2021 REPORT ON THE

HEALTH OF COLORADO'S FORESTS

Managing Colorado's Forests During Drought

Colorado State Forest Service forester Meg Halford leads a tour of the Plum Creek area at Chatfield Reservoir. CSFS foresters are completing a five-year monitoring plan at Chatfield State Park to ensure forests remain healthy during the reservoir's expansion. Photo: Amy Bulger, CSFS

Colorado State Forest Service

Together, We Will Meet the Moment for Colorado's Forests

Matt McCombs

This is a unique moment for Colorado's forests. This report highlights how years of persistent drought, an indicator of a warming climate, have stressed our state's forests, creating ideal conditions for insect and disease outbreaks and large-scale wildfires. These conditions, combined with a growing population in areas where wildlands intermingle with neighborhoods, warrant bold action to protect our forests and the communities that depend on them.

In response, Governor Polis and the Colorado Legislature are making critical investments in our forests. During the 2021 legislative session, they secured a sustainable funding source for the Healthy Forests and Vibrant Communities Fund and the Forest Restoration and Wildfire Risk Mitigation grant program, and channeled millions of dollars in state stimulus funds into fuels reduction and forest health projects.

The Colorado State Forest Service will lead in every corner of the state to ensure these investments reach Colorado's communities, preparing residents for wildfire and protecting watersheds and our forest-based recreation economy. As Colorado's new state forester, I will deploy the expertise, ingenuity and passion of CSFS staff and our vast network of partners to meet this critical moment for our state. Colorado is a national leader in innovation and collaboration supporting forest management, and as Colorado's premier forestry organization, the CSFS will continue operating at the center – bringing everyone together to move forward in the shared stewardship of our forests.

Working together, we will ensure the many benefits our forests provide to Coloradans endure now and deep into the future. I am honored to take the helm at the CSFS and look forward to working with you to improve the health and resiliency of Colorado's vast forest resources.

Matthew M. McCombs, State Forester and Director,
Colorado State Forest Service

Colorado Department of Natural Resources

State Stimulus Funds Kick-Start Shared Stewardship Efforts

Dan Gibbs

Colorado has long been a leader in efforts to promote forest health, reduce wildfire risk and protect watersheds. However, past efforts have lacked the coordination, landscape-scale focus and robust state investment required to properly address the scale of forest health impacts from insects, disease and catastrophic wildfires. The Colorado State Forest Service estimates in its *2020 Colorado Forest Action Plan* that over $4.2 billion is needed to restore 2.4 million acres of Colorado's forests, with over $760 million alone needed for fuels reduction work in high-risk areas of the wildland-urban interface.

During the 2021 Colorado legislative session, Governor Polis and legislative leaders announced a large-scale Colorado Recovery Plan to utilize state stimulus dollars to protect communities and create jobs, especially in rural Colorado. In total, $88 million was allocated for wildfire and post-fire watershed recovery efforts on our lands and waters.

Wildfires, insects and disease don't know the difference between a state park, national forest or private land. Future forest health projects have to be better integrated and in close collaboration among federal, state and local government and private landowners. State stimulus funding is kick-starting our shared stewardship efforts, and we are committed to working with the CSFS and other partners to ensure forest management projects are done in the right places, at the right scale, and using all our available tools for active management.

I am proud of the state agency staff, federal partners, non-profits, local governments and private landowners working to protect forest health in Colorado. This annual forest health report emphasizes the importance of working together to strengthen our collective ambition on forest restoration.

Dan Gibbs, Executive Director,
Colorado Department of Natural Resources

2021 KEY FOREST TAKEAWAYS

CSFS

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Drought threatens more than just water supplies, outdoor recreation, and farming and ranching. Dry conditions in Colorado are placing our forests in greater jeopardy as a catalyst for insect outbreaks and wildfires.

Spruce beetle remains the most deadly forest pest in Colorado. Explore the impact weather had on forest pests and which insects and diseases were notable in 2021.

CSFS

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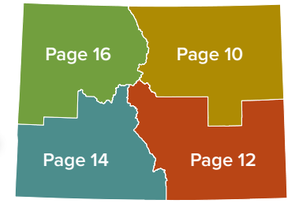

Across Colorado, the Colorado State Forest Service is working with residents, communities and partners to improve forest health and reduce wildfire risk on a local level. CSFS projects tackle the leading forest health issues in every corner of the state.

Glenwood Springs Fire Department, via CDOT

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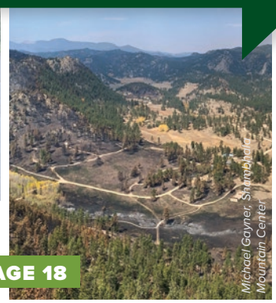
Colorado is grappling with post-fire mudslides, flooding and charred mountainsides after historic wildfires in 2020 and the most destructive wildfire in state history in terms of insured losses in 2021. Leaders must heed the wake-up call from these fires by reducing wildfire fuels and preparing communities for fire.



Michael Gayner, Shambhala Mountain Center

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State leaders are making critical investments in the health of Colorado's forests with funding that helps communities lower their wildfire risk. Work completed with one particular state grant helped firefighters save the Shambhala Mountain Center during the Cameron Peak Fire.

Drought Creates Downward Spiral for Colorado's Forested Watersheds

There is a critical connection between the quality of water and the health of the forested watershed from which it flows. Most of Colorado's water sources start in the state's forests, so Colorado residents rely on healthy forests to provide clean water for drinking and agricultural uses. But persistent drought conditions are stressing Colorado's forests.

Trees need adequate precipitation to remain healthy, so they can perform their ecosystem service as a natural water filter. A forest with healthy trees captures and cleans pollutants before they enter water collection systems and natural waterways, helping ensure clean water flows out of taps. A healthy forest also reduces the chances a wildfire scorches the soil and creates conditions for post-fire mudslides.

The Colorado State Forest Service, partners and residents are working together to stave off the downward spiral that drought poses for forests and water supplies. Explore the *2020 Colorado Forest Action Plan* for goals, strategies and approaches for managing Colorado's forested watersheds at csfs.colostate.edu/forest-action-plan.

Stressed by drought, these Engelmann spruce trees in the Rio Grande National Forest succumbed to the spruce beetle. Drought weakens the defenses in trees and predisposes them to attack by bark beetles. If drought conditions persist, bark beetles can build up populations that reach epidemic levels and damage vast swaths of forest. Photo: Adam Moore, CSFS

Drought: Setting the Stage for More Dead Trees

Ongoing drought conditions in Colorado continue to affect the state's forests, leaving trees susceptible to insect outbreaks and increasing the risk of wildfires.

Forests in many parts of Colorado are stressed and weakened. Following a wet summer in 2019, areas of the state have since been in the grips of persistent drought conditions, particularly southwestern Colorado, according to the U.S. Drought Monitor. Dry conditions are having profound impacts on water supplies, outdoor recreation, agriculture and the health of forests in Colorado and across the West. Drought can kill trees, as water is necessary for their survival. But drought has a far greater impact on forests because it's also a catalyst for insect outbreaks and wildfire – two of the leading causes of forest disturbance and subsequent tree mortality in Colorado.

Trees need adequate water to remain healthy and thrive. During drought conditions, trees become stressed and their defenses wane, leaving them more susceptible to insect attacks. During periods of prolonged drought, when host trees are predisposed to attack, bark beetles can build up populations and reach epidemic levels, spreading quickly as they attack and kill vast acreages of trees. The drought conditions around the turn of the century were a catalyst for the outbreak of mountain pine beetle from the late 1990s to 2013, which affected about 80 percent of all pine forests in Colorado. The drought conditions also incited the outbreak of spruce beetle, which has affected about 40 percent of high-elevation Engelmann spruce forests in the state.

The insects and disease overview on page 6 and the sections of this report dedicated to specific areas of the state offer more examples of tree-killing insects that currently are thriving during periods of prolonged drought in parts of Colorado. Small outbreaks of insects normally ebb and flow with changes in precipitation levels, and trees can recover from these attacks after several consecutive years of adequate precipitation. The impact of large, drought-induced insect outbreaks on Colorado's forests, however, persist for years afterward. In their wake, forests left thick with dead trees are unsightly, pose a danger to recreationists and alter the arrangement of wildfire fuels, which can impact fire's behavior, its ecological effects and suppression options available to fire managers.

Drought also increases the risk of wildfire, another leading cause of tree mortality in Colorado and a continual threat to communities and municipal water supplies. A lack of rain and snow can leave fuels dry and ready to burn. Combine drought with warm temperatures, high winds, challenging terrain and forests dense with dry fuel, and the risk of fire increases. In the fall of 2020, Colorado experienced its two largest fires in state history, Cameron Peak and East Troublesome, during a period of extreme drought in Grand and Larimer counties, according to the U.S. Drought Monitor. At the end of 2021, the Marshall Fire started west of Superior on an exceptionally windy and warm day during a historic stretch of low precipitation in the Denver area.

In recent decades, drought has been an almost constant in Colorado's forests. The Colorado State Forest Service and its partners are managing the state's forests, in part, to account for the cascading effects of drought, since it spurs the largest disturbances in the state's forests. Data from the Forest Inventory & Analysis program in Colorado, a joint effort of the CSFS and U.S. Forest Service, indicate the leading disturbances for Colorado's forests from 2010-2019 as insects (62.5%), disease (26.5%) and fire (6.7%). Annual aerial surveys to detect disturbance from insects and disease from the air, which is another joint CSFS-USFS program, paint a similar picture of large acreages of forests impacted by pests.

Given the persistent drought conditions in Colorado, forest managers must increase the pace and scale of forest health treatments. Drought threatens more than just water supplies, outdoor recreation, and farming and ranching. It places the health of Colorado's forests and the many benefits they provide – from clean air and water to carbon sequestration to wildlife habitat – in greater jeopardy.

The CSFS will continue to tackle the challenges exacerbated by drought through science-based forest management that addresses the impacts a changing climate is having on forests in Colorado.

A tree uses precipitation to produce resin. When beetles try to bore into the bark, a tree releases resin to pitch out the bugs – in this case, roundheaded pine beetles. As adequate precipitation wanes during a drought, a tree's available resin diminishes and its ability to defend itself decreases. Photo: Dan West, CSFS

Dry, Warm Weather Stressed Trees in 2021

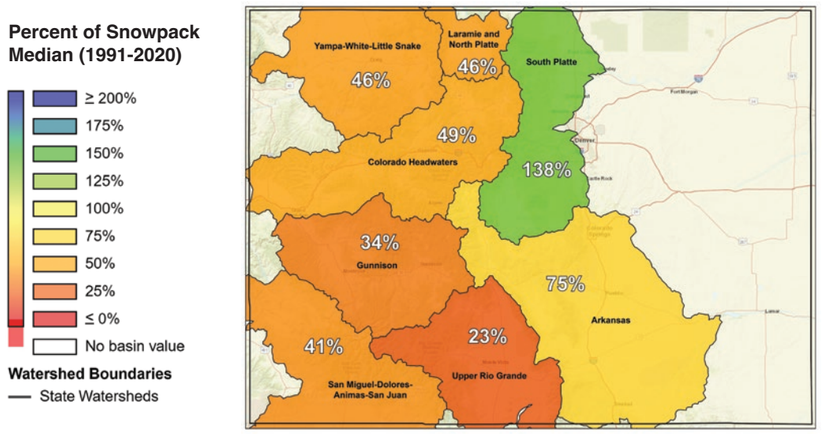
Weather plays a crucial role in insect and disease activity in Colorado's forests. As temperatures and precipitation levels change, so do the defenses within trees. During periods of drought, trees are unable to produce enough resin to ward off insects trying to enter through the bark. Drought-stressed trees become more susceptible to attack by bark beetles and to other forest health issues.

Trees across much of Colorado remained weakened by ongoing drought in 2021. May was the 11th wettest month on records for Colorado dating back to 1895, according to the National Oceanic and Atmospheric Administration. However, that precipitation primarily fell in the eastern half of the state and drought conditions returned to the Front Range and plains toward the latter part of the year. The western half of Colorado was much drier than normal all year long and long-term drought conditions remained there. In forests across the state, trees are stressed and need several years of adequate precipitation to recover their defenses following drought conditions.

Temperature patterns also have serious implications for tree health and insect and disease activity. Temperatures in Colorado were above average from June through December last year, according to NOAA. Only the month of February ranked as cooler than average in 2021, while the state experienced its third-warmest September on record last year.

These warmer temperatures, paired with average to below-average precipitation in Colorado in 2021, resulted in trees around the state further declining in health and becoming more susceptible to widespread mortality from forest pests.

Percent of Normal Snowpack in Colorado Watersheds on June 1, 2021



Drought conditions in 2021 resulted in a low snowpack in spring and less snowmelt than normal in forests across much of Colorado. A wet May in 2021 boosted the snowpack in the mountains of eastern Colorado, but little precipitation fell in the western mountains of the state that month. By mid-June, the snowpack was nearly gone in mountains statewide. This lack of snowmelt stressed trees and meant less moisture was available for them to build defenses against invading insects. Data: Snow water equivalent percent NRCS 1991-2020 median in Colorado watersheds. Map: National Water and Climate Center, Natural Resources Conservation Service

A NOTE ABOUT AERIAL SURVEY DATA

Annual monitoring for the damage caused by forest insects is a necessary component of forest management. The primary source of information on forest pest conditions in Colorado is the annual aerial detection survey. This cooperative program is conducted by specialists from the U.S. Forest Service Rocky Mountain Region and the Colorado State Forest Service. Trained observers representing both agencies fly over the state's forests in small aircraft to map and classify the current year's damage intensity. Some areas flown during the aerial survey also are ground-checked to verify the insect or disease responsible for the damage and its severity.

FOREST HEALTH: INSECTS AND DISEASE

Spruce Beetle Remains Most Deadly Forest Pest

INTERACTIVE MAPS AND DATA
on these and other forest insects and diseases: bit.ly/ForestHealthReport

To detect and monitor insect and disease activity, trained aerial observers with the U.S. Forest Service Rocky Mountain Region and Colorado State Forest Service take to the skies, collecting data that give an annual snapshot of forest health conditions in Colorado. The following pests had a notable impact on forests around Colorado in 2021, as indicated by last year's aerial detection survey data. The sections of this report on specific areas of the state offer localized insights on insect and disease activity.

SPRUCE BEETLE *(Dendroctonus rufipennis)*
Acres affected statewide in 2021: 53,400
Spruce beetle remains the most deadly forest pest in Colorado. This native bark beetle continues to infest high-elevation Engelmann spruce throughout several areas of Colorado. Forests within Chaffee and Park counties continue to experience new infestations, indicating the spruce beetle outbreak has not fully depleted susceptible trees and is still on the move. Intensities of spruce beetle infestations in Grand and Gunnison counties have progressively declined as fewer large-diameter Engelmann spruce remain in the forest. Since 2000, this forest pest has affected at least 1.89 million total acres, or about 40 percent of the spruce-fir forests in the state.

DOUGLAS-FIR BEETLE *(Dendroctonus pseudotsugae)*
Acres affected statewide in 2021: 8,000
Significant tree mortality from the Douglas-fir beetle persists in the state's central and southern mixed-conifer forests containing Douglas-fir trees. Douglas, Gunnison, Jefferson, Eagle, Pitkin and Custer counties continue to see severely affected Douglas-fir stands. Many of the largest trees in affected areas have been depleted over the past decade.

WESTERN SPRUCE BUDWORM *(Choristoneura freemani)*
Acres affected statewide in 2021: 91,500
Western spruce budworm is the most widespread forest pest in Colorado. This insect is a small moth at full maturity. During its caterpillar stage, it partially consumes the needles of Douglas-fir, true fir and spruce trees, leaving the remaining foliage a rust/burnt color. Damaged trees defoliated for numerous years are at high risk of attack from the deadly Douglas-fir beetle. The south-central forests of Colorado continue to experience intense disturbance and infestations. Saguache, Gunnison, Chaffee, Park, Teller and Fremont counties were among the most affected by the budworm in 2021.

PIÑON IPS *(Ips confusus)*
Acres affected statewide in 2021: 17,600
Piñon Ips beetle populations are increasing in lowland piñon-juniper forests, spurred by prolonged drought conditions. Piñon pine and several juniper species are well-suited to grow in harsh conditions. However, the soil hasn't been able to retain enough moisture for these trees to remain healthy. Stressed by drought, piñon trees are susceptible to the piñon Ips beetle, resulting in increased mortality. Delta, Montrose and Mesa counties had significant infestations through 2021, with other counties across the state experiencing pockets of mortality that have progressively increased in recent years.

WESTERN BALSAM BARK BEETLE *(Dryocoetes confusus)*
Acres affected statewide in 2021: 28,400
A decline in subalpine fir is becoming increasingly prevalent across high-elevation forests, with small groups of trees turning red from western balsam bark beetle infestations. In Colorado, subalpine fir grows intermingled with Engelmann spruce and becomes susceptible to bark beetle attack and decline during prolonged drought. Clear Creek, Boulder, Eagle, Garfield, Gunnison, Mesa, Rio Blanco and Routt counties have seen an uptick in subalpine fir mortality from this beetle and associated root diseases.

Forests dense with beetle-killed trees blanket this valley in the Rio Grande National Forest near Creede. Spurred by drought, spruce beetle has impacted 1.89 million acres of high-elevation Engelmann spruce forests in Colorado since 2000. Photo: Dan West, CSFS

Western spruce budworms crawl across a CSFS forester's arm. In its caterpillar stage, the budworm partially consumes the needles of spruce trees. Photo: Sam Pankratz, CSFS

Colorado Communities Must Adapt to a New Normal

Ongoing drought, warmer temperatures, unhealthy forests and an expanding wildland-urban interface continue to leave Coloradans vulnerable to wildfires and their long-term impacts. The record-setting fires over the past two years punctuated how this new normal for wildfire conditions in the state can lead to large-scale and destructive wildfires. Already grappling with post-fire mudslides, flooding and charred mountainsides after 2020 and the most destructive wildfire in Colorado history after 2021, the state must heed the wake-up call from these fires and further reduce fuels, mitigate wildfire risk and prepare our communities for inevitable future wildfires. Our safety, our air, our water and our way of life as Coloradans depend on it.

Last year, persistent drought conditions, warmer temperatures linked to climate change and forests thick with living and beetle-killed fuels set the stage for the types of wildfires seen in Colorado in 2020. Despite these conditions – and thanks to the efforts of wildland firefighters – the state did not experience many large wildfires and appeared to have escaped a significant fire year in 2021. Then, at the tail end of the year during extreme drought, the Marshall Fire ignited west of Superior. Driven by exceptional winds, the fire swept over grasslands and into urban areas, destroying more than 1,000 homes and businesses and becoming the most destructive wildfire in state history in terms of insured losses.

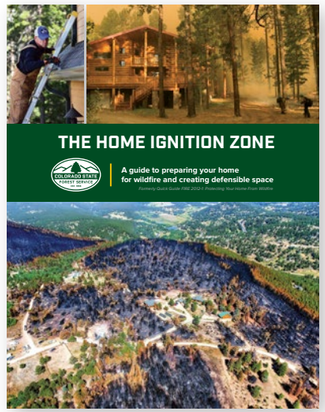
The Marshall Fire was a tragic reminder that wildfires can occur any time of year in Colorado and can have devastating consequences when they occur in the wildland-urban interface under drought conditions coupled with extreme weather. The WUI is where human-built structures and flammable vegetation meet and intermingle. In Colorado, that includes not just forests but grasslands and shrublands. More than half of all Coloradans live in the WUI and are susceptible to the negative impacts of wildfires, according to the Colorado State Forest Service's 2017 Colorado Wildfire Risk Assessment. It is imperative that all residents living in the WUI know and lower their wildfire risk, communities plan for wildfires and forest managers reduce the buildup of fuels in our forests and wildlands.

The costs are simply too high not to take these actions, especially for residents who lose homes and businesses and for communities left with a massive recovery price tag following a fire. Severe wildfires have long-term consequences, including lives that must be rebuilt, erosion and mudslides that result in loss of life and property, road closures, degraded water quality and more. Last year, mudslides from the 2020 Grizzly Creek Fire burn scar closed Interstate 70 through Glenwood Canyon several times, blocking a national transportation and shipping route and hurting local and state economies that rely on tourism and outdoor recreation. In July, several people died in the Poudre Canyon during flooding and mudslides that originated in the Cameron Peak Fire burn scar. These are all enormous costs to bear – costs that Colorado's communities will endure for years to come.

Managing fuels is critical for lowering the risk of wildfire. Harvesting trees from overgrown forests or using prescribed fire removes fuels that can influence how a wildfire burns and can aid firefighters in protecting homes and communities. Across Colorado in 2021, the CSFS and its partners actively managed thousands of acres of forests around communities to mitigate that risk. The CSFS also worked with partners and communities to update and implement Community Wildfire Protection Plans and assisted residents in preparing their homes and properties for wildfire.

During the 2021 legislative session, Governor Jared Polis and the State Legislature increased funding to implement more on-the-ground fuels reduction projects and prepare more communities for fire. This work is critical to protect homes, communities, water supplies and other resources. (See pages 18-19 for more on 2021 legislation and the impact it will have on Colorado.) The state recognizes the risk posed by wildfire and the need to live alongside fire as a natural part of the environment. The CSFS, partners and communities must continue to work together to reduce fuels, mitigate wildfire risk and foster more fire-adapted communities to meet the challenge wildfire poses in this new normal.

LEARN YOUR WILDFIRE RISK
coloradoforestatlas.org



To help residents prepare for fire, the CSFS released the Home Ignition Zone *guide during Wildfire Awareness Month last May. It contains science-based, practical guidance for residents to lower their wildfire risk.*

Winds gusting over 110 miles per hour spurred the Marshall Fire, which began around 11 a.m. on Dec. 30, 2021. By nightfall, the fast-moving fire had torn across drought-stricken grasslands and into residential neighborhoods in Superior and Louisville, destroying more than 1,000 structures and forcing more than 30,000 residents to evacuate. Photo: milehightraveler/iStock

Community Wildfire Protection Plans in Colorado

1-5 YEARS OLD:	6-10 YEARS OLD:	OVER 10 YEARS OLD:
23	57	164

(TOTAL PLANS: 244)

With funds from the Colorado Recovery Act, the Colorado State Forest Service will help communities across the state update their Community Wildfire Protection Plans. The process of updating a CWPP helps spur activity to reduce fuels around communities, raises awareness among residents about wildfire risk and brings people and organizations together to prepare for wildfire. Ideally, CWPPs should be updated at least every five years.

A tall stack of harvested timber dwarfs log trucks being loaded at the Greater Larkspur Community Fuels Mitigation Project. The Colorado State Forest Service is leading the three-phase wildfire mitigation effort in the Douglas County wildland-urban interface. Phase one removed nearly 4 million pounds of dead timber on public and private lands near Sandstone Ranch Open Space, with almost all going to Front Range mills to be processed into firewood and lumber that will support Colorado's economy. More timber removal on the remaining project phases will take place this year. Photo: Meg Halford, CSFS

Nearly 4M Pounds of Dead Timber Removed in Douglas County

Residents in Douglas County are breathing easier about wildfire risk, thanks to a Colorado State Forest Service project near Sandstone Ranch Open Space that has already removed almost 4 million pounds of wood from residential areas in this wildland-urban interface.

The Greater Larkspur Community Fuels Mitigation Project, started in 2021, includes three phases of fuels reduction spanning public and private lands west of Larkspur – in the Perry Park Metro District, on the privately owned Haystack Ranch and at the public open space Sandstone Ranch, owned by Douglas County. It will benefit more than 4,500 residents and over 2,000 homes and structures in surrounding subdivisions and Pike National Forest lands.

A Douglas-fir tussock moth outbreak in 2015 decimated over 20,000 acres of forest in Douglas County, killing almost 100 percent of the Douglas-firs. The Douglas-fir beetle has also affected this forest. Home to critical riparian and wildlife habitat, including for the Preble's meadow jumping mouse, this overcrowded forest is also part of major water infrastructure in the Upper South Platte watershed and is a high-priority area in the *2020 Colorado Forest Action Plan*.

Spencer Weston, a CSFS forester, is leading the wildfire risk reduction project that includes removing dead Douglas-fir with the help of partners including Perry Park, Douglas County Open Space, the USFS South Platte Ranger District, Larkspur Fire Department and Denver Water. The project enhances 700 acres, creating a resilient forest with benefits that trickle down to the area's watersheds and wildlife, as well as Colorado's recreation-loving residents.

Dove Creek Forestry implemented the project, assisted by two mills, JCK Enterprises in Brighton and Oaklands Ranch Sawmill in Sedalia. They used nearly 100 percent of the cut logs. Most will be made into firewood and some will be lumber.

"We want the material that is cut to go to our local outlets and produce a Colorado wood product," Weston said. "This helps local economies and also reduces wildfire risk on these properties."

Phases two and three continue into the fall, broadening fuelbreaks and connecting mitigation already completed on adjacent USFS land. Phase three, to include steep-slope or helicopter logging, is backed by more than $400,000 from a Forest Restoration and Wildfire Risk Mitigation grant, as well as other state, federal and private funding. Meetings are underway with the USFS Pike National Forest Ranger District about a potential Good Neighbor Authority agreement to extend the project to neighboring communities.

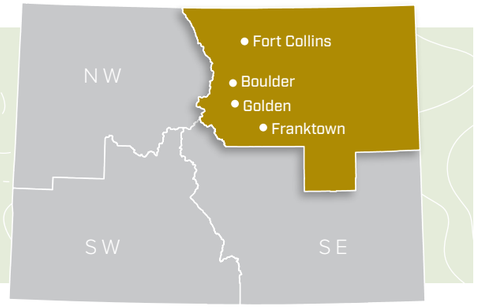
> "We want the material that is cut to go to our local outlets and produce a Colorado wood product."
>
> *– Spencer Weston, CSFS Forester*

"After completion, this project will create a nearly 2-mile-long fuelbreak that's 650 to 1,300 feet wide, along the western boundary of Haystack Ranch and Perry Park Metro District," Weston said. "It's going to be a huge value added to Perry Park and surrounding communities."

FOREST HEALTH WHERE YOU LIVE

Contact your nearest CSFS field office for guidance and resources to help you manage trees and forests where you live in Colorado: csfs.colostate.edu/northeast/

Searchable maps and county-level data on forest insects and diseases: bit.ly/ForestHealthReport



Forest Health Issues in Northeast Colorado

Photo: Mercedes Siegle-Gaither, CSFS

DROUGHT STRESS

Persistent drought conditions are resulting in the decline and mortality of trees in the northeast part of the state. Colorado State Forest Service foresters have noticed drought-related damage to trees at low elevations, particularly among pines and Douglas-fir trees but also in aspen and spruce.

This is concerning, as drought-stressed trees are more susceptible to outbreaks of bark beetles. It is approaching a decade since the mountain pine beetle epidemic subsided in Colorado, but CSFS foresters are again noticing this beetle in new pockets of forests over the last 1-2 years. Tree decline and death from drought stress are compounded in areas experiencing additional forest insect and disease issues that may not immediately kill the trees, primarily dwarf mistletoe.

The CSFS monitors insect activity and manages forests to increase individual tree vigor and overall forest health, with strategies such as thinning trees to reduce competition for resources.

Photo: Amy Lentz, CSU Extension Weld County

EMERALD ASH BORER

(Agrilus planipennis)

The emerald ash borer remains on the move along the northern Front Range. In 2021, Erie became the latest community to detect this highly destructive tree pest within its boundaries. It has likely spread to other towns and cities, since EAB can infest an ash for up to four years before visible signs of decline in the tree occur. Residents, municipalities, tree care companies and forestry partners must remain vigilant and prepare for EAB.

The Colorado State Forest Service supports small and mid-sized communities on the Front Range in managing EAB through the "Your Ash is on the Line" project. The CSFS is providing ash tree inventories at no charge to 36 communities, web-based resources and guidance to help communities develop EAB management plans, and workshops on ash wood utilization. The third and final workshop in the series will occur spring of 2022.

To access EAB-related resources, visit csfs.colostate.edu/eab.

Photo: Dan West, CSFS

SPRUCE BEETLE

(Dendroctonus rufipennis)

Acres affected in northeast Colorado in 2021: 2,890

Colorado's most deadly forest pest remains active in northeast Colorado. The spruce beetle continues to expand into previously uninfested, high-elevation forests in and around Rocky Mountain National Park. In 2021, drought-stricken spruce-fir forests in Larimer and Boulder counties further declined, as the spruce beetle has depleted much of these forests of susceptible, large-diameter trees.

The Colorado State Forest Service works closely with residents and partners to help spruce-fir forests recover and build resiliency to the spruce beetle. Treatments include thinning trees in greener forests to increase age class and species diversity and removing dead and dying spruce from stands experiencing excessive mortality. CSFS foresters may also recommend hanging pheromone (semiochemical) packets from trees to deter this native bark beetle from attacking.

Cuchara Mountain Park spreads out above the small community of Cuchara on Highway 12 in southern Colorado. Often overlooked in large-scale wildfire mitigation plans for the state, residents have taken a hands-on approach to wildfire mitigation, working on seven projects in the valley with the Colorado State Forest Service and other partners to lower the town's wildfire risk and establish a safe evacuation route. Photo: Amy Bulger, CSFS

Small Town Takes Big Strides in Wildfire Protection

Nestled along the scenic Highway of Legends between La Veta and Trinidad, the tiny mountain town of Cuchara sneaks up and disappears in the rearview mirror quickly. It barely pushes its 1-square-mile boundary and only about 10 percent of its residents live there year-round. Yet, it's one of Colorado's most resonant success stories about wildfire mitigation.

In Cuchara, community fuels action. Although the Colorado State Forest Service identified the area as high priority in the *2020 Colorado Forest Action Plan*, its distance from the Front Range and major population centers means it's frequently left off many state and federal fireshed protection priority maps. But with the help of the CSFS and partners, this small burg is accomplishing high-profile fuels reduction and community wildfire protection work that's benefitting people, property and infrastructure along the Cucharas River watershed. With CSFS guidance, multiple grants have been secured for seven project areas in the valley. Work began in 2021 and will continue for the next two years.

When the rapidly moving Spring Fire in 2018 jumped Highway 160 and roared south, cresting the ridge above Cuchara, hundreds of local and federal firefighters battled flames that sometimes reached 300 feet to keep the town safe. After the fire was out, it became the spark that rallied residents – the need to protect their community was immediate.

Part-time resident Marshall Moore, a retired landscape designer from Texas, launched mitigation work to create on-the-ground examples so his neighbors could see the benefits of successful mitigation practices. CSFS forester Jared Fleming held public meetings, and an official project scope formed as more residents joined in. Funds have since been awarded from the CSFS-administered Forest Restoration and Wildfire Risk Mitigation Grant Program, Great Outdoors Colorado, a State Fire Assistance WUI grant and a National Forest Foundation grant.

Fleming cites the FRWRM funding as a crucial component of community-driven mitigation work. "It has allowed for the project to be flexible," he said about the grant that lets work continue through 2023. "Plans could be adapted as more residents signed on to be included."

Work also began in 2021 to create a 150-foot buffer along the two-lane Highway 12, the only evacuation corridor through the valley.

> "The CSFS wants to support small communities, and this is how we do that."
>
> *– Jared Fleming, CSFS Forester*

Partners including the Spanish Peaks Alliance for Wildfire Protection, La Veta Fire Protection District and the U.S. Forest Service have been instrumental, tackling what could become part of a landscape-scale work area with a neighboring federal project in development. Future funding could support additional community work.

"More funding sources are needed to keep this good work going," Fleming said. "The CSFS wants to support small communities, and this is how we do that."

FOREST HEALTH WHERE YOU LIVE

Contact your nearest CSFS field office for guidance and resources to help you manage trees and forests where you live in Colorado: csfs.colostate.edu/southeast/

Searchable maps and county-level data on forest insects and diseases: bit.ly/ForestHealthReport

Forest Health Issues in Southeast Colorado

Photo: Steve Rudolph, CSFS

WESTERN SPRUCE BUDWORM

(Choristoneura freemani)

Acres affected in southeast Colorado in 2021: 41,678

The western spruce budworm is a native forest pest, primarily affecting Douglas-fir, true fir and spruce trees. This defoliator is widespread throughout low-elevation mixed-conifer forests and spruce-fir forests in southeast Colorado. A cooler, wet May in 2021 seems to have muted its activity last year, but forest conditions have not changed appreciably and consecutive years of budworm defoliation continue to leave drought-stressed trees susceptible to attack by Douglas-fir and other bark beetles.

This insect is causing significant damage to forests in the Sangre de Cristo and Wet mountains, western Fremont County and southern Park County near Guffey. Continued budworm defoliation has occurred in the Sangre de Cristo Mountains for numerous years, resulting in significant mortality.

Colorado State Forest Service foresters manage stands to have well-spaced trees growing at a uniform height to curb budworm activity. This also lowers the risk of high-severity fire in those stands and allows other tree species not susceptible to western spruce budworm, such as aspen and pines, to regenerate. Cutting smaller fir and spruce for Christmas trees and boughs can be a practical and festive form of treatment, while leaving the larger, mature trees on the land.

Photo: Kamie Long, CSFS

PIÑON IPS

(Ips confusus)

The piñon Ips beetle is attacking piñon pine trees in southeast Colorado that are stressed and weakened by drought conditions and recent wildfires.

Colorado State Forest Service foresters in the La Veta Field Office have noticed the piñon Ips beetle is increasingly active in piñon-juniper forests north of Highway 160 between Walsenburg and Fort Garland, particularly in forests adjacent to the Spring Creek Fire burn scar in Costilla County.

CSFS foresters are monitoring the impacts of this native bark beetle on State Land Board parcels and private lands. They are also educating residents about strategies to prevent infestations and reduce competition for resources among piñon trees. Overly dense forests are susceptible to beetle outbreaks and severe fire behavior, so removing trees in dense stands can address both forest health issues.

The CSFS offers a guide for the piñon Ips beetle including identification tips and management options. The guide is available at csfs.colostate.edu or by contacting a local CSFS field office.

Timber contractors stack harvested Englemann spruce logs during the Alpine Plateau Timber Salvage. Cutting is near completion on the project, which grew out of management efforts to slow a spruce beetle outbreak in the forest between Gunnison and Montrose. The resulting salvage of more than 3,500 acres is the largest timber sale ever administered by the Colorado State Forest Service through the Good Neighbor Authority program. Photo: Scott Johnson, CSFS

State's Largest Timber Salvage Battles Beetles, Boosts Forest Industry

Foresters thought their plans to curb spruce beetle infestation between Gunnison and Montrose would be a decade-long project. But things escalated quickly.

"The plan was to be proactive to manage spruce beetles in this area," said Scott Johnson, the Colorado State Forest Service forester administering the Alpine Plateau Timber Salvage. "We were planning for impending timber sales, maybe a couple hundred acres per year. But then the spruce beetle blew up."

Once CSFS entomologist Dan West and his federal counterparts agreed the area was at high risk of a beetle outbreak, the salvage ballooned to more than 3,500 acres. The CSFS responded with adaptive forest management, thanks to a robust forest products industry in southwest Colorado and the Good Neighbor Authority program that allowed the CSFS and U.S. Forest Service to pool resources to battle one of the most destructive forest pests in the state.

Now – just five years later – most cutting will be finished on what has grown into the largest timber sale ever administered by the CSFS through the GNA program. The 3,500-acre salvage includes two massive timber sales, Big Willow and Ridgestock. A salvage supports the forest products industry by allowing trees to be cut while they retain value for making wood products. Salvages also prepare the land for new trees to thrive in these opened areas.

Montrose Forest Products purchased the timber and Colorado-based crews with Perry Brandt Logging, CRS Timber and Jeff Burleson Logging have been harvesting in the project area since 2019. Where beetle-killed ghosts once stood, young trees in a diversity of species now grow.

"Our contractors have done a great job harvesting a majority of the dead and high-risk overstory to help the problem, while leaving the stronger trees in the understory that will help the forest regenerate," Johnson said.

The Alpine Plateau salvage also lowers wildfire risk by removing more than 7,000 log trucks full of Engelmann spruce and subalpine fir from the land. The Big Willow timber sale is 4 miles south of the Arrowhead and Blue Mesa subdivisions – home to more than 300 residences in a wildland-urban interface. The community benefits from removing standing dead timber that might otherwise serve as fuel for an approaching wildfire.

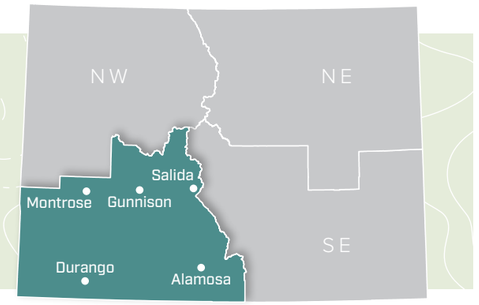
Where beetle-killed ghosts once stood, young trees in a diversity of species now grow.

Led by the CSFS Montrose and Gunnison field offices, in cooperation with the USFS Gunnison Ranger District, work on the Alpine Plateau is a prime example of shared stewardship in Colorado. The GNA program allows the USFS and Bureau of Land Management to partner with the CSFS to accomplish projects quickly and efficiently, and can include work such as fuels management, habitat improvement, insect and disease control, commercial timber removal and more.

FOREST HEALTH WHERE YOU LIVE

Contact your nearest CSFS field office for guidance and resources to help you manage trees and forests where you live in Colorado: csfs.colostate.edu/southwest/

Searchable maps and county-level data on forest insects and diseases: bit.ly/ForestHealthReport



Forest Health Issues in Southwest Colorado

Photo: Kamie Long, CSFS

DOUGLAS-FIR BEETLE

(Dendroctonus pseudotsugae)

Acres affected in southwest Colorado in 2021: 3,558

Persistent drought conditions are fueling increased activity of the Douglas-fir beetle in southwest Colorado, particularly in small pockets of low-elevation forests.

Colorado State Forest Service foresters are noticing more beetle activity in overly dense forests on steep, rocky, well-drained slopes. Often these infested, drought-stressed stands of Douglas-fir have previously experienced defoliation by the western spruce budworm.

This beetle is affecting mixed-conifer forests in much of southwest Colorado, especially in Costilla, Rio Grande, Saguache, Gunnison, Archuleta, La Plata and Montrose counties.

CSFS foresters offer science-based advice and strategies to residents and communities to manage this native bark beetle, including pheromone (semiochemical) packets to deter the beetle from attacking and assistance with harvesting trees killed by the beetle.

Photo: Dan West, CSFS

ROUNDHEADED PINE BEETLE

(Dendroctonus adjunctus)

Acres affected in southwest Colorado in 2021: 5,461

The roundheaded pine beetle is a native insect that attacks ponderosa pine. It often works in conjunction with other native species of bark beetles to create a "bark beetle complex" that kills trees. Compared to other beetles in the complex, it attacks trees later in the year, resulting in trees being under attack by beetles for much of their growing season.

Drought adds additional stress to pine trees. Warmer than average temperatures combined with extreme to severe drought conditions in southwest Colorado over the last two years were beneficial to the roundheaded pine beetle and associated native bark beetles.

This beetle continues to affect more acres of forests in La Plata, Montezuma and Dolores counties, and new infestations were identified in San Miguel County last year. It is particularly active in The Glade area of the San Juan National Forest in Dolores County and the Cherry Creek drainage in La Plata County.

Photo: CSFS

MOUNTAIN PINE BEETLE

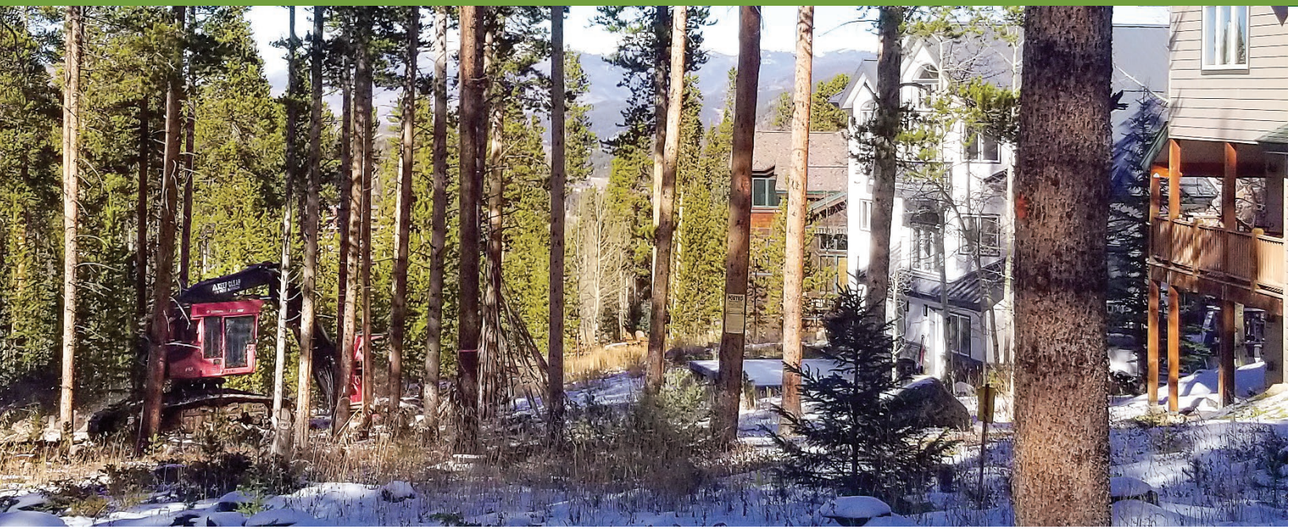
(Dendroctonus ponderosae)

Acres affected in southwest Colorado in 2021: 1,196

New pockets of mountain pine beetle-killed trees are appearing in forests in north Gunnison County. The area had a dry summer in 2020, followed by below-average snowpack in the winter of 2020-2021. The drought there has stressed lodgepole pines, which rely on moisture from melting winter snowpack for early summer growth. Drought will likely spur even more beetle activity within lodgepole stands in the coming months.

Beetle activity is most prevalent in the Taylor River drainage and near Crested Butte. Colorado State Forest Service foresters are seeing new pockets of beetle-killed trees in the Ohio Creek, East River and Quartz Creek drainages, often in inaccessible areas.

The CSFS and partners are working on a project in the Taylor Canyon area to mitigate the beetle's spread. Over 250 acres of infested stands were treated from June 2020 to July 2021, and more treatments are planned.



A feller buncher works in the trees near homes on White Cloud Drive in Breckenridge. This mile-long mitigation project near Breckenridge Ski Resort lowers wildfire risk in the Warrior's Mark neighborhood, regenerates an old forest, establishes fuelbreaks and adds to a strategic community protection zone throughout this wildland-urban interface. Photo: Bill Wolf, CSFS

Mitigation Finds Creative Solutions in Breckenridge

Wildfire was likely the last thing on skiers' minds this winter. But from the Peak 10 slopes in Breckenridge, timber harvesting machinery could be seen working near the Warrior's Mark neighborhood below. The mitigation project will lower this community's wildfire risk long after the snow melts, and the local forest products industry helped make it possible.

"The forest products industry helps forest management," said Colorado State Forest Service forester Bill Wolf, the project lead. "It allows for us to do wildfire mitigation, manage forest health and support the industry, all at the same time."

This Good Neighbor Authority partnership allowed the CSFS to lead fuels reduction projects on 134 acres of U.S. Forest Service land in the Dillon Ranger District that was dense with both live lodgepole pine and dead trees killed during the mountain pine beetle epidemic. Without management, the dead trees fall, which can lead to intense wildfire scenarios.

The GNA program permits the USFS to partner with state agencies to ensure critical forest management work happens quickly and across ownership boundaries. This project furthered Summit County's goal of connecting fuelbreaks to establish a community protection zone in this wildland-urban interface.

Feller buncher operators with Colorado Timber Resources began work in November next to homes and vacation rentals on White Cloud Drive. As the snow fell in December, trucks hauled harvested logs through the heart of town. The timber was taken to a sawmill 60 miles away in Parshall, to be made into lumber that carpenters use for framing houses and making furniture. Putting the harvested trees to use helped offset about $300,000 in treatment costs from the Summit County Strong Future Fund, a voter-approved reserve specifically for mitigation.

For early season skiers, the activity was a reminder of how this community is working together to protect homes, towns and the drinking water that flows through the Blue River.

Earmarked in the 2010 Community Wildfire Protection Plan the CSFS crafted with Summit County, the area also drew attention in a USFS forest health assessment in 2011. Flanked by a growing neighborhood without good access for heavy equipment, the project met challenges until Wolf found a creative solution – one empty residential lot. Supportive of mitigation work, the property owners granted access through the lot until their home construction begins.

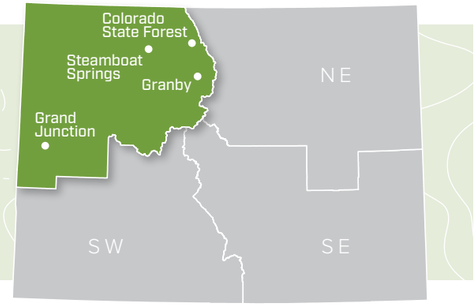
> The mitigation project will lower this community's wildfire risk ... and the local forest products industry helped make it possible.

"If we didn't have the community support, the project wouldn't have happened," Wolf said, citing Summit County government and the towns of Breckenridge and Blue River as other crucial partners that helped get the project accomplished while ensuring community and tourism activity continued seamlessly in one of Colorado's popular ski towns.

FOREST HEALTH WHERE YOU LIVE

Contact your nearest CSFS field office for guidance and resources to help you manage trees and forests where you live in Colorado: csfs.colostate.edu/northwest/

Searchable maps and county-level data on forest insects and diseases: bit.ly/ForestHealthReport



Forest Health Issues in Northwest Colorado

Photo: CSFS

DOUGLAS-FIR BEETLE

(Dendroctonus pseudotsugae)

Acres affected in northwest Colorado in 2021: 3,025

Ongoing drought conditions in northwest Colorado continue to spur the spread of the Douglas-fir beetle. This native bark beetle attacks and kills Douglas-fir trees, a high-value timber species. Trees killed by this beetle add significant heavy fuels to already dry, dense forests, which is a cause for concern as beetle-killed trees contribute to wildfire hazards.

This bark beetle is affecting forests in pockets throughout Routt, Eagle, Garfield, Summit, Pitkin and Mesa counties.

Colorado State Forest Service foresters are responding by selectively thinning forests to promote a diversity of age classes and tree species and deploying pheromone (semiochemical) packets on Douglas-fir trees to deter beetles from attacking.

CSFS foresters are also working with homeowner associations to prevent and mitigate the beetle's impact around neighborhoods and homes.

Photo: Kamie Long, CSFS

PIÑON IPS

(Ips confusus)

Acres affected in northwest Colorado in 2021: 12,938

Piñon Ips beetle is causing considerable die-off of piñon pines in parts of western Colorado, spurred by persistent drought conditions.

Populations of this native bark beetle are so high in some piñon-juniper forests, such as in the Glade Park and Gateway Canyon areas of Mesa County, that these forests are losing a significant number of their mature piñon trees. These may become single-species forests with only junipers as the beetle kills larger piñons and smaller trees succumb to drought.

The piñon Ips beetle also is spreading in the Cedaredge area of Delta County and around Rifle and Glenwood Springs in Garfield County.

While treatment of infested trees can be challenging and costly, proactive management is critical. Colorado State Forest Service foresters work with residents to offer guidance to prevent infestations and reduce competition among piñon trees for resources.

Photo: Dan West, CSFS

WESTERN BALSAM BARK BEETLE

(Dryocoetes confusus)

Acres affected in northwest Colorado in 2021: 21,306

Across higher elevations in northwest Colorado, western balsam bark beetle is causing a decline in subalpine fir, exacerbated by prolonged drought that has weakened tree defenses. Groups of trees turn red from infestation by this native bark beetle and fungi that cause root decay.

Western balsam bark beetle is affecting both younger and mature trees. Its impact is particularly notable around Rabbit Ears Pass and Buffalo Pass in the Routt National Forest, in north Routt County and around Steamboat Springs and Emerald Mountain, in northeastern Rio Blanco County and in the Grand Mesa National Forest.

Aside from removing infested trees before adult beetles fly to new trees the following year, foresters have few management strategies to counteract these beetles due to the spotty nature of infestation and low value of the wood to offset treatment costs.

Blackened ground shows the path of the Cameron Peak Fire as it bore down on the Shambhala Mountain Center in October 2020. The area between the burn scar and the buildings in the middle of the photo tells the story firsthand of how firefighters were able to save many structures because of the mitigation work previously completed. Photo: Michael Gayner, Shambhala Mountain Center

CSFS Awards $6.4M for Communities to Prepare for Wildfire

The grounds at Shambhala Mountain Center in the foothills northwest of Fort Collins exemplify how prior mitigation work can pay off in the face of wildfire. With support from grant funds administered by the Colorado State Forest Service, the Fort Collins Conservation District reduced wildfire fuels around the center. This work proved critical in helping firefighters save many structures, including the center's iconic Stupa, when the Cameron Peak Fire bore down on the campus in October 2020.

To help communities like the Shambhala Mountain Center lower their wildfire risk and address other forest health issues, the CSFS offers funding through the Forest Restoration and Wildfire Risk Mitigation Grant Program. Last spring, the Colorado Legislature passed and Governor Jared Polis signed several bills to bolster the FRWRM program and get more work done on the ground.

In August, the CSFS awarded $6.4 million in FRWRM funds to municipalities, local fire departments, homeowner associations and others, thanks to a one-time $6 million appropriation to the program through Senate Bill 21-054. In addition, Senate Bill 21-205 allocates $8 million to the FRWRM program annually through the Long Bill, moving funding to a more dependable source than volatile severance tax funds that at best could provide $1.05 million annually to the program. This boost in funds means more communities will be better prepared for wildfire.

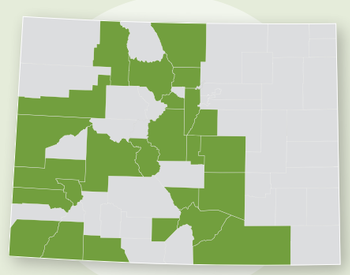
The CSFS will announce the next round of funding through the FRWRM program in summer of 2022. For information about the program, visit csfs.colostate.edu/funding-assistance.

2021 Forest Restoration and Wildfire Risk Mitigation Grants

$6.4 million awarded of $14.7 million requested

42 projects funded with 12 of them located in areas of fewer economic resources

Projects awarded grant funds during the 2021 cycle are in **25 counties in Colorado**.



CSFS: Fostering Healthy, Resilient Forests in Colorado

Since 1955, the Colorado State Forest Service has served the residents and communities of Colorado with forestry assistance, wildfire mitigation expertise, and outreach and education. With 17 field offices across Colorado, the CSFS works alongside residents and partners to improve forest health, offering:

- Leadership, resources and guidance in forest management
- Wildfire risk reduction and community wildfire protection planning
- Adaptive forest management that addresses climate change
- 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

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. In 2021, the CSFS employed 133 staff and 41 student and non-student employees.

CSFS foresters pause for a selfie while working in the woods on Owl Mountain in Jackson County. Photo: Ashley Garrison, CSFS

Putting Stimulus Funds to Work to Lower Wildfire Risk

As part of the state stimulus package, the Colorado State Forest Service received $7.5 million* through Senate Bill 21-258 to address wildfire risk in Colorado. From loans for wood products businesses to community wildfire planning to outreach materials for underserved communities, the CSFS is putting those one-time stimulus funds to work on the ground to help residents and communities prepare for wildfire. The CSFS will use those funds to address and provide:

- Community Wildfire Protection Plans
- Wildfire risk resources and training
- Outreach and education materials
- Support for the forest products industry
- Information on carbon in forests and wood products

** SB21-258 allocated $5 million for the Healthy Forests and Vibrant Communities Fund and $2.5 million for the Forest Business Loan Fund.*

Report Acknowledgements

The following individuals and groups provided content, guidance and technical review for this report:

- U.S. Forest Service, Region 2, State and Private Forestry and Tribal Relations, and the Forest Health Management group
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- Gretchen Reuning and Jake Marlow, Fort Collins Conservation District
- Dan West, Forest Entomologist, CSFS
- CSFS program division staff and associate directors
- CSFS field office personnel

Cover Photography

Front cover top: *The CSFS is working with partners and residents to reduce wildfire risk in the Cuchara area of Huerfano County. Read about the project on page 12. Photo: Amy Bulger, CSFS.*
Lower left: *A feller buncher operator maneuvers along the edge of the Warrior's Mark/White Cloud neighborhood in Breckenridge. Read about the project on page 16. Photo: Bill Wolf, CSFS.*
Lower right: *CSFS Salida Field Office intern Joel Allen takes a core sample from a Douglas-fir at the base of Mount Princeton using an increment borer. Photo: Mercedes Siegle-Gaither, CSFS*

Back cover: *A feller buncher operator cuts trees to reduce wildfire fuels on Sheep Mountain in Grand County. Photo: Teddy Parker-Renga, CSFS*

FORESTS SUPPORT RURAL ECONOMIES

From feller buncher operators to log truck drivers to mill operators, behind every large-scale wildfire mitigation project on Colorado soil there are timber industry workers to thank. Healthy forests are critical for supporting timber industry jobs and rural economies across Colorado. In turn, the people in those jobs support our state's forest management goals. The healthier the timber industry, the healthier our forests can be. It's a good reminder that a hillside full of healthy trees supports so much more than a pretty Instagram post.

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OUR MISSION

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