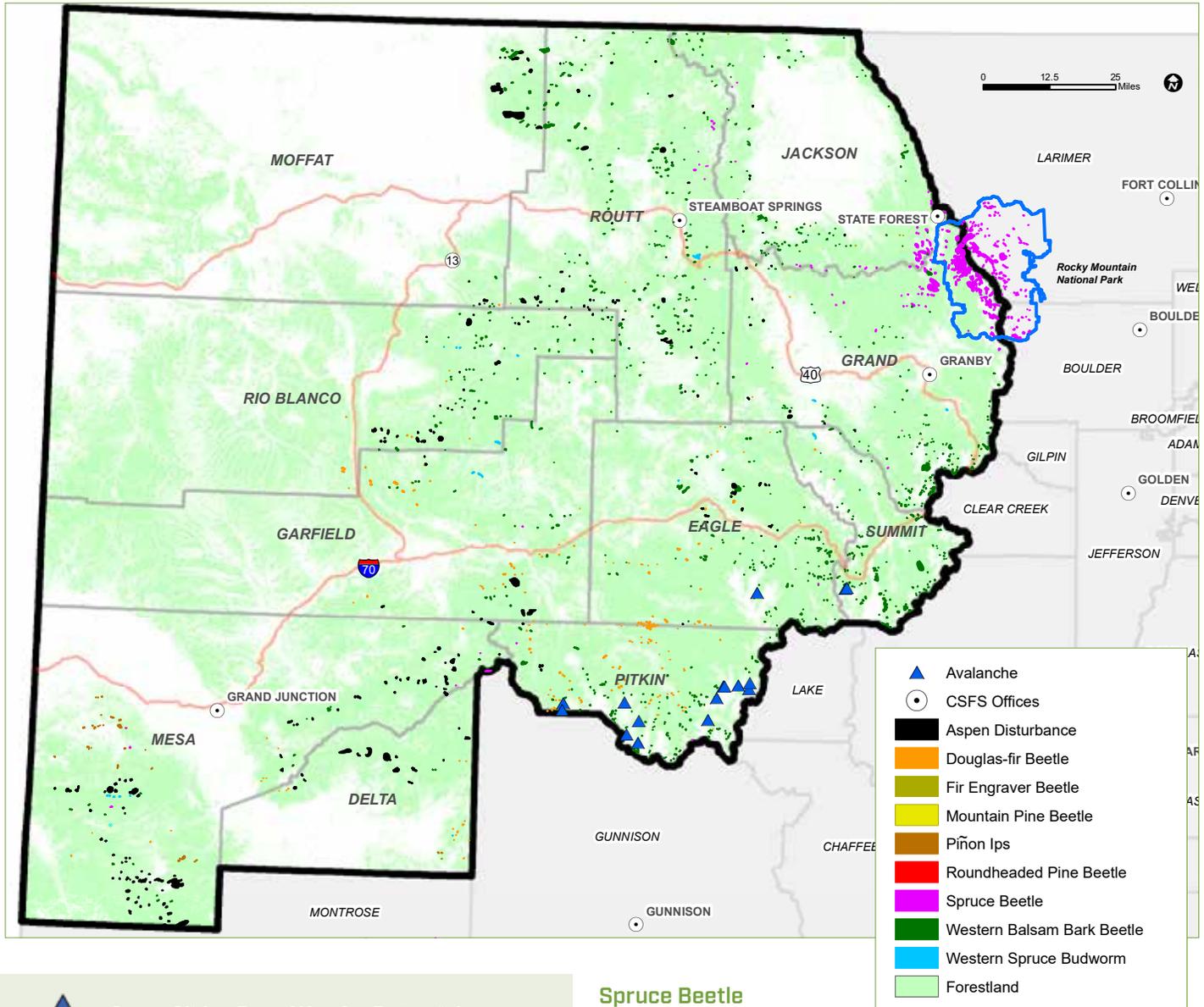


Insect and Disease Trends

The burly snowpack in 2019 caused significant and heavy snow slides in high-elevation forests in the Northwest Area. The accumulation of downed trees within the slide areas may be cause for concern in coming years as bark beetle populations may build within these trees and spread to adjacent live trees. The Northwest Area continues to experience intense spruce beetle-caused

mortality in high-elevation Engelmann spruce-fir forests in and around Rocky Mountain National Park. Piñon pines and juniper woodlands at lower elevations were particularly susceptible after 2018, the second driest water year on record dating back 124 years. Piñon Ips engraver bark beetles continue to affect low-elevation woodlands as a result of susceptible tree conditions.

Northwest Colorado Insect & Disease Activity



Snow Slides Pave Way for Potential Bark Beetle Outbreaks in Future

The winter of 2018-2019 brought a robust snowpack to the White River National Forest. Blue triangles on the map above mark snow slide locations on nearly 100 acres of high-elevation forests, mostly in Pitkin and Summit counties. Some of these slides extended existing avalanche chutes, and heavy tree accumulation at the base of these slides is now cause for concern about bark beetle-caused mortality in coming years.

Spruce Beetle

[Dendroctonus rufipennis]

Acres affected in 2019: 11,600 of high-elevation Engelmann spruce-fir forest

As in other areas of the state, spruce beetle activity slowed last year in comparison to the nearly 19,800 acres affected in 2018. However, aerial detections of affected trees were difficult as heavy snowpack persisted later than usual, delaying tree symptoms by more than three weeks, which might explain some of the decline in acres affected. In 2019, nearly 18 percent of the acres targeted by spruce beetle (nearly

2,000 of 11,600 acres) were in previously unaffected areas. The region along the Fraser River in Grand County was hit particularly hard, and the Craggs area on the southwest end of the Colorado State Forest in Routt County still had noticeable activity. Forests containing spruce near Rocky Mountain National Park continue to see widespread, often intense levels of spruce beetle-caused tree mortality. The Northwest Area has had nearly 21 percent of its spruce-fir forest affected by spruce beetle since 2000.

Douglas-fir Beetle
[Dendroctonus pseudotsugae]

Acres affected in 2019: over 1,800 of low-elevation mixed-conifer forests

Nearly 1,300 of the acres these beetles attacked in 2019 were previously unaffected by the current outbreak. Since 1996, the Northwest Area has witnessed 26 percent of its mixed-conifer forests that contain Douglas-fir affected by this insect.

Piñon Ips *[Ips confusus]*

Acres affected in 2019: nearly 500 of piñon pine woodlands

Record-warm temperatures and record-low precipitation in 2018 along the West Slope and in the southwest corner of Colorado resulted in continued dieback and die-off of piñon pines in these areas in 2019. Isolated or localized tree mortality was observed in and near the Colorado National Monument around Glade Park and along the Interstate 70 corridor near Rifle, Carbondale and Grand Junction.

Piñon pines typically grow in harsh, low-elevations below mixed-conifer/ponderosa pine forests of Colorado. Piñons often grow in proximity to juniper trees and shrubs, where conditions are dry and precipitation fluctuations are the norm. During prolonged periods of below-average precipitation, populations of the piñon Ips bark beetle can build in already-stressed piñon trees.

Western Balsam Bark Beetle/Root Disease Complex

Acres affected in 2019: nearly 16,000 in small groups of high-elevation subalpine fir trees

Signs of the western balsam bark beetle (*Dryocoetes confusus*) on individual trees and groups of trees persist throughout much of Eagle, Grand, Routt and Summit counties. The area affected by this beetle may vary from year to year, though it is typically relatively low



Aspen fungal leaf spots. Photo: Dan West, CSFS

in intensity without drought conditions that make trees more susceptible to this pest.

Western Spruce Budworm
[Charistaneura freemani]

Acres affected in 2019: more than 700

In 2019, western spruce budworm affected less acreage than in 2018, when about 2,100 acres were detected. Some regions within the Northwest Area have experienced numerous years of defoliation, causing tree top dieback, upper branch dieback and even mortality. In 2019, defoliation continued in Byers and Gore canyons in Grand County. Budworm populations are considered low in southern Routt County, though they still persist. Low levels of infestation also were detected on Piñon Mesa near Grand Junction in 2019.

Defoliating Insects/Leaf Diseases of Aspen

Acres affected in 2019: 19,500

Years with wet springs followed by additional rains can result in foliar fungal issues on cottonwoods, poplars and aspens. In 2019, nearly 15,000 acres were affected by foliar leaf spots in the Northwest Area. Aspen stands in Routt County and on the western side of the Flat Tops in Garfield and Rio Blanco counties were noticeably affected in 2019, and aspens on the west side of the Grand Mesa also were affected.

Juniper Dieback/Die-Off

Piñon pine-juniper forests occupy approximately 5.1 million acres of Colorado's 24.4 million forested acres. Extreme early-season temperature fluctuations, coupled with numerous years of below-average

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precipitation, have resulted in some juniper dieback and die-off along the West Slope.

Cedar bark beetles (*Phloeosinus* spp.), juniper borers (*Atimia* spp.), the black-horned juniper borer (*Callidium texanum*) and the juniper twig pruner (*Styloxus bicolor*) are typically associated with dead and declining juniper trees. No other pests or diseases have been associated with observed damage.

Pine Needle Scale
[Chionaspis pinifoliae]

Pine needle scale activity declined in 2019 throughout Grand County, where it had caused significant tree damage from 2015-2018. Scales remained persistent in the communities of Fraser, Grand Lake and Vail, as well as portions of Summit County.

Pine needle scale feeds on needles of most pine species, Douglas-fir, Engelmann spruce and Colorado blue spruce. During outbreaks, insects settle on the needles, robbing the tree of nutrients. Heavy infestations can cause premature needle drop, branch dieback, increased susceptibility to other insects or disease, or even tree death. Lodgepole pines of every size, from small saplings to mature trees, can be heavily infested during outbreaks. Heavy, prolonged, year-after-year insecticide spraying to protect against mountain pine bark beetle can diminish populations of natural predators and beneficial insects that keep scale infestations in check.



CSFS foresters Max Erickson and John White assess wood harvested during the Heavens Project. The CSFS engaged the wood products industry to ensure trees felled during the project became saw logs, firewood and wood chips for a biomass power plant. Photo: Nathan Beckman, CSFS

Residents Working Together Reduce Fire Risk in Jefferson County

To be truly successful, forest management needs to occur at a landscape scale – after all, wildfires and insect outbreaks don’t adhere to legal boundaries. But this is challenging due to the patchwork of land ownerships in high-priority, populated areas, such as the foothills southwest of Denver.

“Property lines are one of the primary obstacles Colorado foresters face,” said Max Erickson, forester for the Golden Field Office of the Colorado State Forest Service.

The CSFS and partners are making strides in successfully engaging private landowners for cross-boundary projects by demonstrating the collective benefits when we all come together to meet common goals. One example is the Heavens Forest Management Project near Conifer. This recently completed project consisted of simultaneous work across properties belonging to five adjacent landowners.

Using forest management and harvesting techniques, the CSFS addressed forest restoration, wildfire risk reduction and watershed health in mixed-conifer forests. More than 350 acres were identified for forest management activities over two years, with the final 208 acres completed in 2019. Ecological goals were met by engaging the wood products industry to ensure all harvested trees became wood products. The project ultimately yielded 100 truckloads of timber, such as saw logs and firewood, and another 280 loads of wood chips for a

Removing fuels allows for more successful fire suppression actions and improved evacuation routes for area homeowners.

biomass power plant on Colorado’s West Slope.

The Heavens Project is part of the larger Upper South Platte Partnership, which since 2015 has actively managed private and non-federal lands within the watershed by leveraging the expertise, resources and reach of various stakeholders. The partnership seeks to restore forest conditions to a healthier state by reducing the density of trees to pre-settlement levels. Heavens Project partners include the CSFS, Denver Water, The Nature Conservancy, U.S. Forest Service, Inter-Canyon Fire Protection District, Colorado Forest Restoration Institute and American Forest Foundation.

By improving the watershed’s forest structure and removing excess woody fuels, the CSFS and its partners are reducing the risk of catastrophic wildfire. Removing fuels allows for more successful fire suppression actions and improved evacuation routes for area homeowners as well. It also helps create a healthier forest, meeting the USPP’s goals of protecting forest and water resources from the impacts of wildfire.



2.4 MILLION FORESTED ACRES IN THE NORTHEAST AREA

(almost the same size as the Big Island of Hawaii)



35%

of forests are on private land



1.6M

forested acres are in the wildland-urban interface (WUI)



460

active CSFS forest management plans are affecting 123,000 acres

CSFS SPECIALTIES: Community wildfire risk mitigation and planning, forest management on Upper South Platte watershed and state lands, landowner site visits and assistance, urban and community forestry



Photo: Matt Norville, CSFS

Lory State Park Forest Restoration

County: Larimer

Primary benefit: Enhanced forest health through restoration

Acres treated: 146

Nestled in the foothills west of Fort Collins, Lory State Park is a popular haven for wildlife and outdoor enthusiasts. For over a decade, the Colorado State Forest Service has worked with Colorado Parks and Wildlife to improve the health of the park's dense ponderosa pine forest.

In 2019, a CSFS contractor masticated trees on 146 acres in the park, with the long-term goals of reducing the number of trees per acre and restoring the composition of trees to historic levels. This, in turn, reduces risk of catastrophic wildfire; protects the water supply in Horsetooth Reservoir, which abuts the park; and improves wildlife habitat. Other partners included Peaks to People, the Coalition for the Poudre River Watershed and Northern Water, which received a Forest Restoration and Wildfire Risk Mitigation grant from the CSFS for this work.



Photo: Spencer Weston, CSFS

Valley Park Fuels Mitigation

County: Douglas

Primary benefit: Wildfire fuels reduction

Acres treated: 30

When Douglas-fir tussock moths ravaged the forest in the Valley Park community in 2015, the insects left the Firewise USA® site southwest of Larkspur full of dead trees. On many properties, the moths killed 80-100 percent of the Douglas-firs. Fortunately, Valley Park residents recognized the potential wildfire risk of having all those dead trees on the land.

The Colorado State Forest Service worked with residents and the Larkspur Fire Department to remove dead trees from 11 properties across 30 acres, resulting in 45 truckloads of logs, or 675 cords of firewood.

The CSFS also improved defensible space around structures and reduced wildfire fuels along Douglas County roads in the community and on an adjacent open space. A U.S. Forest Service State Fire Assistance grant helped fund the project.



Photo: Brian Dornbrock, Colorado Parks and Wildlife

Green Ranch Forest Restoration

County: Gilpin

Primary benefit: Enhanced forest health through restoration

Acres treated: 42

Aspen trees grow best where sunshine is plentiful. They do not compete well with more shade-tolerant conifer trees. On the Green Ranch section of Golden Gate Canyon State Park northeast of Black Hawk, conifers are outcompeting aspens in certain areas.

To turn that tide, the Colorado State Forest Service removed fir, pine and spruce trees within aspen stands on 42 acres of the Green Ranch section in the winter of 2019-2020. Not only will this bolster forest health and help retain aspens in the absence of a natural disturbance like wildfire, it also ties into other fuels mitigation work in the state park and improves habitat for elk, deer and other wildlife.

This project was funded through state and federal grants, including funds from Great Outdoors Colorado.



Insect and Disease Trends

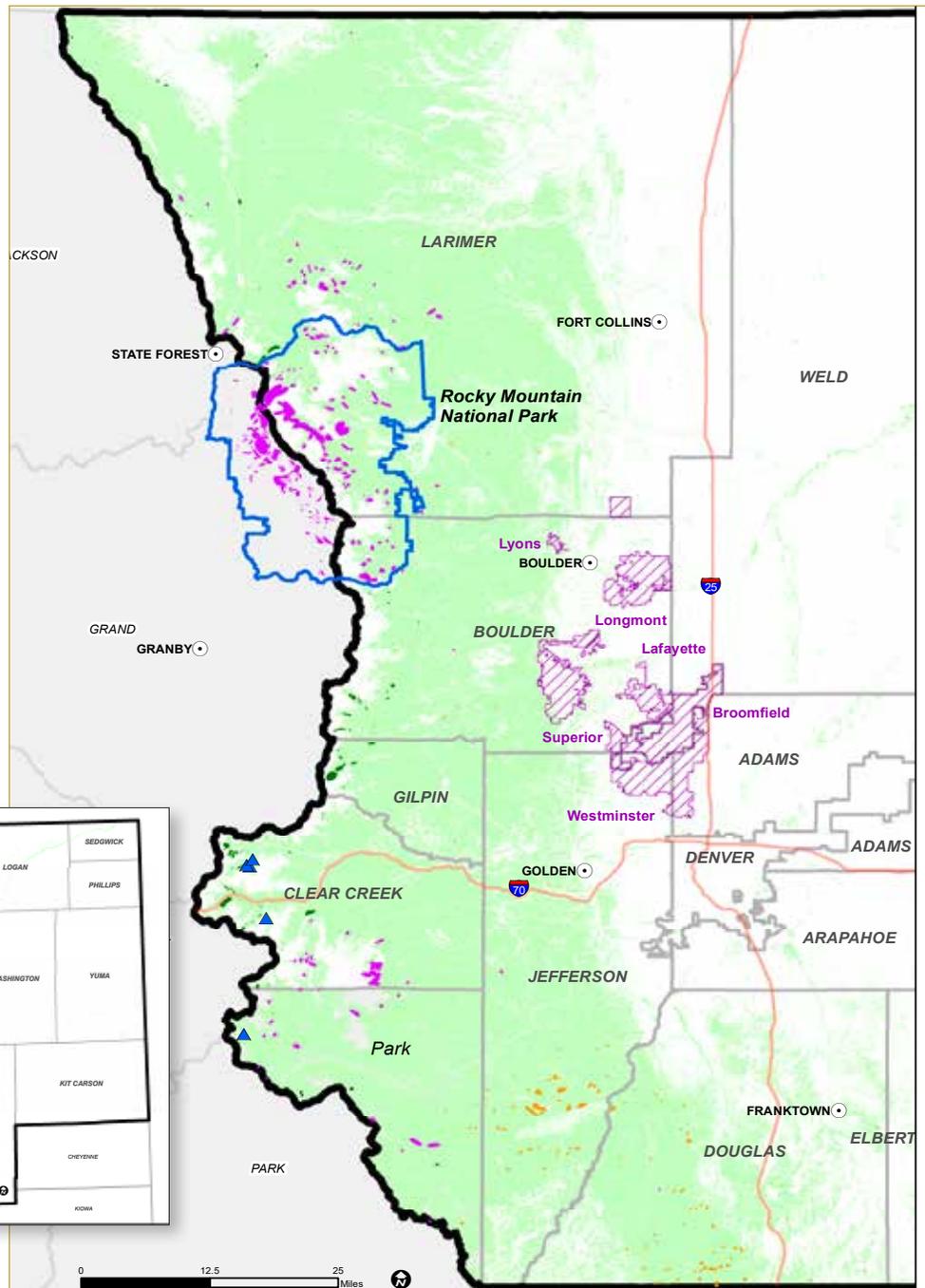
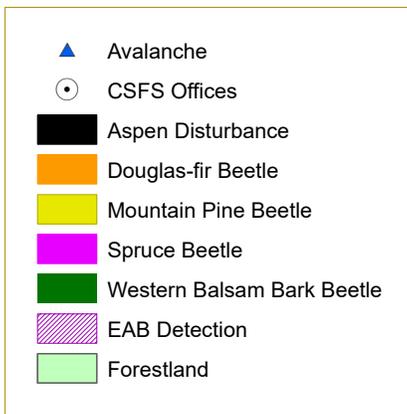
The Northeast Area continues to see effects from spruce beetle throughout Rocky Mountain National Park and surrounding communities and forests. Beetle-caused mortality has intensified in recent years in the park, causing mountainsides to be changed long into the future. Additionally, two exotic pests continue to cause declines and losses in urban forests. Emerald ash borer was detected outside of Boulder County for the first time. Although emergence was delayed for Japanese beetles in most Front Range communities, they later came on strong, all seemingly at the same time. Significant impacts continued from Fort Collins to Pueblo.

Spruce Beetle [*Dendroctonus rufipennis*]

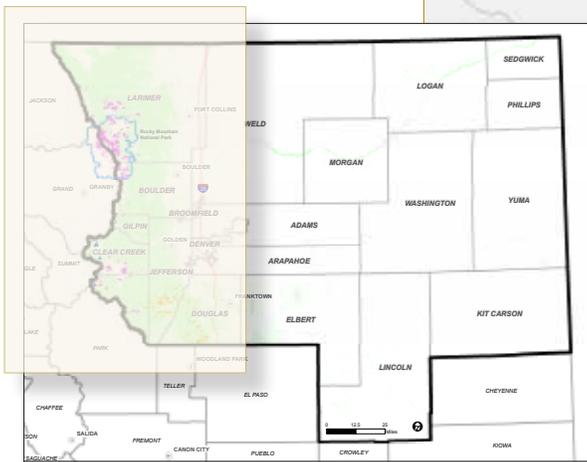
Acres affected in 2019: almost 8,000 of high-elevation Engelmann spruce forest

New spruce beetle activity slowed dramatically in the Northeast Area after nearly 20,000 acres were affected in 2018. However, aerial detections were difficult as heavy snowpack persisted later than usual, delaying tree symptoms by more than three weeks, which might explain some of the decline in acres affected. In 2019, 28 percent of trees the spruce beetle targeted in this area of the state (nearly

Northeast Colorado Insect & Disease Activity



Area enlarged to show detail



2,200 of 8,000 acres) were in previously unaffected locations. This beetle's effects are quite noticeable in spruce forests near Rocky Mountain National Park, where scores of visitors continue to see widespread, often intense levels of bark beetle-caused tree mortality. Since 1996, more than 29 percent of the Northeast Area's high-elevation Engelmann spruce-fir forest has been affected by spruce beetles.

Douglas-fir Beetle
[Dendroctonus pseudotsugae]

Acres affected in 2019: nearly 1,000

These bark beetles infested 820 new acres of Douglas-fir trees that had remained unaffected in prior years. Since 1996, the Northeast Area has seen mortality from this beetle in about 10 percent of its mixed-conifer forests. Beetle activity is still occurring in Jarre Canyon and Jackson Creek, as well as near the communities of Valley Park, Perry Park and Woodmoor Mountain.

Mountain Pine Beetle
[Dendroctonus ponderosae]

Acres affected in 2019: 5

Mountain pine beetle activity in the Northeast Area has been occurring at subdued levels since 2014. Individual and groups of pine trees along the Front Range mountains had low activity in 2019 after two decades of epidemic populations from 1996-2013. These native bark beetles infest all pine species naturally found in Colorado. Populations reproduce once every year, requiring new, live trees to complete development. Adults fly to green trees typically from late June into early August in Colorado, where they lay their eggs inside the bark. Aside from localized activity, populations remain low statewide.

**Western Balsam Bark Beetle/
 Root Disease Complex**

Acres affected in 2019: 4,000 in small groups of high-elevation subalpine fir trees

This beetle and its effects were seen on 700 acres in Boulder County and nearly 1,100 acres in Larimer County in 2019. Locations targeted by western balsam bark beetle (*Dryocoetes confusus*) may vary from year to year, though infestations are typically relatively low in intensity when there aren't drought conditions that make trees more susceptible to this pest.

Western Spruce Budworm
[Choristoneura freemani]

Western spruce budworm activity continues from previous years near Diamond Peak in northern Larimer County. The signs of caterpillars feeding have been evident in this area in recent years, and new, significant populations affected Jefferson County in 2019, around the towns of Conifer and Evergreen.

**Defoliating Insects/
 Leaf Diseases of Aspen**

Acres affected in 2019: 41

Years with wet springs followed by additional rains can result in foliar fungal issues on cottonwoods, poplars and aspens. In 2019, a mere 41 acres were affected by foliar leaf spots in the Northeast Area. Stands in Park County in the Kenosha Mountains were noticeably affected in 2019.

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Combating Urban Pests: EAB and Japanese Beetle

Quelling two notorious urban insect dwellers remains a high priority for entomologists and teams of foresters along Colorado's Front Range and beyond. The emerald ash borer kills ash trees, while the Japanese beetle singles out and defoliates trees. Both have the ability to spread rapidly.

Considered the most destructive tree insect ever introduced in North America, EAB (*Agrilus planipennis*) was first detected in Colorado in Boulder in 2013, with new detections in 2019 in Broomfield, Westminster and Larimer County. About 15 percent of all trees in Colorado's urban and community forests are ash, making EAB a major threat to these forests statewide.

A collaborative Colorado EAB Response Team consisting of the CSFS, Colorado Department of Agriculture and other municipal, state, federal and university partners coordinates surveys and pest management activities to limit the spread and reduce the borer's impact on communities.

Along with participating in the EAB team, the CSFS initiated the Your Ash is on the Line project in 2019 to increase detection



An emerald ash borer emerges from bark on an ash tree. Photo: City of Westminster

efforts and prepare small and mid-sized communities along the Front Range for EAB. More on how the CSFS is tackling EAB can be found at csfs.colostate.edu/eab.

Japanese beetle (*Popillia japonica*) is an invasive pest that affects hundreds of species of trees, grasses and plants in North America. In 2019, Boulder, Denver and Pueblo had high Japanese beetle populations, while the remainder of Front Range communities experienced varying degrees of infestation ranging from moderate to low. No new detections in 2019 occurred north of Fort Collins and Greeley, nor south of Pueblo.





Surrounded by forests, Lake Moraine stores water for Colorado Springs Utilities and its nearly 480,000 customers. In July 2019, the utility, CSFS and U.S. Forest Service announced plans to invest \$15 million over a five-year period in forest and watershed restoration projects in the Pikes Peak Watershed. Photo: Andy Schlosberg, CSFS

Partnership Protects Colorado Springs' Water Supply

The aftermath of destructive wildfires has shown us what happens to blackened forestlands when heavy rains follow. Severe fires significantly increase risks for dangerous post-fire flooding, erosion and sediment production up to 200 times greater than in forests burned at moderate to low severity. This results in property damage, degraded water quality and reduced water storage capacity. Many Front Range forests, however, including those west of Colorado Springs, have become unhealthy and overly dense, setting the stage for devastating wildfires and costly post-fire impacts.

The Pikes Peak Watershed, owned and operated by Colorado Springs Utilities, consists of 15,000 acres on four management units surrounding Pikes Peak in El Paso and Teller counties. The management units encompass reservoirs and drainages that meet critical water collection and storage needs for the City of Colorado Springs and other municipal customers.

In 1987, the Colorado State Forest Service created the first Pikes Peak Watershed Management Plan for these forested units. Since then, the CSFS has worked with the utility to implement the plan. Goals include not only protecting water quality and improving water yields, but also reducing wildfire risk to nearby communities, improving forest health and wildlife habitat, and maintaining recreation.

Since 2002, the partnership has been able to address 200-300 acres of forest management each year, with key partners including the Coalition for the Upper South Platte, U.S. Forest Service and El Paso County Parks and Recreation, as well as private landowners.

Most project work focuses on thinning dense forests conducive to devastating wildfire behavior. Through the watershed management plan, forests on more than 3,200 acres have been treated to help protect the area's water supply.

The project involves thinning Engelmann spruce stands to reduce wildfire hazard, improve wildlife habitat, better retain snow and encourage aspen regeneration.

The CSFS Woodland Park Field Office, with assistance from the agency's GIS and watershed specialists, currently is contracting work on a 284-acre project on the partnership's South Slope unit. The project, scheduled for completion in 2020, involves thinning Engelmann spruce stands to reduce wildfire hazard, improve wildlife habitat, better retain snow and encourage aspen regeneration. Additionally, in 2019, a CSFS contractor planted 3,000 aspen seedlings – which are less susceptible to fire than evergreens – in a previously treated unit.

"This partnership remains strong, continuing to achieve critical treatments in priority watersheds," said Eric Howell, forest program manager for Colorado Springs Utilities. "Collaboration and partnerships are the foundation for successful forest management now and in the future in Colorado."



3.7 MILLION FORESTED ACRES IN THE SOUTHEAST AREA

(about the same size as the entire state of Connecticut)



55%

of forests are on private land



860K

forested acres are in the wildland-urban interface (WUI)



129

active CSFS forest management plans are affecting 64,000 acres

CSFS SPECIALTIES: Landowner site visits and assistance, seedling tree sales, Forest Ag (producing forest products on private land), forest management assistance for Colorado Springs Utilities and the State Land Board



Photo: Luke Cherney, CSFS

Fishers Peak Carbon Timber Cruise

County: Las Animas

Primary benefit: Forest health assessment

Tree species identified: 11

The Colorado State Forest Service is putting its forest assessment expertise to good use on what will become Colorado's newest state park, Fishers Peak. The Nature Conservancy and Trust for Public Land recently purchased the Crazy French Ranch, where the iconic flat-topped peak rises south of Trinidad.

In 2019, TNC hired the CSFS to assess forest conditions on the ranch. Foresters spent nearly two months in this biodiversity wonderland, conducting a carbon timber cruise. They collected data on the types of trees (11 different species), their heights and diameters, and numbers. With these data, TNC can calculate about how much carbon is locked into the trees on the ranch, which is in need of protection so wildfire does not release it into the atmosphere. The CSFS also was able to assess forest management needs for the future state park.



Photo: Luke Cherney, CSFS

Waugh 2 Timber Sale

County: Fremont

Primary benefit: Salvage of beetle-kill wood

Volume sold: 1.3 million board feet of timber

On Waugh Mountain in Fremont County, the spruce beetle has hungrily attacked Engelmann spruce, uncommonly feasting on trees as small as 4 inches in diameter. The beetles' continued spread was brought on by factors such as recent drought, warm temperatures and the age of the area's older, dense stands of trees.

In 2018-2019, with help from the Bureau of Land Management, the Colorado State Forest Service worked with a contractor to harvest spruce from a State Land Board property on the flanks of Waugh Mountain, harvesting trees for forest products while the wood was still usable.

The sale not only produced 1.3 million board feet of wood – enough to build 114 good-sized homes – it helped reduce wildfire fuels on the mountain, where beetles are still active.



Photo: Derek Sokoloski, CSFS

North Lake Water Quality Protection

County: Las Animas

Primary benefit: Watershed protection

Acres treated: 60

At the North Lake State Wildlife Area in the mountains west of Trinidad, the Colorado State Forest Service has been working to protect the reservoirs that supply almost 85 percent of Las Animas County residents with fresh water. To protect this important water source, the CSFS and the Stonewall Fire Protection District have been reducing the risk of wildfire in the forests around North and Monument lakes.

In 2019, the Stonewall FPD, with guidance from the CSFS, hand-thinned trees on 20 acres and mechanically thinned trees on another 40 acres. Colorado Parks and Wildlife also joined in on the project last year, since this work will improve habitat for bighorn sheep at the state wildlife area. The Stonewall FPD received two Forest Restoration and Wildfire Risk Mitigation grants from the CSFS to do this work.

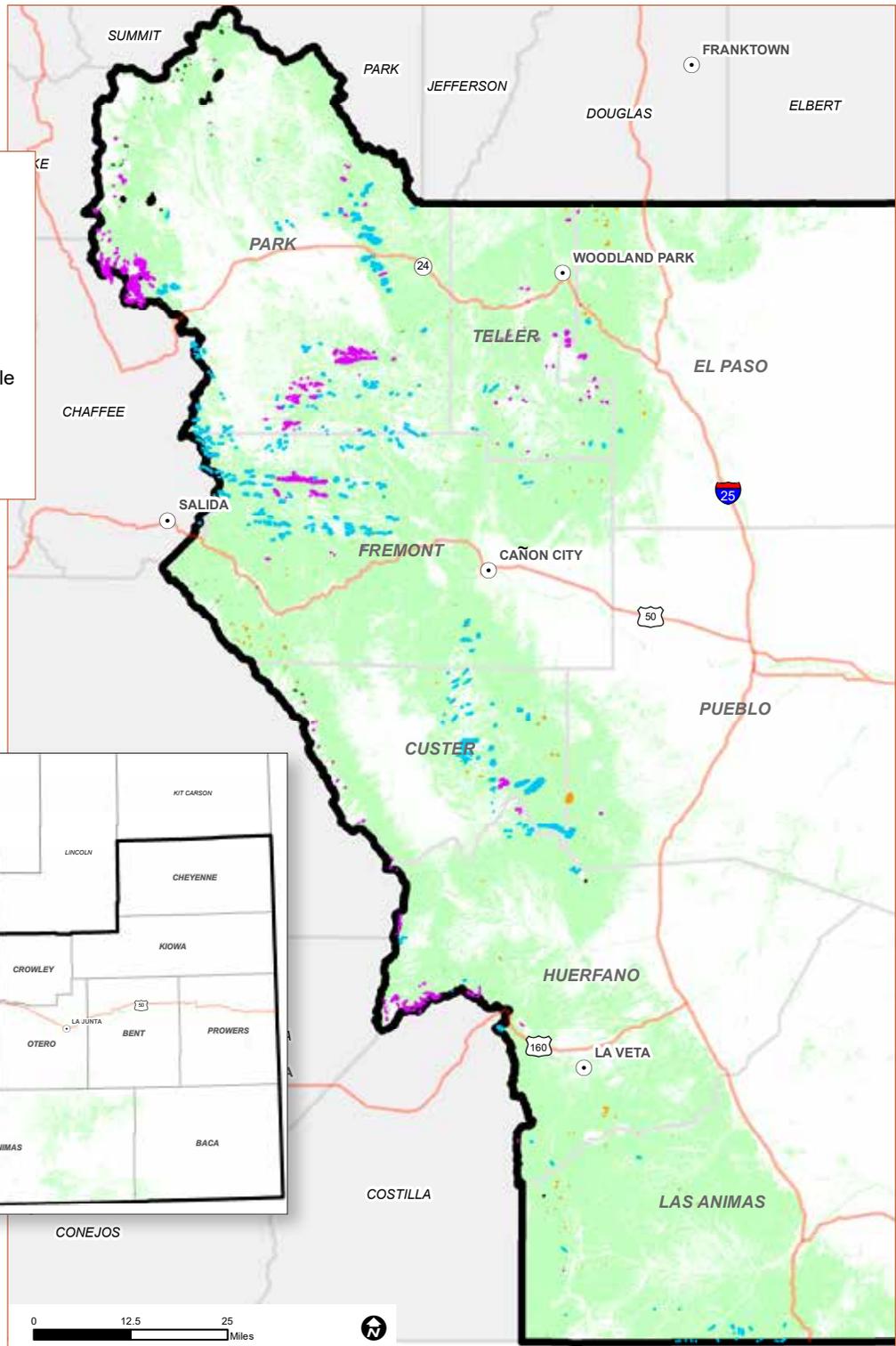


Insect and Disease Trends

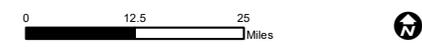
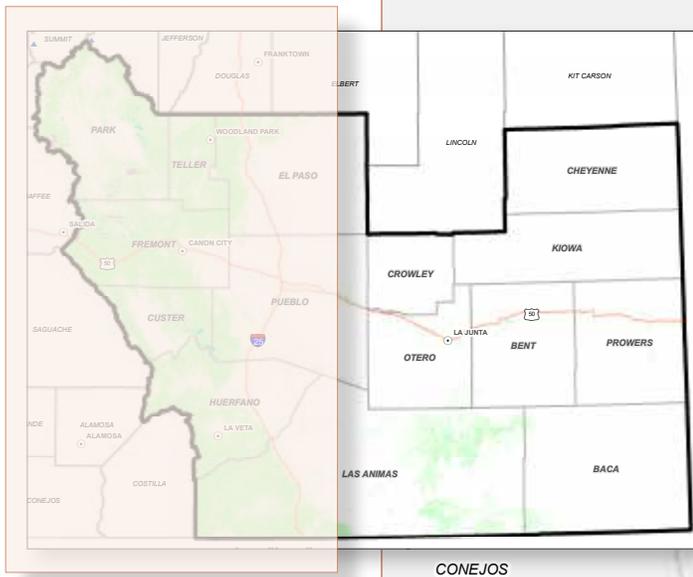
The Southeast Area continues to see spruce beetle move into previously unaffected forest, particularly in Park County along the Collegiate Peaks. Communities like St. Elmo and Alpine saw significant impacts as the beetle outbreak progresses. The Colorado State Forest Service has been highly engaged with these communities and others to reduce the effects of bark beetle activity.

Low-elevation piñon pine woodlands were heavily affected by drought conditions in 2018, which allowed bark beetles and needle scales to build populations and cause thinning of tree crowns and tree death. More precipitation in early 2019 allowed many reservoirs to fill and rivers to run well into late summer months, bringing needed moisture to build reserves for tree defenses for the upcoming year.

Southeast Colorado Insect & Disease Activity



Area enlarged to show detail





Adult scales, the small dots above, feed on a piñon pine's older needles, causing tree decline. A stand of piñons turns a telltale brown, rust color as needles die. Drought conditions in 2018 led to piñon scale spread in 2019 across southern Colorado. Photo: Dan West, CSFS

Spruce Beetle

[Dendroctonus rufipennis]

Acres affected in 2019: 16,000 of high-elevation Englemann spruce forest

At first glance, estimates seem to point to spruce beetle activity slowing in the Southeast Area after 22,800 acres were affected there in 2018. However, aerial detections were difficult last year, as heavy snowpack persisted later than usual, delaying tree symptoms by more than three weeks, which might explain some of the decline in acres affected.

In 2019, 41 percent of the acres targeted by spruce beetle (nearly 6,500 of 16,000 acres) were in locations previously unaffected by the current outbreak, indicating this pest is still moving into new areas. Active populations are currently disturbing high-elevation forests west of Antero Reservoir and Thirtynine Mile Mountain in Park County, as well as the Blanca Peak area in Huerfano County. More than 38 percent of the Southeast Area's high-elevation Engelmann spruce-fir forest has been affected by spruce beetle since 1996.

Douglas-fir Beetle

[Dendroctonus pseudotsugae]

Acres affected in 2019: over 1,100

Douglas-fir beetle primarily targeted new forested acres not impacted in prior surveys in 2019. Nearly all 1,100 acres were previously unaffected by the current outbreak. Since 1996, approximately 7 percent of the Southeast Area's mixed-conifer forests that

hold Douglas-fir have been affected by this pest. Groups of tree-kill affected the northern Sangre de Cristo Mountains in Fremont County and groups of Douglas-fir trees in the Wet Mountains. Douglas-fir beetle continues to cause group tree mortality in El Paso County as a result of weakened trees after a Douglas-fir tussock moth outbreak.

Mountain Pine Beetle

[Dendroctonus ponderosae]

Acres affected in 2019: 28

A native bark beetle, the mountain pine beetle infests all pine species naturally found in Colorado, except for piñon. Populations reproduce once every year, requiring new, live trees for this beetle to complete development. Adults fly to green trees typically from late June into early August in Colorado, where they lay their eggs inside the bark.

Aside from localized activity, populations remain at endemic – or baseline – levels across the state. Areas in the Taylor River drainage experienced increased lodgepole pine tree mortality in 2019, but overall the 28 acres affected across the Southeast Area were far fewer than the 115 acres detected in 2018. Most of the additional affected areas are high-elevation, five-needle pines within the Sangre de Cristo Range.

Western Balsam Bark Beetle/ Root Disease Complex

Acres affected in 2019: 154

Small groups of high-elevation subalpine

fir trees died on 154 acres in the Southeast Area in 2019. Locations affected by western balsam bark beetle (*Dryocoetes confusus*) may vary from year to year, though they are typically relatively low in intensity when there aren't drought conditions to make trees more susceptible to this pest.

Western Spruce Budworm

[Choristoneura freemani]

Acres affected in 2019: 20,000

In 2019, acres affected by western spruce budworm were down from 2018, when insects fed on trees across about 37,700 acres. Activity continues in the Wet and Sangre de Cristo mountains and between McKenzie Junction and Rye, on the Highway 165 corridor. Park and Teller counties also continue to be affected, as in years past.

Piñon Needle Scale

[Matsucoccus acalyptus]

Piñon needle scale is a native sap-sucking insect that feeds on piñon pine in the southwestern United States.

When this insect feeds repeatedly on needles more than 1 year old, it may cause small trees to die or larger trees to be weakened, which exposes them to attack by the piñon ips bark beetle. Trees with needle scale often have thin foliage throughout the crown, making this pest a serious threat to planted trees that provide shade or screening.

The most widespread impacts from this pest have occurred north of La Veta to Walsenburg.

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Since the Spring Creek Fire of 2018, above, the Colorado State Forest Service has been guiding residents through recovery with post-fire resource education, technical advice and \$55,000 in grants for equipment. Photo: Derek Sokoloski, CSFS

Residents in Spring Creek Fire Path Focus on Mitigation, Recovery

In 2018, the Spring Creek Fire, fueled by extreme drought and high winds, burned through the Forbes Park and Forbes-Wagon Creek Ranch communities in the Sangre de Cristo Mountains. By the time firefighters had the 108,000-acre blaze under control, it was the third largest in state history and had destroyed 147 homes. Now the communities are working toward recovery.

“No one wants to be stuck in a post-fire cleanup situation,” said Adam Moore, supervisory forester for the Colorado State Forest Service Alamosa Field Office. “But being able to use our skills before a fire to help landowners manage their land post-fire is a great benefit to affected residents.”

More homes may have been lost if many of the residents hadn’t already been working with the CSFS for more than a decade to reduce wildfire risk. While these communities continue to address wildfire risk, challenges remain. Many of the landowners live out of state, and the majority of properties do not have homes built on them, making mitigation work a low priority.

The CSFS is now guiding landowners through the long-term recovery process. This includes education about post-fire site conditions and recovery options, site visits and technical advice for landowners. The agency also awarded the communities \$55,000 through the Forest Restoration and Wildfire Risk Mitigation grant program to purchase equipment that aids with post-fire erosion control and grinding trees into mulch to help create defensible space near homes.

“The CSFS has helped provide great technical forestry services and contracting advice as Forbes works through the fire recovery efforts,” said Laurin Haber, Forbes Park manager.

The CSFS has been guiding landowners through the long-term recovery process, which includes providing education about recovery options, site visits and technical advice for landowners.

Many landowners are applying for free seedlings from the CSFS Nursery through the Restoring Colorado’s Forest Fund, which donates trees for post-disaster planting efforts. Contributions from the Girl Scouts of Colorado into the forest fund have already paid for seedlings to replant a living snow fence that burned along U.S. Highway 160. Additionally, the Colorado Water Conservation Board provided a grant to assess the fire’s burn pattern to help guide erosion control efforts in the watershed.

The CSFS also recently organized a group of landowners interested in salvage logging the burned trees on 1,200 acres. A logging company has already begun to process wood into posts and poles for fencing and will continue until at least 2021, as long as the wood remains usable.



9.6 MILLION FORESTED ACRES IN THE SOUTHWEST AREA

(about the size of a third of Ohio)



22%

of forests are on private land



772K

forested acres are in the wildland-urban interface (WUI)



106

active CSFS forest management plans are affecting 97,000 acres

CSFS SPECIALTIES: Good Neighbor Authority projects, urban and community forestry, Community Wildfire Protection Plan implementation, state lands management, local timber industry support



Photo: Jodi Rist, CSFS

Big Willow and Ridgestock Timber Sales

County: Gunnison

Primary benefit: Wildfire risk reduction

Acres to be treated: 3,500

Much-anticipated cutting has begun on the largest timber sale ever administered by the Colorado State Forest Service through the Good Neighbor Authority program. The Big Willow salvage operation on the Alpine Plateau — along with the contiguous Ridgestock timber sale — will reduce serious wildfire threat by removing about 35 million board feet of standing Engelmann spruce trees. That's about 7,000 log trucks full of timber.

This forest has been dramatically affected by spruce beetle, and the salvage allows for trees to be cut while they retain value, which also enhances the local wood market. Led by the CSFS Montrose and Gunnison field offices, in cooperation with the U.S. Forest Service Gunnison Ranger District, the salvage is on federal land 4 miles south of the Arrowhead and Blue Mesa subdivisions — home to over 300 residences in a wildland-urban interface. The project is scheduled to be completed within five years.



Photo: Sam Scavo, CSFS

Rio Grande Timber Salvage

Counties: Rio Grande, Mineral, Saguache

Primary benefit: Targeted, efficient timber sales

Volume sold: 900,000 board feet, about 180 log trucks of timber

A unique approach to timber sales in the Rio Grande National Forest is helping state and federal agencies manage an abundance of dead trees. Matching available forest products with small personal and commercial users, this cooperative effort between the Colorado State Forest Service and U.S. Forest Service helps combat massive spruce beetle outbreaks that have affected nearly 90 percent of spruce-fir trees in the national forest since 2003.

The program is a model for a new approach to targeting landowners and small timber operations in need of wood. It mimics an old USFS "Green Sheet" program and helps small timber purchases under \$10,000 get completed quickly and efficiently. Since summer 2017, there have been 14 small-sales permits issued.

The CSFS hopes to replicate these successes in other parts of the state, making timber more accessible to smaller mill operations.



Photo: CSFS

Blue Mesa Forest Health

County: Gunnison

Primary benefit: Merging forest management projects for greater impact

Acres treated: over 212

Since 2016, the Colorado State Forest Service has pieced together a patchwork of forest health projects in southern Gunnison County — with a larger plan in mind. By focusing funding and efforts, the CSFS has merged 14 projects with landowners into forest management spanning more than 212 acres across the plateaus south of Blue Mesa Reservoir.

Working alongside private landowners, local and tribal governments, and nonprofit agencies, the CSFS has increased forest resiliency against Douglas-fir beetles and improved habitat for big and small game, such as elk, deer and dusky grouse. Foresters have also worked with the Blue Mesa Subdivision, a Firewise USA® site, to reduce risk of wildfire. Federal, state and local funding, including Western Bark Beetle and Forest Restoration and Wildfire Risk Mitigation grants, has assisted with many projects. As the patchwork grows, so will positive impacts to forests, watersheds and wildlife.



Insect and Disease Trends

On the heels of an intense wildfire season in 2018, the Southwest Area has cause for concern from potential bark beetle-caused mortality within burn scars. Spruce beetle continues to intensify in the San Juan Mountains, north through the West Elk Mountains and White River National Forest, and through the northern Sangre de Cristo Mountains. The pine forests of Dolores County continue to suffer from three different bark beetles causing

tree death. Scant precipitation in 2018 and late spring frosts in prior years caused piñon and juniper woodlands to become susceptible to pests, resulting in groups of tree mortality in this ecosystem.

The snowpack in 2019 helped the Southwest Area rebound from the prior drought, though weak monsoonal wind patterns late in the summer left much of this area abnormally dry going into the 2019-2020 winter season.

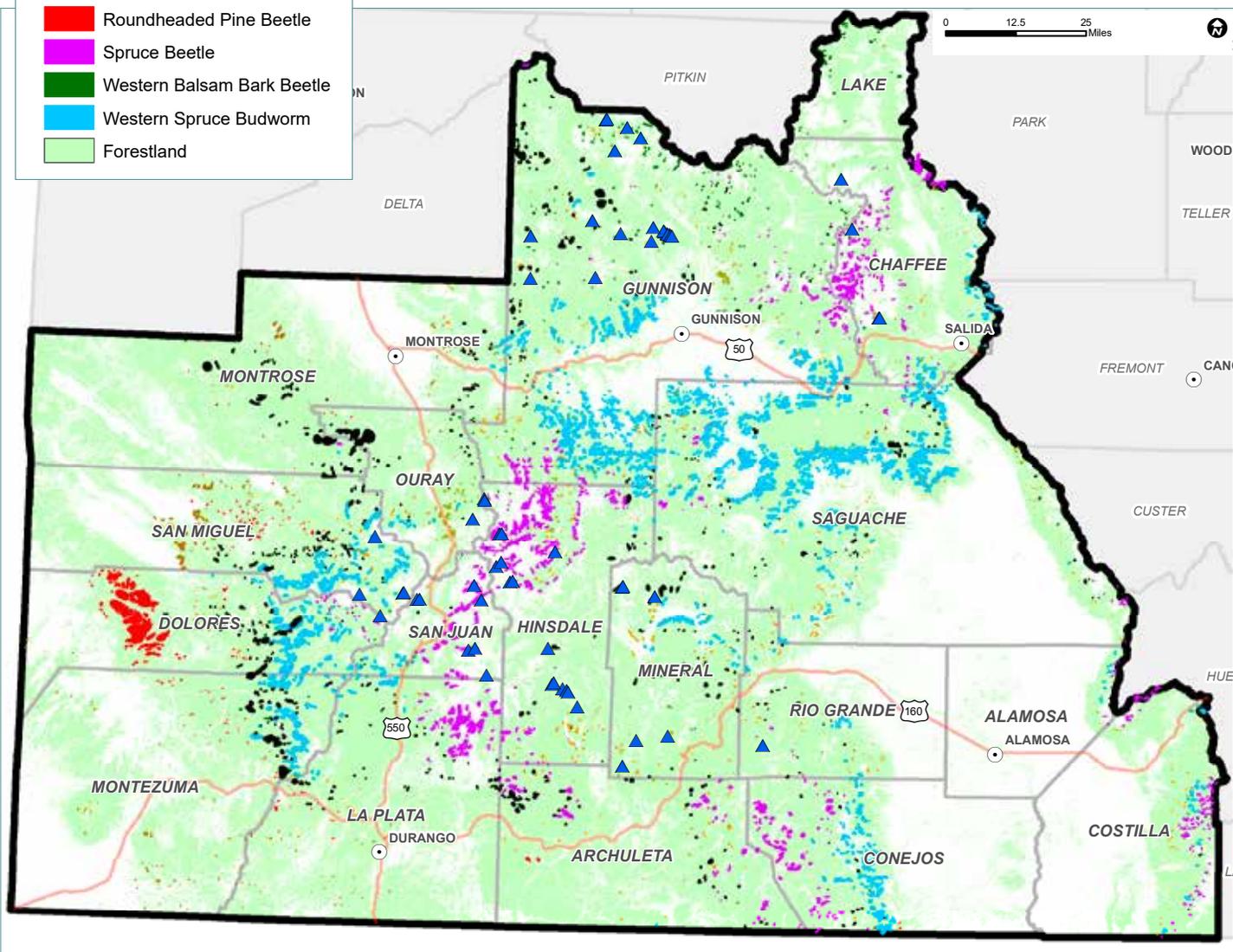
Southwest Colorado Insect & Disease Activity

- Avalanche
- CSFS Offices
- Aspen Disturbance
- Douglas-fir Beetle
- Fir Engraver Beetle
- Mountain Pine Beetle
- Piñon Ips
- Roundheaded Pine Beetle
- Spruce Beetle
- Western Balsam Bark Beetle
- Western Spruce Budworm
- Forestland



Snow Slides Pave Way for Potential Bark Beetle Outbreaks in Future

The winter of 2018-2019 brought a robust snowpack to the San Juan Mountains, the West Elk Mountains and the Sawatch Range. Just over 1,300 acres of high-elevation forests were affected by snow slides in 2019, with most in Gunnison, Hinsdale, Mineral and San Juan counties. Some of these slides extended existing avalanche chutes, where heavy tree accumulations are now cause for concern about beetle-caused mortality in coming years.



Spruce Beetle

[Dendroctonus rufipennis]

Acres affected in 2019: 55,900 of high-elevation Engelmann spruce-fir forests

Though the affected acreage of this epidemic is still incredibly high, spruce beetles spread less in the Southwest Area in 2019, compared to nearly 115,300 acres affected in 2018. However, aerial detections were difficult as heavy snowpack persisted later than usual, delaying tree symptoms by more than three weeks, which might explain some of the decline in acres affected.

Last year, 25 percent of the acres affected (nearly 14,000 of 55,900 acres) were in previously unaffected areas. The high-elevation Engelmann spruce-fir forests in the Sneffels Range southwest of Ridgway were hit particularly hard in 2019; the outbreak traces back to high winds in 2017 that blew down trees and led to active and building spruce beetle populations. These beetles also continue to affect the San Juan Mountains, particularly in the Weminuche Wilderness in La Plata and San Juan counties, as well as areas south of Wolf Creek Pass in Archuleta County. Since 1996, spruce beetle has affected close to 53 percent of spruce-fir forests in the Southwest Area.

During heavy infestations of spruce beetle, nearby and adjacent lodgepole pines are occasionally attacked. As a result of epidemic populations of spruce beetle in 2019, an additional 539 acres of lodgepole pine trees were affected. While these trees may not allow spruce beetle to complete reproduction cycles, the attack can result in low intensity tree mortality. The majority of lodgepole pine mortality from spruce beetle attacks has occurred in Gunnison and Saguache counties.

Roundheaded Pine Beetle

[Dendroctonus adjunctus]

Acres affected in 2019: nearly 22,000 in Dolores County; includes acres affected by associated native bark beetles

The roundheaded pine beetle is a bark beetle native to Colorado, closely related to mountain pine beetle, spruce beetle and Douglas-fir beetle. It is often associated with several other species of bark beetles — typically western pine beetle, pine engraver beetles and mountain pine beetle. Working in conjunction, these insects produce a “bark beetle complex” that results in tree injury and death. The acreage affected by this complex in 2019 is slightly lower than the 26,900 acres

detected in 2018; however, the intensity of the outbreak remains low.

In Colorado, these beetles attack trees later in the year than other Colorado bark beetles, from late August through November, and they target a wide range of tree sizes and ages. The range of this bark beetle extends into southern Colorado from as far south as Guatemala; southern Colorado is the northernmost extent of its range. Ponderosa pine is the only primary host tree species in the U.S., though other pine species are attacked throughout Mexico and into Central America. Outbreaks south of Colorado’s border are typically short in duration, though mortality has increased in contiguous ponderosa pine forests in Dolores County for the past seven years. Approximately 16 percent of the ponderosa pine forest in the county was affected in 2019.

Douglas-fir Beetle

[Dendroctonus pseudotsugae]

Acres affected in 2019: over 3,400 of Douglas-fir forests

Large populations of Douglas-fir beetle persist in Archuleta, Gunnison, Hinsdale, Mineral and Saguache counties. Douglas-fir beetle hit nearly 2,500 acres of forest across the Southwest Area that were previously unaffected. Since 1996, 30 percent of the area’s mixed-conifer forests containing Douglas-fir have been affected.

Piñon Ips (*Ips confusus*)

Acres affected in 2019: nearly 2,800 of piñon pine

Record-warm temperatures and record-low

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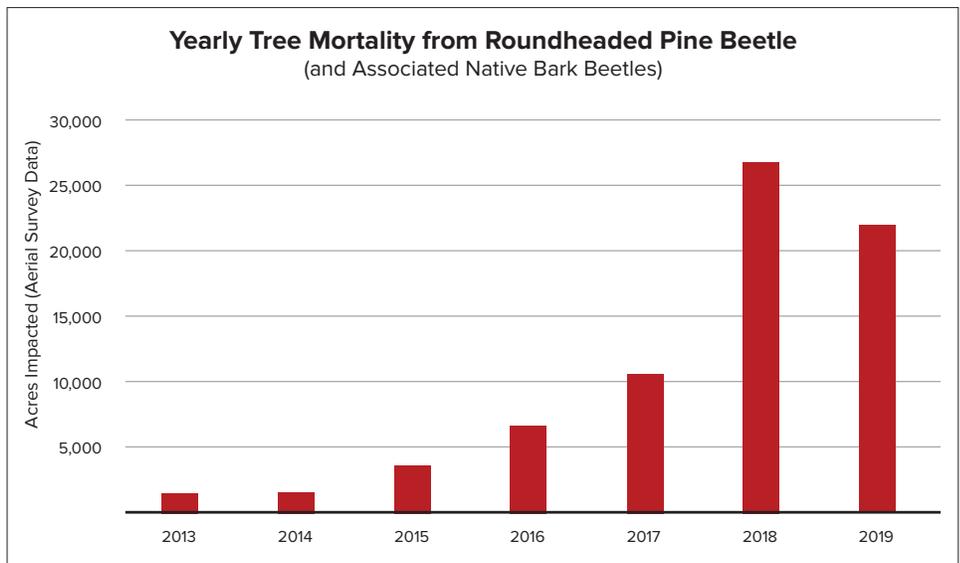
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precipitation in 2018 along the West Slope and in the southwest corner of Colorado produced continued dieback and die-off of piñon pines in 2019. Isolated or localized tree mortality was observed around Mesa Verde and Canyons of the Ancients national monuments. Additionally, localized activity was detected in Montrose County.

Piñon pines typically grow in harsh,





low-elevation sites below the mixed-conifer/ponderosa pine forests of Colorado. During prolonged periods of below-average precipitation, populations of the piñon Ips bark beetle can build in already-stressed piñon trees.

Mountain Pine Beetle
[Dendroctonus ponderosae]

Acres affected in 2019: 687

The native mountain pine beetle infests all pine species naturally found in Colorado. Its populations increased slightly in 2019 in the Southwest Area from previous years. In 2018, only 184 acres were detected.

Areas in the Taylor River drainage experienced increased lodgepole pine tree mortality. Infestations in ponderosa, limber and bristlecone pines continued at low levels in the northern and central Sangre de Cristo Mountains.

Western Balsam Bark Beetle/Root Disease Complex

Acres affected in 2019: 2,000 in small groups of high-elevation subalpine fir trees

The acreage affected by western balsam bark beetle (*Dryocoetes confusus*) may vary from year to year, but it is typically relatively low in intensity without localized drought conditions.

Fir Engraver Beetle
[Scolytus ventralis]

Acres affected in 2019: 860

The fir engraver beetle has taken advantage of the Southwest Area's drought conditions in 2018 to continue to cause tree mortality near Ouray. Approximately 85 percent of the white firs in the Uncompahgre River Gorge near Ouray have been killed in recent years. Despite this localized setback, tree mortality

from these beetles continued to decrease statewide, occurring in southern and central Colorado where white fir grows in mixed-species forests, often alongside Douglas-fir.

The fir engraver is a native bark beetle that primarily impacts white fir, and occasionally subalpine fir, Douglas-fir and Engelmann spruce. Outbreaks often are associated with below-normal precipitation or defoliation. The peak of adults dispersing to seek new trees in which to lay eggs under the bark usually takes place in July and August.

Western Spruce Budworm
[Choristoneura freemani]

Acres affected in 2019: 126,900

Affected acreage from the western spruce budworm is slightly up since 2018, when about 89,200 acres were detected.

Among the most affected locations are: the Uncompahgre Plateau; the Sneffels Range; the San Juan Mountains in Dolores and Montezuma counties; the South San Juan Wilderness in the Rio Grande National Forest, from the Sawatch Range in southern Chaffee County south to Poncha Pass; and throughout the Sangre de Cristo Range.

Some regions within the southwest part of the state have experienced numerous years of defoliation, causing top dieback, upper branch dieback and even mortality.

Defoliating Insects/Leaf Diseases of Aspen

Acres affected in 2019: 51,600

The Southwest Area witnessed a dramatic increase of foliar leaf spots in 2019, but that was on the heels of well-below-average precipitation in 2018 that resulted in a mere 9,900 affected acres. Years with wet springs

followed by additional rains, which occurred in 2019, can result in foliar fungal issues on cottonwoods, poplars and aspens. Last year, aspens in Dolores and Montezuma counties were heavily affected.

Juniper Dieback/Die-Off

Acres affected in 2019: nearly 1,800

Extreme early-season temperature fluctuations, coupled with numerous years of below-average precipitation, have resulted in juniper dieback and die-off in the Four Corners region. Mortality is spread across Dolores, La Plata, Montezuma, Montrose and San Miguel counties.

The piñon pine-juniper forest cover type occupies approximately 5.1 million acres of Colorado's 24.4 million forested acres.

The below-average precipitation in southern Colorado predisposed Rocky Mountain juniper, one-seed juniper and Utah juniper to branch die-off and dieback. Cedar bark beetles (*Phloeosinus* spp.), juniper borers (*Atimia* spp.), the black-horned juniper borer (*Callidium texanum*) and the juniper twig pruner (*Styloxus bicolor*) are typically associated with dead and declining juniper trees.

Piñon Needle Scale
[Matsucoccus acalyptus]

The piñon needle scale is a native sap-sucking insect that feeds on piñon pines in the Southwest Area.

Locations from Buena Vista south to Salida experienced heavy infestations in 2019. Affected trees often have thin foliage throughout the crown, making this pest a serious problem for trees that provide shade or screening.

A Note About Aerial Survey Data

Due to the nature of aerial surveys, the data on insect and disease maps in this report provide rough estimates of location, intensity and the trend information for agents detectable from the air. Some destructive diseases are not represented on the maps because they are not detectable from aerial surveys. The data on these maps should only be used as an indicator of insect and disease activity and should be validated on the ground for actual location and causal agent. Color areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable, and not all trees in these areas are dead or defoliated.

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Strategies for the Future

New Forest Action Plan Available in June

Forest conditions are continually changing through fire, insects and other factors, so the Colorado State Forest Service must always be thinking ahead, taking a proactive approach to achieve its vision of healthy and resilient forests. To ensure the agency is making an impact where it counts most for the future of our forests, the CSFS is updating Colorado's Forest Action Plan.

Using the latest science and data, the 10-year plan will offer important insights and guidance in promoting forward-thinking forest management. In developing the plan, the CSFS has analyzed forest conditions and identified areas of most concern across Colorado – watersheds most susceptible to large-scale, catastrophic wildfires, outbreaks of tree-killing insects and disease, potentially costly damage to water supplies and increased development in the wildland-urban interface. The plan will help the CSFS protect these and other critical resources at risk in Colorado.

“This upcoming Forest Action Plan will ensure we’re focusing our limited resources to make the biggest impact we can in the areas of greatest need,” said Mike Lester, state forester and CSFS director.

The plan will guide the work of the CSFS over the next decade and provide a useful tool for landowners, communities and partners to plan and complete wildfire mitigation and other forest health-related projects on local and regional scales. Along with the document, an online mapping application will allow users to access and use the latest data in their planning efforts.

Each area of the state has a unique, important role to play in ensuring the health of our forests in the future. With that in mind, to

Coming in June 2020

The Statewide Forest Action Plan, a federal requirement of state forestry agencies, will be available in June 2020.

Once completed, access the plan and the interactive priority watershed map at csfs.colostate.edu, or contact your local CSFS field office for a copy.



The Colorado State Forest Service gathered feedback for the upcoming Forest Action Plan from partners across the state using a “participatory mapping” approach. Photo: Carolyn Aspelin, CSFS

“This upcoming Forest Action Plan will ensure we’re focusing our limited resources to make the biggest impact we can in the areas of greatest need.”

— Michael B. Lester, State Forester and CSFS Director

develop the plan, the CSFS identified key themes across public and private land ownership in Colorado:

- Watersheds
- Forest conditions
- Wildfire
- Urban and community forestry
- Forest products
- Wildlife
- Forest Legacy (conservation of undeveloped forests)

Then, CSFS staff met with nearly 100 representatives from partner organizations across the state to gather local feedback, knowledge and concerns. The CSFS is now working to develop management strategies and refine mapping of priority watersheds based upon this feedback. During this process, the CSFS also is incorporating management design considerations to address climate change. Once complete, the Statewide Forest Action Plan will identify current issues, priorities and goals and offer strategies to ensure healthy trees and forests into the future.

With this plan, the CSFS and other forest stewardship partners will have further guidance and tools to make a positive impact on the health of Colorado's forests, so they will thrive for generations to come.



Photo: CSFS

MITIGATION WORKS



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OUR MISSION

*To achieve stewardship of Colorado's diverse forest environments
for the benefit of present and future generations*