

A NORTHERN FRONT RANGE LANDOWNER GUIDE TO LIVING WITH BARK BEETLES

You are the steward of your land!

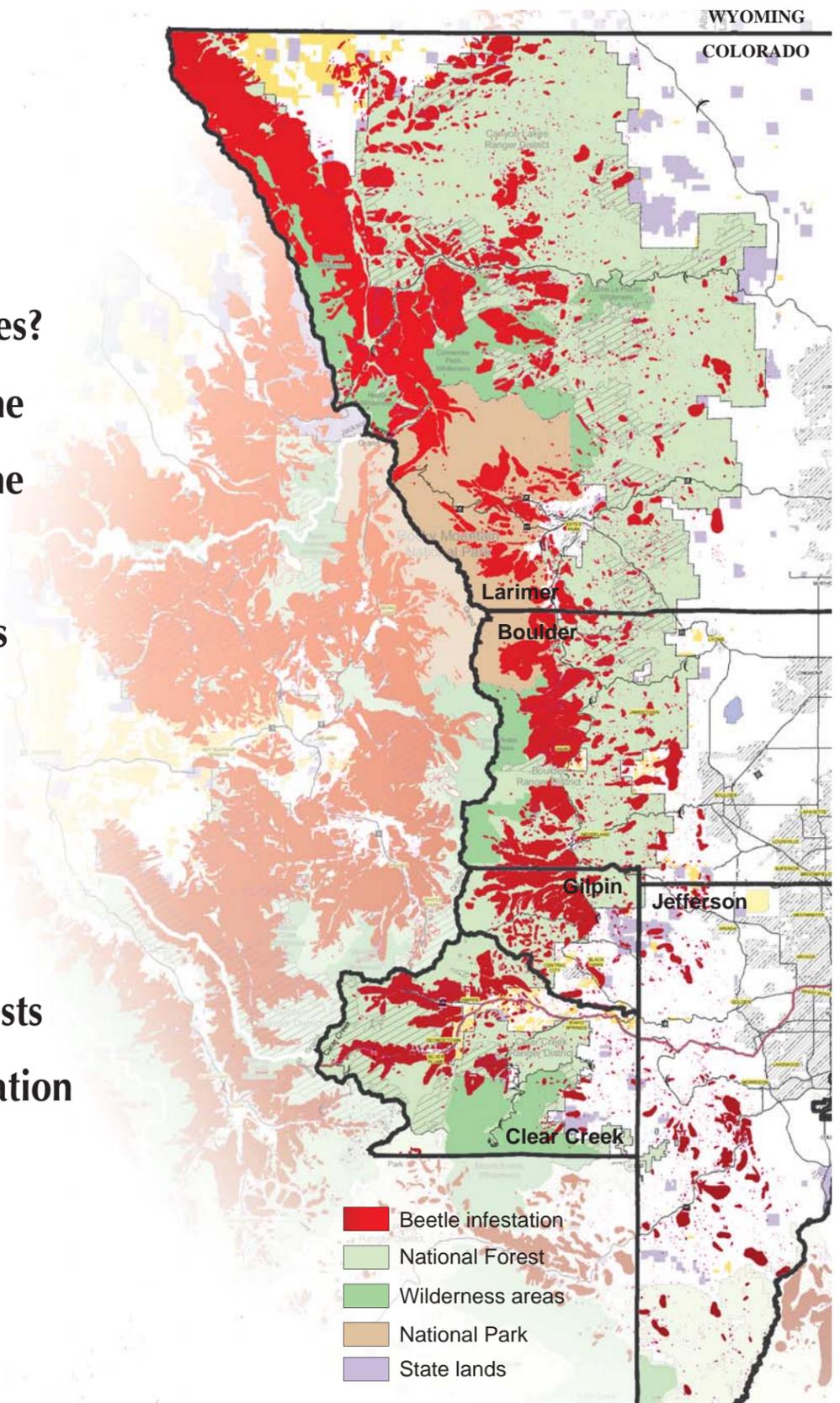
Pine beetles are changing the look of forests throughout the West. Although the forests will recover, many property owners will see trees around them die. Each homeowner can take steps to minimize the impact on their land, speed the recovery of the forest around them, and minimize the danger of wildfire to their property.

The following pages contain information on the nature of the threat to property and the types of assistance available through federal, state, and county programs.



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Small beetles, big impact.

Whitney Cranshaw, Colorado State University, Bugwood.org

MEET THE BEETLES: TWO SPECIES OF CONCERN

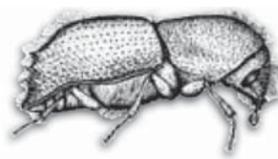
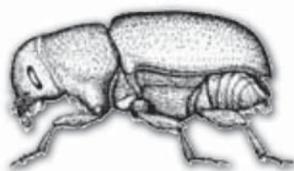
By Colorado State Forest Service Staff

Mountain Pine Beetle

The mountain pine beetle (MPB), *Dendroctonus ponderosae*, is a bark beetle native to western North America. Its range extends west from the Great Plains, from British Columbia to Mexico.

The MPB usually takes 1 year to complete its lifecycle, developing through four stages: egg, larva, pupa, and adult. Except for a few days during the summer when adults emerge and fly to new trees, all development takes place under the bark of infested trees. Female beetles lay tiny, pearl-white eggs under the bark of pine trees in the late summer and early fall. The eggs hatch in 10 to 14 days. The white larvae overwinter in galleries under the bark and begin to mature the following spring. By July, most pupae have transformed into adults. Adults are black and 1/8- to 1/4-inch long.

Adults feed under the bark during the summer and emerge through an exit hole, with peak emergence occurring from mid-July to mid-August. Within a few days, the beetles enter other trees—there are usually enough insects emerging from one tree to attack several additional trees. In Colorado, MPB can attack all native species of pine, including lodgepole, ponderosa, limber, and bristlecone, and even some urban pines like Scotch and Austrian. Beetles carry the spores of blue-stain fungi on their bodies and introduce them into pine trees. The combination of the feeding beetles and spreading fungi kills the tree within a year.



Ips Beetles

Eleven species of Ips beetles are native to Colorado; *Ips pini*, the pine engraver beetle, is the most common. Its primary hosts are the same as MPB—lodgepole pine and ponderosa pine—but

it can attack most other species of pine in its range, which extends across the United States and much of North America. Generally, Ips beetles attack stressed or dying pine trees and do not cause a lot of damage. But, Ips beetle populations have been increasing due to the effects of the MPB epidemic, drought, and the availability of wounded trees. In some counties, Ips beetles have recently killed dozens to hundreds of healthy trees in a single year. Like the MPB, Ips beetles introduce blue-stain fungi to trees; the fungi quicken tree death by blocking the flow of water up the tree.

Ips beetles complete their four-stage lifecycle in only 40 to 55 days, and can produce two to four generations of beetles per year. This makes them more challenging for the homeowner to control than MPB. In the spring, beetles begin to emerge as early as March, when consistent daytime temperatures reach 50 to 60°F, and flight can continue into November. Beetles can attack trees throughout the flight period; however, the first spring flight appears to be the most damaging. Ips beetles are about the size of a grain of rice (1/8- to 3/8-inch long), reddish-brown to black, and can be distinguished from MPB by the depressed cavity and spines at the rear end of the body.



YOU ARE THE STEWARD OF YOUR LAND! HERE'S WHAT YOU CAN DO AS A FOREST LANDOWNER

By Irene Shonle, Director, CSU Extension, Gilpin County

Although this mountain pine beetle (MPB) epidemic is too big to stop, you might be able to slow the spread of both MPB and Ips beetles and reduce the level of tree mortality in your backyard forest. Be proactive! Look for new Ips beetle attacks throughout the warm months, and survey the trees on your property in the fall to look for new MPB attacks. Removing beetle-infested trees early will have a positive impact on forest health, reduce the number of hazard trees on your property, and decrease potential wildfire danger.

Is Your Tree, Slash Pile, or Firewood Still Infested?

You may already know which trees on your property have been attacked by beetles and whether slash and firewood came from beetle-infested trees, but determining if the wood is still infested by those beetles can be tricky. In general, infested wood should be free from MPB after about 1 year—adult MPB typically fly from infested trees anytime between July and September, a year after their eggs were laid. Ips beetles have a much shorter life cycle, and they may live in a tree or slash pile for as little as 6 weeks before emerging. Take time to look carefully at your trees, wood, and slash before transporting them to other locations.

To determine whether a tree is still infested, look for pitch tubes or small mounds of reddish-orange boring dust on the main tree trunk. Peel back an area of bark the size of a deck of cards just above the tubes or dust. A wound like this will not hurt a healthy tree, but don't cut into a tree more than once or twice if you don't find signs of beetles. If you see live adult insects, eggs, or larvae in breeding galleries, the tree is still infested and will need to be treated to kill the beetles before moving the wood.



Peel back bark to check for insects, eggs, or larvae in beetle galleries.

If you see blue staining and breeding galleries but no insects, and you also find small, circular exit holes about the size of a BB gun pellet on the outer surface of the bark, then the insects have already flown from the tree. The wood is no longer infested, and it is safe to be used as firewood. If tree needles have been red and dead for at least 1 year, then the tree is no longer infested. You can examine firewood and slash using these same techniques—with slash, peel back the bark on the largest branches.

Fall Is a Great Time to Survey Your Trees and Determine Treatment Options

In the fall, most new beetle attacks have already occurred, except for those by a few late-season Ips beetles. There is no snow on the ground, the days are beautiful, and there are many treatment options, including saving newly infested wood for firewood. As the flight time of the beetles approaches during the spring, the number of treatment options decreases.

Experts recommend that people carry out their forestry practices (cutting trees for beetle sanitation, fire mitigation, or forest health) during the fall and winter months. In addition to the reasons noted earlier, this is because Ips beetles are attracted to the smell of newly cut wood and slash. Restricting your cutting to the cooler season will help prevent new infestations. If it is not possible to perform your forestry work during this time, it is still better to cut infested trees or work on fire mitigation during the spring or summer than not to do it at all. Be sure to follow the slash management guidelines, and store any newly cut wood away from living trees.

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Was Your Tree Hit by Ips Beetles or MPB?

Beetle	Pitch Tubes	Time of Fading	Boring Dust at Base of Tree	Signs of Woodpecker Feeding	Blue-stain	Gallery Shape	Sawdust in Galleries?	Diameter of Attacked Tree
Ips	No	March–November	Yes: fine and reddish	Yes	Yes	Y, X, or H	No	Smaller than 8"
MPB	Yes	May–July	Yes: coarser and reddish-white	Yes	Yes	I or J	Yes	Usually bigger than 6"



MPB pitch tubes and boring dust (sawdust) are evident on infested trees.



Ips beetle galleries often form a Y, X, or H shape.



MPB galleries often form an I or J shape.

Treating Infested Trees

Trees must be treated to destroy live beetles after they are cut down. Here are some options:

1. Take the entire tree to a sort yard for disposal. Visit <http://www.peaktopeakwood.org> for information on sort yard locations.
2. Chip the entire tree and/or slash pile to destroy the beetle. Spread the chips out in a thin layer so they will dry quickly and not attract Ips beetles.
3. Peel the bark from the trunk with a chain saw, draw knife, or Log Wizard® (a chainsaw attachment that peels logs). You can store peeled logs for firewood without a problem.
4. Use solar treatment: In the fall, lay logs in a single layer in a very sunny, south-facing location. Cover the logs with clear (not black), 6 mm plastic and leave the logs covered for at least 8 weeks. If you choose not to cover the logs with plastic, leave them for at least 3 months and partially roll the logs every few weeks to ensure all sides of the log are exposed to direct sunlight.

This treatment often is not as effective at higher altitudes because it requires a lot of heat to kill the beetle. A common misconception is that the plastic is used to trap beetles, but in fact, the beetles can easily chew through it. Plastic is used to raise the temperature under the bark enough to “cook” the beetles to death.

5. Use infested wood for firewood. In the fall, cut wood to firewood length and split—this will allow the wood to dry out enough to burn in the spring. Mark your infested pile and ensure that the entire pile is burned before July, when remaining beetles could fly to live trees.



After cutting infested trees, choose from five treatment options: disposal, chipping, removing bark, using solar treatment, or burning the wood as firewood.

Slash Pile Management

Active slash pile management is a forestry tool for use primarily on large acreages. Ips beetles are attracted to freshly cut branches in slash piles, so if you don't intend to actively manage your slash, haul it away or chip it as soon as possible. Only if managed properly can slash piles be used to attract beetles *away* from living trees.



Check with your local sort yard for chipper availability.

If you plan to manage slash, pile it away from live trees and chip it every 4 to 6 weeks.

Continuously pile fresh slash away from living trees from July to September to avoid attracting emerging Ips adults. Haul off or chip the entire pile every 4 to 6 weeks and start a new pile in its place.

By using this method, you will provide the beetles with enough green material to breed, but you will treat the material before the beetles are able to fly to live trees. Be careful! If you don't haul off or chip the slash every 4 to 6 weeks, Ips beetles can complete their lifecycle and emerge from the pile to infest new trees.



Tips for Planning Your Future Forest

- Remember the three “Ds” of diversity: encourage diversity in *species*, diversity in *age*, and diversity in *spacing* of your forest. By encouraging diverse forests, you will make your forest healthier and less susceptible to future insect and disease outbreaks.
- Create defensible space by thinning forests around homes and communities. Fires are a natural component of our forests and are something to which we need to adapt. Thinning will help reduce the risk of severe fire and make your community a safer place. To learn how to create defensible space around your home, contact your local Colorado State Forest Service district office or visit the CSFS Web site at: <http://www.csfs.colostate.edu>.
- Remove conifers from aspen stands to improve wildlife habitat and help aspen regenerate.
- Create a long-term forest management plan to promote a healthier, more resilient forest that will be sustainable over time. Envision what you want your forest to look like in 20 years, then work with your local foresters to plan your future forest.



Maintain diversity in species, age, and spacing of your forest to promote forest health.

PREVENTIVE SPRAY OR PHEROMONE POUCHES—WHAT’S THE BEST OPTION?

By Ingrid Aguayo, Entomologist, Colorado State Forest Service

A burning question for many homeowners is whether to use preventive spray or pheromone pouches to protect their trees. My answer is always: “It depends.” Depending on the tree species you want to protect, location of the trees, beetle population, or personal preference, you may choose to use one or the other, or both. But before you make a decision, it is important to know that whether you use a preventive spray, pheromone, or any other preventive treatment method, you will not eliminate MPB. These methods are intended only to minimize tree mortality.

Spraying trees to prevent attack from MPB is effective when protecting a small number of high-value pine trees, but it is not recommended on a

large scale. If you live in an area faced with a high beetle population, it is only realistic to choose a few individual trees that you want to save. Always use a licensed pesticide applicator to spray your trees, and make sure trees are sprayed before the MPB fly in July.

Verbenone, the main anti-aggregant pheromone emitted by MPB and other western bark beetle species, is meant to be used as part of an integrated pest management strategy. Pheromone pouches can be placed throughout your forest and are an option in areas near waterways, where preventive spraying is usually not an option. So far, research on pheromone use has shown mixed results in a natural forest

setting. Effectiveness appears to depend on tree species, beetle population levels, and many other environmental factors.

In reality, no single preventive method offers a comprehensive solution, and, many times, different management methods work best when used as part of an integrated pest management strategy. Such a strategy may include destroying currently infested trees, maintaining healthy forest conditions, and, in some cases, spraying trees or using pheromone pouches. The effectiveness of any strategy depends on many factors, including the level of beetle infestation.

Dead Trees = Hazard Trees

Bark beetles have the potential to kill millions of trees in Front Range communities. Over the next few decades, these dead trees will fall down and could pose a significant risk to your community.

By following these simple guidelines, you can make your community safer:

- Remove dead trees from around your home, garage, driveway, propane tank, utility lines, roads, and other areas people frequently visit.
- Be alert and keep an eye on your surroundings. Avoid walking through or stopping in dense patches of dead trees. They can fall without warning.
- Be extremely careful in strong winds. Lodgepole pines have shallow roots and easily blow over.
- Have an ax or chainsaw nearby to remove fallen trees from your driveway and roads, in case you become trapped by downed trees.
- Help spread the word about the dangers of dead trees. Educate your children, friends, visitors, and neighbors about the hazards.
- Remove standing dead trees. Doing so not only will make your home safer, it also will reduce risks associated with wildland fire.

MOUNTAIN PINE BEETLE IN LODGEPOLE PINE

By Irene Shonle, Director, CSU Extension, Gilpin County, and Taylor Stonehouse, Public Affairs Specialist, Arapaho-Roosevelt National Forest

Lodgepole pines (*Pinus contorta*) are one of the first trees to come in after a major disturbance such as a fire or insect outbreak, and they often grow as vast expanses of even-aged trees. Pure stands occur between 9,000 and 10,000 feet elevation, but the trees live anywhere between 6,000 and 11,000 feet. The average life span of a lodgepole pine tree is 250 years or less; after about 80 years, they become increasingly susceptible to stand-replacing disturbance events. In Colorado, the average age of lodgepole pine stands varies between 80 and 200 years, so it is easy to recognize that the stands are ripe for replacement.

Wanted: Stand Diversity

Under ideal conditions, fires help maintain a discontinuous landscape, with scattered stands of lodgepole pine at varying levels of maturity (seedlings, saplings, poles, and mature trees). But according to Arapaho-Roosevelt National Forest South Zone Silviculturist Kevin Zimlinghaus, the absence of fire and other factors has left current lodgepole pine populations with little variation in age or tree size, which has weakened the stands. The mountain pine beetle (MPB) has taken advantage of these more susceptible stand conditions, a major factor in the current infestation.

Most scientists agree that active vegetation management is unlikely to stop the spread of the current MPB outbreak in lodgepole pine, because the outbreak covers such a vast land area and is spreading so rapidly. Although the outbreak is

unlikely to be stopped by removing infested trees, retaining large areas of standing dead timber near forested communities is also not desirable. It is still a good idea to remove dead and newly infested trees, where possible. To promote maximum diversity for the future forest, save and replant with species other than lodgepole pine.

To Thin or Not to Thin?

Natural stands of lodgepole pine are typically very dense and self-thin only slowly with age—current stand densities are actually close to normal. It is possible to thin lodgepole pine forests, but the trees have shallow root systems and those remaining in stands that have been thinned too much could blow over when exposed to the high winds common along the Front Range. Give careful consideration to when and how you thin your lodgepole pine forest.

The best way to achieve a low-density lodgepole pine forest is to start to thin regularly when trees are small saplings, and then maintain appropriate densities as the trees mature. In the next few years, homeowners will have a chance to manage regenerating trees for optimal future forest health as mature trees die from pine beetle attacks.

Younger trees may improve their vigor and become more resistant to MPB infestation as a result of the less-crowded growing conditions that follow thinning. In order for trees to have time to respond to improved growing conditions, thinning must be done well in advance of beetle attacks—this may be a minimum of 5 years or more.

In older stands, it may be too late to greatly improve a tree's chances at fending off the beetle. Older trees are less likely to "release" or start growing more vigorously unless competing trees around them are removed early.

Patch Cuts

A homeowner might want to consider using patch cuts rather than thinning in established lodgepole forests. Patch cuts are used to create "holes" in the landscape to allow regeneration of lodgepole pine and other species. Depending on property size and management objectives, one might accomplish this by clearing a full 5-acre area or by removing a small group of trees to improve defensible space. Patch cuts can be used as a tool to produce a mosaic of stand development stages and a diversity of trees, thereby creating diverse wildlife habitat and a healthier lodgepole pine ecosystem. Where aspen are present, patch cuts can promote aspen growth, as aspen trees share lodgepole pine's preference for full sun and thrive in disturbed, open areas. Flowers, grasses, and shrubs also will move into the open spaces.

A recent report titled "Lodgepole Pine Management Guidelines for Land Managers in the Wildland-Urban Interface" discusses management recommendations for this forest ecosystem. The document applies to lodgepole stands in the wildland-urban interface prior to, during, and after a MPB attack. The publication is available in the Colorado State Forest Service online library at <http://www.csfs.colostate.edu>.

Lodgepole Pine (*Pinus contorta*)

Bark	Light brown, thin, with many small scales
Needles	Yellow to dark-green evergreen needles 1 to 3 inches long Sharply pointed, stiff, stout, slightly flattened, often twisted Two needles in a bundle
Cones	Shiny, yellow-brown ¾ to 2 inches long Egg-shaped with raised, rounded cone scales and a tiny point Often remain closed on the branch; persistent
Elevation Range	6,000 to 11,000 feet
Tree Height	20 to 80 feet
Typical Habitat	Well-drained soils at high elevations, often in pure lodgepole stands



MOUNTAIN PINE BEETLE IN PONDEROSA PINE

By Jeff Witcosky, Entomologist, U.S. Forest Service

Mountain pine beetles (MPB) are on the increase in Front Range forests. Many homeowners in forest settings have seen the severe mortality in high-country lodgepole pine forests and now wonder whether their lower-elevation ponderosa pine forests will face a similar fate.

Unfortunately, recommendations and suggestions for managing ponderosa pine may prove variable in their rate of success over the course of the current beetle epidemic. This epidemic has been extremely severe in its intensity (percentage of trees killed in a given area), extent (area impacted), and duration (in excess of 12 years and counting in lodgepole pine). Mountain pine beetle populations are at very high levels; each summer, beetles seek out living trees to attack and in which to produce their brood. At best, we can hope that the suggested treatments will reduce the losses from MPB, leaving more live trees when the epidemic subsides.

Forest Structure

The structure of ponderosa pine forests is different from lodgepole pine forests. Along the Front Range, ponderosa pine does not occur in vast expanses of continuous forests characteristic of the dense lodgepole pine forests found in the high country. Ponderosa pine stands tend to be patchy and open, and of variable age and size, and individual tree canopies tend to be separated from one another.

Ponderosa pines growing in open conditions create an environment that is less attractive to dispersing MPB. Entomologists believe that the elevated levels of sunlight and higher temperatures at the

bark surface in an open forest stimulate beetles to continue their dispersal flight, rather than remain in the stand. In contrast, ponderosa pines growing in dense, overstocked stands provide more attractive environmental conditions for dispersing beetles.

Ponderosa pine restoration treatments, which return overstocked stands to more open and sustainable growing conditions using thinning and prescribed fire, should reduce losses of trees to the MPB under most conditions. If homeowners are considering restoration treatments, it is advisable that they act sooner rather than later, when beetle populations are likely to be much higher.

Managing for Beetles

Is it beneficial to identify and remove beetle-infested trees from a ponderosa pine stand each year? Entomologists are in general agreement that the routine removal of MPB-infested trees from a stand is valuable in reducing the overall impact from this bark beetle, even for ponderosa pine stands that have been opened up through a restoration treatment.

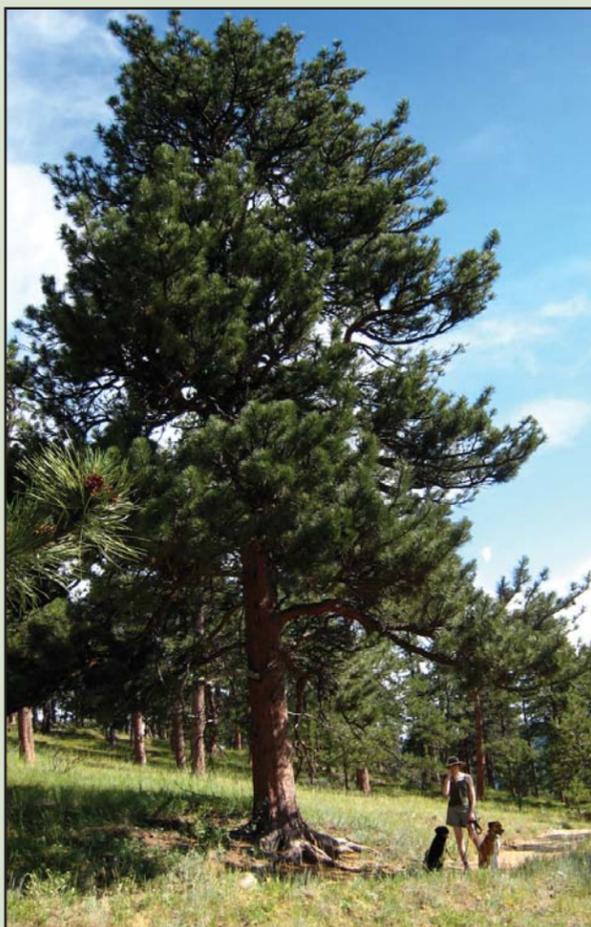
One final cautionary note: it appears that MPB are moving in large numbers from high-elevation forests into low-elevation ponderosa pine forests via upper-level air currents. This means that beetles may show up “out of nowhere” at any location along the northern Front Range ponderosa pine belt. This long-distance transport of beetles makes it imperative that forest landowners examine their trees each year during late summer and fall to look for and remove newly infested trees.

What Will Happen to Ponderosa Pine Forests?

When will the current MPB epidemic finally subside, and what will our ponderosa pine forests look like once the epidemic is over? Truthfully, no one can answer these questions with any degree of confidence. Barring an unusual event, such as very cold and prolonged winter temperatures (-30°F or colder) that kill beetle larvae under the bark, the epidemic is likely to continue for another 5 to 10 years. Regarding the cumulative impact of the MPB epidemic on Front Range ponderosa pine, the following generalizations appear to apply:

1. Ponderosa pine mortality is likely to be variable across the landscape, with areas of high mortality intermixed with areas of more moderate mortality.
2. Dense forests are likely to experience higher levels of mortality than open stands.
3. Larger-sized ponderosa pines (greater than 7 inches diameter at 4.5 feet above the ground) will experience the most severe losses, and smaller trees (trees 7 inches in diameter and smaller) will experience less severe losses.
4. Ponderosa pine stands adjacent to large-diameter lodgepole pine stands sustaining high levels of MPB-caused mortality are likely to experience higher losses than those at a distance from beetle-infested lodgepole pine stands.

Ponderosa Pine (*Pinus ponderosa*)



Bark	Young trees: Dark and thin Mature trees: Red-orange; nearly 3 inches thick; furrowed into large, flat, scaly plates; often smells like butterscotch
Needles	Dark yellow-green, stiff evergreen needles 3 to 7 inches long Two to three needles in a bundle, forming tufts near ends of branches
Cones	Light red-brown 3 to 4 inches long Egg-shaped, with scales that have a sharp point Contain small, long-winged seeds



Elevation Range	5,000 to 9,500 feet
Tree Height	40 to 160 feet
Typical Habitat	Dry, nutrient-poor soils in open, park-like stands or in mixed-conifer stands with Douglas-fir, Rocky Mountain juniper, and spruce

NEIGHBORS HELPING NEIGHBORS: COMMUNITY ORGANIZATION CAN BE KEY TO YOUR SUCCESS!

By Ryan Ludlow, Forestry Education and Outreach Coordinator, Boulder County Land Use

With each passing year, more and more trees in Front Range forests are succumbing to attack by bark beetles. This exponential increase in tree mortality is quickly becoming a bigger job to deal with than any individual can address on his/her own. Bark beetles don't care about property boundaries; they care about finding new suitable host trees. Now, neighbors need to work together to accomplish the shared goal of making safer, more

livable communities.

Although the current bark beetle outbreak is more destructive than past outbreaks, we can still learn from outbreaks that took place in the 1970s and use past management strategies to fight the current infestation. In the 1970s, grassroots community groups developed strategies to fight the beetles. Neighbors worked with neighbors to remove thousands of infested trees from their private lands.

Communities were able to accomplish significantly more while working in concert instead of in isolation. Many people believe this unified effort helped reduce some of the impacts of that beetle outbreak. The current outbreak is more intense, but the same basic strategies can be implemented. Communities working together can have a positive impact on the health of our forests.



Neighbors work together to identify and remove infested trees.

Tips for Organizing Your Community

- 1. Use existing community networks** – Many communities already have established networks that can be a great starting point in creating your own bark beetle group. Regularly scheduled meetings, email distribution lists, and phone trees can be an extremely effective way to share current information about the beetle epidemic.
- 2. Find individual talents** – Working with the entire community will allow you to capitalize on the group's collective skills. Everyone has something to offer—some individuals are great at organizing and planning, others are good at cutting trees, and others might be good at motivating neighbors.
- 3. Seek power in numbers** – Cutting and hauling trees is demanding physical labor and can be overwhelming when working in isolation. Pool your resources and find equipment that your community already has available. Perhaps one neighbor has a tractor, another has a chainsaw, and yet another has teenage kids willing to haul slash. When communities work together, they can be a powerful force and accomplish much more work on the ground than any individual. In addition, neighbors working with neighbors might allow your community to get discounted rates on cutting, hauling, and chipping services. Forestry contractors might be able to offer discounted rates if they know they have an entire community to work with instead of just individual property owners.
- 4. Make your community safer** – We may not be able to stop the current bark beetle outbreak, but we can have a positive impact on our forests and the safety of our communities. We know bark beetles will kill thousands of Front Range trees, and these trees will begin to fall down over the next few decades. As these trees fall, they will pose a significant risk to a community's infrastructure and homes. By working together to remove these hazardous trees, you will help protect your neighborhood from wildland fire and make it a safer place to live.



Cutting and hauling trees is demanding physical labor. Pool community resources to make the job easier and more enjoyable.



FIRE BEHAVIOR IN BEETLE-INFESTED FORESTS

By Colorado State Forest Service Staff

Wildfires in Colorado are a natural element of our forest ecosystems and can help restore and maintain healthy forest stands. Although many forest lands historically and regularly experienced fire, the growing number of people, homes, and rural communities in the wildland-urban interface means that most fires now must be suppressed to protect lives and property.

For more than a decade, as we have continued to exclude fire from ecosystems, wildfire risk and severity in Colorado have increased. Wildfire behavior is always a complex process and varies depending on conditions such as wind, humidity, temperature, and vegetation (fuel) moisture at the time of the fire. Fire is always challenging to manage, and an even greater challenge exists now that mountain pine beetles (MPB) are part of the fire-behavior equation.

Severe drought during the past decade, accompanied by relatively warm temperatures in both summer and winter, has resulted in stressed trees and perfect conditions for MPB outbreak. The beetles prefer to feed on and breed in large trees with thick bark, and they have had an abundant food supply in Colorado's 1.5 million acres of aging lodgepole pine forests. The epidemic continues to impact Colorado's lodgepole and ponderosa pine forests and has resulted in high mortality in these stands, changes in forest structure and composition, and modification of fuels, which can affect fire behavior for decades.

Land managers are concerned about the probable impacts the MPB epidemic will have on fire behavior and fire hazard in infested stands. Even with information from beetle outbreaks in other locations, the science of fire ecology, and fire-behavior predictions, the degree of increased fire risk due to the epidemic has been a matter of debate. To protect lives and communities, public land managers and private landowners should prepare for the possibility of severe fire.



Fire severity depends on many factors—including wind, humidity, temperature, and fuel moisture.

Forest landowners can reduce hazardous fuels and snags by removing MPB-killed trees. As a first step to eliminate some of these hazards, landowners should establish defensible space around their homes.

For additional information about what you can do to actively manage your forest lands, reduce wildfire hazards, and restore forest health, visit the Colorado State Forest Service Web site at <http://www.csfs.colostate.edu> or contact your local CSFS district office.

Fuel Progression in Lodgepole Pine Forests

Experts agree that, during a dry season when needles, branches, and down wood are dry enough to catch fire, fire behavior in MPB-impacted lodgepole pine forests is likely to progress as follows:

Red Needle Stage

Within 8 to 10 months after a successful beetle attack, pine needles, which contain flammable chemicals, dry out and turn red to reddish brown. The needles can remain on trees for 3 to 5 years. With these dry fuels, if wind, low humidity, or high temperatures exist, relatively benign ground fires could transition into independent crown fires (fires in tops of trees).

Gray Tree Stage

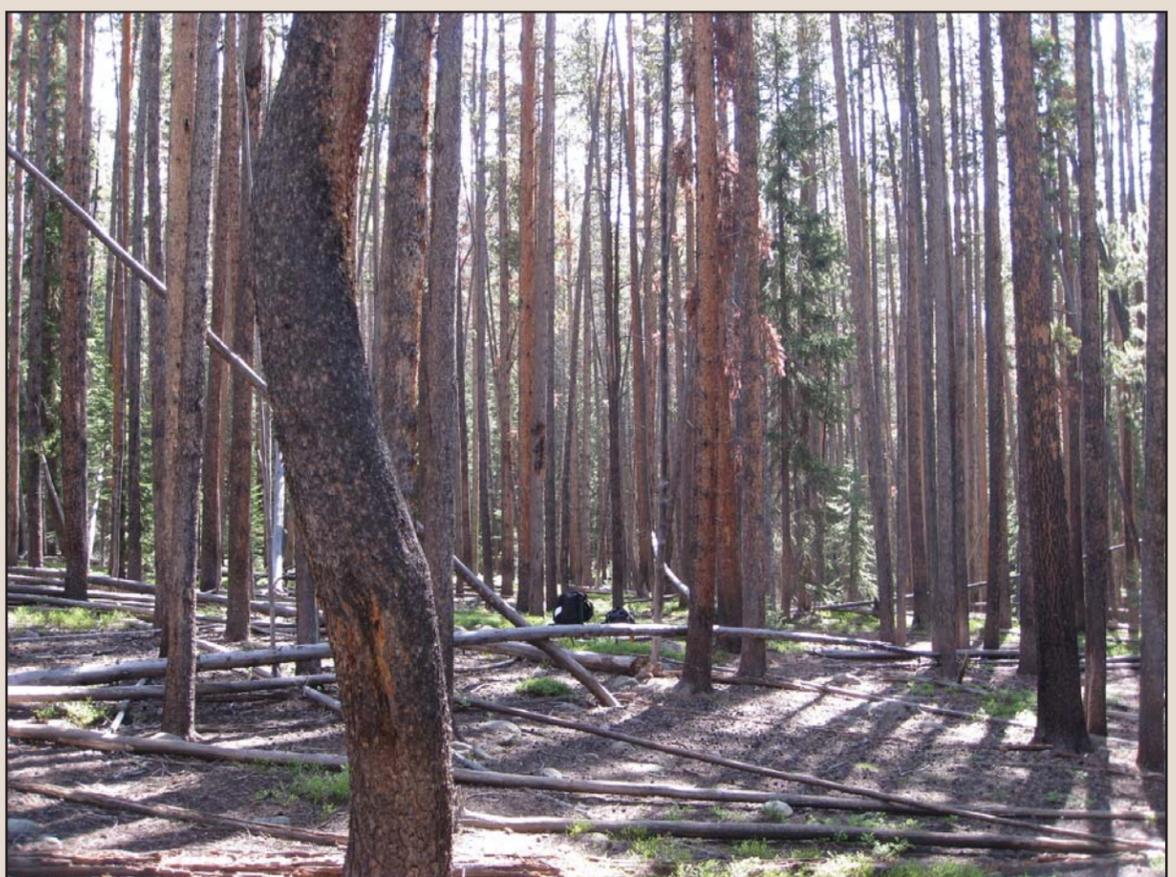
Once the dry needles fall off the trees, it is hard for trees to ignite. Fire behavior is expected to be much more subdued and predictable for this period of time, and the stand will not sustain a crown fire. The increase in available large fuels could result in slower-moving but potentially more intense fires that are hard to control. The number of standing dead trees (snags) greatly increases during this stage, creating a hazard for firefighters.

Down-and-Dead Stage

As trees weaken and fall down, logs and large branches accumulate on the ground. These heavy fuels increase the risk of hot surface fires that are hard to control. The heavy fuels likely will be in contact with lighter, flashy fuels like grasses, flowers, and seedling trees that grow more vigorously as a result of the added sunlight and moisture available in dead stands. The combined

increase in surface temperature and decrease in fuel moisture also may increase the probability of both human and natural fire ignitions. Wildfires can be intense, long, and difficult to suppress, and may cause severe soil damage.

Falling trees and large fuels on the ground threaten firefighter safety. These fuels also create special challenges for fireline construction and firefighter access.



During the down-and-dead stage, falling trees are a threat to firefighter safety.

DEFENSIBLE SPACE CAN ALWAYS BE IMPROVED

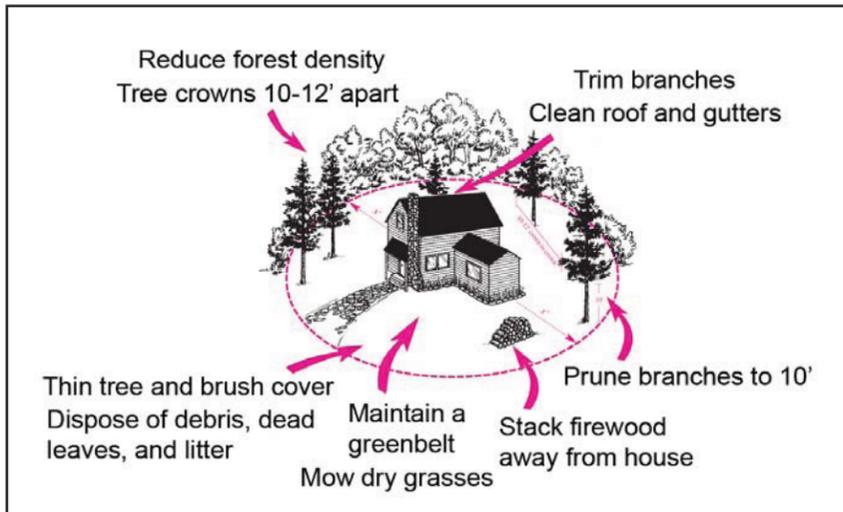
By Colorado State Forest Service Staff

Forest and fire management agencies encourage individuals and groups to be proactive in their efforts to create defensible space and reduce hazards from wildfire and falling trees around homes, businesses, utilities, infrastructure, and other high-value properties.

Defensible space is an area in which fuels and vegetation are treated, cleared, or reduced to slow the spread of wildfire toward a structure. Defensible space also can reduce the chance of a structure fire spreading to the surrounding forest and provides a safe area for firefighters to do their jobs. Your house is more likely

to survive a wildfire if grasses, brush, trees, and other common forest fuels are managed to reduce a fire's intensity.

Defensible space can reduce wildfire hazard in all forest types, and does not mean that your landscape has to be barren. To learn how to create defensible space around your home, contact your local Colorado State Forest Service district office or visit the CSFS Web site at <http://www.csfs.colostate.edu>. Go to Resources for Homeowners & Landowners, then click on Protect your Home, Property & Forest from Wildfire.



Taking these actions...

...could save this home.



COMMUNITY WILDFIRE PROTECTION PLANS—WHAT DO THEY MEAN FOR YOU?

By Colorado State Forest Service Staff

Community Wildfire Protection Plans (CWPPs) offer one of the best opportunities to tackle threats to wildland-urban interface (WUI) communities. The plans identify and prioritize hazardous fuels reduction project areas; determine values at risk; rank priorities for management actions; and assess current levels of preparedness.

The process for developing CWPPs requires collaboration between community members, fire districts, and local, state, and federal government representatives. Community members are main contributors to the process, which helps build local relationships and capacity to better prepare individuals and communities to protect life, home, and property. The Colorado State Forest Service and federal agencies have grants and programs that support counties and communities in CWPP development and implementation.

Communities that work through the CWPP process realize many benefits. Communities can define their own WUI area based on what is important to them, and because CWPPs are developed on a landscape scale, the plans can include private, state, and federal lands. Federal agencies are directed to give priority to fuels reduction projects that are tied to CWPPs and the values they identify.

Defensible space is a key element to the success of any CWPP. Follow the standard FireWise guidelines (available at <http://www.csfs.colostate.edu/pages/wildfire.html>) to mitigate impacts to your property and home that could result from wildland fire. These actions give firefighters a safe area to fight a fire and give your home the best chance for survivability.

Communities should review and update CWPPs as they complete the action items and fuels treatments identified in the plan. Updated plans are an invaluable

resource for firefighters when protecting a community involved in a wildland fire.

Visit the Rocky Mountain Wildland Fire Information Web site at <http://www.rockymountainwildlandfire.info> to search the grants database and access other wildland fire-related information. The site offers a calendar of events, training opportunities, fire management resources, media tools, featured news, and links to related Web sites.

Currently, more than 140 CWPPs have been completed in Colorado. Check with your local fire protection district or homeowners association to see if one has been developed for your area or to learn how you can participate in developing a plan. A list of all Colorado CWPPs by county can be found at <http://www.csfs.colostate.edu/pages/CommunityWildfireProtectionPlans.html>. If you have any questions about CWPPs, please call the Colorado State Forest Service at 970-491-6303.

BENEFITS OF FIRE TO FOREST HEALTH

By Colorado State Forest Service Staff

Colorado is home to many species that rely on periodic fire to maintain their health and overall wellbeing. From tree species that depend on fire to release their seeds, to animals that depend on fire to open up habitat, fire plays many roles.

Fire can be both beneficial and destructive, depending on the severity of the disturbance. The short-term effects may seem negative—fire often appears destructive to habitat and causes injury or death to some living organisms. However, fire is nature’s way of restoring ecosystem health. Its long-term benefits may not be visible for a few months or for several years, even as positive changes take place.

Above the ground, fire can have huge visible impacts. But, even when fire kills standing trees, it may benefit a site by thinning dense stands of timber to let the remaining trees thrive. Periodic surface

fires limit the accumulation of fuel in some conifer stands, and fire can promote stand diversity, which may help deter outbreaks of insects and disease.

Many of the less-obvious benefits of fire occur at or below the soil surface. Some happen almost

immediately—fire consumes dead and accumulating litter and releases essential nutrients to the soil. After the fire, the increased rate of nutrient cycling resulting from the disturbance stimulates new growth in grasses, flowers, and trees. Fire prepares seedbeds by exposing mineral soil and eliminates competition from shade-tolerant and fire-sensitive tree species. Fire helps regenerate stands by stimulating root growth and seed germination.

Over the last century, fire suppression in low-elevation forest types has resulted in dense forest stands and the accumulation of fallen timber and woody debris on the forest floor. Heavy fuel loads such as these can increase fire severity in a forest. Managed fire, used in conjunction with other forestry practices like thinning and pruning, can improve forest health and decrease the risk of severe fire.



Firefighters monitor a prescribed fire on county open space land.

Colorado’s Fire-Dependent Ecosystems

Fire behavior changes based on many biological and physical variables. The effects of fire on an ecosystem largely depend on species composition, fuel availability, and fire frequency. Two of Colorado’s most common forest types, lodgepole pine and ponderosa pine, are both fire-dependent ecosystems, but their fire regimes and species adaptations are vastly different.

Lodgepole pines grow in dense stands at high elevations, where plant growth is rarely limited by moisture. Fuels (both living and dead trees) are always available in these stands, and fires can spread because there is very little space between tree canopies. In these ecosystems, fire occurrence is limited by climate—only during very hot, dry years can the fuels dry out sufficiently to burn. When fires do occur in these systems, the dense stand structure and large amounts of fuel make

it possible for entire forest stands to burn. Lodgepole pines are adapted to these infrequent, high-intensity fires by producing serotinous cones, specialized cones that remain closed on branches for many years. When exposed to the high heat of a fire, the resin on the cones melts, causing the cones to open. Seeds fall on the bare soil, where it is easy for them to germinate without competition.

Front Range ponderosa pine forests take many forms. At low elevations, frequent surface fires maintain low-density stands and remove fuels like grasses and dead wood from the understory. At higher elevations, fires burn less frequently, allowing more trees to grow and more fuel to build up between fire events. Fires in ponderosa pine forests at higher elevations naturally vary from low to high severity. Ponderosa pines have adapted to more frequent fires by shedding their lower branches and developing thick, cork-like bark that insulates the tree and allows mature trees to withstand all but the most severe fires.

MOUNTAIN PINE BEETLES ALSO LIKE URBAN PINE TREES

By Keith Wood, North Area Community Forester, Colorado State Forest Service

The native mountain pine beetle (MPB) currently is at epidemic levels from New Mexico into Canada. Over the past few years, it has also been found in urban areas along the northern Front Range. In 2006 and 2007, MPB sporadically attacked trees in Fort Collins. Most of the attacks were attributed to infested firewood that was transported from mountain areas. However, in late 2008, many northern Colorado communities—Denver, Boulder, Longmont, Berthoud, Loveland, Greeley, Windsor, Wellington, and especially the Fort Collins area—reported that multiple trees were attacked by MPB. Due to the sharp increase in the number of attacks in 2008, experts believe that a strong wind event carried the beetles from Colorado’s high country to Front Range communities.

It appears that Scotch (Scots) pine is the preferred host tree for MPB in urban areas, but some attacks are occurring in ponderosa pine and other pine species that grow in northern Colorado communities. In August 2009, MPB was spotted in ponderosa pine as far east as Logan County.

To increase tree defenses against MPB, use good watering practices throughout the year—even during the winter months. This fall, help stop the transport of infested firewood. Let friends and neighbors know that transporting firewood from the mountains to the Front Range also brings the MPB into our communities.

What to do if Your Pine Tree is Infested

First, assess the pine tree in question. If the tree is completely dead, with red or no needles, it no longer is a threat because the MPB have already flown out

of the tree. If the needles are green and the pine tree shows symptoms of heavy infestation—many pitch tubes and boring dust on the main trunk—then MPB larvae probably are developing under the bark.

Treatment options include cutting, debarking, and chipping the tree if it is heavily infested. The idea is to kill the larvae so the beetles do not develop to the adult stage and infest new pine trees next season.

No registered chemicals are available to treat trees that are heavily and successfully infested. If pine trees in your neighborhood are infested, but yours are only lightly infested or not yet infested at all, you can protect them from future infestation by using a chemical labeled for MPB. Such chemicals include carbaryl, permethrin, and bifenthrin. Spraying should be administered before July when the beetles emerge and begin to fly. The spray is effective for 1 year, and should only be applied by a certified, licensed applicator to a handful of your high-value trees. If you live by a stream or lake, or your neighbors are sensitive to chemicals, spraying may not be an option.

If you have questions or concerns about MPB in your trees, contact:

- Your local city or county forester,
- A local, licensed, ISA-certified arborist,
- Your local Colorado State Forest Service representative, or
- Your local CSU Extension office.



USING WOOD FROM BEETLE-INFESTED FORESTS

By Colorado State Forest Service Staff

The sale of wood products generates four billion dollars in revenue annually in Colorado. Yet 90 percent of those products, including blue-stain, do not originate in Colorado.

Now, as communities and forest land managers across the West remove dead trees from private and public forests impacted by MPB, efforts are underway to

put this local wood to use. Local wood can be used as lumber or in community biomass and wood pellet heat generators. In addition, private forest landowners, local communities, state and local governments, and wood products businesses are exploring opportunities to manufacture, market, and sell wood products made of Colorado blue-stain wood.

About Blue-Stain Wood

Both MPB and Ips beetles introduce the spores of blue-stain fungi to pine trees when they attack. The fungi grow in the tree's moist outer wood, spreading and staining the wood an attractive faded-blue color.

Blue-stain fungi are not mold and do not cause wood to decay or rot. They are harmless to wood products and people, and the fungi usually are dead by the time wood leaves the manufacturer. The blue discoloration does not affect the wood's strength. Certain paints, stains, and wood preservatives can be used to either mask or enhance the blue coloring, depending on the user's personal preference.

What Can Be Produced From Beetle-Killed Trees?

In many wood markets, the presence of blue-stain is a valuable attribute to consumers. Blue-stain wood can be used for many of the same products as non-stained wood, and blue-stain can enhance products like furniture, wood cabinetry, flooring, wall paneling, and creative novelty or gift items. Fuelwood and biomass markets can also use beetle-killed wood.

Forest health and economic returns will increase with consumer knowledge about the benefits of buying local wood products. Awareness also will help overcome negative perceptions concerning the appearance, use, and durability of blue-stain wood products.

Promoting Use of Colorado-Grown Wood

A commitment to sustainable management of Colorado's forest land will foster the growth and development of an industry that utilizes more local wood. Businesses can turn Colorado's dead trees into useful forest products, helping to offset the costs of forest management and boosting our state's economy.

Colorado Wood Utilization and Marketing Program (CoWood)

CoWood facilitates the retention, expansion, and recruitment of forest and wood products businesses. Through applied research, technical and business assistance, and education and outreach to Coloradans, CoWood positively impacts Colorado's forest management, forest conditions, and forest and wood products economies.

For more information about CoWood, visit the CSFS Web site at <http://www.csfs.colostate.edu/cowood> or contact your local CSFS district office.

Colorado Forest Products™ Program

Colorado Forest Products (CFP™) is the only statewide program that campaigns on behalf of local, wood-based businesses. At least 50 percent of wood used to manufacture their products comes from public and private forests in Colorado. The program also informs consumers about how purchasing wood products from these CFP™ member businesses can benefit our local forests.

For more information about CFP™, visit <http://www.coloradoforestproducts.org>.

Peak to Peak Wood Program

Peak to Peak Wood is a collaborative effort between Boulder, Clear Creek, Gilpin, Jefferson, and Larimer counties to create markets for wood products that are generated from forest management projects on public and private lands. Peak to Peak helps operate public wood collection and sort yards in the five Front Range counties to reduce fuels treatment costs.

For more information about Peak to Peak Wood, visit <http://www.peaktopeakwood.org>.



Blue-stain logs are strong and sound and can be used for furniture, flooring, and cabinetry.



Businesses offer a variety of local wood products.

Online Resources and Contact Information

For frequently asked questions and additional information about bark beetles and bark beetle contacts please visit <http://www.FrontRangePineBeetle.org>

Boulder County

Colorado State Forest Service–Boulder District: 303-823-5774
Boulder County Land Use: 303-441-3930

Clear Creek and Jefferson County

Colorado State Forest Service–Golden District: 303-279-9757, 303-279-2011
Jefferson County Weed & Pest: 303-271-5989

Gilpin County

Colorado State Forest Service–Boulder District: 303-823-5774
CSU Extension, Gilpin County: 303-582-9106

Larimer County

Colorado State Forest Service–Fort Collins District: 970-491-8660
Larimer County Natural Resources: 970-498-5765

This publication represents a cooperative effort involving private landowners and:

