REPORT OF THE ROCKY MOUNTAIN REGION (R2) 2014 FOREST HEALTH CONDITIONS

R2-SPF-TR-15-RO-31

This Report of 2014 Rocky Mountain Region (R2), Forest Health (FH) Conditions is a compilation of 18 smaller reports, distributed throughout the region and are grouped into 4 sections.

SECTION 1 of this report contains 12 reports about the 2014 FH conditions on the R2 National Forests (NF); these were sent to the Forest Supervisors and staff of each of the Region's national forests. These reports were produced by the 3 FHP Service Centers in the Region that assist national forest managers with their FH concerns. Section 1 contains the original reports with figures, maps and photos labeled as in the original reports written by R2 FHP Service Centers.

SECTION 2 is a compilation of the 2014 Forest Health Highlights (FHH) Reports produced by the 5 states in the Rocky Mountain Region: Colorado, Kansas, Nebraska, South Dakota, and Wyoming. These Forest Health Highlights reports were brief reports produced by FH specialists in the various state forestry agencies and posted on the FH Monitoring website. http://fhm.fs.fed.us/

SECTION 3 is the original 2014 Aerial Detection Survey Summary for the Rocky Mountain Region (R2). The original page numbers that were used are still used here to coordinate with the Table of Contents used in the original 2014 Aerial Detection Survey Summary.

SECTION 4 contains additional documentation used to meet requirements for all US Government reports It also contains acknowledgements to all of the contributors of this compilation report.

Section 1

Reports to National Forests in the Rocky Mountain Region

2014 Forest Health Conditions Highlight: Arapaho-Roosevelt National Forests

USDA Forest Service
Rocky Mountain Region
Forest Health Protection
Lakewood Service Center
740 Simms Street
Golden, CO 80401

Conditions Highlights

In 2014, spruce beetle activity continued to increase to 20,300 acres on the Arapaho-Roosevelt National Forests (ARNF) predominately in Grand (18,000 acres) and Larimer (24,000 acers) Counties (Map 1). Numerous windthrow events since 2011 have increased the potential for spruce beetle activity through much of the Region and predominately dry conditions continue to stress high-elevation mix-conifer forests.

Overall tree mortality associated with mountain pine beetle (MPB) declined throughout Colorado to levels observed prior to the recent outbreak (15,000 acres). The majority of MPB activity that was observed on the ARNF occurred in Larimer (10,000 acres) and Boulder (980 acres) Counties.

Dwarf mistletoe continue to be one of the most common and damaging diseases in lodgepole, limber, and ponderosa pine on the ARNF. A great opportunity exists for managing and reducing the impacts of this disease while the forest conducts vegetation management in campgrounds, administrative areas, and in the forest following the bark beetle epidemic.

White pine blister rust (WPBR) continues to spread and intensify in limber pine in northern Colorado. The disease is well established in Colorado near the Wyoming border but new infection centers have been identified in Allenspark in 2015, Rocky Mountain National Park in 2010, Ward, CO in 2006, and just east of Estes Park in 2005. Blister rust has not been identified on Rocky Mountain bristlecone pine in northern Colorado but infected bristlecones have been confirmed in the Great Sand Dunes National Park and Preserve. FHP continues to monitor the distribution, severity, and impacts of this disease.

Aerial Detection Survey Highlights

- Spruce beetle activity increased in Colorado and southern Wyoming from 404,000 acres in 2013 to 494,000 acres in 2014
- Mountain pine beetle activity in Colorado and southern Wyoming decreased to 18,000 acres in 2014

- Western balsam bark beetle or subalpine fir decline activity occurred on 180,000 acres in 2014

FHP Projects

- FHP staff have recommended considering reassessing need for chemical spray for individual tree protection and support moving to an application every other year if MPB activity continues to decline.
- FHP staff assessed spruce blowdowns at Guenella Pass for developing spruce beetle. This activity will continue into 2015.
- The USFS (Rocky Mountain Research Station, Dorena Genetic Resource Center, and FHP) and the National Park Service are actively collaborating to identify WPBR resistance in limber and bristlecone pine families in the Region. A high level of rust resistance has been confirmed in some limber and bristlecone pine families on the ARNF.
- FHP and the Rocky Mountain Research Station continue to use verbenone to protect trees with confirmed resistance to WPBR from MPB on the Boulder, Canyon Lakes, and Clear Creek Ranger Districts.

Surrounding Area Conditions of Note

- Rocky Mountain National Park continues to manage high-value, high-risk pines predominately near historic structures and campgrounds with carbaryl or verbenone to prevent mountain pine beetle activity.
- Trees damaged during the September 2013 flood event may become more susceptible to insects and diseases of concern for neighboring forests.
- Douglas-fir tussock moth activity has been observed in the area northwest of Boulder.
- Emerald ash borer, a federal regulated pest, has been detected in the city of Boulder. Boulder County is under quarantine for the movement of ash material and all hardwood firewood that does not meet treatment standards outlined in the quarantine rules.
- WPBR resistance in limber and bristlecone pine families is being verified at a revitalized CCC nursery on the Medicine Bow National Forest. Seed from resistant families (tested and confirmed in OR) from throughout the Southern Rockies, including families from the ARNF, was sown and seedlings grown at the Colorado State Forest Service Nursery. The seedlings will be periodically assessed for signs and symptoms of WPBR over the next 10 years.
- Several recreation sites associated with RMNP and other National Forests have been inspected and identified the need for hazard tree removal.

Recent Reports and Resource List

Forest Health Protection (FHP), in cooperation with the Colorado State Forest Service, Wyoming State Forestry, and other partners, compiles a Forest Pest Conditions report for the Region each year. They also conduct an annual aerial forest health survey, ground surveys and site visits to

identify and map insect and disease-caused tree mortality and damage throughout the Region. The following is a list of recent reports and resources available.

- LSC-FY15-3 Evaluation of FY14 Bark Beetle Projects in Rocky Mountain National Park
- LSC-FY14-3 Forest Health Conditions in a Forest Stand near Nederland Elementary School, Clear Creek Ranger District, Arapaho-Roosevelt National Forest
- LSC-FY14-2 Forest Health Protection Visit to Canyon Lakes Recreation Sites
- RMRS and FHP are in the process of developing a Limber Pine Conservation Strategy for Rocky Mountain National Park that is relevant to the ARNF
- Guide to Dwarf Mistletoes Ecology and Management in the Rocky Mountain Region
- Forest Health Protection
    - Other Forest Condition Reports
    - Other Regional Reports
    - Aerial Detection Survey
        - Shapefiles
        - Data tables by state, county, and forest available by request
    - Mapping and Reporting
- Forest Health Technology Enterprise Team
    - Risk Map
    - National Forest damage Agent Range Maps
    - Forest Pest Conditions

We look forward to continued work with the ARNF regarding your forest insect and disease concerns. Please do not hesitate to contact us with your inquiries.

Lakewood Service Center
- Jim Kruse, Group Lead, jkruse@fs.fed.us, 303-236-9541
- Sky Stephens, Entomologist, ssstephens@fs.fed.us, 303-236-9552
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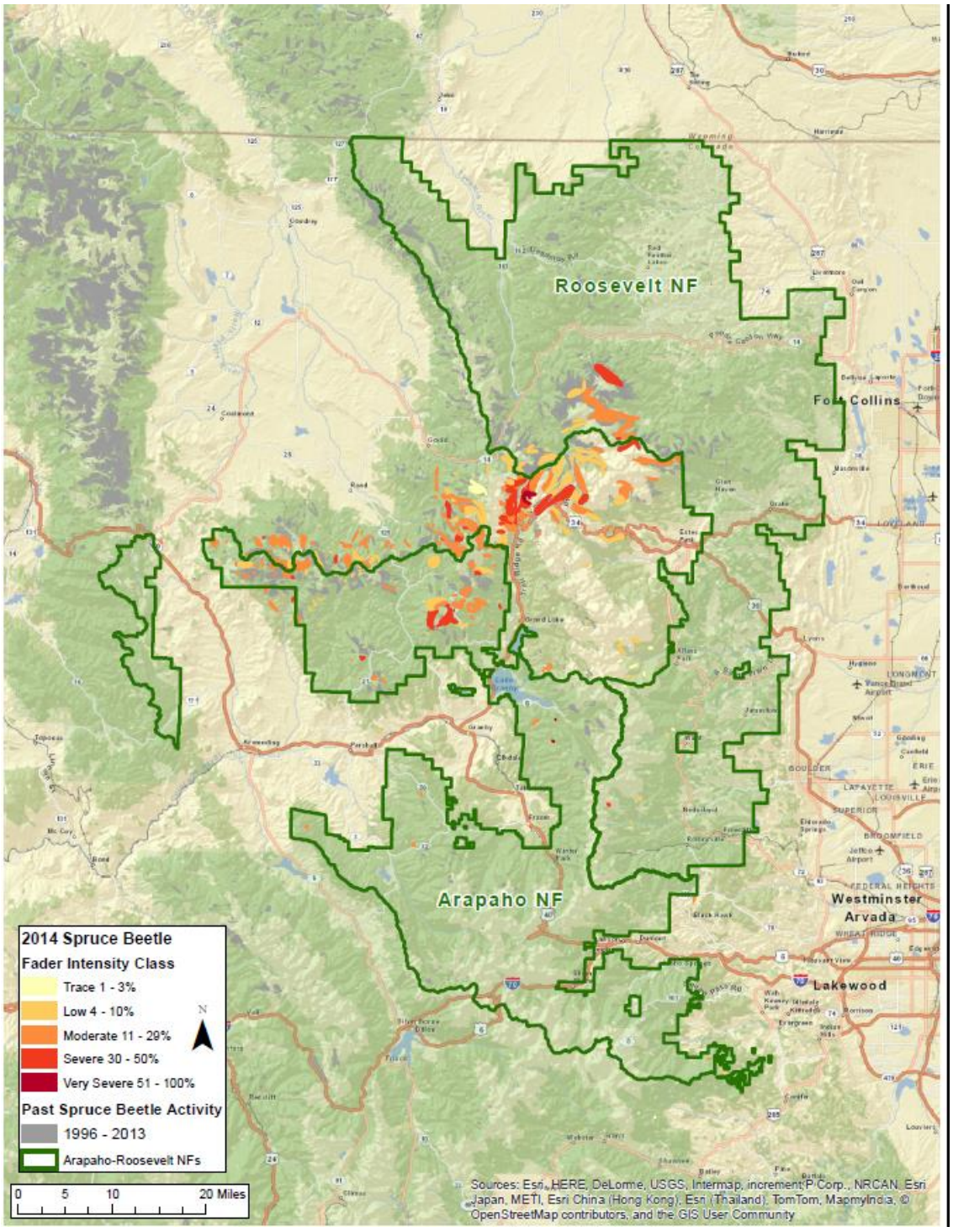
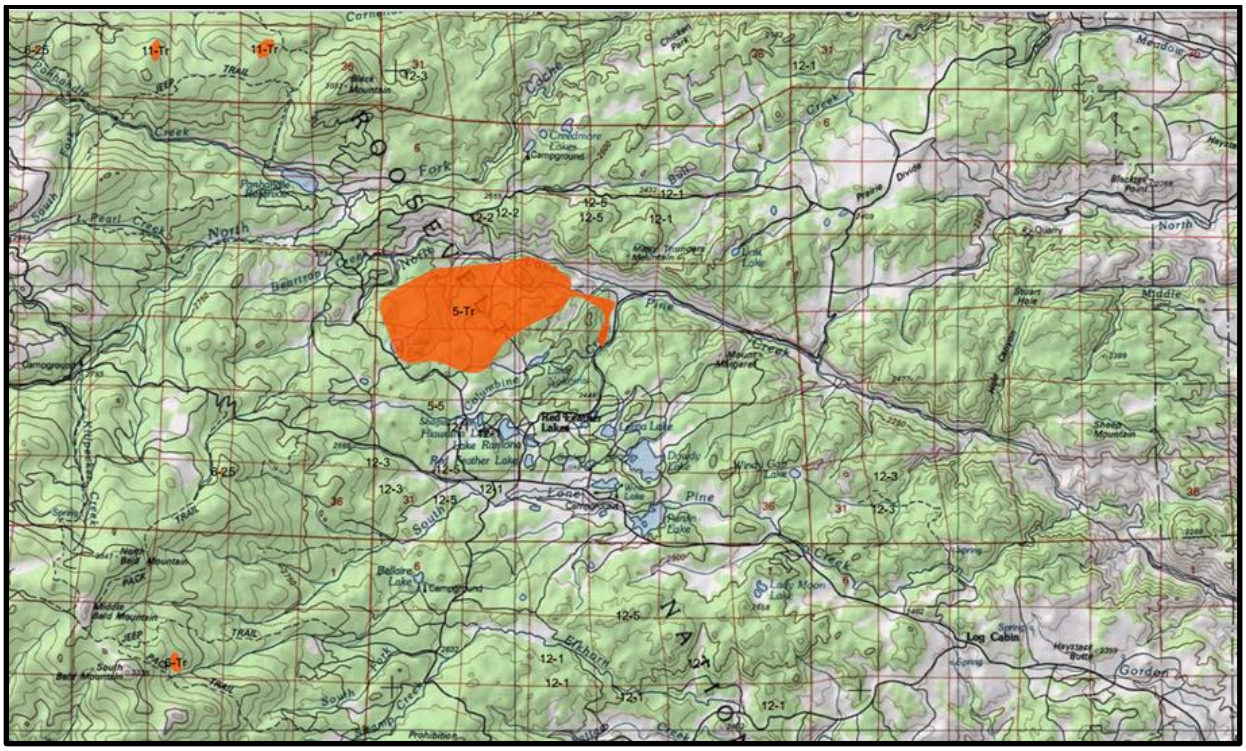
- Justin Hof, Biological Science Technician, justinhof@fs.fed.us, 303-236-8053

Appendix 1

Maps



Map 1. 2014 spruce beetle activity on the ARNF by severity class.



Map 2. Trace (1-3% area impacted) mountain pine beetle activity in ponderosa (5) and lodgepole (6) pines near Red Feather Lakes in 2014 may impact management at ARNF recreation sites.

Photos

Figure 1. Recent blowdown in spruce at Guenella Pass is being examined for developing spruce beetles. Clear Creek County, CO. 2014. Photo: Sky Stephens

Figure 2. Gray overstory in lodgepole stand typical of areas heavily impacted by MPB activity. Note relatively minor impacts in regenerating clearcuts. Arapaho N.F. east of Branch Reservoir, CO. 2013. Photo: Justin Backsen

2014 Forest Health Highlights: Bighorn National Forest

USDA Forest Service, Rocky Mountain Region, State & Private Forestry – Tribal Relations
Forest Health Protection, Rapid City Service Center,
8221 S Highway 16, Rapid City, SD 57702

Insect & Disease Conditions

- Large areas of the Bighorn National Forest were unaffected by bark beetles in 2014 (**Fig. 3** – ADS map), but the forest still remains susceptible to damage by these insects.
    - Western balsam bark beetle is causing significant mortality in subalpine fir; 3,300 acres affected. In other forests, Armillaria root disease is contributing to subalpine fir mortally, but this disease is less common in subalpine fir in the Bighorn National Forest (**Fig. 1**).
    - Ponderosa, lodgepole, and limber pine tree mortality caused by mountain pine beetle decreased on the Forest to 120 acres, mostly in the northeast (**Fig. 1**).
    - Pine engraver beetles (*Ips* sp.) were detected in lodgepole pine in the southeast.
    - Only 1 acre of spruce bark beetle and no Douglas-fir bark beetle damages were observed during the 2014 aerial survey. There is continued use of MCH to protect high value areas as remnant beetle populations subside.

Figure 1. Tree mortality caused by mountain pine beetle and western balsam bark beetle on the Bighorn National Forest.

- Dwarf mistletoe disease continues to causes extensive damage to lodgepole throughout the Bighorn National Forest. Treatment of infected stands occurs across the forest.
- White pine blister rust disease, caused by an exotic invasive fungus, is found in most limber pines stands and causes extensive mortality in Ten Sleep and Shell Canyons. However, some of the limber pine trees appear to be resistant to the disease (**Fig. 2**).
- Comandra blister rust disease is common and damaging in lodgepole pines, though the disease incidence is decreasing; likely due to low infection rates and tree mortality.

Figure 2. White pine blister rust disease causing some limber pine mortality on the Bighorn NF.

For Additional Information and Assistance:

An excellent resource that provides more detailed information on these and other forest insects and forest diseases is the "Field Guide to Diseases & Insects of the Rocky Mountain Region". This publication contains illustrations and descriptions of the damage agents, guidelines for management and a brief introduction to the literature concerning the pertinent topics. This document may be obtained in soft cover format from Rocky Mountain Region Service Centers, or may be seen or downloaded from the site: http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/insects-diseases/?cid=stelprdb5176420

The **Rapid City Service Center** continues to monitor the status of forest health throughout the Bighorn National Forest.

For additional information, please do not hesitate to contact the Rapid City Service Center:

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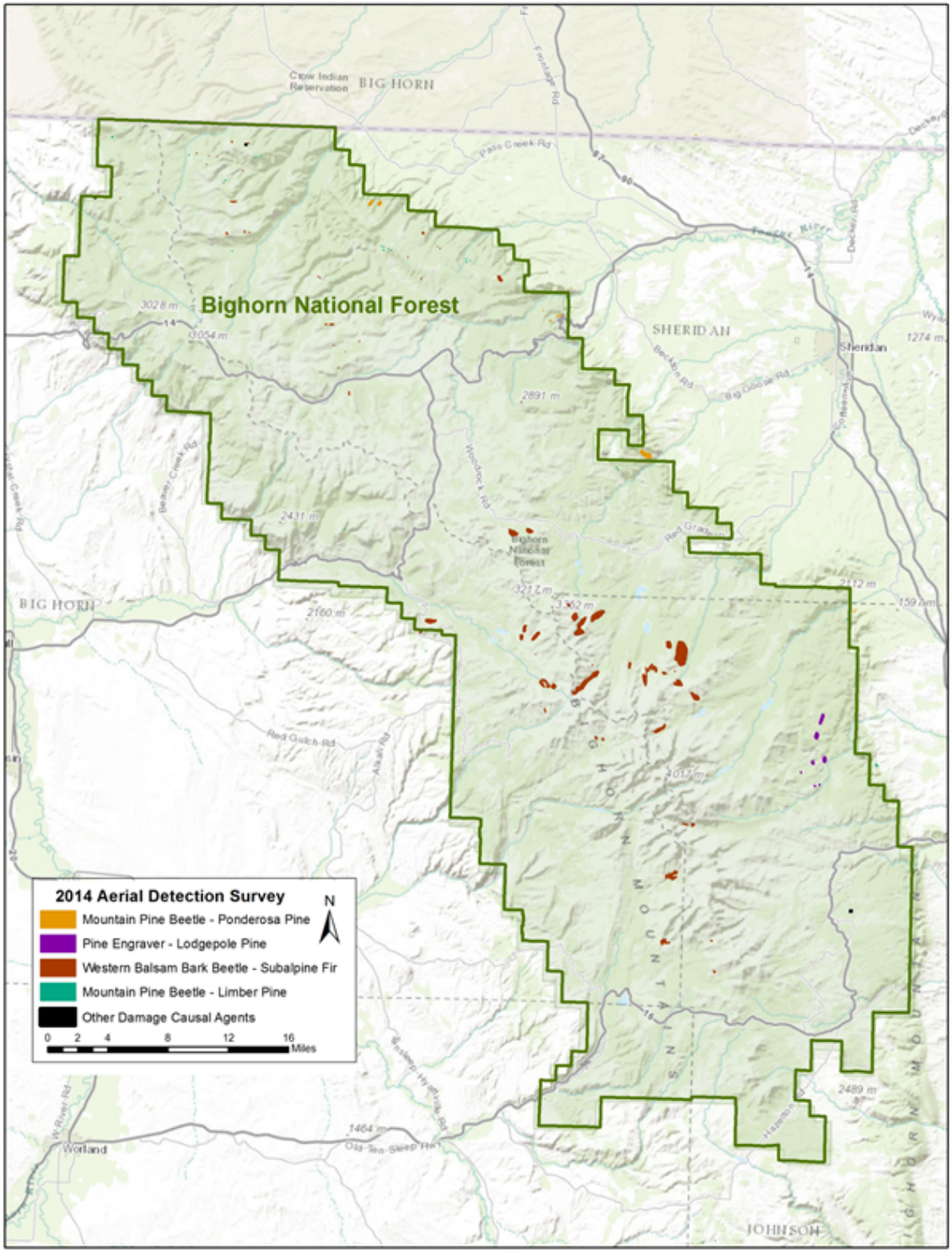

Figure 3. Aerial detection survey (ADS) map of the Bighorn National Forest: 2014.

2014 Forest Health Highlights: Black Hills National Forest

USDA Forest Service, Rocky Mountain Region, Forest Health Protection
Rapid City Service Center, 8221 S Highway 16, Rapid City, SD 57702

Kurt Allen, Entomologist; Jim Blodgett, Plant Pathologist; Al Dymerski, Forestry Technician; Kendra Schotzko, Entomologist. p: 605-343-1567

Conditions

- Mountain pine beetle continues to be the most frequent damage agent found across the forest, with 16,500 acres killed in 2014 (**Fig. 2**). This number is down from 34,000 acres killed in 2013. Preventive spraying of high value trees in campgrounds and landscape level thinning of forest stands have provided protection to remaining trees where these have been implemented (**Fig. 1**).

- Pine engraver beetles (*Ips* sp.) have been detected throughout the forest. Mortality caused by engravers has been low the past few years as we have seen normal to above normal spring moisture.

- There has been an increase in the number of wood borers due to recent mountain pine beetle mortality (**Fig. 1**).

- White pine blister rust disease, an exotic, invasive fungus, is found in limber pine stands and continues to cause tree mortality around Harney Peak and in Custer State Park (**Fig. 1**). Mountain pine beetle has killed a number of the larger limber pine.

- *Diplodia pinea* disease is common throughout the forest with occasional small outbreaks of mortality.

Figure 1. Mountain pine beetle mortality and treatment areas, wood borer, and white pine blister rust cankers on the Black Hills NF.

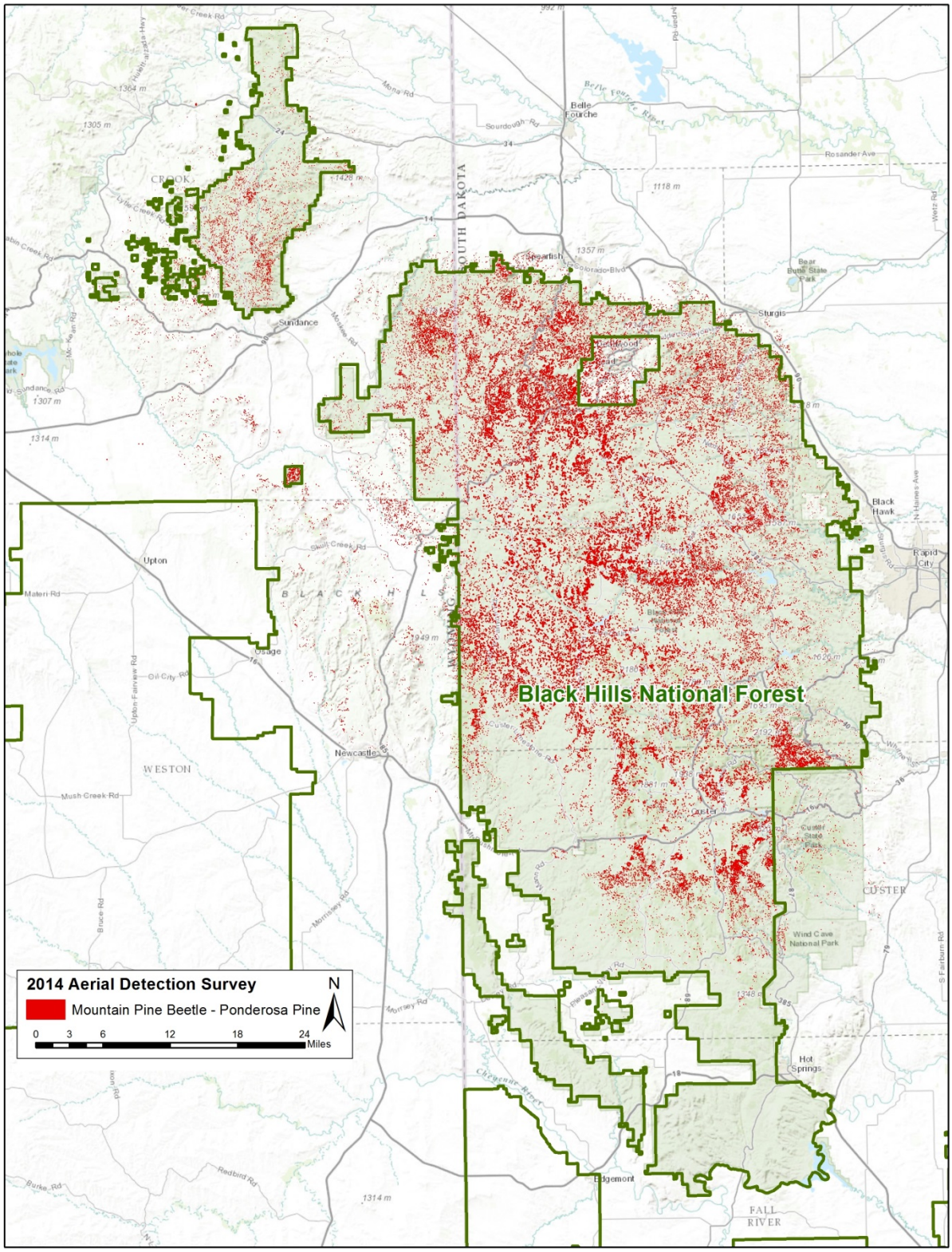

Figure 2. Aerial detection survey map of the Black Hills National Forest: 2014.

2014 Forest Health Highlights: Grand Mesa Uncompahgre & Gunnison (GMUG) National Forests

USDA Forest Service - Rocky Mountain Region (R2) – State & Private Forestry-Tribal Relations

Forest Health Protection - **Gunnison Service Center** – 216 N. Colorado, Gunnison, CO 81230

Insect activity on the Grand Mesa, Uncompahgre and Gunnison National Forests recorded during 2014 can be attributed to just a few native species **(Table 1 and Figure3)**. Most forest cover types are being impacted by native insect species that have co-evolved with their hosts. Much of this recent activity can be attributed to stand conditions and the drought conditions of the past decade.

Table 1. Insect activity on the GMUG National Forests varies with tree species and cover types.

Agent	Acres Affected (rounded to nearest hundred)
Spruce Beetle*	107,700
Subalpine fir mortality	20,000
Douglas-fir Beetle	10,000
Fir engraver *	4,000
Western Spruce Budworm *	1,600
Mountain pine beetle *	800
Ips pini *	100

Spruce beetle (Dendroctonus rufipennis) activity has the most prominent impact on the Forest, affecting the most acres and occurring in many high visibility areas. The current level of spruce beetle consists of widely scattered outbreak areas, but a significant proportion is the result of epidemic populations moving generally northward from the Rio Grande National Forest. Huge numbers of beetles carried on the wind have been observed inundating previously unaffected stands in a single year.

While the majority of the spruce stands on these Forests were affected, some locales that stand out were: the Grand Mesa, the West Elk Mountains, and the Continental Divide from Sargents Mesa to the Lake City area. The nature of the beetle activity appears to be influenced by the locality; the outbreak along the Continental Divide can be characterized as being of an intense, all-encompassing nature, while beetle activity on the Grand Mesa is much more dispersed on this wind-swept plateau. The ultimate impact of the spruce beetle outbreak will be determined largely by weather patterns over the next several years.

Subalpine fir mortality caused by a combination of western balsam bark beetle (Dryocoetes confusus) and Armillaria root disease affects large portions of the spruce-fir cover type. Subalpine fir mortality

was widely scattered, but some localities and large areas were affected. Notable areas with high levels of subalpine fir mortality include the Grand Mesa, areas to the north and west of Crested Butte (especially Mt. Axtell and Gibson Ridge), the higher elevations surrounding Taylor Canyon, Alpine Plateau and the Cimarron, and the vicinity of Telluride. The patterns of subalpine fir mortality wax and wane over time but chronic activity was noted.

Douglas-fir beetle (Dendroctonus pseudotsugae) activity is also widely scattered. Around 10,000 acres of Douglas-fir beetle activity was recorded in 2014, but locations where the mortality was a prominent landscape feature was limited to the north fork of the Gunnison River (near Paonia), the Lake Fork of the Gunnison, and areas surrounding Mt. Uncompahgre. The Cochetopa Canyon and the San Miguel Canyon also had visible impacts due to Douglas-fir beetle, but the dispersed nature of this activity makes it difficult to observe these impacts on a large-scale map. The importance of Douglas-fir in the mixed conifer cover type, and the tendency of the beetles to concentrate their attacks on larger host trees increase the overall importance of this bark beetle.

Other forest insects were at low numbers compared to spruce beetle and subalpine fir mortality, but can have a huge impact on a local basis. A case in point is the impact of the fir engraver (*Scolytus ventralis*) on the GMUG National Forest. The 4,000 acres of activity recorded during 2014 represents a very small proportion of the overall Forest. However, because this activity affects the area adjacent to Ouray, Colorado, its local impacts are severe. The occurrence of white fir (*Abies concolor*) on the Forest was extremely limited, but it is believed that high-grading of stands for ponderosa pine and Douglas-fir during the mining era left white fir as the most significant component of the local forest. Fire exclusion policies and subsequent lack of forest management have resulted in a forest that is comprised of older age classes of white fir, with a significant understory of white fir as well. This forest structure, aided by generally droughty conditions over the past decade, has fostered the epidemic of fir engraver activity which has now killed a large proportion of the mature fir. The tendency of dead white fir to retain their needles for long periods of time causes a striking appearance of the local forest, with dead trees remaining visually prominent for several years.

Unlike surrounding National Forests, the GMUG National Forests currently experience very few impacts due to the western spruce budworm (Choristoneura occidentalis). In the past, western spruce budworm has had large impacts on several areas of the Forest (particularly the vicinity of Lake City). Multi-story stands of shade-tolerant tree species are particularly susceptible, and in some cases fire exclusion policies of the past have created forest conditions that favor this insect. Current activity is at a very low level, but unless stand conditions are altered to discourage this insect, defoliation will increase at some point in the future. While feeding by western spruce budworm does not usually kill dominant and co-dominant host trees, stress from repeated defoliation can cause top-kill and can predispose trees to attack by other insects.

Mountain pine beetle (*Dendroctonus ponderosae*) activity was recorded at low levels for several years in the same localities. The continuing pine mortality may indicate a potential for an outbreak. The most significant areas of mountain pine beetle activity were located on the Norwood Ranger District on sites just to the south of the town of Norwood, as well as within the ponderosa pine stands of the southern

Uncompahgre Plateau. District staffs were aware of this situation and continue to work with Gunnison Service Center to implement sanitation strategies to mitigate ongoing beetle activity.

Pine engravers (*Ips pini*) are at low levels and widely scattered in ponderosa pine stands from the Cochetopa Canyon west to the Powderhorn area on the Gunnison Ranger District. The beetles are killing trees in poor condition due to many years of drought in these areas. The beetles are acting as scavengers for these unthrifty trees, and their numbers are not expected to increase greatly in the foreseeable future.

Disease Activity:

Trends in aspen stands affected by Sudden Aspen Decline (SAD)

Although SAD stopped spreading to new areas by 2009, re-measurements of 2007/08 SAD plots in 2013 showed that affected stands continued to deteriorate. Live basal area in sick plots decreased a further 28% and now only 38% of the plots were labeled as "healthy plots". Sick plots had much more recent damage than healthy plots: almost three times as much recently dead basal area, over twice the density of recently dead trees, and almost four times as much recent crown loss.

The important contributing agents in SAD (Cytospora canker, aspen bark beetle, bronze poplar borer) were still active in sick stands in 2013. Sucker density increased in healthy plots and decreased in sick plots. Thus, sick plots have well below half the live density and basal area of healthy plots, but are losing stems, basal area and canopy 2-4 times faster, while regeneration is decreasing. Timely regeneration treatments may be needed in some such stands to facilitate recovery.

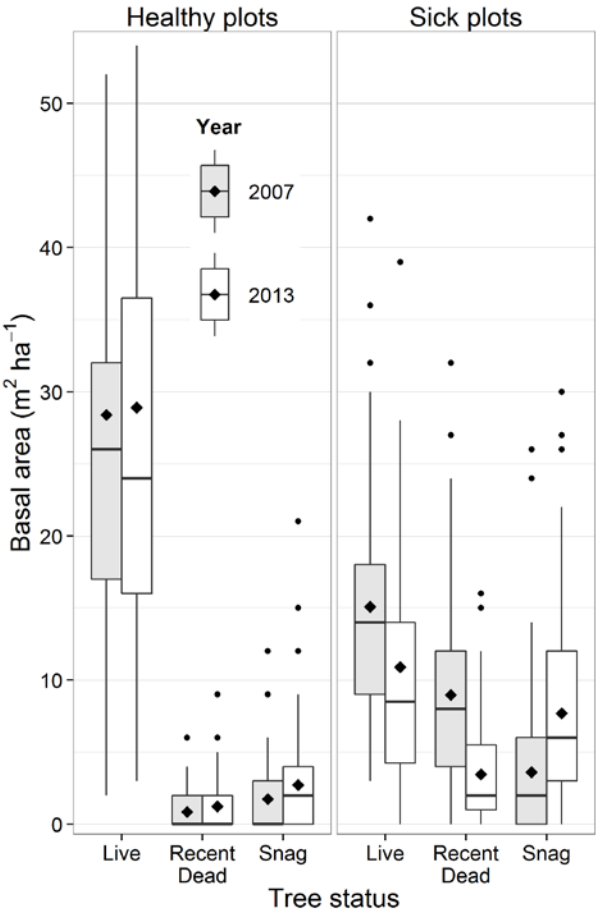

Figure 1. Basal area in healthy and sick plots in 2007/08 and 2013. The lower and upper box edges are the first and third quartile (containing the middle 50% of values), the bold horizontal line is the second quartile (median), the whiskers extend to the farthest points within 1.5 times the range of the box, the dots are outliers, and the solid diamond is the mean.

Treatment for SAD-affected aspen

The results of an Applied Silvicultural Assessment (HFRA), conducted in the Terror Creek watershed north of Paonia in cooperation with GMUG and Forest Health, were published in 2015 by Wayne Shepperd. The experiment was designed to test the effectiveness of clearfell harvesting to

regenerate deteriorating aspen stands. Nine stands with three levels of mortality attributed to SAD were used; half of each stand was clearfelled and half was left uncut. Cut treatments with low and moderate mortality had the best regeneration response, and those with the heaviest mortality exhibited the poorest regeneration response. Uncut treatments exhibited very little regeneration response, regardless of the initial overstory mortality level. These results indicate that it is possible to successfully regenerate aspen forests affected by SAD, provided that treatment occurs before the majority of the aspen are dead. Fire that kills the overstory would likely have a similar benefit.

Annosus root disease

Much like fir engraver (see above), annosus root disease is responding to the uncharacteristically pure, mature white fir stands in the Ouray area. Mechanical failure of green trees is the typical mode of death. Thus, unlike fir engraver, it is much more of a safety concern in developed areas than an aesthetic concern. Several recreation sites with white fir have multiple root disease centers that require ongoing management and vigilance.

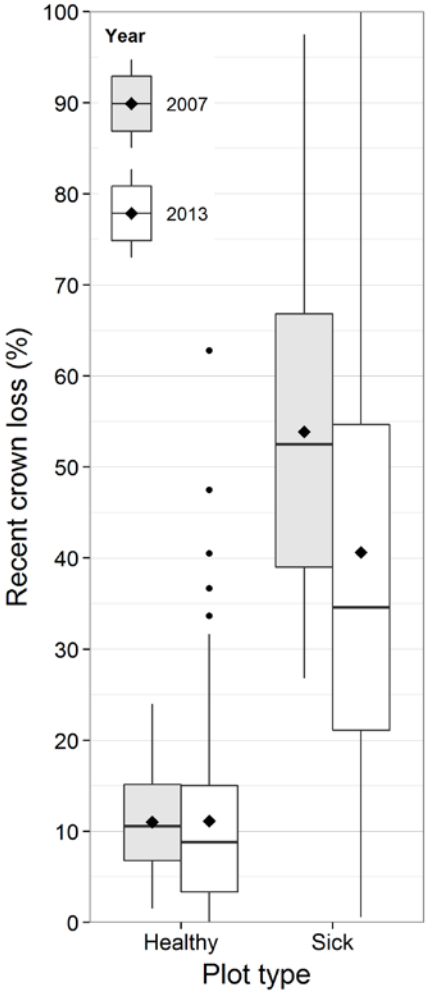

Figure 2. Recent crown loss in healthy and sick plots as measured in 2007/08 and 2013. Symbology is as described for Fig. 1. Recent crown loss is based on twig and branch condition and is estimated to have occurred within the preceding 2-3 years.

For Additional Information and Help:

An excellent resource that provides more detailed information on these and other forest insects and forest diseases is the "Field Guide to Diseases & Insects of the Rocky Mountain Region". This publication contains illustrations and descriptions of the damage agents, guidelines for management and a brief introduction to the literature concerning the pertinent topics. This document may be obtained in soft cover format from Rocky Mountain Region Service Centers, or may be seen or downloaded from the site: http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/insects-diseases/?cid=stelprdb5176420

The **Gunnison Service Center** continues to monitor the status of forest health throughout the GMUG National Forests. For additional information, please do not hesitate to contact the Gunnison Service Center: Jim Worrall at 970-642-4453.

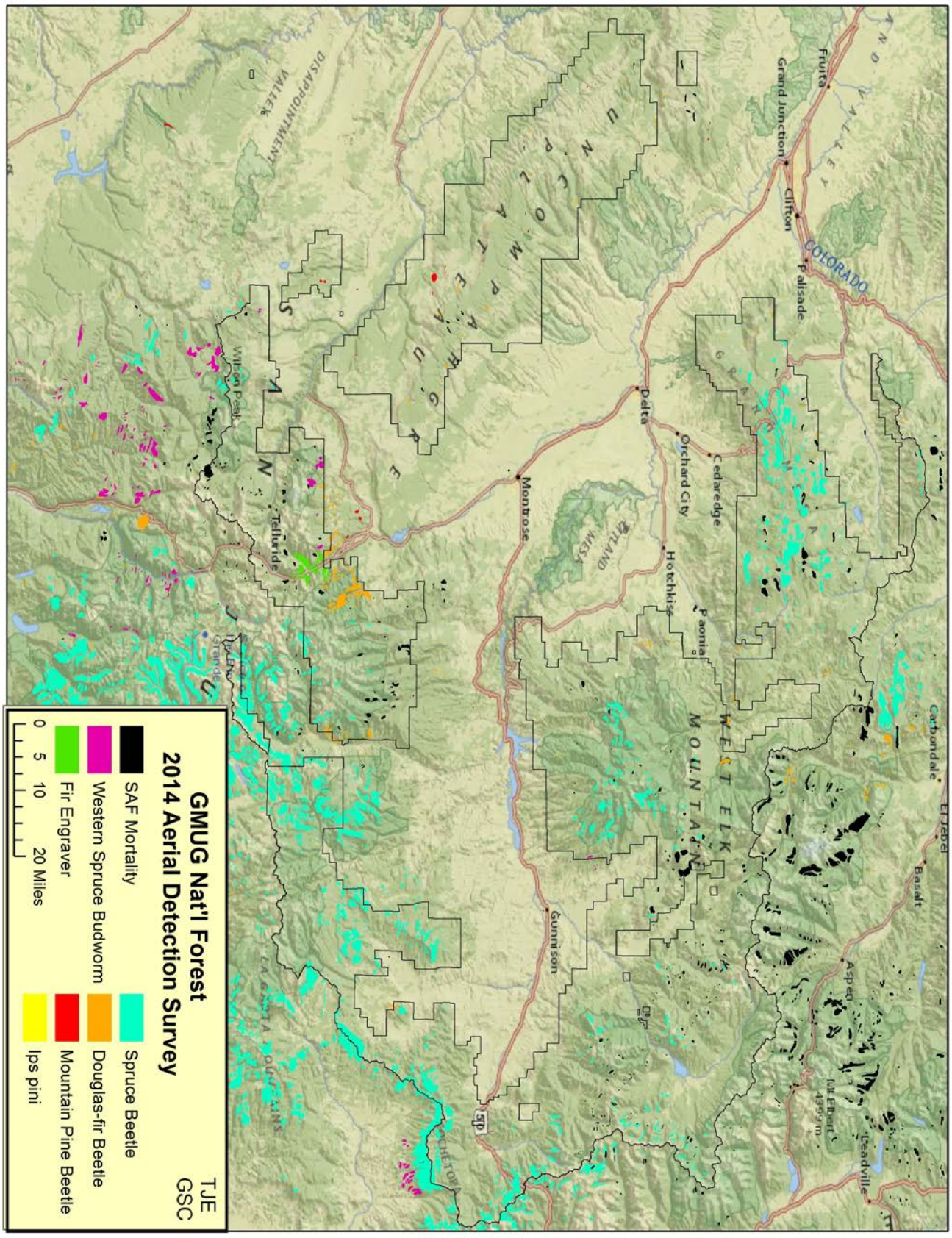

Figure 3. Conifer mortality agents were mapped in the 2014 forest insect and disease aerial detection survey over the GMUG National Forests.

2014 Forest Health Highlights: Medicine Bow-Routt National Forests

USDA Forest Service
Rocky Mountain Region
Forest Health Protection
Lakewood Service Center
740 Simms Street
Golden, CO 80401

Conditions Highlights

In 2014 Colorado and southern Wyoming saw continued increase in spruce beetle activity including 23,000 acres on the Medicine Bow-Routt National Forests (MBRNF) predominately in Jackson County, CO (14,000 acres) and Carbon County, WY (9,000 acres) Counties. Numerous windthrow events since 2011 have increased the potential for spruce beetle activity through much of the Region and predominately dry conditions continue to stress high-elevation mix-conifer forests.

Overall tree mortality associated with mountain pine beetle (MPB) continued to decline throughout Colorado and southern Wyoming to levels observed prior to the recent outbreak (18,000 acres). No more than 1000 acres of MPB activity, in Natrona County, WY, was observed on the MBRNF in 2014.

Dwarf mistletoes continue to be one of the most common and damaging diseases in lodgepole, ponderosa, and limber pine on the MBRNF. A great opportunity exists for managing and reducing the impacts of this disease while the forest conducts vegetation management in campgrounds, administrative areas, and in the forest following the bark beetle epidemic.

White pine blister rust (WPBR) is well established and continues to spread and intensify in limber pine in southern Wyoming. However, only one infected tree has been identified in the Sierra Madre Range and the disease has not been detected on the Routt National Forest. FHP will continue to monitor the distribution, severity, and impacts of this disease.

A recent field survey of aspen health in Colorado and southern Wyoming found that overstory aspen on the MBRNF was healthy overall, with normal levels of adult aspen mortality and low crown dieback, despite nearly ubiquitous presence of disease and high incidence of insect damage (Dudley *et al.*, in press). Regeneration is present in stands with overstory damage, and stems are measurably healthier than regeneration in healthy stands. The vast majority of stands surveyed contained multiple cohorts, indicating that most stands in the study area undergo periodic episodes of regeneration.

Aerial Detection Survey Highlights

- Spruce beetle activity increased in Colorado and southern Wyoming from 404,000 acres in 2013 to 494,000 acres in 2014
- Mountain pine beetle activity in Colorado and southern Wyoming decreased to 18,000 acres in 2014
- Western balsam bark beetle or subalpine fir decline activity occurred on 180,000 acres in 2014.
- No aspen dieback and/or mortality were detected on the MBRNF in the 2014 Aerial Detection Survey.

FHP Projects

- FHP staff have recommended considering reassessing the need for insecticide spraying for individual tree protection and support moving to an application every other year if MPB activity continues to decline.
- FHP staff have made numerous assessments of hazard trees at recreation sites including several sites that have been closed and may be reopened.
- The USFS (Rocky Mountain Research Station (RMRS), Dorena Genetic Resource Center, and FHP) and the National Park Service are actively collaborating to identify WPBR resistance in limber and bristlecone pine families in the region. A high level of rust resistance has been confirmed in some limber pine families on the MBNF.
- FHP and RMRS continue to use verbenone (an MPB anti-aggregation pheromone) to protect trees with confirmed resistance to WPBR from MPB on the Laramie Ranger District.
- The Southern Rockies Rust Resistance Trial (SRRRT) was initiated at a revitalized CCC nursery on the MBNF in 2013 to field-verify WPBR resistance. Seed from resistant families (tested and confirmed in OR) from throughout the Southern Rockies, including families from the MBNF, was sown and seedlings grown at the Colorado State Forest Service Nursery. The seedlings will be periodically assessed for signs and symptoms of WPBR over the next 10 years.
- A study to evaluate the efficacy of pruning to reduce WPBR impacts was initiated in 2005 on two study sites including Vedauwoo Campground on the MBNF and the Mosca Creek Trail in the Great Sand Dunes National Park and Preserve. FHP will conduct the final assessment of these trees in 2015 and a final report will be available in the future.
- We completed the second measurement of 88 long-term monitoring plots, including 22 on the MBNF, originally established in 2006 to evaluate limber pine health in the Rocky Mountains. A report will be available in 2015.
- A study of the extent, severity, and causes of aspen mortality in Colorado and southern Wyoming was recently completed (Dudley et al., in press).
- Restoration planting options have been developed for limber pine in the Southern Rocky Mountains (Casper et al., in press).

Surrounding Area Conditions of Note

- Rocky Mountain National Park continues to manage high-value, high-risk pines predominately near historic structures and campgrounds with carbaryl or verbenone to prevent mountain pine beetle activity.
- Trees damaged during the September 2013 flood event may become more susceptible to insects and diseases of concern for neighboring forests.

Recent Reports and Resource List

Forest Health Protection (FHP), in cooperation with the Colorado State Forest Service, Wyoming State Forestry, and other partners, compiles a Forest Pest Conditions report for the Region each year. They also conduct an annual Aerial Detection Surveys, ground surveys and site visits to identify and map insect and disease-caused tree mortality and damage throughout the Region. The following is a list of recent reports and resources available.

- LSC-FY15-4 Evaluation of continued preventative spraying for MPB on the Laramie Ranger District
- LSC-FY15-5 Evaluation of Hazard Tree Issues in Tie City Campground and Trailhead
- RMRS and FHP are in the process of developing a Limber Pine Conservation Strategy for Rocky Mountain National Park that is relevant to the MBRNF
- Dwarf Mistletoes: Ecology and Management in the Rocky Mountain Region
- Dudley MM, Burns KS, and Jacobi WR (in press). Aspen mortality in the Colorado and southern Wyoming Rocky Mountains: extent, severity, and causal factors. Forest Ecology and Management.
- Casper AM, Jacobi WR, Schoettle AW, and Burns KS (in press). Restoration Planting Options for Limber Pine (*Pinus flexilis* James) in the Southern Rocky Mountains. Journal of the Torrey Botanical Society.
- Forest Health Protection
    - Other Forest Condition Reports
    - Other Regional Reports
    - Aerial Detection Survey
        - Shapefiles
        - Data tables by state, county, and forest available by request
    - Mapping and Reporting
- Forest Health Technology Enterprise Team
    - Risk Map
    - National Forest Damage Agent Range Maps
    - Forest Pest Conditions

We look forward to continued work with the MBRNF regarding your forest insect and disease concerns. Please do not hesitate to contact us with your inquiries.

Lakewood Service Center

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Appendix 1

Photos

Figure 1. Over 1400 limber and bristlecone pine seedlings planted in 2013 and 2014 at the Southern Rockies Rust Resistance Trail (SRRT) Pole Mountain Work Center, Laramie Ranger District, Medicine Bow NF, Wyoming. Photo: Anna Schoettle.

2014 Forest Health Highlights: Nebraska National Forest

USDA Forest Service, Rocky Mountain Region, Forest Health Protection
Rapid City Service Center, 8221 S Highway 16, Rapid City, SD 57702

Kurt Allen, Entomologist; Jim Blodgett, Plant Pathologist; Al Dymerski, Forestry Technician; Kendra Schotzko, Entomologist. p: 605-343-1567

Conditions

- Pine engraver beetle (Ips sp.) continues to be the main damage agent in ponderosa and jack pine (**Fig. 1**). Fire has damaged many of the forested areas and helped maintain high levels of engraver beetles.
- Aerial detection survey detected 3,800 acres of pine engraver beetle damage in ponderosa pine in the Pine Ridge Ranger District; other districts were not flown in 2014 (**Fig. 2**).
- Diplodia shoot blight and canker disease is affecting mainly ponderosa and jack pine trees with occasional large damage events associated with hail storms (**Fig. 1**).
- The main nursery damage agents in conifers are *Diplodia pinea*, *Fusarium*, *Phytophthora*, and *Pythium*; and occasionally *Phomopsis*.
- The main nursery damage agents in hardwoods include black-knot and shot hole in *Prunus*; and occasional foliage diseases including Anthracnose; powdery mildews; Melampsora rust on cottonwood; rusts on *Ribes*; and Gymnosporangium rust ("cedar apple rust") on *Amelanchier*, *Malus*, and *Crataegus*.
- These **nursery diseases** are being well managed with proper watering practices, healthy plants, and timely control applications to reduce significant loss.
- Animal damage is minimized with deer fence and woven electric fence for small mammals.
- Nursery weeds are well managed by mowing and maintaining weed free wind-breaks/fields with hand-pulling, herbicide, and mechanical methods.

Figure 1. Pine engraver beetle and fire in ponderosa pine, pine engraver beetle in jack pine, and Diplodia shoot blight and canker disease in ponderosa pine.

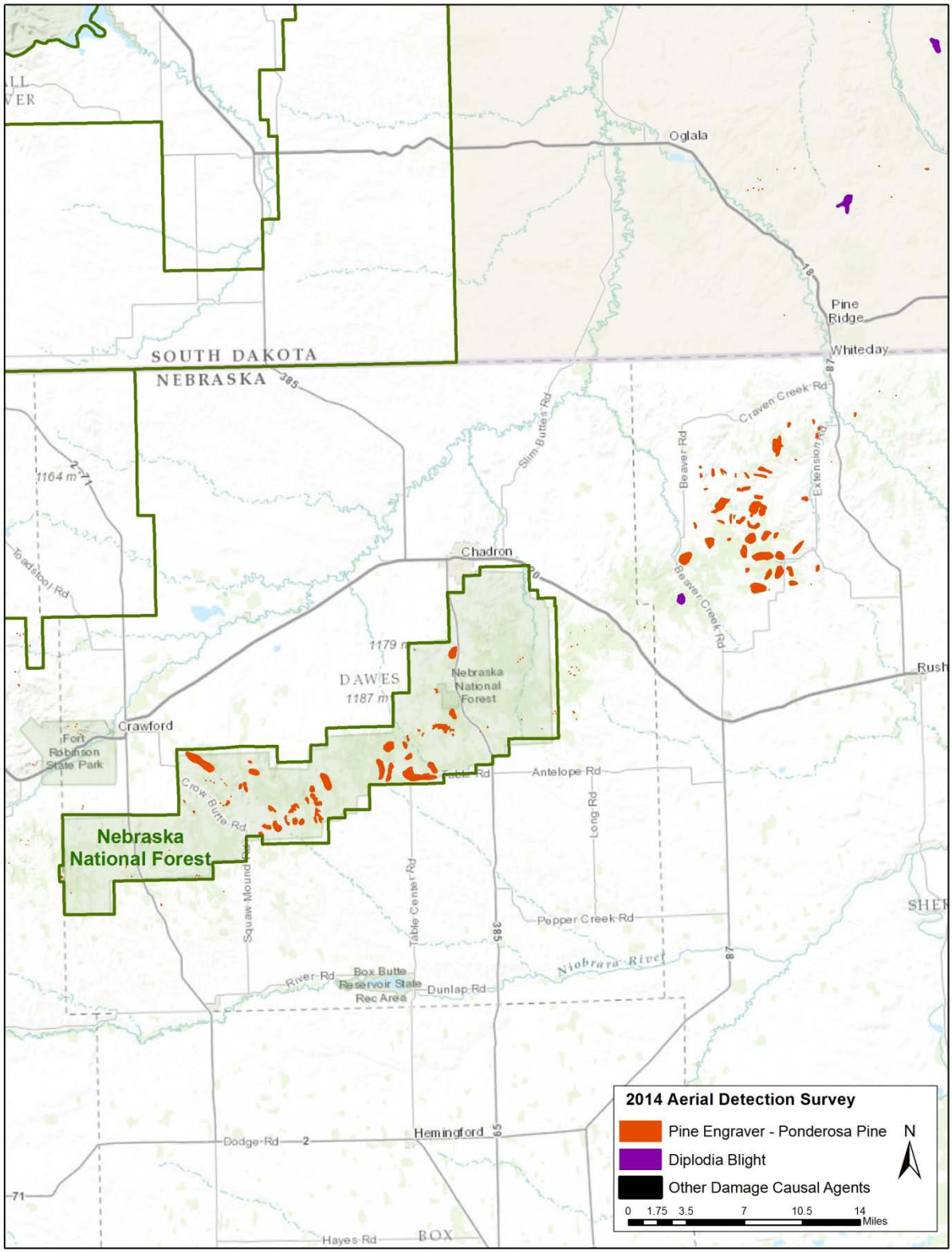

Figure 2. Map of Aerial detection survey of the Nebraska National Forest: 2014. Only Pine Ridge Ranger District was flown.

2014 Forest Health Highlights: Pike National Forest

USDA Forest Service
Rocky Mountain Region
Forest Health Protection
Lakewood Service Center
740 Simms Street
Golden, CO 80401

Conditions Highlights

In 2014 the Pike National Forest (PNF) saw an increase in Douglas-fir tussock moth and western spruce budworm activity around and within the Rampart Range Reservoir area. Defoliation has occurred in previous years in this area but with less intensity and acreage.

Dwarf mistletoes continue to be the most common and damaging disease in Douglas-fir, lodgepole pine, and ponderosa pines on the Pike National Forest.

White pine blister rust continues to spread and intensify in limber pine on the forest. The disease is well established in the Sangre de Cristo and Wet Mountains but new infection centers have been identified near Crystal Reservoir in 2009 and in the Rampart Range in 2013, Pikes Peak Ranger District. The only infected bristlecone pines identified to date are located within the Great Sand Dunes National Park and Preserve. Forest Health Protection (FHP) will continue to monitor the distribution, severity, and impacts of this disease.

A recent field survey of aspen health in Colorado and southern Wyoming found that overstory aspen on the PNF was healthy overall, with normal levels of adult aspen mortality and low crown dieback, despite nearly ubiquitous presence of disease and high incidence of insect damage (Dudley and others, in press). Regeneration is present in stands with overstory damage, and stems are measurably healthier than regeneration in healthy stands. The vast majority of stands surveyed contained multiple cohorts, indicating that most stands in the study area undergo periodic episodes of regeneration.

Aerial Detection Survey Highlights

- Western spruce budworm activity increased on the PNF from 300 acres in 2013 to 15,000 acres in 2014.
- Douglas-fir beetle activity decreased on the PNF from 7,500 acres onto 3,600 acres in 2014.
- Western balsam bark beetle activity on the PNF increased from 9,100 to 13,000 acres in 2014.
- No aspen dieback and/or mortality was detected on the PNF in the 2014 Aerial Detection Survey.

FHP Projects

- FHP visited several recreation sites on the Rampart Range and identified the need for further surveys of defoliator activity in 2015.
- FHP deployed a chemical application of MCH for control of Douglas-fir beetle at a public day use sight known as Topaz Point along the Rampart Range.
- FHP will assess Douglas-fir beetle activity along portions of the Rampart Range including Topaz Point and Devil's Head during the summer of 2015.
- The second measurement of 28 long-term monitoring plots within limber and bristlecone pine stands in the Sangre de Cristo Mountains (San Isabel and Rio Grande National Forests and Great Sand Dunes National Park and Preserve) was recently completed. These plots were originally established in 2006 to monitor tree and regeneration health and to determine the extent and severity of white pine blister rust (WPBR) and mountain pine beetle in the area. A report will be available later in 2015.
- The USFS (Rocky Mountain Research Station, Dorena Genetic Resource Center, and FHP) and the National Park Service are actively collaborating to identify WPBR resistance in limber and bristlecone pine families in the region. A high level of rust resistance has been confirmed in some families of both species.
- The Southern Rockies Rust Resistance Trial (SRRRT) was initiated at a revitalized CCC nursery on the Medicine Bow National Forest in 2013 to field-verify WPBR resistance. Seed from resistant families (tested and confirmed in OR) from throughout the Southern Rockies, including families from the SINF, was sown and seedlings grown at the Colorado State Forest Service Nursery. The seedlings will be periodically assessed for signs and symptoms of WPBR over the next 10 years.
- A study of the extent, severity, and causes of aspen mortality in Colorado and southern Wyoming was recently completed (Dudley et al., in press).
- Restoration planting options have been developed for limber pine in the Southern Rocky Mountains (Casper et al., in press).
- Hazard Tree Management training session June 23-24, 2015 on the Manitou Experimental Forest, Pikes Peak Ranger District. Please contact Kelly Burns for more information.

Surrounding Area Conditions of Note

- U.S. Air Force Academy including the recreational site, Farish Recreation Area, has experienced light defoliation from western spruce budworm within stands of Engelmann spruce.
- Cheyenne Mountain Air Force Station and the adjoining land on Cheyenne Mountain State Park have experienced a few hundred acres of partial to complete defoliation by Douglas-fir tussock moth in stands of Douglas-fir.
- A study to evaluate the efficacy of pruning to reduce WPBR impacts was initiated in 2005 on two study sites including Vedauwoo Campground on the Medicine Bow National Forest and the Mosca Creek Trail in the Great Sand Dunes National Park and

Preserve. FHP will conduct the final assessment of these trees in 2015 and a final report will be available in the future.

Recent Reports and Resource List

Forest Health Protection, in cooperation with the Colorado State Forest Service, Wyoming State Forestry, and other partners, compiles a Forest Pest Conditions Report for Colorado each year. They also conduct an annual Aerial Detection Surveys to identify and map insect and disease-caused tree mortality and damage throughout the state. For additional information or assistance please contact the Lakewood Service Center or Gunnison Service Center.

- LSC-14-17: Evaluation of Douglas-fir Tussock Moth on Cheyenne Mountain
- LSC-14-18: Forest Health Protection Visit to Pikes Peak Ranger District
- LSC-15-2: Evaluation of Douglas-fir Tussock Moth Activity on the Air Force Academy
- LSC-15-6: Evaluation of Western Spruce Budworm Defoliation at the Rampart Range Recreation Area on the Pikes Peak Ranger District.
- R2 Dwarf Mistletoe Management Guide
- Dudley MM, Burns KS, and Jacobi WR (in press). Aspen mortality in the Colorado and southern Wyoming Rocky Mountains: extent, severity, and causal factors. Forest Ecology and Management.
- Casper AM, Jacobi WR, Schoettle AW, and Burns KS (in press). Restoration Planting Options for Limber Pine (*Pinus flexilis* James) in the Southern Rocky Mountains. Journal of the Torrey Botanical Society.
- Forest Health Protection
    - Other Forest Condition Reports
    - Other Regional Reports
    - Aerial Detection Survey
        - Shapefiles
        - Data tables by state, county, and forest available by request
- Forest Health Technology Enterprise Team
    - Risk Map
    - National Forest Damage Agent Range Maps
    - Forest Pest Conditions

We look forward to continued work with the PSNF regarding your forest insect and disease concerns. Please do not hesitate to contact us with your inquiries.

Lakewood Service Center

- Jim Kruse, Service Center Leader, jkruse@fs.fed.us, 303-236-9541
- Sky Stephens, Entomologist, ssstephens@fs.fed.us, 303-236-9552
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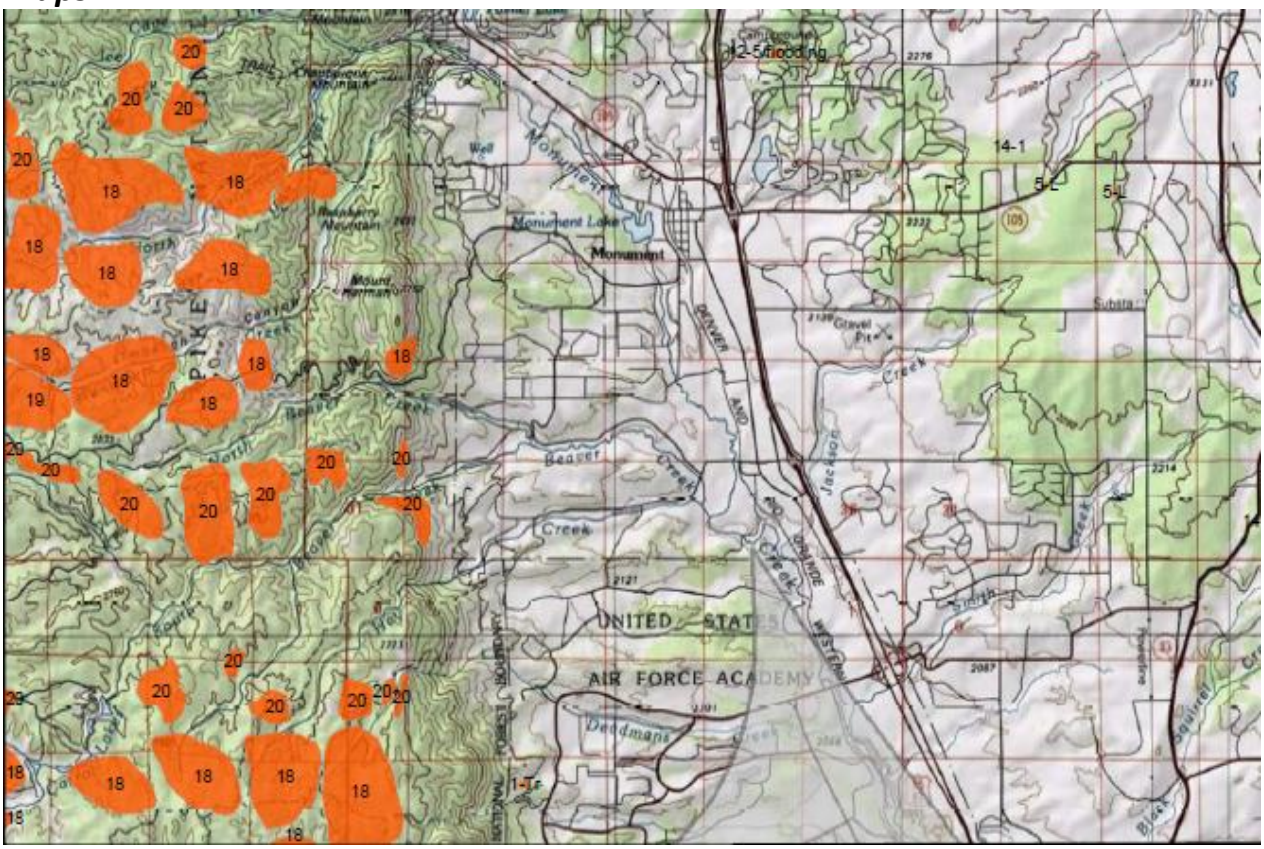
Appendix 1

Photos

Figure 1. Defoliation in predominately Douglas-fir stands by Douglas-fir tussock moth, Cheyenne Mountain Air Force Station and Cheyenne Mountain State Park, July 2014. Photo: Bill Ciesla, Forest Health Management International.

Figure 2. Western spruce budworm defoliation in a spruce-dominated stand in the Rampart Range, Pikes Peak Ranger District, October 2014. Photo: Sky Stephens, USFS.

Maps



Map 1. *Western spruce budworm activity according to severity of defoliation (18-light, 19-moderate, 20-severe) west of Monument, CO and the U.S. Air Force Academy.*

2014 Forest Health Highlights: Rio Grande National Forest

USDA Forest Service - Rocky Mountain Region (R2) – State & Private Forestry-Tribal Relations

Forest Health Protection - **Gunnison Service Center** – 216 N. Colorado, Gunnison, CO 81230

Insect and Disease activity on the Rio Grande National Forest in 2014

The spruce beetle epidemic expanded most rapidly in southern Colorado's Forests and impacted many thousands of acres. The impact was evident throughout the entire elevation range of Engelmann spruce, from approximately 9500 feet up to 12,000 feet (timberline).

Aerial survey in south central Colorado showed spruce beetle epidemics expanded on the Rio Grande National Forest with 192,000 acres of new spruce mortality. Some of the spruce beetle epidemics moved through entire drainages in the course of one year. In the most heavily impacted drainages, nearly every mature spruce was killed. There were also large numbers of lodgepole pine in the proximity of Engelmann spruce that were also infested by spruce beetles.

Western Spruce Budworm, a defoliating insect, feeds on the new needles of white fir, Douglas-fir and sometimes on spruce and subalpine fir **(Fig. 1).** Activity was observed in over 12,000 acres on the Rio Grande National Forest.

In many areas, the western spruce budworm populations fluctuate over the course of decades in response to long-term weather patterns; many of the more susceptible stands often have chronic populations of these insects. Western spruce budworm impacts in these areas are a constant factor in stand dynamics. Disruption of the multi-storied condition of the shade tolerant species through management activities reduces the impact of this insect over the long run. Such work can often be accomplished in cooperation with fuels management activities.

Feeding by western spruce budworm does not directly kill the tree, however stress from repeated defoliation causes top-kill and predisposes the tree to attack by other insects.

Douglas-fir beetles killed Douglas-fir trees in widely scattered acres around the Rio Grande National Forest. In some stands, almost every mature tree was infested and even trees less than 4 inches DBH were observed Douglas-fir trees were killed in about 400 acres of forests, but in 2014, there was less damage caused by Douglas-fir beetle than in previous years **(Fig.2)**

Subalpine fir mortality occurs most often as a combination of attack from **Armillaria root rot disease and western balsam bark beetle**. Large groups of tree mortality (>25 trees) result from decline caused by these two damage agents.

Tree mortality due to western balsam bark beetle is ubiquitous throughout the range of subalpine fir.

While much of the actual subalpine fir mortality was attributed to western balsam bark beetle, it is likely that many of these trees were pre-disposed to beetle attack because of infections from Armillaria root disease.

Patterns of mortality were widely scattered throughout mixed conifer forests on the Rio Grande National Forest **(Fig. 3).** Some declining subalpine firs may have several overlapping generations of beetles in the same tree.

Increases in subalpine fir mortality often track periods of drought where increased stress on the subalpine firs results in tree death.

Western balsam bark beetle activity was detected on 1,400 acres in subalpine firs on the Rio Grande National Forest. These beetle infestations are generally widespread and yet kill fewer trees per acre than other bark beetles.

Figure 1. Western spruce budworm larvae on Douglas-fir needles by Brian Howell

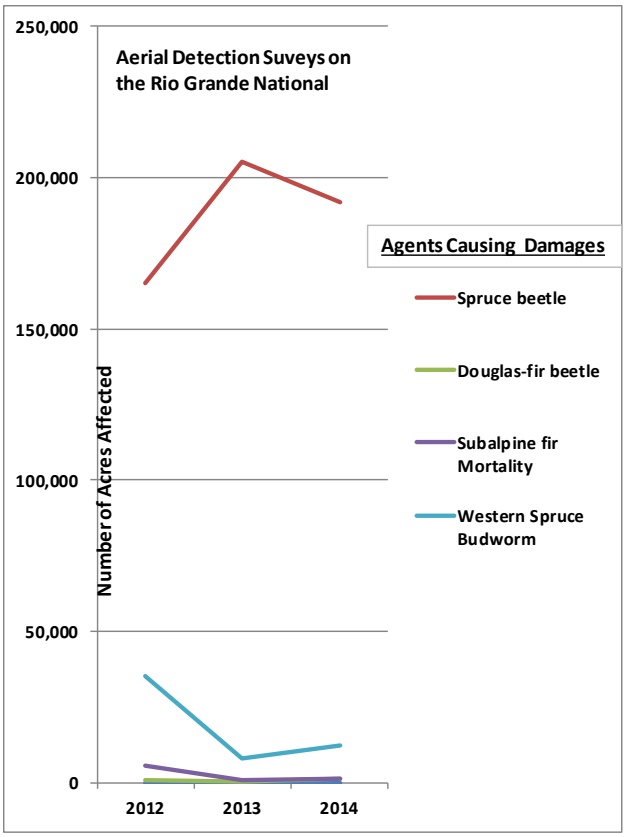
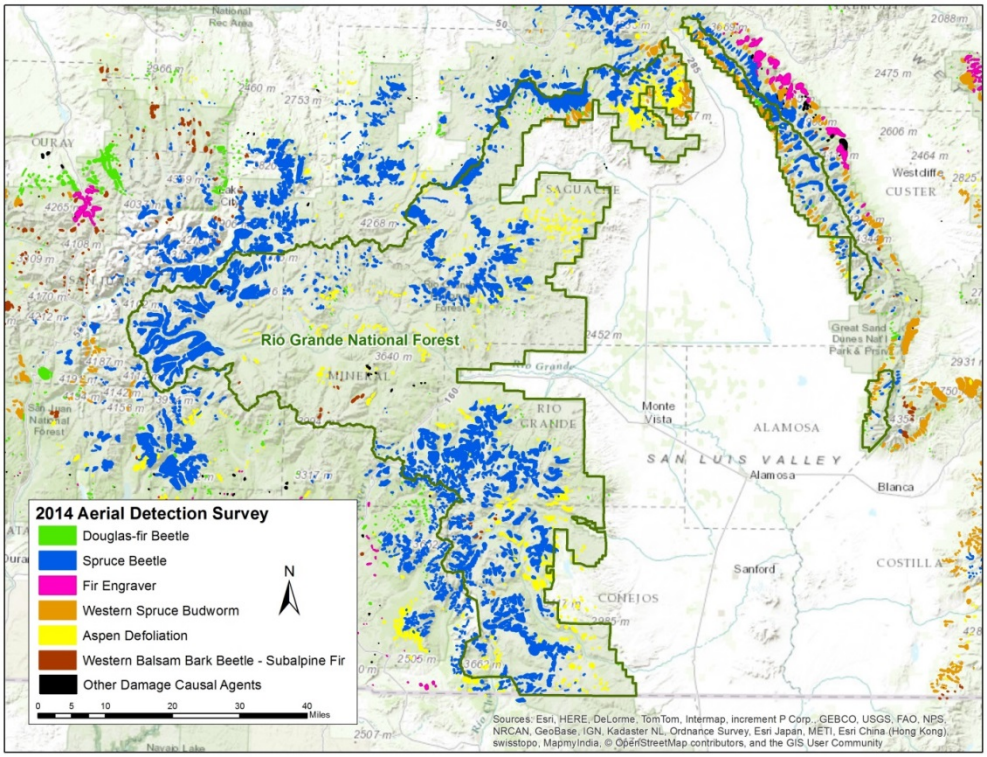


Figure 2. Number of damaged forest acres and the damaging agents from 2014 Aerial Detection Surveys

Figure 3. Map of 2014 Aerial Detection Survey of the Rio Grande National Forest



2014 Forest Health Highlights: San Isabel National Forest

USDA Forest Service - Rocky Mountain Region (R2) – State & Private Forestry-Tribal Relations

*Forest Health Protection - **Gunnison Service Center** – 216 N. Colorado, Gunnison, CO 81230*

Conditions Highlights

There is a wide range of insects currently affecting forest conditions throughout the San Isabel National Forest. Most forest cover types are being impacted by native insect species that have co-evolved with their hosts. Much of this recent activity can be attributed to stand conditions and the drought conditions of the past decade.

Insect Activity: The wide variety of insect activity on the San Isabel National Forest is indicative of the many cover types found on the forest. In general, these insects are associated with a particular cover type or species of tree (Fig.1).

- **Damage caused by the western spruce budworm *(Choristoneura occidentalis)* is widespread and affects the largest area on the forest.** Visible defoliation caused by western spruce budworm occurs across the southern half of the forest throughout the mixed conifer cover type. The Sangre de Cristo Mountains, the Wet Mountains, and areas around La Veta and Spanish Peaks are currently affected.
- Western spruce budworm feeding damages were detected in aerial surveys on about 57,000 acres; this was observed in primarily shade tolerant Douglas-fir and white fir in the mixed conifer type. Multi-story stands of these tree species are particularly susceptible, and in some cases fire exclusion policies of the past have created forest conditions that favor this insect. In many areas western spruce budworm populations fluctuate over the course of decades in response to long-term weather patterns; many of the more susceptible stands often have chronic populations of these insects. Western spruce budworm impacts in these areas are a constant factor in stand dynamics. Disruption of the multi-storied condition of the shade tolerant species through management activities can reduce the impact of this insect over the long run. Such work can often be accomplished in cooperation with fuels management activities. While feeding by western spruce budworm does not directly kill the host, stress from repeated defoliation can cause top-kill and can predispose trees to attack by other insects.
- **In 2014, fir engraver bark beetle** caused tree mortality on over 24,000 acres of the San Isabel National forest. This situation is being observed in the north-eastern Wet Mountains and the Sangre de Cristo Mountains. Multiple years of chronic western spruce budworm defoliation has made white fir in these portions of the forest susceptible to beetle attack, and fir engraver beetle (*Scolytus ventralis*) is currently causing significant tree mortality. While western spruce budworm activity has been chronic throughout much of the southern portions of the forest, this recent increase in fir engraver activity has occurred only within the past several years.

- Spruce beetle (*Dendroctonus rufipennis*), is also killing trees primarily in the Sangre de Cristo Mountains and the Wet Mountains. While this activity within these two areas appears similar, the genesis of these outbreaks is somewhat different.
    - *Spruce beetle populations in the Sangre de Cristo Mountains appeared to have been a result of the huge spruce beetle infestation to the west on the Rio Grande National Forest.* Large numbers of spruce beetle have been carried by prevailing winds from the west to the spruce stands found to the east in the northern portion of the Sangre de Cristo Mountains.
    - By comparison, *spruce beetle activity in the Wet Mountains originated locally from populations building in wind thrown host material.* This population has increased over time and has only recently reached outbreak status.
    - Also, it should be noted that spruce beetle activity is the most difficult damage agent to identify via aerial survey*. The forest wide estimate of acres affected is most likely greater than the 33,000 acres as recorded by aerial survey.*
- **Aspen defoliation by two different defoliating insects** was seen in several portions of the San Isabel National Forest on approximately 5000 acres. Western tent caterpillar *(Malacosoma californicum)* and large aspen tortrix *(Choristoneura conflictana)* caused this 2014 defoliation.
    - While these two insects are difficult to distinguish from the air, ground checking identified specific locales with some increasing aspen defoliation.
    - Aspen stands surrounding the town of La Veta had less defoliation. This follows a 5-year outbreak of these defoliators. It is likely that the caterpillar populations of these 2 insects will continue to decline to endemic levels.
- **Other insects** currently at low population levels: piñon ips (*Ips confusus*), piñon twig beetles (*Pityopthorus* spp.), and pine tip moths (*Rhyacionia* spp. and *Dioryctria* spp).
    - Around 1200 acres of mountain pine beetle (*Dendroctonus ponderosae*) activity were recorded on the Forest in 2014. However, the wide host ranges of this insect make it important to distinguish where the activity is taking place. Approximately 600 acres of ponderosa pine were affected, and some 500 acres of five-needle pines were infested in other locations.
    - Large portions of the northern portions of the forest, particularly in the headwaters of the Arkansas River, were at a high level of susceptibility and require only a trigger event such as a severe drought to instigate a major outbreak of mountain pine beetle. Management activities such as the proposed Tennessee Creek Project can reduce the susceptibility of specific portions of the forest, and the long-term diversification of the forest type will provide the best mitigation for the activities of mountain pine beetle.
    - Ips pine engraver beetles (*Ips confusus*) in piñon pine were quite active in the piñon forests near Canyon City and the Royal Gorge for about 5 years. Piñon pine mortality throughout the San Isabel National Forest, as well as on nearby BLM lands, is currently at a low level.
    - Other damaging agents such as piñon twig beetle and pine tip moth were also at low levels and the condition of the piñon pine in the San Isabel National Forest is good.

Disease Activity:

On the northern reaches of the forest, scattered groups of **subalpine fir mortality** occurs by a combination of western balsam bark beetle, and armillaria root disease. The patterns of subalpine fir mortality wax and wane over time and current levels appear to be at the low end of the spectrum (about 6000 acres). Large groups of subalpine fir mortality (>25 trees) result from this complex of Armillaria root rot disease and western balsam bark beetle attack. These damage agents usually occur in scattered stands of mixed conifers with subalpine fir and are ubiquitous throughout the range of subalpine fir in the Region. While most of this fir mortality is attributed to the easily seen western balsam bark beetle damage, much of this activity is often the result of subalpine firs infected by Armillaria root disease.

Patterns of mortality are widely scattered and the affected trees often have several overlapping generations of beetles. Determination of the exact year of death is difficult even when inspecting trees on an individual basis. Increases in subalpine fir mortality often track periods of drought where increased stress on host trees results in tree death.

White pine blister rust disease was monitored by evaluating permanent plots: the second measurement of 28 long-term monitoring plots within limber and bristlecone pine stands in the Sangre de Cristo Mountains (San Isabel and Rio Grande National Forests and Great Sand Dunes National Park and Preserve) was completed. These plots were originally established in 2006 to monitor tree and regeneration health and to determine the extent and severity of white pine blister rust and mountain pine beetle in the area.

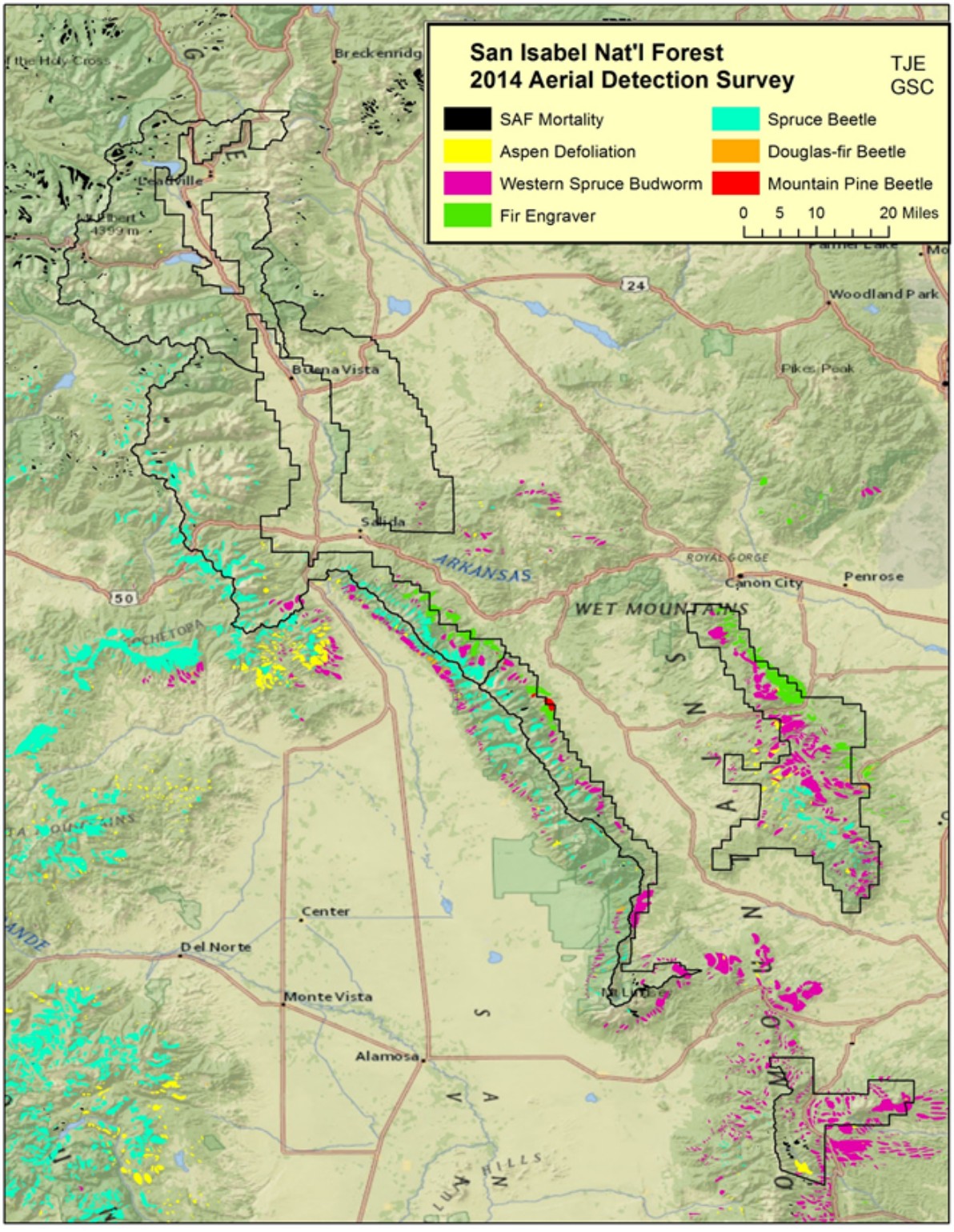
Additional Information

An excellent resource that provides more detailed information on these and other forest insects and forest diseases is the “Field Guide to Diseases & Insects of the Rocky Mountain Region”. This publication contains illustrations and descriptions of the damage agents, guidelines for management and a brief introduction to the literature concerning the pertinent topics. This document may be obtained in soft cover format from Rocky Mountain Region Service Centers, or may be seen or downloaded from the site: http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/insects-diseases/?cid=stelprdb5176420

The **Gunnison Service Center** continues to monitor the status of forest health throughout the San Isabel National Forest. For additional information, please contact Jim Worrall at the Gunnison Service Center at 970-641-4453.

Figure 1. Map of Aerial Detection Survey of the damaging agents to forest health observed on the San Isabel National Forest during 2014.

Figure 1. 2014 Aerial Detection Survey Map of the San Isabel National Forest



2014 Forest Health Highlights: San Juan National Forest

USDA Forest Service - Rocky Mountain Region (R2) – State & Private Forestry-Tribal Relations

Forest Health Protection - **Gunnison Service Center** – 216 N. Colorado, Gunnison, CO 81230

Insect and Disease activity on the San Juan National Forest in 2014

Aerial survey in south central Colorado showed spruce beetle epidemics started to decline from 75,000 acres in 2013 to 53,000 acres damaged in 2014 by spruce beetle on the San Juan National Forest **(Fig. 1).** Some of the spruce beetle epidemics moved through a entire drainages in one year. In the most heavily impacted drainages, nearly every mature spruce was killed **(Fig. 2).** There were also large numbers of lodgepole pine in the proximity of Engelmann spruce that were also infested by spruce beetles.

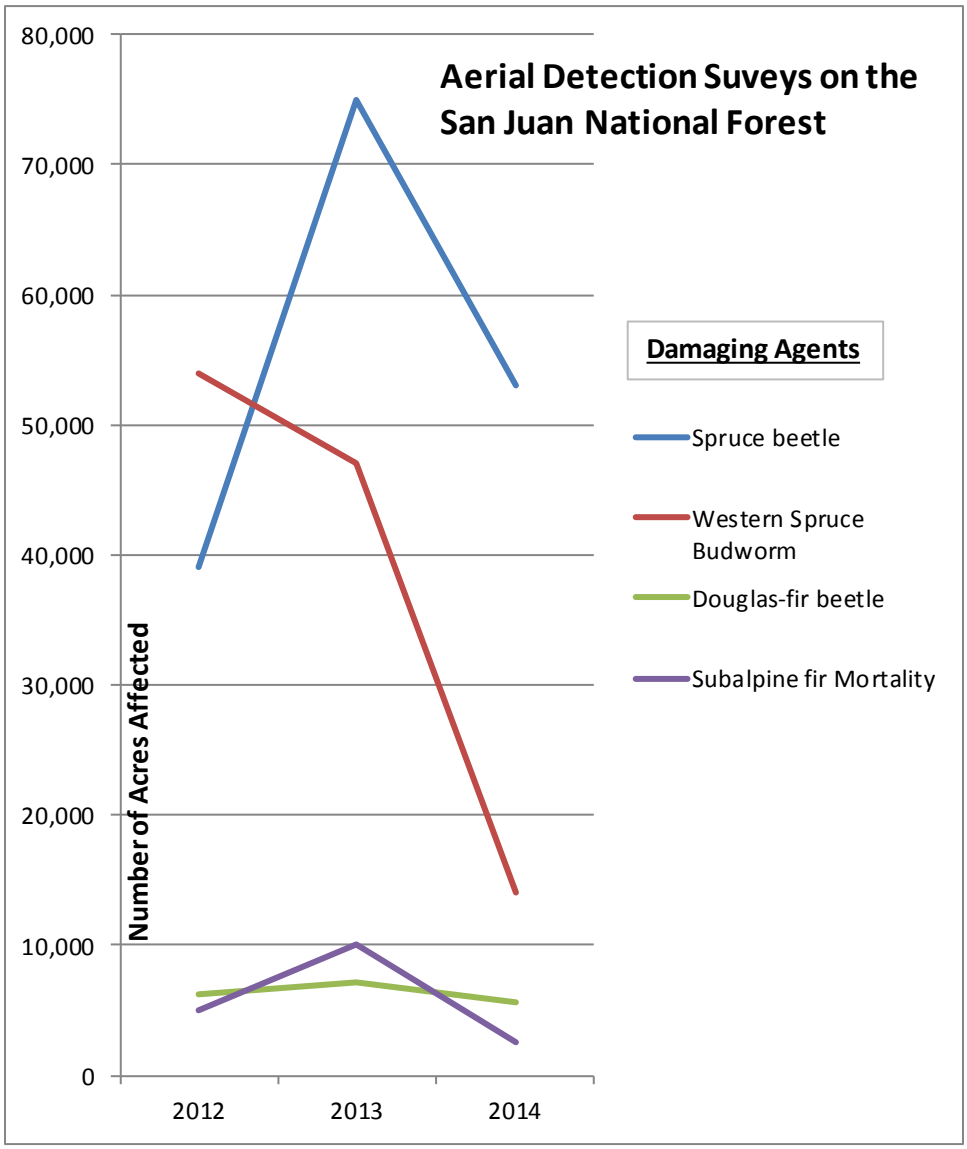


Figure 1. Number of damaged forest acres and the damaging agents from 2014 Aerial Detection Surveys

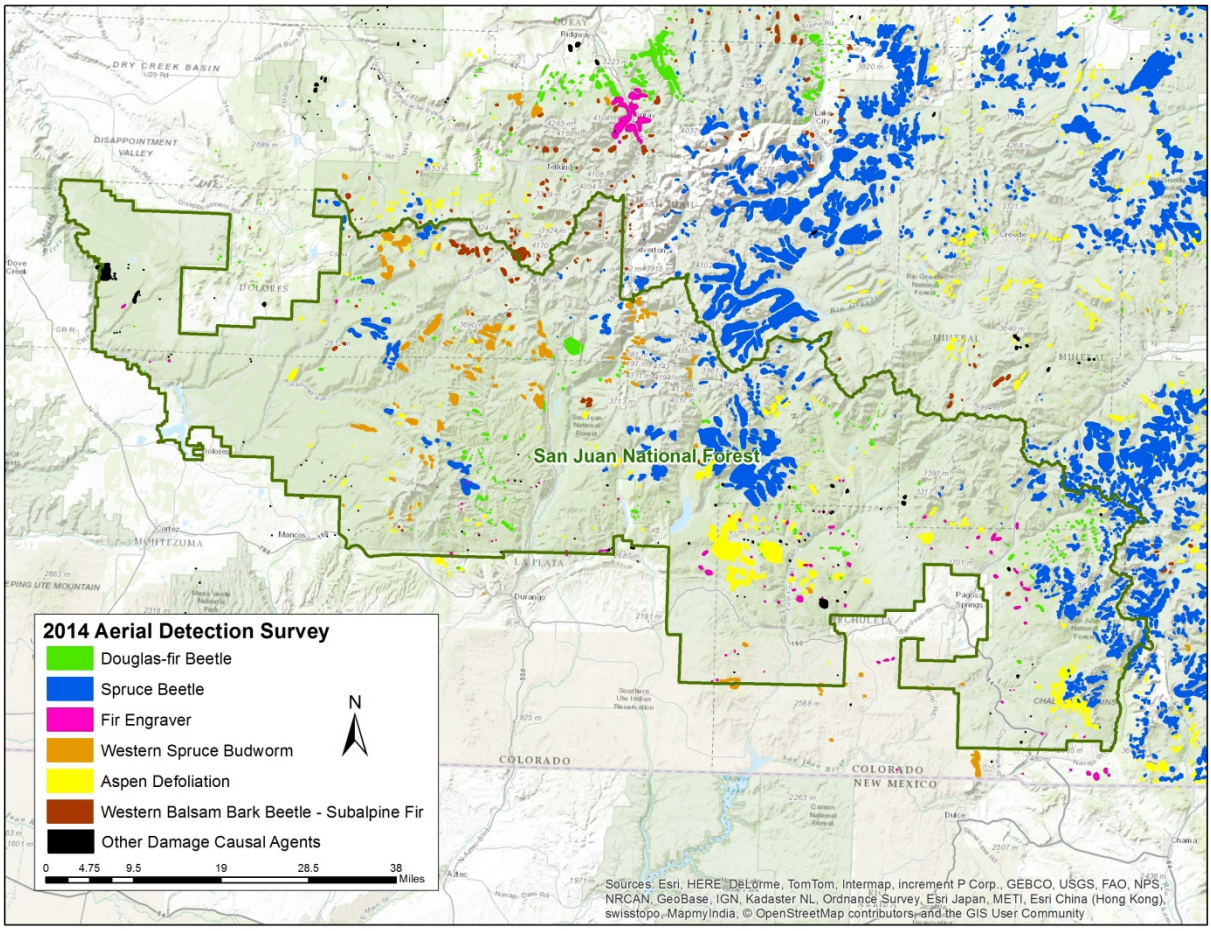


Figure 2. Map of 2014 Aerial Detection Survey of the Rio Grande National Forest

Western Spruce Budworm, a defoliating insect, feeds on the new needles of white fir, Douglas-fir and sometimes on spruce and subalpine fir **(Fig. 3).** Activity was observed in over 14,000 acres on the San Juan National Forest.

In many areas, the western spruce budworm populations fluctuate over the course of decades in response to long-term weather patterns; some of the more susceptible stands often have chronic populations of these insects. Western spruce budworm impacts in these areas are a constant factor in stand dynamics. Disruption of the multi-storied condition of the shade tolerant species through management activities reduces the impact of this insect over the long run. Such work can often be accomplished in cooperation with fuels management activities.

Feeding by western spruce budworm does not directly kill the tree, however stress from repeated defoliation causes top-kill and predisposes the tree to attack by other insects.

Figure 3. Western spruce budworm larvae on Douglas-fir needles by Brian Howell

Douglas-fir beetles killed Douglas-fir trees in widely scattered acres around the Rio Grande National Forest. In some stands, almost every mature tree was infested. Douglas-fir trees were killed in about 5,600 acres of forests, which was a decline in damages from Douglas-fir beetle in previous years **.**

Subalpine fir mortality occurs sometimes as a combination of attack from **Armillaria root rot disease and western balsam bark beetle**. Subalpine fir mortality, due to western balsam bark beetle, is ubiquitous throughout the range of subalpine fir. While much of the actual subalpine fir mortality was attributed to western balsam bark beetle, it is likely that many of these trees were pre-disposed to beetle attack because of infections from Armillaria root disease.

Patterns of subalpine fir tree mortality were widely scattered throughout mixed conifer forests on the San Juan National Forest**.** Some declining subalpine firs may have several overlapping generations of beetles in the same tree. Increases in subalpine fir mortality often track periods of drought where increased stress on the subalpine firs results in tree death.

Western balsam bark beetle activity was detected on 2,600 acres in subalpine firs on the San Juan National forest. These beetle infestations were generally widespread and yet kiled fewer trees per acre than other bark beetles.

2014 Forest Health Highlights: Shoshone National Forest

USDA Forest Service, Rocky Mountain Region, Forest Health Protection
Rapid City Service Center, 8221 S Highway 16, Rapid City, SD 57702

Kurt Allen, Entomologist; Jim Blodgett, Plant Pathologist; Al Dymerski, Forestry Technician; Kendra Schotzko, Entomologist. p: 605-343-1567

Conditions

- Lodgepole and 5-needle pine tree mortality caused by mountain pine beetle (**Fig. 1**) increased to 58,000 acres; mostly in 5-needle pines (**Fig 2**). The epidemic shifted south in 2014 to areas where susceptible hosts are abundant. Verbenone is being used to protect 5-needle pine and preventive spraying is used to protect trees in campgrounds.
- Spruce beetle mortality was detected in 41,000 acres (**Fig. 1**), almost doubling in acres on the forest.
- Western spruce budworm increased to 26,000 acres affected; mostly in the north.
- Western balsam bark beetle, Armillaria root disease, and potentially other damage agents are causing mortality in subalpine fir with an increase from 5,300 acres in 2013 to 9,000 acres in 2014.
- Douglas-fir bark beetle damage was observed in 90 acres in 2014 aerial surveys.
- White pine blister rust, an invasive fungal disease, continues to intensify and cause significant mortality in limber and whitebark pine stands.
- Dwarf mistletoe continues to cause damage to lodgepole, limber, and whitebark pines in the Forest.
- Comandra blister rust disease is common in lodgepole pines.

Figure 1. Mountain pine beetle and white pine blister rust, spruce beetle, and Douglas-fir beetle mortality.

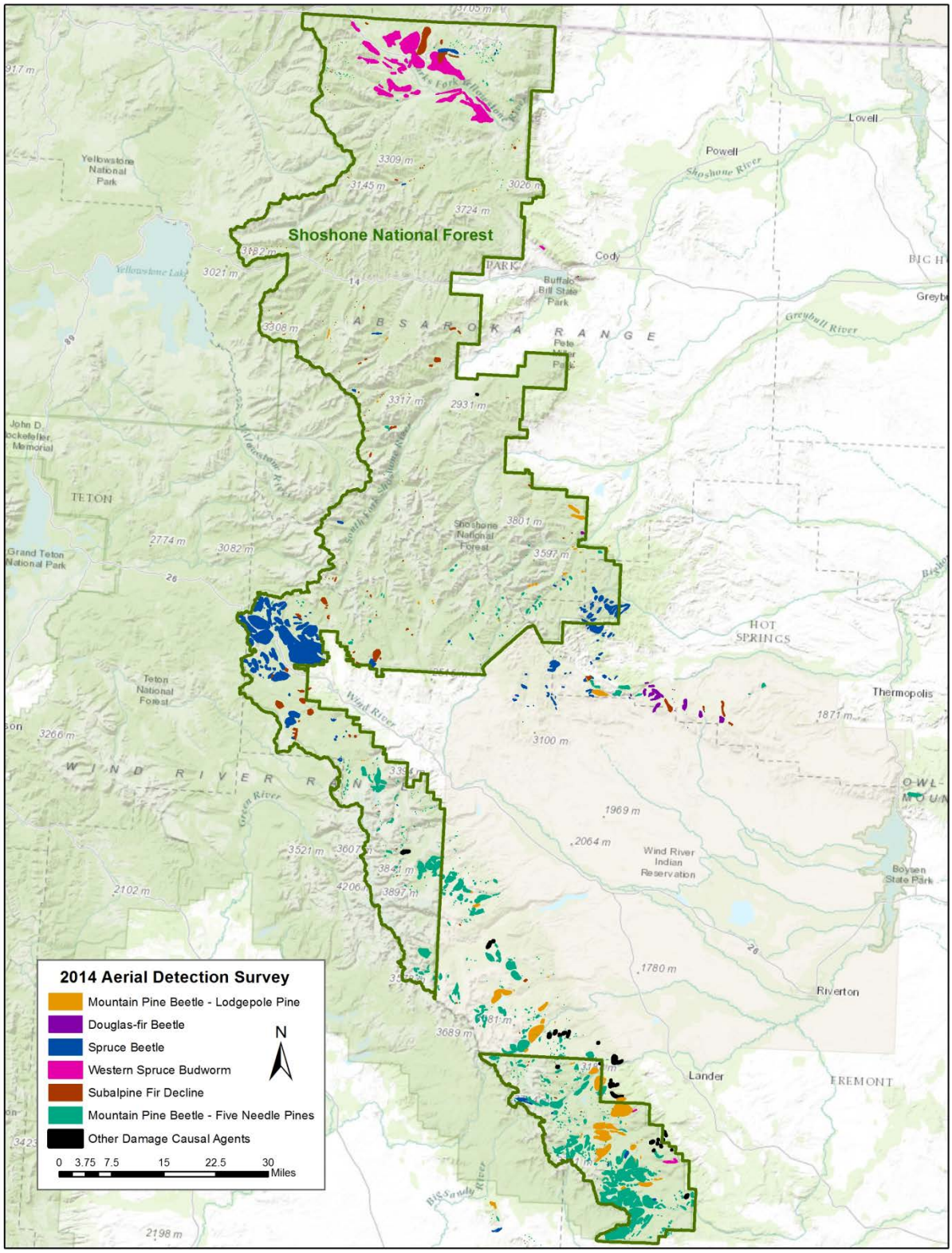


Figure 2. Map of Aerial detection survey of the Shoshone National Forest: 2014.

2014 Forest Health Highlights: White River National Forest

USDA Forest Service - Rocky Mountain Region (R2) – State & Private Forestry-Tribal Relations

Forest Health Protection – **Gunnison & Lakewood Service Centers**

Insect and Disease activity on the White River National Forest in 2014

Spruce beetle:

Aerial survey in south central Colorado indicated spruce beetle epidemics on the White River NF. Scattered activity of spruce beetle continued on the western end of the of National Forest with 5,000 new acres of spruce beetle damage during 2014. (Figures 1 & 2)

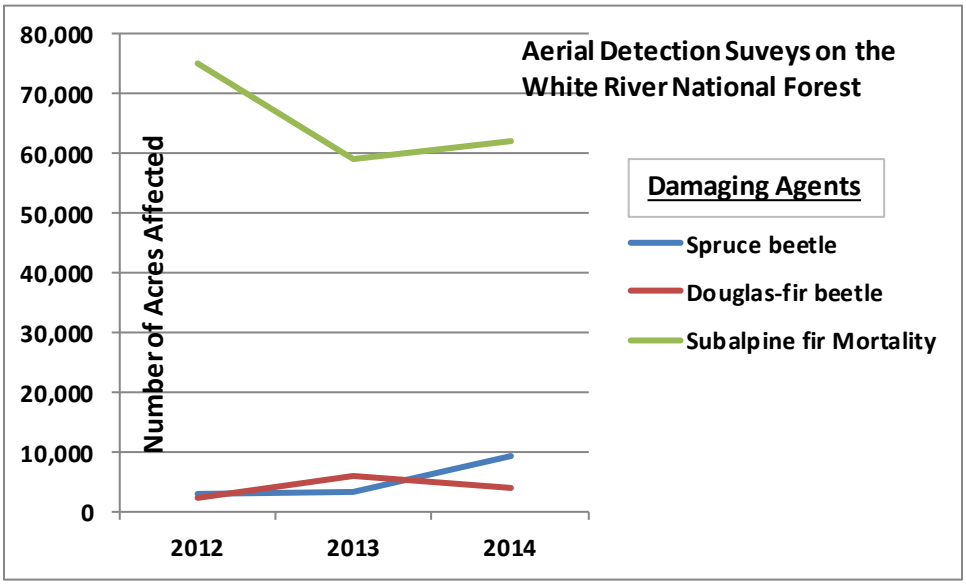
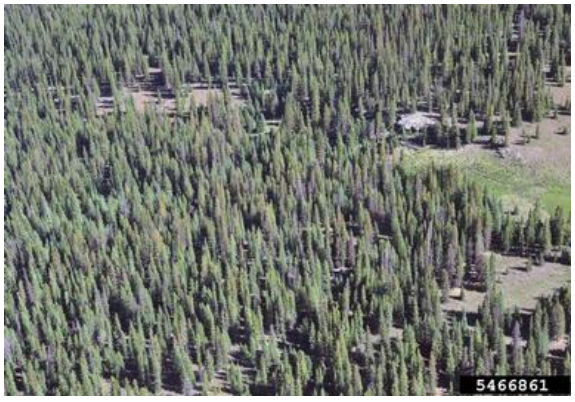


Figure 1. Chart showing the number of damaged acres found on the White River National Forest. Damages and damage agents were observed during the 2014 Aerial Detection Surveys.

Figure 2. Spruce beetle damages in spruce forests.



Douglas-fir beetle:

Widespread, low level Douglas-fir tree mortality caused by Douglas-fir beetle was scattered across much of the susceptible cover type on the White River National Forest. The Douglas-fir mortality that caused the greatest concern occurred when the largest trees were most affected. Levels of Douglas-fir tree mortality varied widely from some of it scattered in a only few stands to almost the total loss of mature Douglas-fir trees in other stands.

Subalpine fir mortality:

Subalpine fir mortality in the White River National Forest **(Fig.3)** is most often caused by attacks by Western Balsam Bark Beetle & Armillaria Root Disease. The 2 damage agents together kill only a few trees per acre. Pockets of this subalpine fir mortality were scattered in high elevations forests stands of only subalpine firs or mixed conifers. Determination of the exact year of death is difficult even when inspecting trees on an individual basis. Increases in subalpine fir mortality often tracks periods of drought where increased stress on host trees results in tree death.

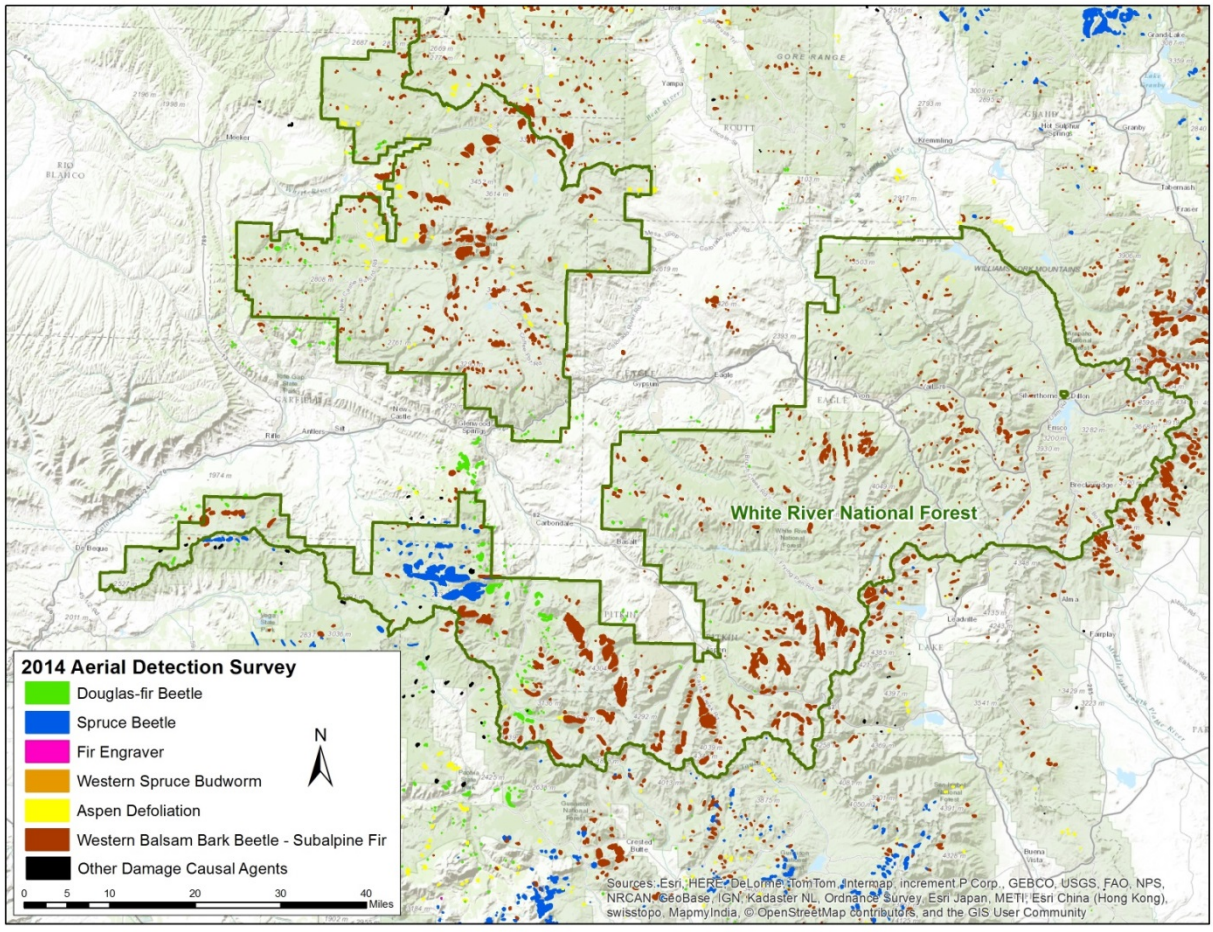


Figure 3. 2014 Aerial detection Survey map of the White River National Forest.

For additional Information:

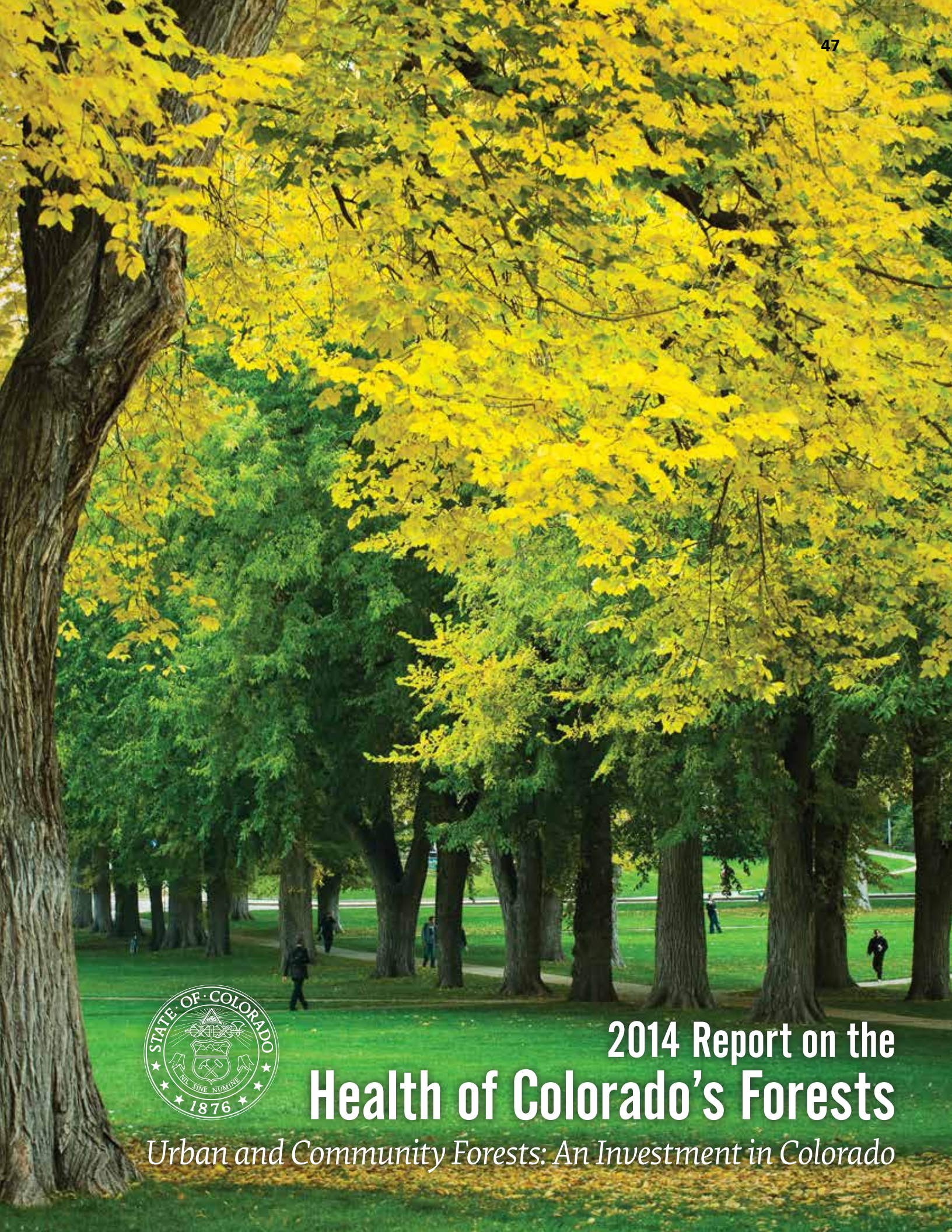
An excellent resource that provides more detailed information on these and other forest insects and forest diseases is the "Field Guide to Diseases & Insects of the Rocky Mountain Region". This publication contains illustrations and descriptions of the damage agents, guidelines for management and a brief introduction to the literature concerning the pertinent topics. This document may be obtained in soft cover format from Rocky Mountain Region Service Centers, or may be seen or downloaded from the site: http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/insects-diseases/?cid=stelprdb5176420

The **Gunnison & Lakewood Service Centers** continue to monitor the status of forest health on the White River National Forest. For additional information, please contact Roy Mask - R2 Forest Health Protection group leader rmask@fs.fed.us 303-275-5061 or Jim Kruse - Lakewood Service Center leader jkruse@fs.fed.us 303-236-9541.

Section 2

States 2014 Forest Health Highlights Reports

Colorado	**(FH sections copied from the original 2014 Report on the Health of Colorado's Forests) Pages 47 – 62**
Kansas	**63 – 68**
Nebraska	**69 – 72**
South Dakota	**73 - 79**
Wyoming	**80 - 85**



2014 Report on the Health of Colorado's Forests

Urban and Community Forests: An Investment in Colorado

Acknowledgments

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- Robert Cain, Entomologist, USDA Forest Service, Lakewood, Colo.
- Whitney Cranshaw, Professor and Extension Specialist, Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colo.
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- Dan West, Entomologist, Forest Management Division, CSFS, Fort Collins, Colo.
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- Mitch Yergert, Director, Plant Industry Division, Colorado Department of Agriculture, Broomfield, Colo.

The following individuals reviewed and/or provided information for the aerial survey results presented in this report:

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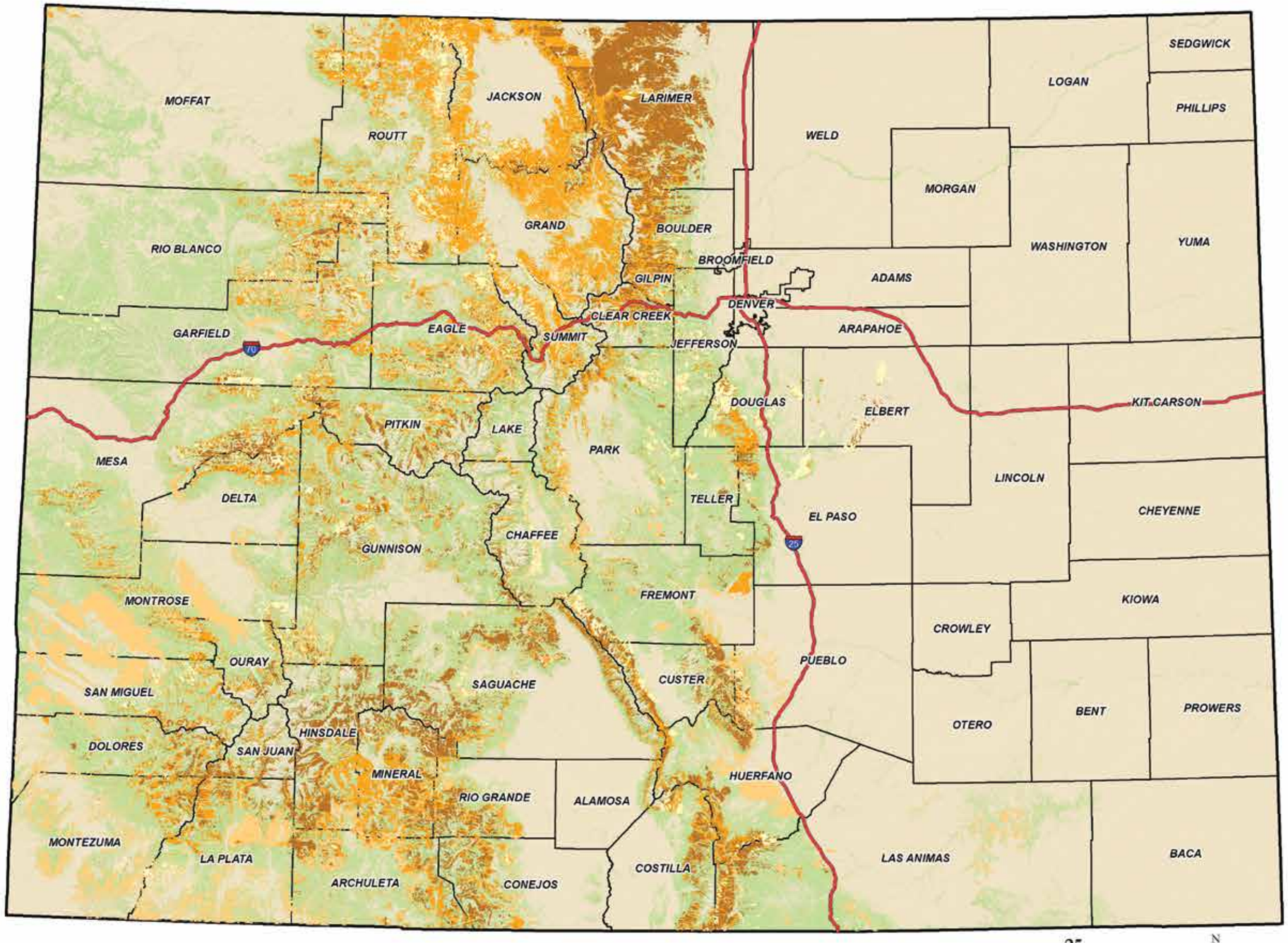
- Michael Till, Assistant District Forester, Woodland Park District, CSFS, Woodland Park, Colo.

Front cover photo: Autumn on the Colorado State University campus. Photo: Bill Cotton, Colorado State University

Background photo this page: Boulder's Pearl Street Mall. Photo: Bill Cotton, Colorado State University

Forest Insect and Disease Progression in Colorado, 1996-2014



Data Source: United State Department of Agriculture (USDA)
Forest Health Technology Enterprise Team (FHTET)

1996-2000
2001-2005
2006-2010
2011-2014

Aerial Survey Data

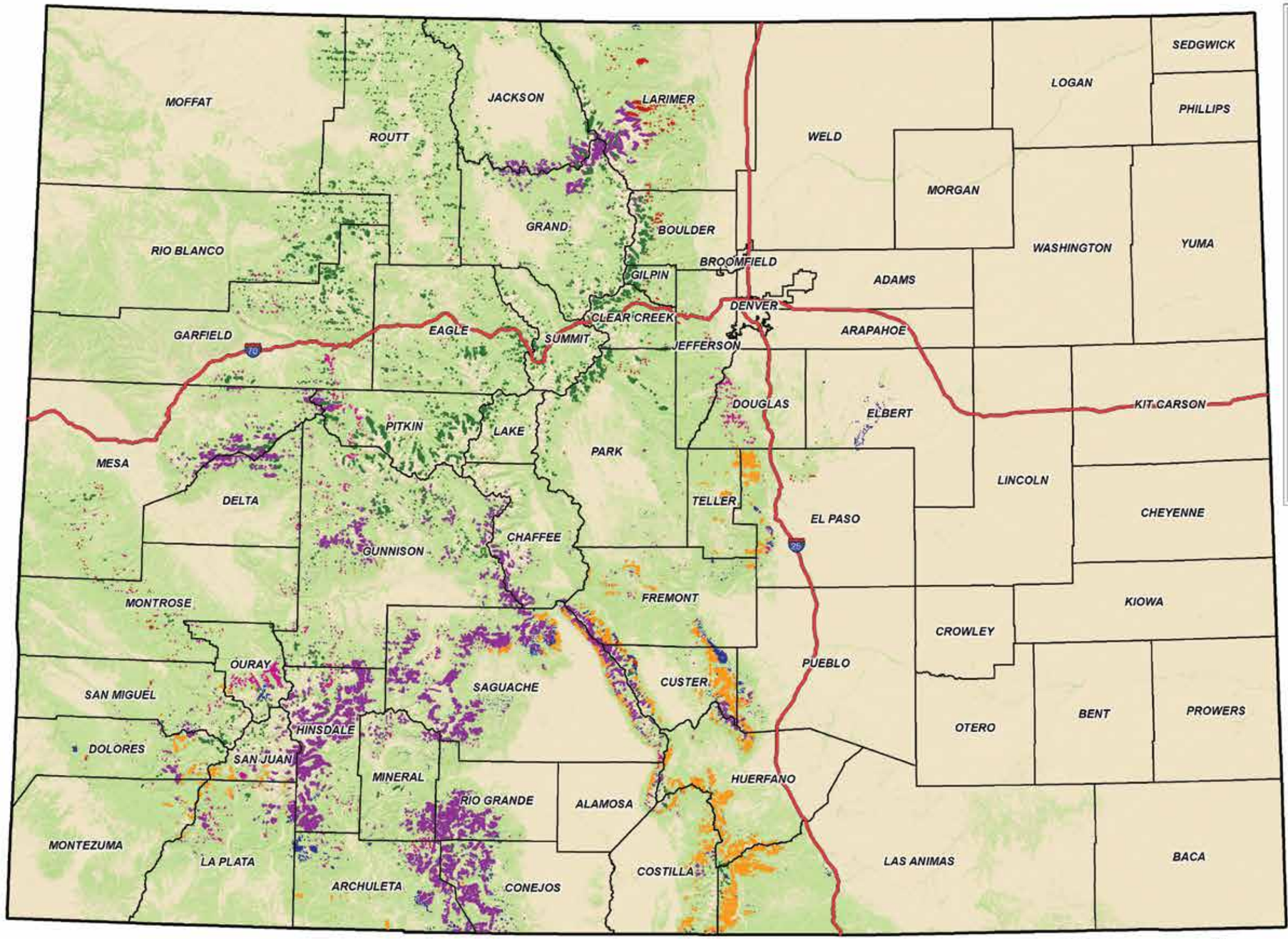
Due to the nature of aerial surveys, the data on this map only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on the map because these agents are not detectable from aerial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

The insect and disease data represented on this map are available digitally from the USDA Forest Service, Region 2 Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this map for purposes other than those for which it was intended may yield inaccurate or misleading results.

Map created December 2014
For more information:
www.csfs.colostate.edu

Colorado State Forest Service

2014 Insect and Disease Activity in Colorado Forests



Spruce Beetle
485,000 Acres

Western Spruce Budworm
178,000 Acres

Subalpine Fir Decline
173,000 Acres

Douglas-fir Beetle
34,000 Acres

Mountain Pine Beetle
15,000 Acres

Other Insects and Diseases
12,900 Acres

Data Source: United State Department of Agriculture (USDA)
Forest Health Technology Enterprise Team (FHTET)

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Map created December 2014
For more information:
www.csfs.colostate.edu

Colorado State Forest Service

▲ Michael B. Lester, State Forester and Director. Photo: Society of American Foresters

Director's Message

January 2015

The objective of the annual Report on the Health of Colorado's Forests is to inform state legislators, citizens and other stakeholders about the condition of our forests, to provide a basis for public dialogue. Each year, the report provides a broad update on forest insect and disease activity throughout the state. This year's report also focuses on the importance of our urban and community forests, challenges we face in managing them, and the actions we can take to address those issues. We chose this emphasis to highlight the contributions that our urban and community forests make to quality of life, and to underscore the importance of proper care for forests at risk to insects, diseases and challenging environmental conditions.

Trees provide numerous benefits, whether growing in our mountain forests or in urban settings. The former provide benefits such as clean water, wildlife habitat, recreation and economic benefits. Equally important are the benefits of urban trees, which help clean our air, provide shade, control storm runoff and contribute to quality of life. They are one of the few components of a community's infrastructure that actually increase in value over time.

Not long after I became Colorado's State Forester in 2013, an urban tree pest I had come to know in Pennsylvania – emerald ash borer – was confirmed in Colorado for the first time. This destructive insect, which has cost Eastern communities billions of dollars to manage, provides a prime example of why it's important we devote significant resources to caring for our urban and community trees.

Successful management of our forests can only be accomplished through partnerships. As a part of the Warner College of Natural Resources at Colorado State University and working closely with the Colorado Department of Natural Resources, the Colorado State Forest Service relies on numerous other partners, many of whom are named in this report, to achieve healthy forests across the state.

I hope you find the information covered in this year's report useful and interesting. Please feel free to contact any Colorado State Forest Service office to learn more about our diverse forests – in both community and wildland settings – and what you can do to help manage them for the benefit of present and future generations.

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

Table of Contents

Executive Summary

The Colorado State Forest Service (CSFS) produces an annual report on the health of Colorado's forests, which provides information to the Colorado General Assembly and citizens of our state about emerging and ongoing forest health issues, and actions being taken to address them. The theme of the 2014 report is *Urban and Community Forests: An Investment in Colorado*. After an overview of the condition of Colorado's forests and insect and disease concerns around the state, this year's report features content devoted to our urban and community forests.

As in previous years, insect and disease data for this report were largely obtained through the annual aerial forest health survey, a cooperative project between the CSFS and the Rocky Mountain Region of the USDA Forest Service. Data also were derived from field inspections, contacts with forest landowners and special surveys designed to ensure early detection of invasive insect species.

For the third straight year, spruce beetle was the most widespread insect pest of Colorado's forests, impacting 485,000 acres of Engelmann spruce forest in 2014. In contrast, the area affected by mountain pine beetle declined to its lowest level since the current outbreak began in 1996. Other insect and disease concerns in Colorado's mountain forests include Douglas-fir beetle, subalpine fir decline, western spruce budworm and defoliating insects of aspen. A more comprehensive list of the damaging agents of Colorado's forests is available in the supplemental *2014 Colorado Forest Insect and Disease Update*, available online at www.csfs.colostate.edu.

Forest health also is an issue in our urban and community forests. In Colorado's community forests, primary insect and disease

◀ Every urban tree returns two-and-a-half times the total investment through higher property values, reduced air and water pollution and energy savings. Photo: Bill Cotton, Colorado State University

concerns are thousand cankers disease, which has been killing black walnut trees in Front Range urban forests for a decade and has now spread to the Eastern Plains, and the highly destructive emerald ash borer (EAB). This pest, which infests all true ash species, was first confirmed in Colorado in 2013, in the City of Boulder. An interagency Colorado EAB Response Team has taken various actions to manage its spread in Colorado, including: establishing a quarantine for Boulder County and surrounding areas; implementing a monitoring/detection process to determine the extent of infestation; conducting outreach efforts on the importance of not moving ash wood; and introducing biocontrol measures to help manage EAB's potential spread. Additional EAB surveys did not detect infestations outside the City of Boulder in 2014, but the pest poses a serious threat to Colorado's urban forests, where ash trees comprise an estimated 15 percent or more of all trees.

Caring for Colorado's urban and community forests – and protecting them from threats like EAB – is vital to preserving their myriad benefits. Planted trees in populated areas, from small towns to larger cities like Denver and Grand Junction, provide countless ecological and economic benefits that directly impact the majority of Coloradans. Each urban tree returns two-and-a-half times the financial investment to plant and maintain it, through higher property values, reduced air and water pollution, and energy savings. For decades, urban trees continually work to capture and store carbon, remove pollutants from the air, reduce stormwater management costs, and provide a more pleasant atmosphere where families live and work.

In Colorado's semi-arid climate, and with the presence of destructive insects and diseases, maintaining healthy urban and community forests presents considerable challenges. Trees on Colorado's Eastern Plains, which have been planted over generations to modify the harsh, windy environment, face perhaps even greater challenges – and arguably reap greater benefits. On the plains, trees serve some of the same functions as in larger towns, and also form windbreaks, living snow fences and shelterbelts that protect livestock, crops, roads, homesteads and other property from wind and snow.

From urban settings to plains communities and mountain forestlands, the CSFS is the lead state agency for providing technical forestry assistance to help private landowners and communities achieve their stewardship goals. As part of this role, the agency offers communities throughout the state technical assistance for urban tree planting, planning, care and maintenance needs. The CSFS also works with private landowners to share best practices for achieving healthy urban trees, through workshops, site visits and publications, and through coordination of the Tree City USA® program in Colorado.

Urban and community forestry encompasses the broad stewardship and management of natural resources, having impacts on not just planted trees, but everything from urban wildlife to air and water quality. Foresters working for municipal, county and state government and for higher education organizations help create healthier, more livable urban environments through active management of community trees. Some of the many public needs addressed by urban and community forestry include planning and planting our next-generation urban forests; invasive species planning and response; tree inventory and assessment; education and outreach; and urban wood utilization.

Tree species diversity is critical for the long-term health of our urban and community forests. Whenever too many trees of the same species (or genus, in some cases) are planted in one area, the odds increase for losing a larger percentage of trees susceptible to diseases or insects when a pest outbreak occurs.

Like the need for tree species diversity, diverse partnerships are critical to addressing forestry challenges in Colorado, and pooling of resources allows for more effective and efficient management. Prominent community forestry partnerships in Colorado include the interagency EAB Response Team, Colorado Tree Coalition and South Platte River Urban Waters Partnership. Also, work to remove invasive trees at Barr Lake State Park provides a good example of collaborative efforts to achieve forestry objectives in Colorado.

Forestry challenges do not stop at property lines, and we all play a role when it comes to addressing forest health. Successful forest management in the mountains, on the plains and in urban or community settings can only be accomplished through the collaborative efforts of various stakeholders – including government agencies, private landowners, tree-care companies and non-profits. We all share responsibility to help restore and enhance our diverse forests, because an investment in our trees is an investment for all of Colorado.

▲ Ensuring a variety of tree species is important to reduce the potential impacts of future insect and disease threats. Photo: Bill Cotton, Colorado State University

Colorado State Forest Service: Facilitating Forest Stewardship on Private Land

The Colorado State Forest Service (CSFS) is the lead state agency for providing technical forestry assistance and wildfire mitigation expertise to private landowners. A service and outreach agency of the Warner College of Natural Resources at Colorado State University, the agency has approximately 130 full-time and seasonal employees, and 19 field offices across the state. The CSFS also provides staffing to the Division of Forestry in the Colorado Department of Natural Resources.

The CSFS works with private landowners, communities, and other agencies and organizations to help them make informed decisions to achieve their stewardship goals, reduce wildfire risk, and promote healthy and diverse forests for present and future generations. Every year, the CSFS helps treat approximately 20,000 acres of forestland, and assists approximately 6,400 landowners and hundreds of communities to help improve forest health.

▲ Top: Aaron Rector, CSFS Cañon City District assistant district forester, measures the diameter of a ponderosa pine. Photo: Kathryn Hardgrave, CSFS

▲ Above: Meg Halford, CSFS Franktown District assistant district forester, talks with landowners about the results of an aerial survey to map pine sawfly defoliation. Photo: William M. Ciesla

The mission of the Colorado State Forest Service is to achieve stewardship of Colorado's diverse forest environments for the benefit of present and future generations.

Statewide Insect and Disease Update

The following sections summarize the status of insect and disease damage in Colorado's forests during 2014. The primary source of these data is the annual aerial forest health survey, a cooperative effort between the Colorado State Forest Service and the Rocky Mountain Region of the USDA Forest Service. The annual survey is an effort at mapping active insect and disease damage that can be detected by aerial observers; acres referenced from the 2014 survey do not include cumulative damage from previous years. Other sources of information for this update are field visits and other contacts with forest landowners, and data from the Forest Inventory and Analysis (FIA) program. In addition, the results of special detection surveys for emerald ash borer, gypsy moth and thousand cankers disease were utilized. A more comprehensive list of the damaging agents of Colorado's forests is available in the supplemental *2014 Colorado Forest Insect and Disease Update*, available online at www.csfs.colostate.edu.

Conifer Forests

Spruce Beetle

(Dendroctonus rufipennis)

Spruce beetle outbreaks continued across Colorado's high-elevation Engelmann spruce forests in 2014. This was the state's most widespread forest pest for the third successive year, with active infestations occurring on 485,000 acres – an increase of approximately 87,000 acres over 2013. Outbreaks continued in the San Juan/La Garita ranges, Grand Mesa, the Wet Mountains and portions of northern Colorado. Infestations increased in severity in the Cochetopa Hills and Sangre de Cristo Range in the southwest part of the state, to the north and east of the largest ongoing outbreak. In some areas, most or all of the mature spruce trees have been killed. Nearly 1.4 million acres of mature spruce have been impacted in Colorado since 1996.

Mountain Pine Beetle

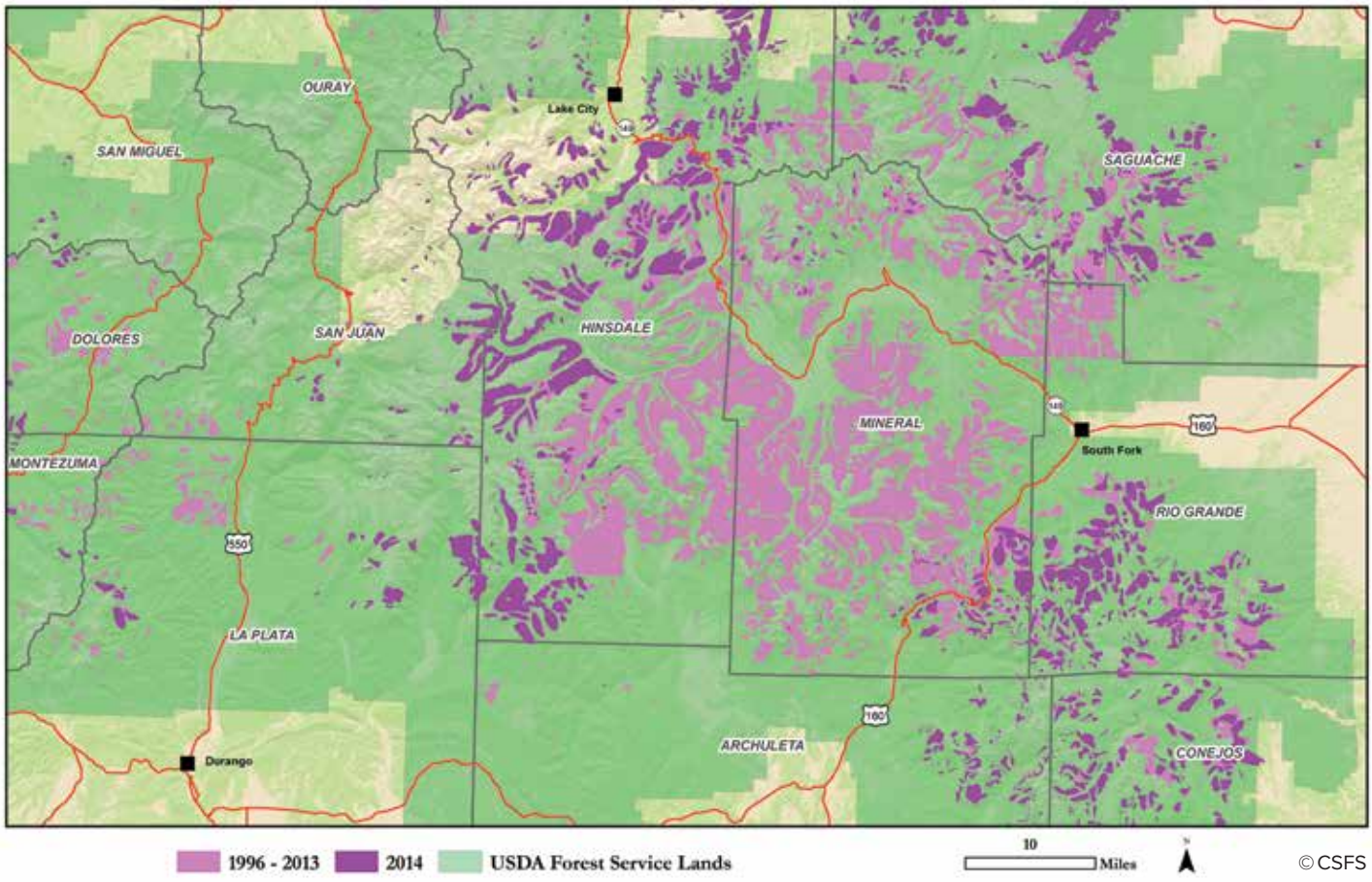
(Dendroctonus ponderosae)

In 2014, the area affected by mountain pine beetle declined to its lowest level since the current outbreak began in 1996. A total of 15,000 acres with some level of active infestation were mapped during the annual aerial forest health survey, and most of the active infestation (approximately 10,000 acres) occurred in Larimer County. Infestations also continued along the eastern slope of the Sangre de Cristo Range and on Miller Mesa near Ridgway. The decline in areas with active infestation is largely due to the death of suitable host trees during previous years of the outbreak. Since 1996, approximately 3.4 million acres of lodgepole, ponderosa and five-needle pines have been impacted by the outbreak in Colorado.

▲ **Before:** This Engelmann spruce forest, located in Slumgullion Pass near Lake City, was healthy and vigorous in 2006. Photo: William M. Ciesla

▲ **After:** By 2014, most of the trees have been killed by spruce beetle in the same Engelmann spruce forest. Photo: William M. Ciesla

Spruce Beetle in Southwestern Colorado, 1996-2014



▲ Spruce beetle outbreaks occurred in many areas of Colorado, but the southwestern region is experiencing the largest ongoing outbreak in the state.

▲ An adult spruce beetle on the bark of an Engelmann spruce tree. Photo: William M. Ciesla

▲ Trees in the Weminuche Wilderness heavily infested with spruce beetles. Fire-scarred trees in the foreground are the result of the West Fork Fire Complex of 2013. Photo: William M. Ciesla

Subalpine Fir Decline

Tree mortality of subalpine fir, caused by a combination of root disease fungi (most commonly *Armillaria spp.* and *Heterobasidion parviporum*) and western balsam bark beetle (*Dryocoetes confusus*) continued at chronic levels during 2014. Approximately 173,000 acres of tree mortality were mapped, compared with 178,000 acres in 2013.

Douglas-fir Beetle

(Dendroctonus pseudotsugae)

Douglas-fir beetle continued to kill groups of mature Douglas-fir trees in several areas of the state, and tree mortality attributed to the beetle was mapped on 34,000 acres. The heaviest damage occurred between Ouray and Ridgway and in the northern portions of the Rampart Range, in Douglas County.

Fir Engraver Beetle

(Scolytus ventralis)

Fir engraver beetle is a pest of true firs (white fir, subalpine fir) throughout the West; in southern Colorado, white fir is the preferred host. In 2014, infestations occurred on 43,000 acres, with areas of significant damage detected on the eastern slopes of the Sangre de Cristo and Wet Mountain ranges and in and around the community of Ouray.

▲ Mortality from subalpine fir decline was noticeable throughout the Elk Mountains between McClure and Independent passes. Photo: William M. Ciesla

▲ An outbreak of fir engraver beetle erupted into moderate to severe levels in white fir stands outside of Ouray, Colo. Photo: William M. Ciesla

Western Spruce Budworm

(Choristoneura freemani [=occidentalis])

The larval stage of western spruce budworm damages buds and current-year foliage of Douglas-fir, true firs and spruce. Outbreaks have been underway across portions of southern Colorado since 1998, and in 2014 a total of 178,000 acres of aerially visible defoliation were mapped – an increase from 156,000 acres in 2013. Infestations have gradually spread northward, and the area of aerially visible defoliation in the southern Rampart Range has increased significantly.

▲ Western spruce budworm larvae feed on buds and current-year foliage of Douglas-firs, true firs and spruce trees. Photo: William M. Ciesla

Douglas-fir Tussock Moth

(Orgyia pseudotsugata)

Douglas-fir tussock moth defoliates Douglas-firs and true firs. Outbreaks are cyclic in nature and occur at seven- to 10-year intervals. The last outbreak in Colorado occurred from 2004 to 2008 near Aspen Park and in the northern Rampart Range. Defoliation by Douglas-fir tussock moth over multiple years can cause mortality in impacted trees.

In 2014, areas of severe defoliation by this moth were detected on the slopes of Cheyenne Mountain south of Colorado Springs and in the northern Rampart Range. In all, 530 acres of aerially visible defoliation were mapped. In addition, localized defoliation of Colorado blue spruce occurred in urban areas in Colorado Springs, Denver, Boulder and Fort Collins.

▲ A pupal case and an adult male Douglas-fir tussock moth. Adult moths emerge from cocoons from late July through November. Photo: William M. Ciesla

▲ Pine sawfly larvae populations were so high in Elbert and El Paso counties in 2014 that they stripped host trees of foliage long before their feeding cycle was completed. Photo: William M. Ciesla

Pine Sawfly

(Neodiprion autumnalis)

The pine sawfly, which as larvae defoliate ponderosa pines, has been present at low to moderate levels in portions of Elbert and El Paso counties, along the easternmost fringes of Colorado's ponderosa pine forests, for many years. However, its population surged into a major outbreak in 2014, causing almost complete consumption of the foliage over large areas of pine forests in these counties. A total of 7,400 acres of defoliation was mapped during the aerial forest health survey.

Deciduous Forests

Defoliating Insects of Aspen

Western tent caterpillar (*Malacosoma californicum*) and large aspen tortrix (*Choristoneura conflictana*) defoliate aspen forests, and both species have caused defoliation of aspen forests in southern Colorado since 2004. In 2014, 78,000 acres of aerially visible defoliation were mapped, compared with 54,000 acres in 2013. Notably heavy damage caused by western tent caterpillar occurred from Poncha Pass south and west to the historic mining town of Bonanza.

Thousand Cankers Disease

Thousand cankers disease (TCD), caused by a fungus (*Geosmithia morbida*) and spread from tree to tree by the walnut twig beetle (*Pityophthorus juglandis*), has been killing black walnut trees in Colorado's urban forests for the past decade. Decline and death of ornamental black walnuts continued in urban areas from Cañon City north to Fort Collins in 2014. Also, a cooperative survey conducted by the CSFS, Colorado State University Extension, the CSU Plant Diagnostics Clinic and the City of Fort Morgan led to the detection of this disease in Fort Morgan – the easternmost location where TCD has been found in Colorado.

Emerald Ash Borer

(Agrilus planipennis)

Emerald ash borer (EAB) is an exotic pest that became established in the U.S. in the late 1990s and now has spread to 24 states and two Canadian provinces, killing millions of ash trees. Only ash trees are at risk from EAB – but all species of true ash (*Fraxinus spp.*) are at risk.

In September 2013, an EAB infestation was first confirmed in Colorado in the City of Boulder. An interagency EAB Response Team began a preliminary delimitation survey that fall to determine the extent of infestation and established a quarantine that now encompasses Boulder County and some surrounding areas.

Early in 2014, the initial delimitation survey was completed and indicated that the known area of EAB infestation was confined to the City of Boulder. Additional surveys in the Metro Denver area and other communities along the Front Range did not detect new infestations in 2014, but monitoring efforts revealed clear evidence of the pest in additional areas of the City of Boulder.

▲ This black walnut tree, beside a Fort Collins home, is infested with thousand cankers disease. Photo: William M. Ciesla

The Importance of Plains Forestry in Colorado

▲ A healthy riparian ecosystem composed of plains cottonwoods, willow species and other broadleaf trees along Chacuaco Creek. Photo: Shelly Simmons, CSFS

▲ District Forester Donna Davis, CSFS La Junta District, teaches Colorado Master Volunteer Forest Stewards how to identify, care for and manage trees in plains communities. Photo: Jamie Dahl, CSFS

Except for the trees naturally occurring in piñon-juniper forests and riparian areas, those on Colorado's Eastern Plains have been planted over generations to modify the harsh, windy environment and make it more suitable for humans, livestock and crop production.

Some of the primary functions of planted trees on the Eastern Plains, in both community and agricultural settings, include:

- creating windbreaks and shelterbelts that enhance water conservation; protect livestock, crops, roads, homesteads and other property from wind and snow; help fight soil erosion; and provide opportunities for economic savings
- offering shade and energy savings through reduced heating/air-conditioning costs in small towns and rural homes
- forming living snow fences that keep roadways accessible
- creating wildlife habitat
- enhancing quality of life for communities, rural landowners and homeowners with trees that offer aesthetic appeal, visual screens, reduced noise and airborne dust mitigation

Practicing forestry in eastern Colorado can be difficult due to the broad geographic scope of a largely treeless landscape, and the budget constraints of many smaller municipalities that lack dedicated forestry staff or the funding necessary to plant and maintain trees. To fill this void, the Colorado State Forest Service helps rural landowners and smaller communities with tree selection, planting and care advice; insect and disease concerns; management of invasive species in riparian settings; development and support for local tree boards; and outreach, service and education. Also, for more than 50 years the CSFS Nursery in Fort Collins has been a reliable source of tree and shrub seedlings for conservation plantings.

Trained local volunteers provide another means to address tree concerns across the Eastern Plains. In the spring of 2014, the CSFS and Colorado Tree Coalition offered the first-ever "Colorado Master Volunteer Forest Steward – Plains" course in La Junta. Nineteen students graduated from the 36-hour, six-week training, held at Otero Junior College and the CSFS La Junta District office. Coursework provided participants with key concepts of individual tree care and knowledge and appreciation of community trees on the plains, enabling them to serve as forestry advocates to widespread plains communities.

native to this region, and thus struggle to thrive in the state's semi-arid climate, broad temperature fluctuations and potentially poor soils without regular care. Severe windstorms and snowstorms that occur in the spring and fall – when leaves are present on deciduous trees – cause additional damage and destruction to community and private trees. Also, new developments and construction present a threat to established trees.

Non-native insect and disease threats are another major challenge facing our community forests. Emerald ash borer (EAB) poses a serious threat to Colorado's urban forests, where ash species comprise an estimated 15 percent or more of all trees.

Besides EAB, our urban forests face other significant insect and disease threats. Thousand cankers disease of black walnut is fully entrenched in Colorado, and has already killed thousands of trees in portions of the Metro Denver area and many other cities along the Front Range and Eastern Plains. Gypsy moth, though not established in Colorado, is a potential threat to many species of deciduous and conifer trees. These and other threats to the state's urban forests have the potential to result in substantial costs, both economic and environmental.

The Value of Metro Denver's Urban Forests

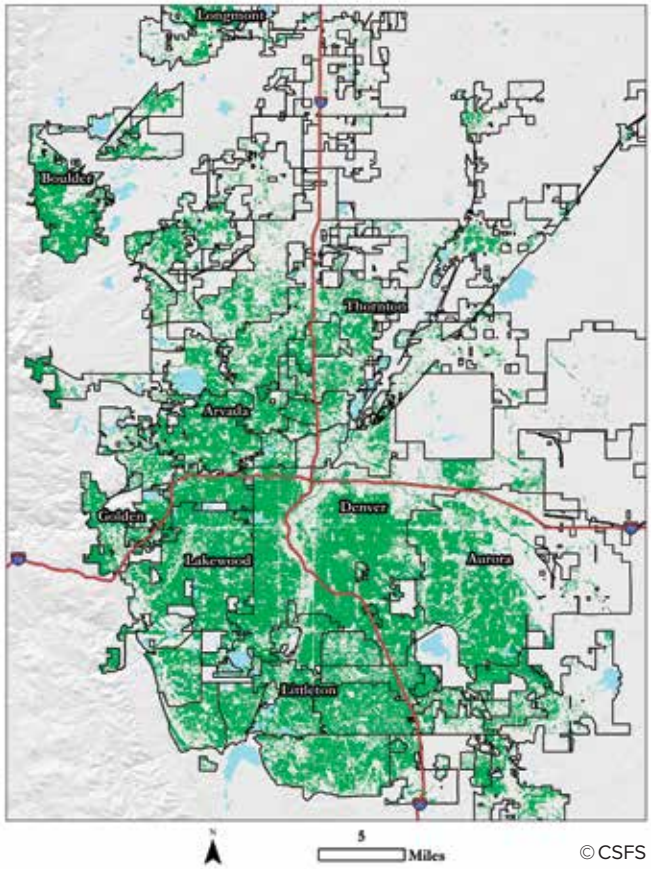
The Denver area attracts many people as an ideal place to live, work and visit, leading to increasingly dense populations in urban environments. Despite the obvious needs for additional housing and infrastructure, green space remains critical to quality of life for residents here. Approximately 10.7 million trees can be found in Metro Denver's urban forests, utilized for everything from shade in recreational locations to helping control excess water flows during intense storm events.

Metro Denver's urban tree canopy covers 16 percent of the land area, ranging to as high as 37 percent in some communities. Impervious surfaces like roads, parking lots and buildings that do not absorb precipitation and runoff account for approximately 34 percent of the land area, while lawns, other vegetation and bare soil account for 48 percent.

The collective urban forests of the Metro Denver area yield significant monetary benefits. The region's 72,272 acres of forest canopy produce services valued at $551 million annually, with the largest benefit being in the form of property value increases.

▲ Approximately 10.7 million trees can be found in Metro Denver's urban forests. Photo: Bill Cotton, Colorado State University

Metro Denver Urban Tree Canopy Cover



▲ Metro Denver's urban tree canopy covers 16 percent of the land area, ranging to as high as 37 percent in some communities. (Data Source: National Land Cover Database 2011)

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Additional Resources

2014 Colorado Forest Insect and Disease Update, www.csfs.colostate.edu

Colorado Emerald Ash Borer information, www.eabcolorado.com

Colorado State Forest Service, www.csfs.colostate.edu

Colorado Tree Coalition, www.coloradotrees.org

Firewise Communities/USA Program, www.firewise.org

South Platte River Urban Waters Partnership, www.urbanwaters.gov/splatte

► Urban trees provide aesthetic appeal and a more pleasant atmosphere for people to live and work. Photo: Bill Cotton, Colorado State University

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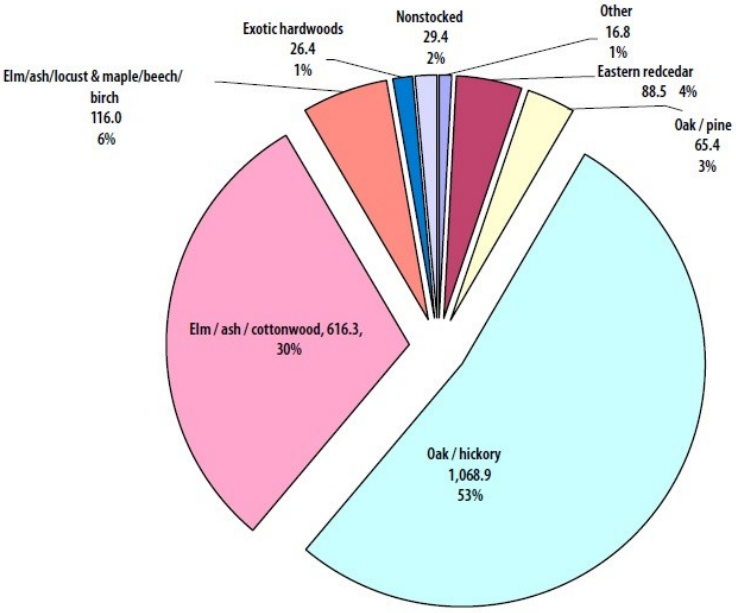
Kansas Forest Health Highlights 2014

Forest Resource Summary

In Kansas, the eastern hardwood forests transition into the prairie of the Great Plains. Forestland accounts for 5.2 million acres, of which over 95% is privately owned. Our forests are productive; local forest products contribute approximately $1.3 billion annually to the Kansas economy.

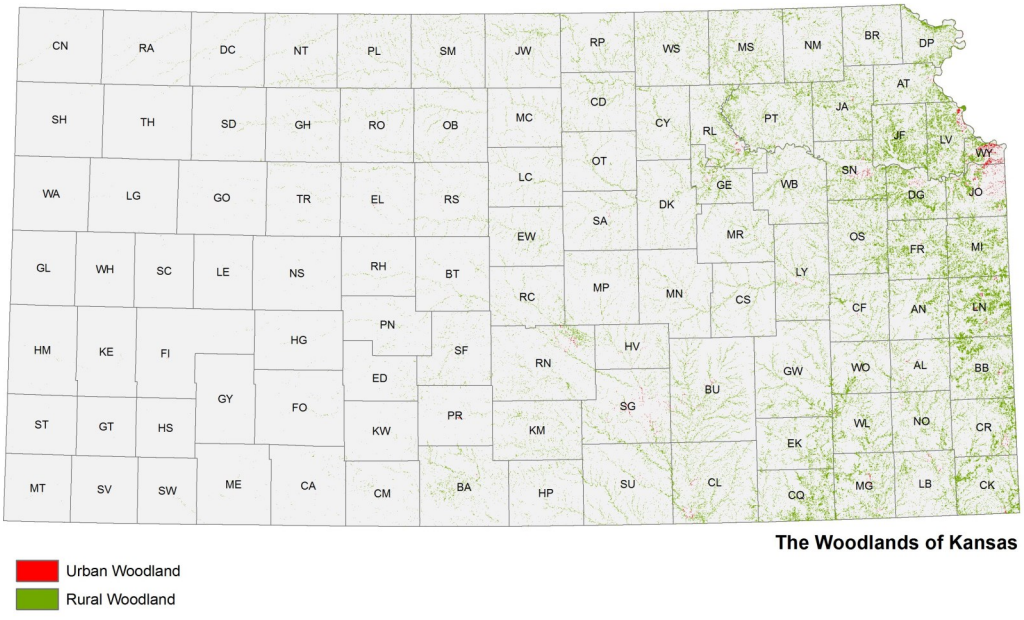


Most of the contiguous forestland is located in the eastern third of the state. Much of the Kansas landscape is devoted to agriculture, but forests and trees are prominent components. The majority of the state's woodlands are linear in nature and follow water features along the terrain.

The top tree species, by statewide volume, are hackberry, cottonwood, American elm, green ash, osage-orange, black walnut, mulberry, bur oak, honeylocust, and American sycamore. Oak/Hickory and elm/ash/ cottonwood are the two dominant forest types.

Over the past 60 years or so, cottonwood regenerations levels have been low. Re-engineering of riparian environments due to expansion of agriculture, construction of dams, and stream channelization have altered the landscape where cottonwood previously flourished. Unlike cottonwoods, eastern red cedar trees have been very successful as early invaders on grasslands and abandoned range and farmlands.

Even though Kansas's forests are increasing in acreage, the oak component is decreasing in some areas as forest succession favors shade intolerant species, such as hackberry and American elm.



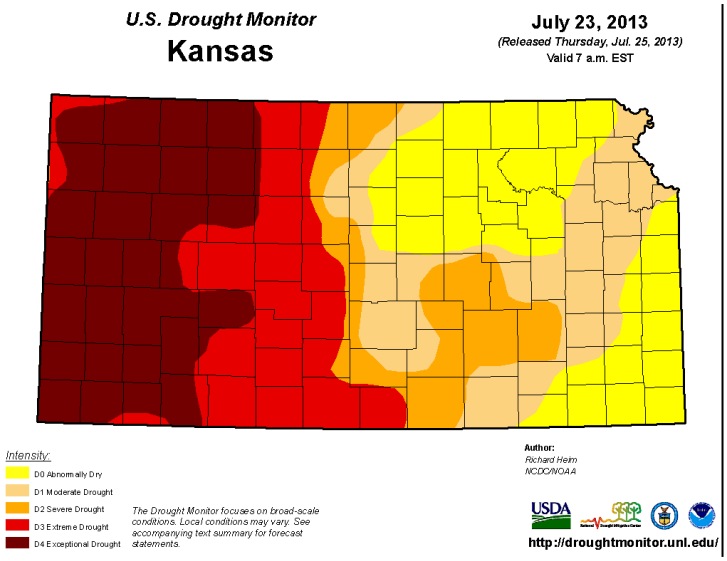
The Woodlands of Kansas

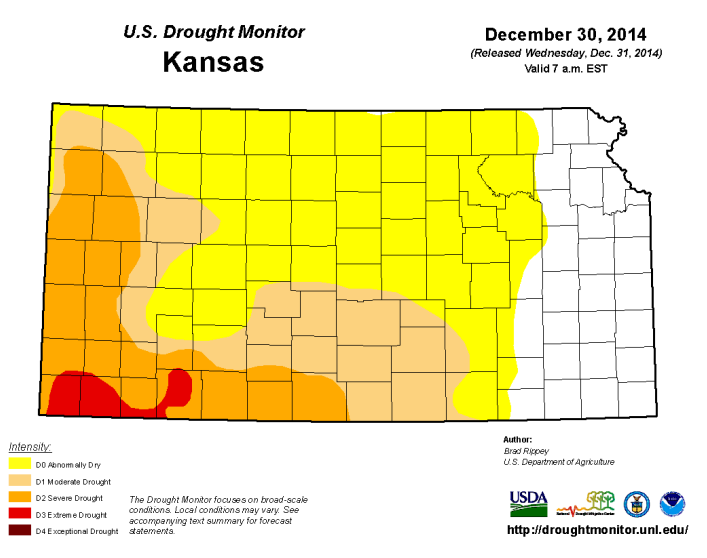
DROUGHT

Urban trees and rural forests saw some relief in 2014 from stress incurred over the previous three years of historic drought conditions. The cumulative effects of a multi-year drought were not totally mitigated by a return to “normal” precipitation levels. It has become common to see windbreaks, riparian forest systems, and large woodlots with significant mortality due to sustained drought and heat stress. As an example, the City of Wichita removed more than 20,000 trees due to drought stress and mortality, with up to a total of 40,000 removals projected in the next two years.

The National Drought Mitigation Center - U. S. Drought Monitor continues to indicate that many Kansas counties remain in at least a "Moderate Drought" (47% of the state), with 34% of Kansas in the "Severe Drought" or worse category.

The continuation of dry weather has taken the toll on our planted pine species, eastern red cedar, native oak species, silver maple, cottonwood, ash, and black walnut. Much decline is seen in mature trees that can not compensate for the additional stress over multiple years. Additionally, natural defenses against damaging insects have been reduced due to drought stress.





URBAN & RURAL FOREST HEALTH ALERTS:

Emerald Ash Borer (EAB)

Agrilus planipennis
All *Fraxinus* spp. susceptible

EAB-infested ash tree showing decline

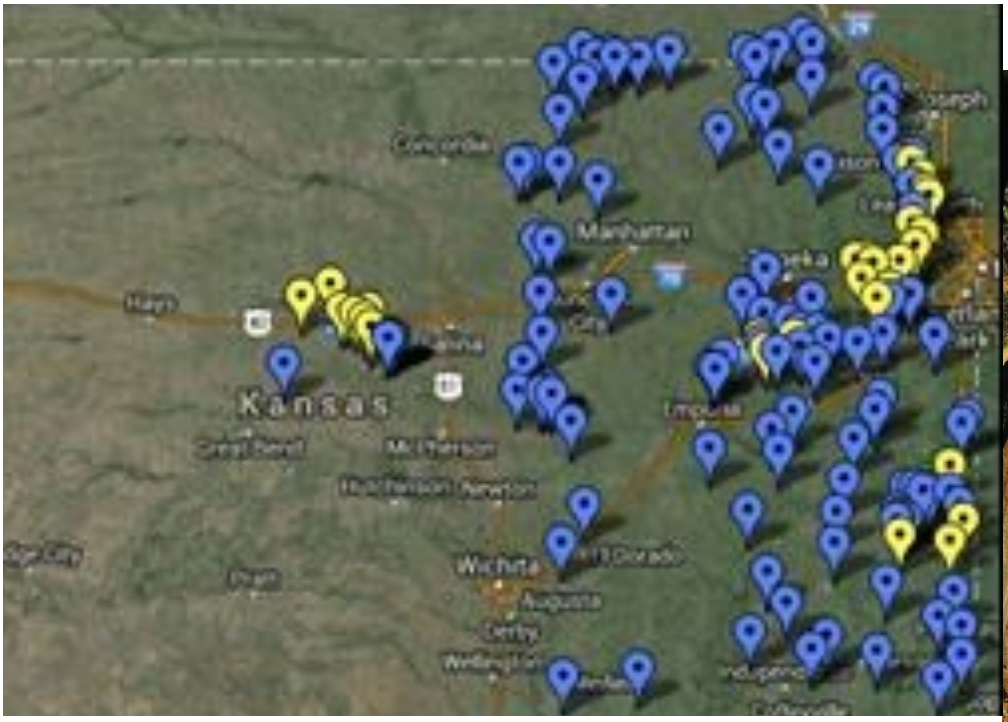
The Kansas Forest Service is involved in projects to survey and prepare Kansas's urban and rural forestland owners for the threat posed by EAB. Efforts are being made to slow the spread from the initial confirmed infestations.

On August 26, 2012, the Kansas Department of Agriculture (KDA) implemented an EAB Quarantine for Wyandotte County. Johnson County was added to the state's quarantined area on July 5, 2013, after a confirmed EAB specimen was found. A trap tree in Leavenworth County was confirmed to contain EAB in 2014.

Information sessions with community leaders in Leavenworth, Wyandotte, and Johnson counties have been held to ensure our cities have the necessary information needed for their EAB Strategic Plans.

State survey efforts were made to detect any new populations. Visual surveys will continue in 2015, along with continued deployment of purple prism traps. Traps are placed at near the initial county finds, and at areas of high-risk like heavily-visited state campgrounds in the east, major travel corridors, and sawmills.

Additional Pest Detector Trainings have been offered around the state to increase our detection efforts and keep our citizens informed. Training sessions to municipality leaders have been conducted in the tri-county region of Leavenworth, Wyandotte, and Johnson.



82 EAB Traps set by KDA (Yellow: in grid, Blue: Not in grid)

EAB larva & feeding gallery

Thousand Cankers Disease (TCD)

Geosmithia morbida & *Pityophthorous juglandis*
Black walnut most susceptible

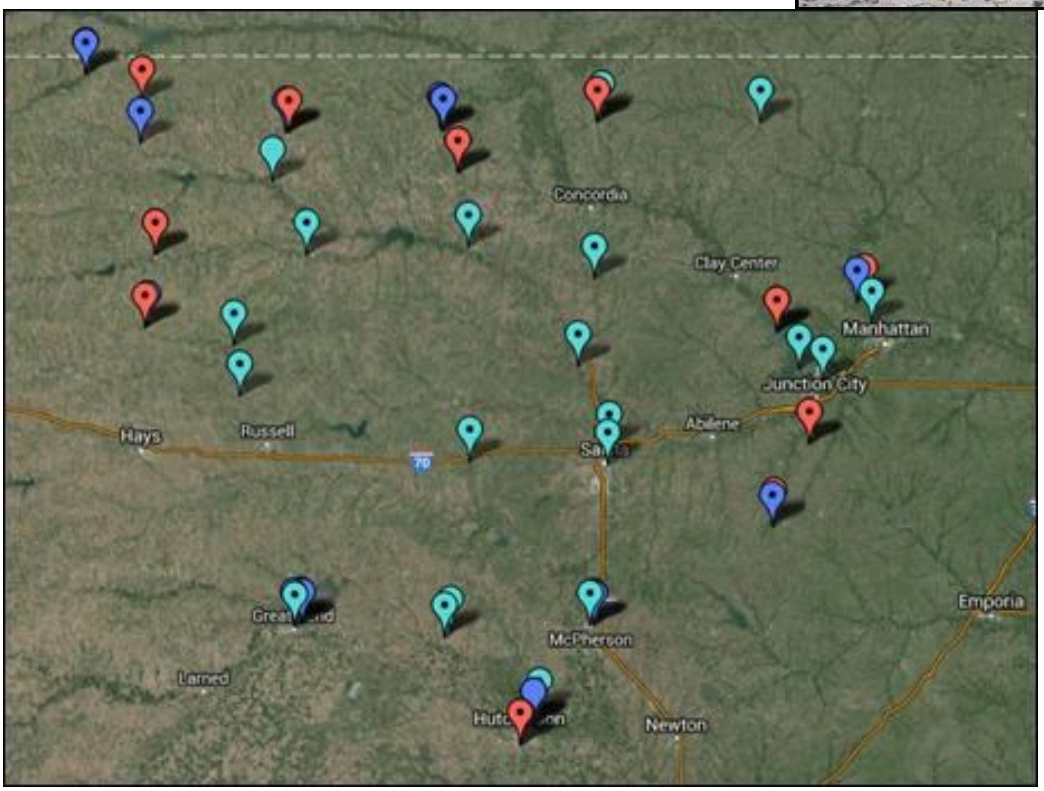
This disease has not yet been detected in Kansas. However, Kansas shares a 200-mile border with Colorado, an infested state, increasing the risk of TCD introduction.

Street-side and on-the-ground visual surveys of black walnut have been conducted across the state. Lindgren traps, with lure, were set and monitored by Kansas Department of Agriculture (KDA) at key locations statewide. No walnut twig beetle (WTB) specimens were found.

KDA conducted an Agroforestry Pest survey for WTB, oak ambrosia beetle (*Platypus quercivorus*) and oak processionary moth (*Thaumetopoea procesionea*) at 36 sites across Kansas. These sites were required to have oaks and walnuts both present to be trapped. No pests of concern were found.

TCD trainings occurred throughout the year to arborists, municipalities, and landowners, greatly increasing the detection network and providing further outreach efforts. A new draft of the TCD Strategic Plan was written and adopted, as well.

A black walnut plantation in eastern Kansas



2014 Survey

- 2 oaks & walnut
- 1 oak & walnut
- 1 oak
- 2 oaks
- walnut

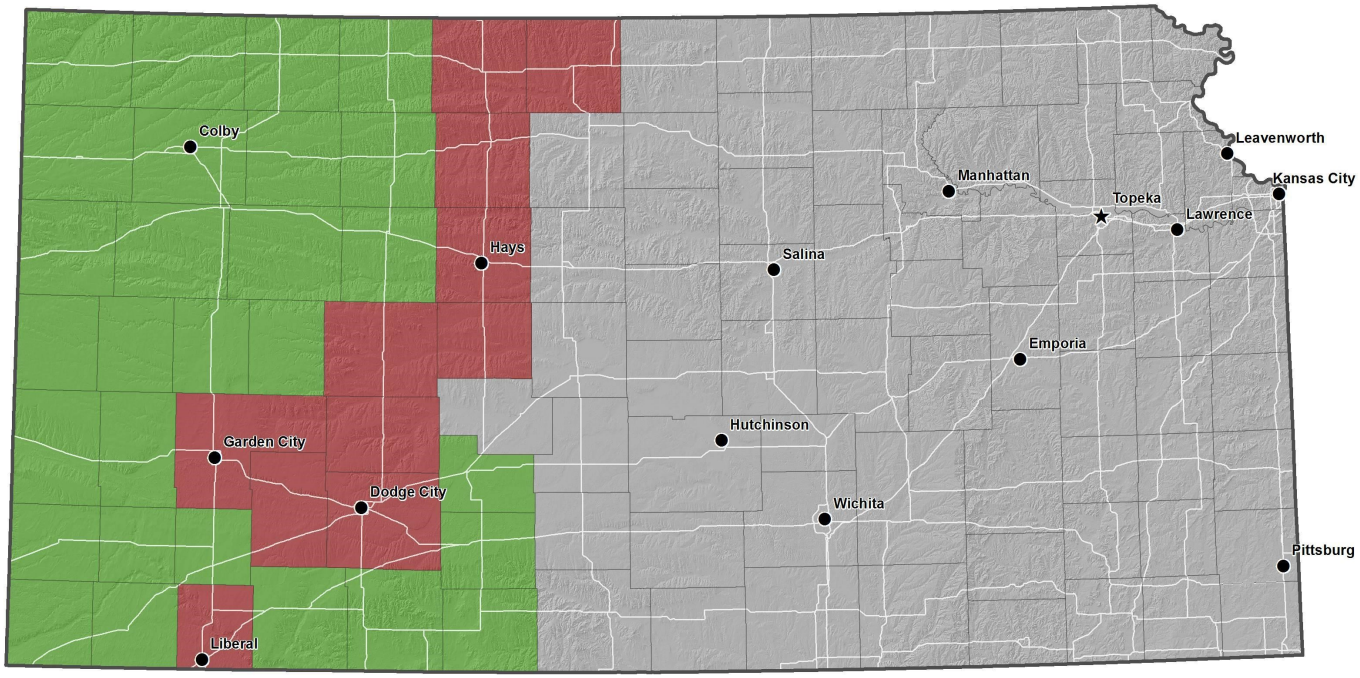
Pine Wilt

Bursaphelenchus xylophilus & *Monochamus* spp.
Scotch, Mugo, Austrian, and White pines

Pine wilt is caused by a plant parasitic nematode called the pine wood nematode, *Bursaphelenchus xylophilus*. The nematode is vectored by the pine-sawyer beetle, a long-horned borer in the genus *Monochamus.* They kill pine trees by feeding and reproducing in the resin canals of the branch and trunk.

In 2014, two new pine wilt detections occurred in Meade County, with eradication ongoing. The city of Hays continues to monitor and eradicate pine wilt amongst several thousand public pines.

This disease is continuing to spread westward, frequently damaging and causing high mortality in windbreaks and conservation plantings containing *Pinus nigra* and *P. sylvestris*.



Pine Wilt established both in communities and rual settings.
Pine Wilt present, but limited to one or a few locations. Eradication ongoing.
Pine Wilt not yet discovered.

Other Forest Health Concerns

Asian Bush Honeysuckle

The non-native bush honeysuckles (*Lonicera maackii*, *L. tatarica*, and *L.* x *bella*) and their vine counterpart, Japanese honeysuckle (*Lonicera japonica*) have invaded many woodlands, forests, and nature preserves causing declines in species diversity and richness of native ground cover and mid-story vegetation.

Honeysuckle infestation can be ascribed, in part, to their adaptability to a wide variety of habitats and spread as a result of being a prolific producer of seeds (bush honeysuckles primarily) that are easily dispersed by birds. Asian bush honeysuckle possesses rapid aboveground and belowground growth, is adapted to low-light environments, begins growth earlier and can continue growing later in the growing season than most other woodland species.

Urban woodlands around Wichita, Topeka, and the Kansas City metro area are now getting additional much-needed management to combat these invasive shrubs and vine. New management techniques utilizing backpack mistblowers (see photo above) show much promise with economical, effective control of this forestland invader. This project will need several seasons of control efforts in the prescribed high priority target areas controlled by county parks & recreation, Kansas Dept. of Wildlife, Parks & Tourism, and private stakeholders.

Additionally, a spectral remote-sensing protocol has been developed to detect and delimit infestations, and will eventually aid in strategic decision-making to treat populations and limit the spread of this invasive plant.

For Forest Health assistance and further information on Forest Health in Kansas, please refer to the following.

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USDA Forest Service – Rocky Mountain Region
Forest Health Protection (FHP) – Forest Health Monitor
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www.fs.usda.gov/goto/r2/fh

Nebraska Forest Health Highlights 2014

The Forest Resource

Nebraska is home to several important forest types. Ponderosa pine dominates the forests in the Panhandle of western Nebraska including the Wildcat Hills in the central Panhandle and the Pine Ridge in the north. Upland deciduous forests are present in the east along the Missouri and Nemaha Rivers. In northern Nebraska, the Niobrara Valley contains an ecologically unique mix of ponderosa pine, eastern redcedar, central hardwood forests (oak and walnut) and remnants of the northern boreal forest (aspen and birch). Riparian forests of cottonwood, elm and ash protect river and stream corridors throughout the state.

The current estimate of forest land area in Nebraska is 1.3 million acres. Windbreaks, shelterbelts and narrow wooded riparian strips account for an additional 423,000 acres of tree-covered land, while community forests add 470,000 acres to the state's total forest resources. In total 3.3 million acres of forested and treed land are present in the state.

Pests and Problems of Concern in Nebraska

Pine wilt

Pine wilt continued to kill thousands of Scotch and Austrian pines in eastern and south-central Nebraska in 2014. The disease also occurred in scattered locations in the central and southwestern parts of the state. Because of pine wilt, the Nebraska Forest Service no longer recommends using Scotch pine in long-term plantings.

Scotch pine windbreak and trees killed by pine wilt.

Diplodia blight

Diplodia blight continued to kill and damage many pines in Nebraska in 2014 in both urban and rural landscapes. Mortality and damage most often occurred on Austrian and ponderosa pines. Stressed trees are more susceptible to the disease, such as those affected by drought and overcrowded stands, and urban landscape trees that have been poorly planted or poorly cared for.

Austrian pines in decline from Diplodia blight.

Ips beetles

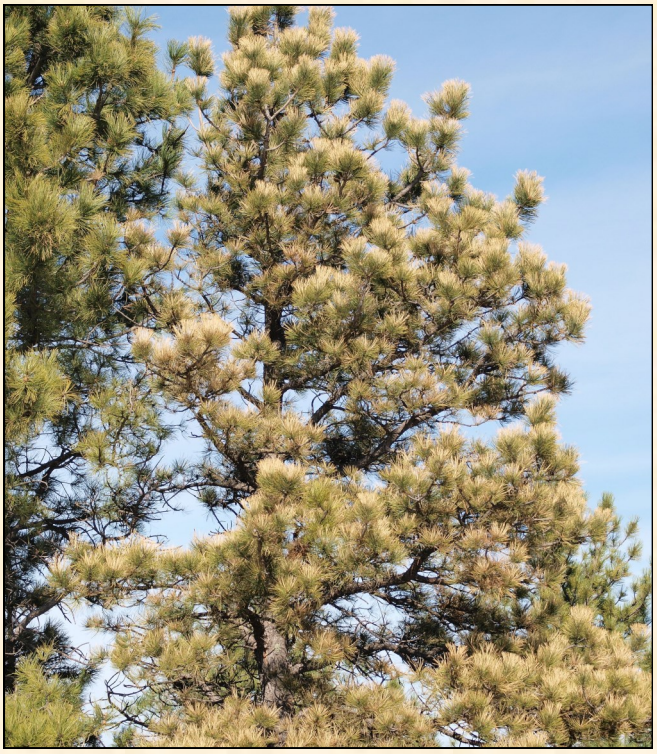
Ips beetles continued to cause damage in native ponderosa pine in western and north-central Nebraska, but caused less mortality and damage in 2014 than in 2013. The reduced damage was most likely because of reduced drought stress resulting from near normal precipitation in 2014 and because of better handling of slash piles after logging operations. Ips beetles also continued to cause mortality within and adjacent to areas recently affected by wildfires.

Ponderosa pines along the Snake River in Nebraska damaged and killed by Ips beetles.

Drought injury

Drought conditions generally improved in Nebraska in 2014 with many areas receiving near normal precipitation for the year. Forests in most areas of the state are now beginning to recover from the severe drought of the previous several years but are still weakened by the previous drought injury.

Pines in far western Nebraska showed substantial needle browning in January 2015 apparently from short-term severe drought stress that began in the fall of 2014. The needle browning seemed to be caused by warm and windy conditions in November and December after the ground had frozen.



Ponderosa pine in western Nebraska injured by warm, windy conditions during late fall.

Freeze injury

Very warm early fall temperatures followed by a rapid drop to below freezing caused freeze injury on many pines in western Nebraska.

Ponderosa and Austrian pine in western Nebraska injured by warm temperatures that rapidly dropped to below freezing.

Zimmerman pine moths

Three species of Zimmerman pine moth (*Dioryctria* spp.) continued to cause branch and tree mortality in Nebraska. Symptoms include masses of pitch (resin) that form on the bark where the insects are tunneling inside. The insects are present throughout western and central Nebraska and in the Lincoln and Omaha areas in the east. Ponderosa, Austrian and Scotch pines are commonly attacked, and young trees generally sustain more damage than mature trees.

Large masses of resin indicate attack by *Dioryctria* species.

Oak decline

Several biological and environmental factors appear to be involved in a general decline of bur oaks in northern and eastern areas of the state. Environmental factors include root disturbance and soil compaction from livestock or human activities, herbicide exposure and long term effects of drought. These factors have stressed trees and made them more susceptible to pests such as cankers, borers and root decays (including *Armillaria*). Oak wilt and bur oak blight (*Tubakia* sp.) are also contributing to the decline in many cases.

Rough bullet gall of oak

Rough bullet gall has become a serious problem on bur oaks in western Nebraska. Abundant galls cause severe stunting of growth, and the honeydew produced by the galls attracts large numbers of nuisance wasps. Some bur oaks are highly susceptible to the gall while others are highly resistant.

Rough bullet galls on bur oak.

Bur oak stunted by heavy infestation of rough bullet gall.

Cytospora canker

Cytospora canker of spruce has become more common in landscape plantings and windbreaks, probably because of additional stress in the trees caused by several years of drought. Colorado blue spruce is the species most commonly affected. Branches and sometimes the tops of trees are killed by the disease.

Branches killed by Cytospora canker.

Dutch elm disease

Dutch elm disease continued to cause mortality in American elm throughout the state, but the mortality was less common than in previous years. Most elms affected are in riparian areas and communities.

Mountain pine beetle

No active mountain pine beetle infestations were detected in Nebraska in surveys in 2014. Beetle populations in western Nebraska forests seem to have returned to the low levels that existed prior to the 2009 outbreak. Monitoring for the beetle will continue.

Emerald ash borer

Emerald ash borer has not been found in Nebraska, but it remains at the top of the list for potential economic impact to the state's forest resources. Detection trapping and surveys in parks, campgrounds and major cities and towns are ongoing efforts.

Thousand cankers disease

Thousand cankers disease of black walnut has not been found in Nebraska. In 2014, street-side surveys and surveys in plantations of black walnut in Nebraska found no evidence of the disease or the twig beetle associated with it. A quarantine of walnut wood from infested states is in effect to prevent the movement of the disease and its vector into Nebraska.

Nebraska Black Walnut Facts

- ✓ 1.5 million trees
- ✓ 40 million board feet of merchantable wood *(value: $40-80 million)*
- ✓ 1 million board feet harvested annually *(value to state's economy: $3.5 million)*
- ✓ 4,000 commercial nut-bearing trees
- ✓ 70,00 pounds of nuts produced annually *(value to state's economy: $1.2 million)*
- ✓ valuable species for wildlife
- ✓ widely used landscape tree for tough sites

For more information on Forest Health in Nebraska, please visit the website:

www.nfs.unl.edu/program-foresthealth.asp

Mark Harrell,
Forest Health Program Leader
Nebraska Forest Service

South Dakota Department of Agriculture

South Dakota 2014 Forest Health Highlights

South Dakota's Forest

Coniferous forests make up more than three-fourths of the state's forest. These forests are situated primarily in the Black Hills, extending north into Harding County and east to Todd County. The dominant species is ponderosa pine. These forests contribute to the state's economy through a vibrant forest products industry, tourism, and agriculture, and provide valuable wildlife habitat. Two-thirds of the coniferous forests in the state are on federal land. The most serious threats to these forests are mountain pine beetles and fires.

Bottomland forests make up only 3 percent of the forested land in the state. These forests consist primarily of cottonwood, willow, green ash, and elm. The forests provide tremendous value in improving water quality and flood control. Approximately 70 percent of bottomland forests in South Dakota are privately owned. The biggest threat to riparian forests is the lack of regeneration of cottonwood trees. Other problems include banded elm bark beetles, Dutch elm disease, and poplar cankers.

Upland hardwood forests of oak, ash, aspen and elm, comprise approximately 20 percent of South Dakota forest land and are scattered primarily in the northeast and southeast corners of the state though aspen, birch, ash, ironwood, and bur oak occur in the Black Hills. The greatest threats to these forests are declining regeneration, disease, invasive species, and land-use changes. The most valuable asset of hardwood forests are the recreational opportunities they provide. About two-thirds of the upland hardwood forests are privately owned; the rest are mostly on federal lands.

Urban or community forests occupy approximately 103,000 acres in the state. There are a large number of species present within community forests with ash being the most common followed by elm, crabapples, and maple. Community forests provide energy conservation, improved water quality, and aesthetic appeal, among other values. Common threats include diseases, development, and weather events. There are two Tree Campus USA universities and 34 Tree City USA communities in South Dakota.

Windbreak forests cover about 200,000 acres across the state. Although not typically thought of as forest land, they serve many valuable functions. Windbreaks protect roads, fields, livestock, and structures from wind and snow, and help prevent soil erosion. They provide habitat for pheasants and other birds. Windbreaks face the same threats as other forests types. The most common species found in shelterbelts is green ash. With the looming threat of emerald ash borer, efforts are being taken to expand the diversity of plantings. There is no ownership data for windbreaks, although most are considered to be privately owned.

South Dakota Forest Insect and Disease Highlights

Bark Beetles

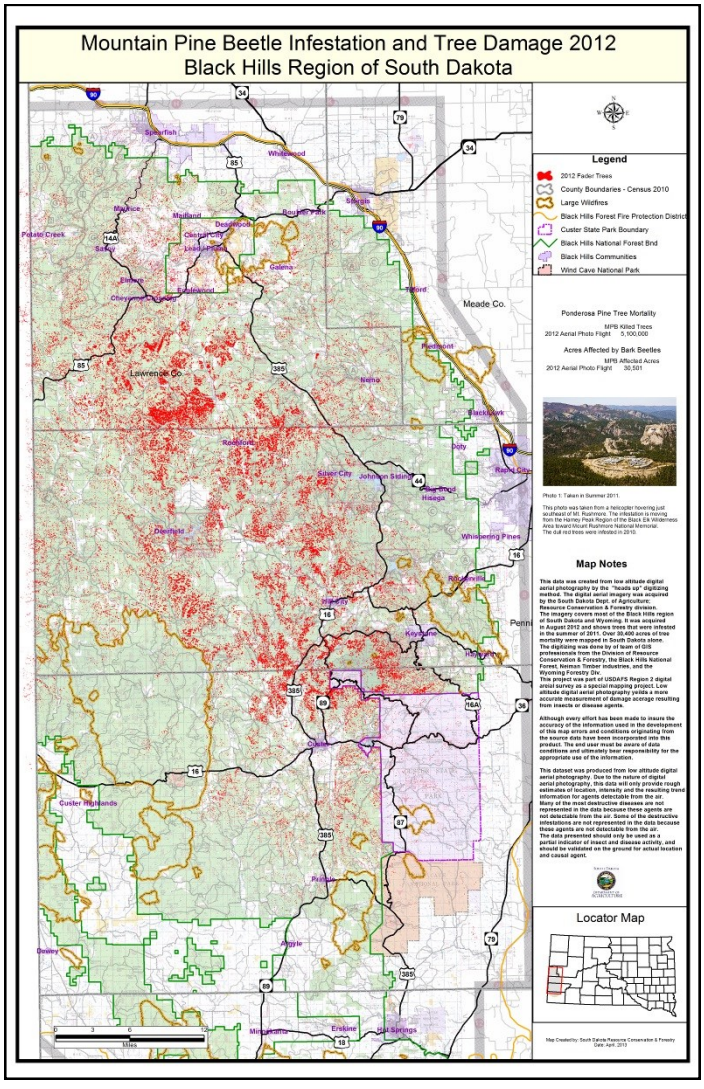
Mountain pine beetle

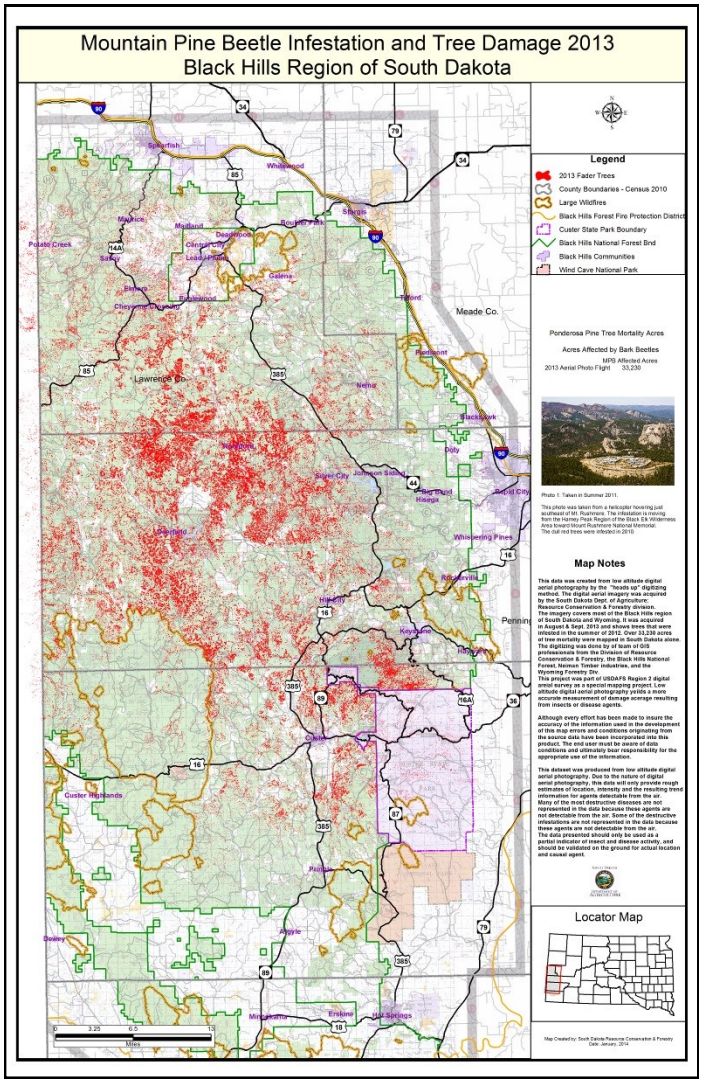
Dendroctonus ponderosae

The Black Hills of South Dakota has been experiencing various levels of mountain pine beetle (MPB) epidemics since 1996, when an epidemic began in the Beaver Park area of the Black Hills National Forest. Since 2010 the epidemic has expanded to affect about 414,000 acres of federal, state, and private forest lands, and over 16 million trees have been killed. Forest Service land surrounding the western and northern border of Custer State Park has been experiencing an MPB epidemic since 2002, particularly within the Black Elk Wilderness Area. The wilderness area borders Custer State Park and has experienced near 100 percent pine mortality in the areas affected. Custer State Park has seen lower pine mortality due to the implementation of management tactics such as thinning stands to reduce susceptibility and sanitation measures. While the epidemic has been held in check in much of Custer State Park, there have been a number of spot infestations that occurred in the western portion of the Park with an estimated 21,000 trees being infested during the past flight (2014). This is a reduction from the previous two years when 31,000 trees were infested following the 2013 flight and 36,000 following the 2012 flight. More than 120,000 infested trees were identified and treated in Custer State Park following the 2011 flight. The infested trees have either been harvested or the boles were cut into short sections (2 feet) and left in place, a solar treatment commonly referred to as "cutting and chunking."

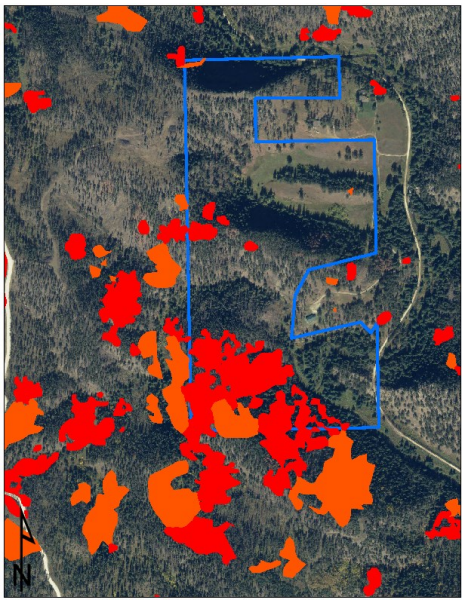
Cutting and chunking in Custer State Park

SDDA RCF file photo





Two year s of MPB infestation on federal and private lands.



Aerial photography analysis shows how wide spread the infestation is in the Black Hills.

The epidemic continues to also affect private lands throughout the Black Hills. Ground surveys on less than 15 percent of private land acres in the Black Hills revealed over 34,000 acres of private lands contained some level of infestation in 2014.

There is a relic stand of limber pine in Custer State Park. An anti-aggregation pheromone, verbenone, has been used as part of the management of this relic stand of trees. The efforts have been very successful with the loss of about 3 percent of the trees infested by mountain pine beetle, despite high loses of ponderosa pine in the immediate vicinity. This past flight (2014) saw 14 trees infested by mountain pine beetle, however larvae have only been found in a few of these trees.

Limber pine in Custer State Park.

SDDA RCF file photo

Banded elm bark beetle

Scolytus schevyrewi

This exotic bark beetle was accidently introduced from Asia sometime during the 1990s, but was not detected in this country until 2003 in Colorado and Utah. It was detected in Pennington County, South Dakota in 2004 and since has been found in much of the state. The most common host is Siberian elm but it can also be found colonizing American elm and Japanese elm. More recently it is being found in the hybrid elms 'Regal' and 'Triumph' that have become popular trees in the state.

Cedar bark beetles

Phloeosinus

These bark beetles are secondary insects that hasten the decline of junipers that are already stressed. The predisposing stress for this outbreak was the drought that occurred earlier in this decade. The combination of the drought and colonization by this insect has resulted in the loss of juniper (cedar) windbreaks in the south central part of the state. This past spring and summer there were numerous reports of declining windbreaks of eastern redcedars. There were few reports of the insect in windbreaks of Rocky Mountain juniper.

Red turpentine beetle

Dendroctonus valens

Populations of red turpentine beetle have appeared to increase recently. The number of infested trees may not be increasing as much as being reported however, as infested trees are probably being identified more often due to the intensive inspections for mountain pine beetle. We are also seeing an increase in turpentine beetles in stands that were chipped in the early spring.

Red turpentine beetle pitch tubes.

SDDA RCF file photo

Pine engraver beetles

Ips pini and I. calligraphus

Pine engraver beetle populations that had been very low during the past several years increased dramatically beginning in 2012 and are resulting in ponderosa pine mortality in the Black Hills, primarily in the southern counties of Fall River and Custer. The population has also increased in the Pine Ridge country of Shannon County. Pine engraver beetles are typically found in dying trees, as well as slash piles, but the populations are expanding and are now becoming a significant cause of tree mortality. The population had increased in the early 2000s due to an increase in susceptible host material as a result of wildfires and weather events, such as hail and snow-breakage that resulted in a tremendous buildup of dead, weakened and damaged tree material. The population is increasing again perhaps due to the number of trees killed by the mountain pine beetle and the aftermath of the 2011-2012 drought. Another factor is the increase in the use of chipping slash following thinning operations. We have seen an increase in pine mortality in stands where the fresh slash has been chipped in early spring. The October 2013 blizzard resulted in many pines with broken canopies and these became infested with *Ips* this past growing season.

Storm damage infested with Ips.

SDDA RCF file photo

Borers

Ash and privet borer

Tylonotus bimaculatus

This insect was reported in declining green ash trees in several southeastern South Dakota counties this past summer. It was also found in one privet hedge in Sioux Falls, SD. Ash and privet borer has been previously recorded in South Dakota though it is a relatively rare insect. The borer is typically found in mature or drought-stricken windbreak ash trees. The larvae pack their galleries with frass and these can appear similar to those created by the emerald ash borer. The insect is not a serious problem in South Dakota but is a close "look-a-like" to the emerald ash borer.

Ash and privet borer.

Photo courtesy of Dr. John

Ash/lilac borer

Podosesia syringae

Ash/lilac borer.

Photo courtesy of Dr. John Ball

This is a common borer of stressed ash trees and there has been an increase in reports of this insect following the recent drought. Ash/lilac borer infestations rarely results in significant mortality, however there are belts of young Manchurian ash that have been attacked and killed by this insect. Manchurian ash is not considered as drought tolerant as green ash. It is being considered as a better ash to plant due to its tolerance to emerald ash borer infestations but its susceptibility to our native borer, and poor adaptation to dry climates, may limit its future use.

Flatheaded appletree borer

Chrysobothris femorata

This borer is being reported in the southeastern part of the state. Flatheaded apple tree borers are attracted to dying, young trees. While they attack a number of tree species, including apple, they are being more commonly reported infesting maples particularly red and silver maples and their hybrid, the freeman maples.

Flatheaded appletree borer galleries.

Photo courtesy of Dr. John Ball

Other Notable Insects

Ash seed weevils

Lignyodes bischoffi

The larvae were reported dropping to sidewalks and driveways beneath ash trees throughout eastern South Dakota this fall. The seed weevil spends its larval stage feeding inside of ash seeds during late summer. The larvae emerge and fall from the hanging seed. Once the larva is on the ground it overwinters either in the soil or the litter layer. The insect is not a threat to the tree but can infest more than 70% of the seed crop during certain years. This may become a problem for seed collections being made of the native ash populations to preserve this genetic resource.

Ash seed weevil damage.

Photo courtesy of Dr. John Ball

Chokecherry midge

Contarinia virginianiae

This insect is an occasional problem in chokecherry fruit. The bright orange larvae was found feeding on the inside of the swollen fruit in southwestern South Dakota. The larvae release a toxin as they feed which causes the seed to abort and the hollow fruit enlarges and becomes distorted. The loss of the cherries this summer was most noted on the Pine Ridge Reservation where the fruit is harvested.

Exotic Invasive

Emerald ash borer

Agrilus planipennis

Emerald ash borer has not been detected in South Dakota but detection trapping in parks and campgrounds continues throughout the state. The only *Agrilus* caught in the traps to-date are the bronze birch borer (*A. anxius*) and two-lined chestnut borer (*A . bilineatus*) Three Pest Detector workshops were held during the summer and more than 65 people, mostly Master Gardeners, were trained in the detection of this pest as well as thousand cankers disease. Master Gardeners reported, and we followed up on, 9 reports of possible emerald ash borer infestations. All reports from trees were identified as the banded ash borer (*Neoclytus caprea*) or the redheaded ash borer (*N. acuminatus*) and the only insects submitted as possible emerald ash borers were the golden buprestid (*Buprestis aurulenta*) and a *Cypriacis*.

Emerald ash borer galleries.

SDDA RCF file photo

Disease Conditions

Bur oak blight

Tubakia iowensis sp *nov*

Bur oaks in some of the draws in Minnehaha County were identified as infested by bur oak blight (BOB). This disease has been previously reported in many of the South Dakota counties bordering Minnesota and Iowa. The appearance of the disease this year may be due to the wet weather that occurred during oak shoot expansion in May. The disease is also one of the most commonly misidentified diseases in the state with people confusing the symptoms of BOB with that of oak anthracnose.

Bur oak blight symptoms.

Photo courtesy of Dr. John Ball

Dutch elm disease

Ophistoma novi-ulmi

Reports of the disease were widespread in eastern South Dakota during 2013 with many communities suffering high losses and this loss was repeated in 2014. Many communities with significant elm populations had a backlog of removals that extended until mid-November. American elm still is one of the most common community trees in the state, comprising more than 8% of the street tree population. This increase in losses due to Dutch elm disease is a particular concern as some communities in the near future may have to deal with this threat and emerald ash borer, a combination that will quickly deplete resources for city forestry departments.

Elm tree with fading leaves from Dutch elm disease.

Photo courtesy of Dr. John Ball

Diplodia tip blight

Diplodia pinea (Sphaeropsis pinea)

Diplodia damage.

Photo courtesy of Dr. John Ball

The disease was commonly reported throughout the state on Austrian and ponderosa pines in shelterbelts and community plantings. While the disease has been reported in these species for many years, the increase in reports may be related to the number of mature pines, more than 80 years old, that are already in decline from drought.

Elytroderma needle cast

Elytroderma deformans

This needle cast is becoming more commonly reported on ponderosa pines in Black Hills. The infected trees have compact witches' brooms in the crown which makes infected trees highly noticeable. This disease is usually not a tree killer, but the loss of foliage can weaken the tree.

Pine wilt nematode

Bursaphelenchus xylophilus

Shelterbelt tree killed by pine wilt.

Photo courtesy of Dr. John Ball

Rapidly declining Austrian and Scotch pine in the southern region of the state (south of I-90) have been found with this disease for more than a decade. Reports of the disease increased in 2013 and 2014 with most of the affected trees occurring in the southeastern counties that border Nebraska. Mature Austrian pines were the species most impacted by this disease but many mature Scotch pines have also been killed by this disease.

White pine blister rust

Cronartium ribicola

This disease was discovered in the relic stands of limber pine in Custer State Park in the early 2000s. A survey revealed only a few new infections in 2014. Pruning has been performed in past years in an effort to slow the spread of the disease. Pruning infested tissue has generally been necessary for only a few small branches, less than 0.5 cm, on an infected limber pine.

Forest Health Conditions with Other Damaging Agents

Winter desiccation injury

Winter desiccation injury was seen in some pole-size ponderosa pine stands in the northern Black Hills this past winter. The trees had reddish brown foliage throughout their canopies except on the branches that just emerged from the snow.

Many birches, catalpas, cherries, and maples showed extensive dieback after the winter. The cause of the decline of these trees may be related to the long, cold winter that followed a dry autumn.

Winter desiccation on spruce

Photo courtesy of Dr. John Ball

South Dakota Dept. of Agriculture

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USDA Forest Service - Rocky Mountain Region, Forest Health Protection (FHP)

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2014 Wyoming Forest Health Highlights

Mountain pine beetle

Mountain pine beetle (MPB) activity slightly increased in Wyoming. Statewide, the number of acres affected declined from 180,000 acres in 2012 to 82,000 acres in 2013 but increased to 113,000 acres in 2014 **(Fig. 1).** Since 1996, the total number of affected acres is over 3.4 million.

MPB activity increased in the Black Hills; namely Weston and Crook Counties. Aerial photograph interpretation detected 760 new acres of mortality in this area.

Despite much of western and southern Wyoming's pine forests having been affected by past MPB activity, there are large expanses of susceptible lodgepole pine stands in north-central Bighorn National Forest. MPB activity continues at low levels in ponderosa pine on the eastern edge of the Bighorn Mountains in Johnson and Sheridan Counties. In pure stands of lodgepole pine, most mature trees have succumbed to MPB attack while younger and regenerating trees survive **(Fig. 2).**

Remote stands of ponderosa pine in Natrona, Goshen, Platte, Laramie, Albany, Converse, and Campbell Counties remain largely devoid of MPB.

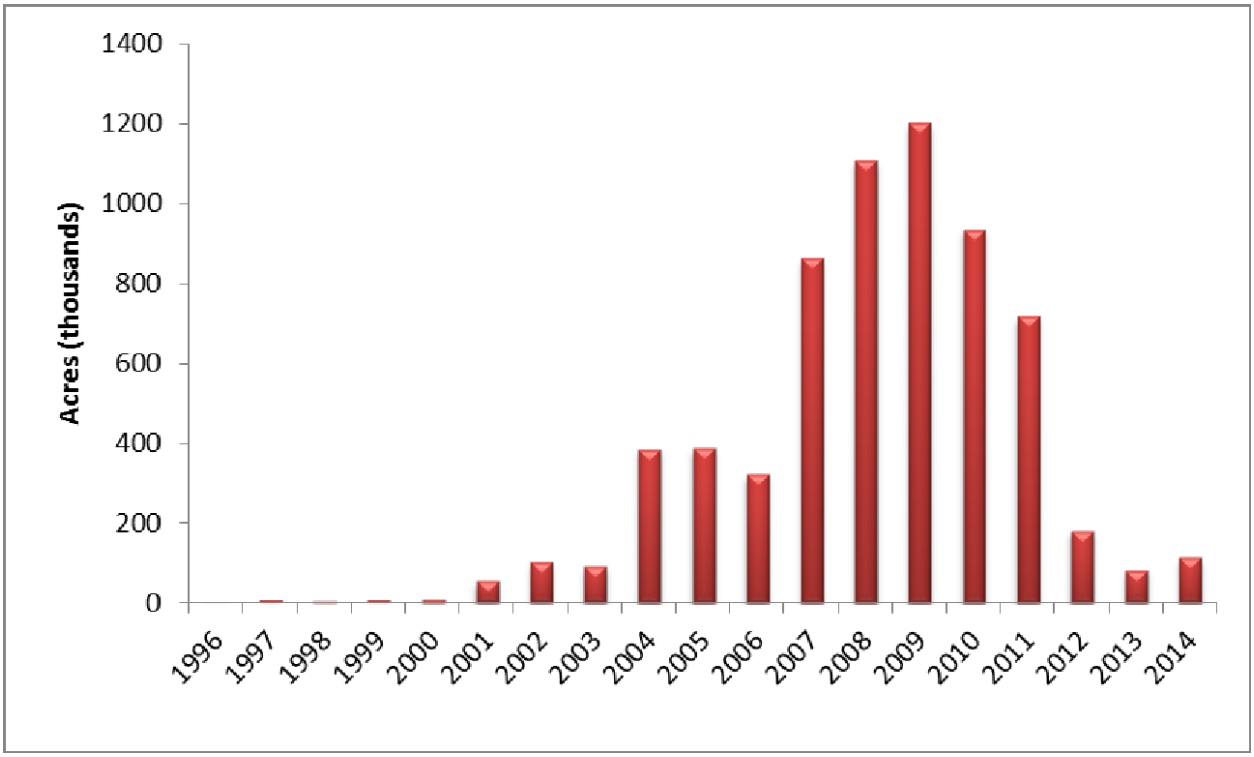
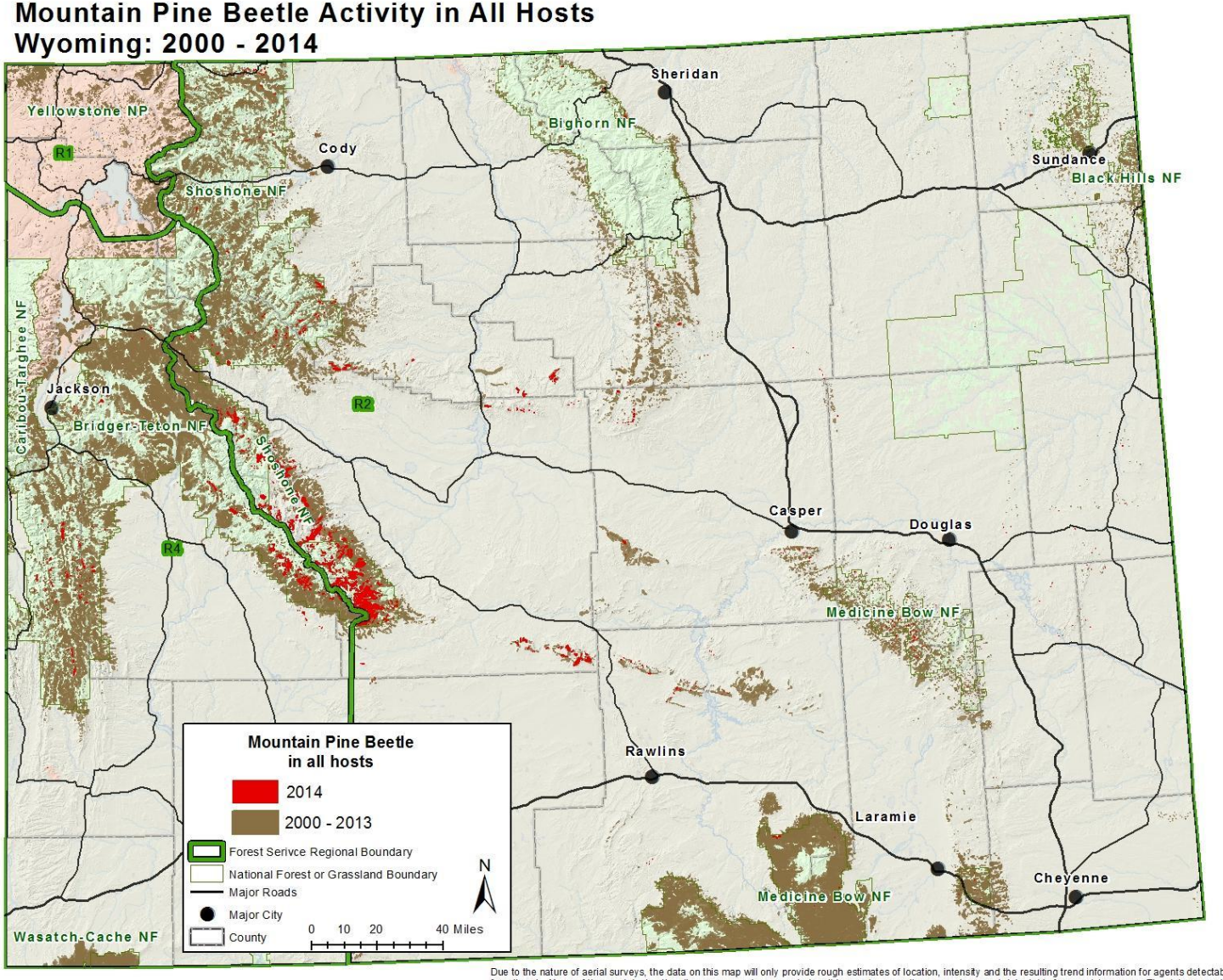


Figure 1. Annual acres affected by mountain pine beetle.

Figure 2, Mountain pine beetle damage in lodgepole pine on the Medicine Bow National Forest, 2014. Photo: Brian Howell

Mountain Pine Beetle Activity in All Hosts
Wyoming: 2000 - 2014



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

Spruce Beetle

With an increase of 90,000 acres detected in 2014, a total of 638,000 acres have been affected by spruce beetle statewide **(Fig. 3)**. There are large expanses of dead standing spruce in the Shoshone National Forest **(Figure 4)**.

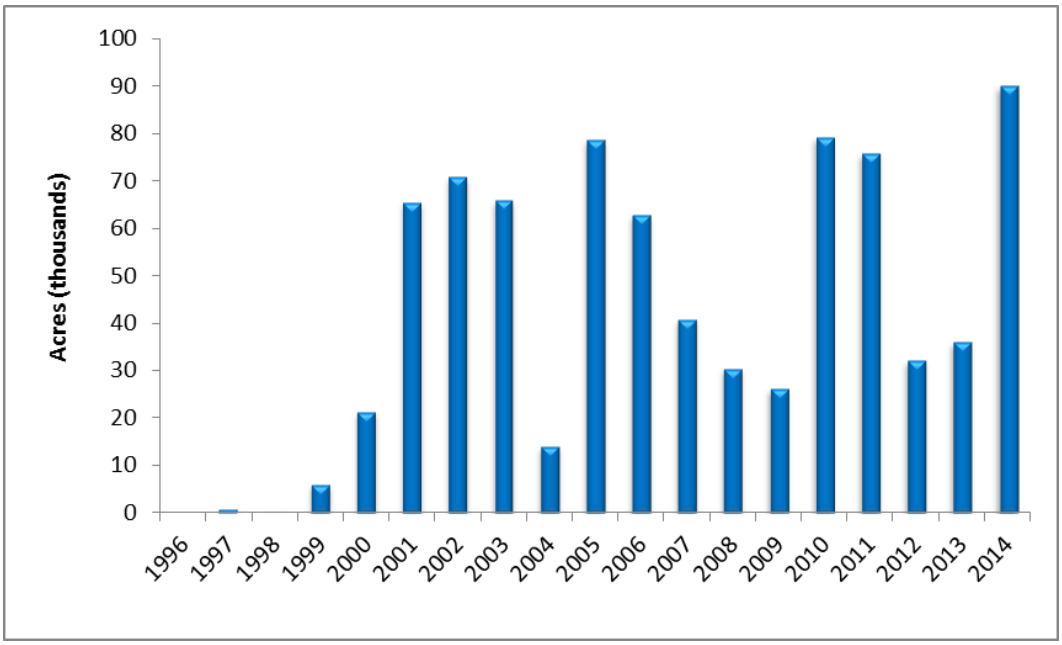


Figure 3. Annual acres of observed spruce beetle activity in Wyoming. Not all areas were surveyed every year.

Figure 4. Dead standing spruce in the Shoshone National Forest

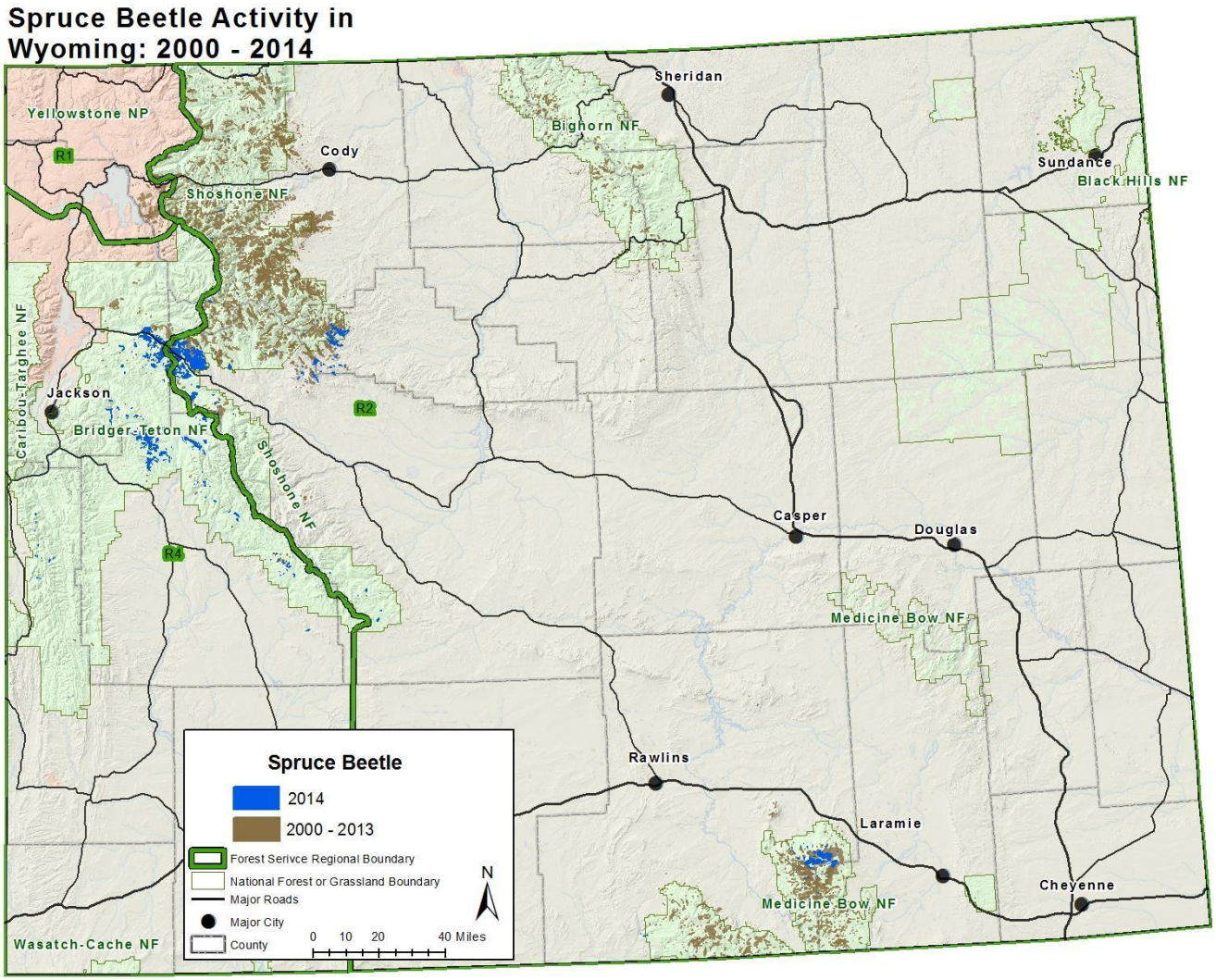


Figure 5. Map of 2014 Spruce beetle damages in forests in Wyoming

Douglas-fir beetle

Past tree mortality from Douglas-fir beetle has been detected on over 430,000 acres, primarily during the early and mid-2000's. Expansion has remained at low levels for several years with only 3,700 acres affected in 2014 **(Fig. 6).** The majority of this year's activity was detected in Hot Springs County.

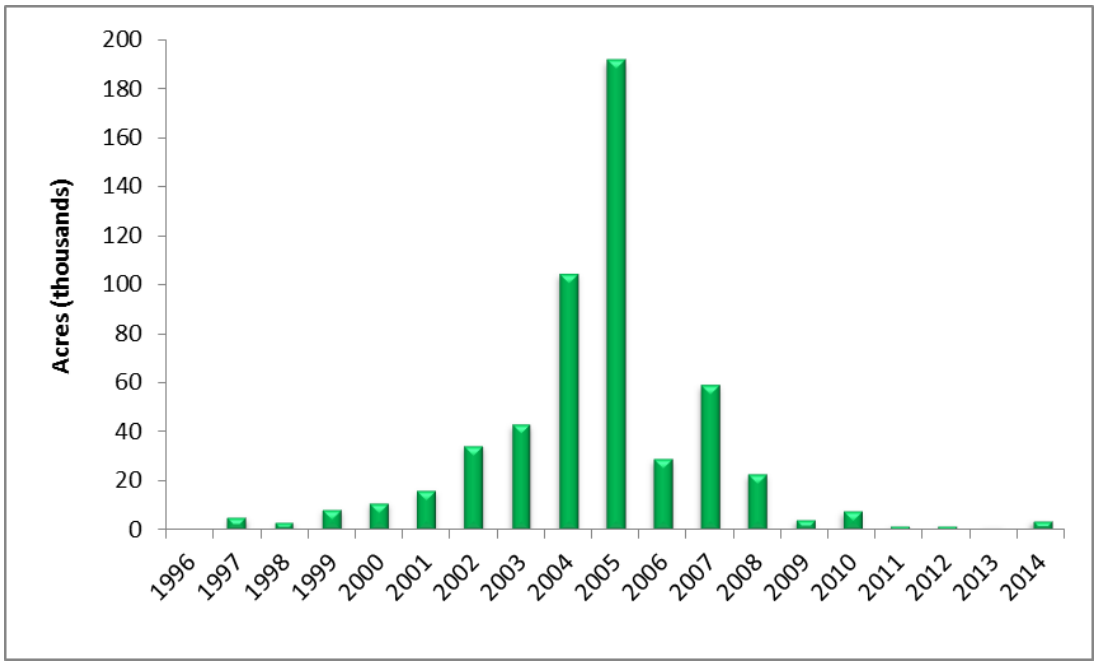


Figure 6. Douglas-fir beetle activity; not all areas were surveyed every year.

Exotic Species

Two exotic species of interest to Wyoming, European gypsy moth and emerald ash borer, were not detected in 2014. Balsam wooly adelgid was detected for the first time by aerial surveys near the Idaho border in Park and Teton Counties. This insect causes growth deformities, growth loss, and eventual mortality in subalpine fir and other true fir species. While this pest has been in western North America for decades, balsam wooly adelgid was first detected in northern Idaho in 1983. Since then, its range has expanded south and east and has caused extensive mortality in subalpine fir.

Section 3

The 2014 Aerial Detection Survey Summary for the Rocky Mountain Region (R2) of the US Forest Service

Pine Sawfly – Elbert County, CO. 2014. Photo credit: Justin Backsen

For more information or additional data requests, please contact:

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Table of Contents

Introduction

Acreage figures are rounded as follows:

X < 10 acres- to the nearest acre
10 < X < 1,000 acres- to the nearest 10 acres
1,000< X < 10,000 acres- to the nearest 100 acres
X > 10,000 acres- to the nearest 1,000 acres

These tables provide summaries for the major damage agents detected in the 2014 aerial detection survey for the Rocky Mountain Region (R2) of the Forest Service.

Counties or National Forests that have zero mapped acres for all categories in the tables are omitted.

Wyoming acres include only damage recorded from the Region 2 aerial survey. Data from Regions 1 and 4 are included in a different version of this table that summarizes all of Wyoming.

CO plus S.WY numbers include all of Colorado and the six Wyoming counties that encompass the Medicine Bow NF: Albany, Carbon, Converse, Laramie, Natrona, and Platte.

Certain calculations using these data should be avoided. Adding numbers from different categories in an attempt to produce a total of acres impacted by multiple agents, for example will produce inaccurate, inflated results because acres experiencing multiple damages are double-counted. Producing totals for multiple agents is a separate GIS exercise.

Caution should be exercised when making year to year comparisons using these data, the survey area is not identical from year to year and extent flown each year may not equal 100 % of the forested acres in a given area. A GIS dataset of area flown is available and provides information on the spatial extent of the aerial survey for a particular year.

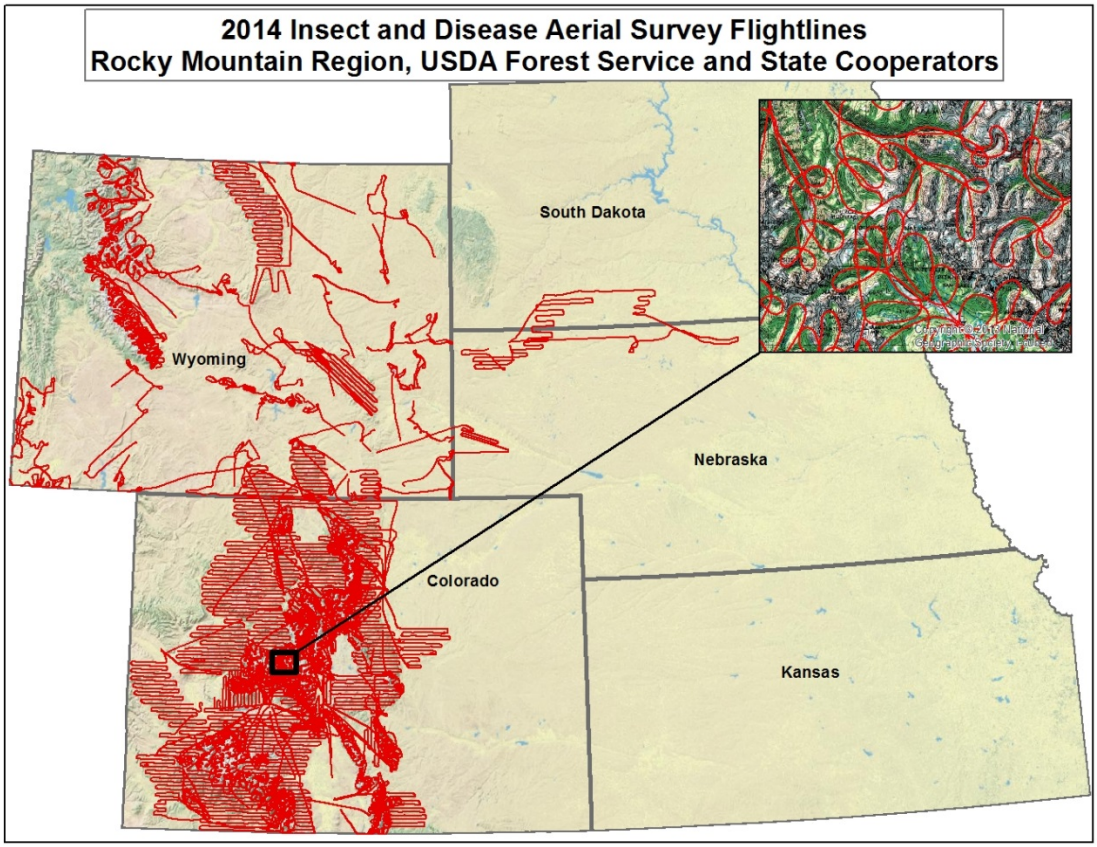
The county summaries include all ownerships within the county boundary. National Forest summaries are based on the Forest's proclamation boundary and include inholdings of all ownership types.

Interpreting the 2014 Aerial Detection Survey Summary Tables

The 2013 aerial detection survey summary tables for the Rocky Mountain Region of the USDA Forest Service have been prepared to answer the majority of questions concerning the aerial survey data and to provide consistent answers to questions from our clients. Raw GIS files are available for analysis; however minor differences in query structure can result in multiple "correct" answers to the same question. Therefore the numbers provided in these tables are to be considered final. The numbers reported here are the results of GIS queries that remain consistent from year to year. In these tables, the major forest pests that were detected in the region's forests are summarized by state, county, and national forest. County totals include all ownerships within a counties' boundary. Forest totals include all acres within the forest's proclamation boundary.

For bark beetles including mountain pine beetle, spruce beetle and Douglas-fir beetle the aerial survey tables provide the number of acres where some level of trees were detected that were currently dying (fading) from bark beetle attack. Fading occurs one year after initial attack so trees mapped in a given year were killed by bark beetles the previous year. Information from the prior year (2013 Acres Affected) is also provided to assess the trend of the epidemic over the last year in a given area. Because bark beetles may be active in an area for multiple years there is considerable overlap of acres from year to year. Cumulative acres affected since 1996 through the current and through the prior year are provided to determine the area affected by the ongoing epidemic. By subtracting the current cumulative acres (1996-2014 Cumulative Acres Affected) for a given area from the prior year's cumulative acres (1996-2013Cumulative Acres Affected) for that area, the expansion of the beetle epidemic onto new (not previously mapped) acres can be determined. .

For western balsam bark beetle and associated subalpine fir disease problems, western spruce budworm, aspen defoliation, and aspen dieback and mortality caused by a combination of insects and diseases only the current and prior years acres detected are provided. For these pests, general trend information about the population of the insect or disease affects can be determined by comparing acres affected with the prior year.



Aspen Defoliation– Rio Grande NF, southeast of Creede, CO. 2014. Photo credit: Justin Backsen

2014 Mountain Pine Beetle Activity

State	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Colorado				
Lodgepole Pine	73,000	8,400	2,607,000	2,608,000
Ponderosa Pine	32,000	5,700	957,000	959,000
5-Needle Pines	2,200	1,300	124,000	126,000
All Hosts	97,000	15,000	3,367,000	3,370,000
Wyoming – R2				
Lodgepole Pine	13,000	24,000	1,118,000	1,129,000
Ponderosa Pine	3,600	1,400	188,000	189,000
5-Needle Pines	44,000	83,000	979,000	1,018,000
All Hosts	54,000	94,000	1,992,000	2,033,000
CO plus S. WY				
Lodgepole Pine	75,000	9,000	3,329,000	3,329,000
Ponderosa Pine	35,000	5,900	1,069,000	1,071,000
5-Needle Pines	4,000	3,000	270,000	272,000
All Hosts	101,000	18,000	4,274,000	4,279,000
South Dakota				
Ponderosa Pine	33,000	16,000	414,000	422,000
5-Needle Pines	0	0	0	0
All Hosts	33,000	16,000	414,000	422,000
Nebraska				
Ponderosa Pine	140	0	460	460
5-Needle Pines	0	0	1	1
All Hosts	140	0	460	460

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Adams	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	1	1
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	1	1
Alamosa	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	430	430
	5-Needle Pines	0	0	10	10
	All Hosts	0	0	430	430
Archuleta	Lodgepole Pine	0	0	3	3
	Ponderosa Pine	2	0	16,000	16,000
	5-Needle Pines	0	0	0	0
	All Hosts	2	0	16,000	16,000
Boulder	Lodgepole Pine	1,400	880	111,000	111,000
	Ponderosa Pine	280	30	69,000	69,000
	5-Needle Pines	50	80	16,000	16,000
	All Hosts	1,600	980	140,000	140,000
Chaffee	Lodgepole Pine	0	0	5,600	5,600
	Ponderosa Pine	2	0	77,000	77,000
	5-Needle Pines	0	0	1,700	1,700
	All Hosts	2	0	83,000	83,000
Clear Creek	Lodgepole Pine	240	60	77,000	77,000
	Ponderosa Pine	1	40	8,900	8,900
	5-Needle Pines	20	0	9,400	9,400
	All Hosts	250	100	82,000	82,000
Conejos	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	4,800	4,800
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	4,800	4,800

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Costilla	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	4,600	4,600
	5-Needle Pines	0	0	7	7
	All Hosts	0	0	4,600	4,600
Custer	Lodgepole Pine	0	0	160	160
	Ponderosa Pine	0	950	35,000	35,000
	5-Needle Pines	40	150	900	1,000
	All Hosts	40	1,100	35,000	36,000
Delta	Lodgepole Pine	0	0	2	2
	Ponderosa Pine	0	0	6	6
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	8	8
Dolores	Lodgepole Pine	0	0	330	330
	Ponderosa Pine	3	200	680	880
	5-Needle Pines	0	0	0	0
	All Hosts	3	200	1,000	1,200
Douglas	Lodgepole Pine	0	0	270	270
	Ponderosa Pine	500	1	34,000	34,000
	5-Needle Pines	0	0	0	0
	All Hosts	500	1	34,000	34,000
Eagle	Lodgepole Pine	3,700	6	190,000	190,000
	Ponderosa Pine	0	0	4,600	4,600
	5-Needle Pines	0	0	190	190
	All Hosts	3,700	6	194,000	194,000
El Paso	Lodgepole Pine	0	0	2	2
	Ponderosa Pine	40	170	13,000	13,000
	5-Needle Pines	0	0	0	0
	All Hosts	40	170	13,000	13,000

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Elbert	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	1	2	430	540
	5-Needle Pines	0	0	0	0
	All Hosts	1	2	430	540
Fremont	Lodgepole Pine	0	0	170	170
	Ponderosa Pine	5	130	32,000	32,000
	5-Needle Pines	70	370	2,000	2,500
	All Hosts	70	500	34,000	34,000
Garfield	Lodgepole Pine	1,100	0	11,000	11,000
	Ponderosa Pine	0	0	60	60
	5-Needle Pines	30	0	510	510
	All Hosts	1,100	0	11,000	11,000
Gilpin	Lodgepole Pine	210	180	52,000	52,000
	Ponderosa Pine	7	1	10,000	10,000
	5-Needle Pines	30	20	16,000	16,000
	All Hosts	250	200	56,000	56,000
Grand	Lodgepole Pine	490	0	579,000	579,000
	Ponderosa Pine	0	0	500	500
	5-Needle Pines	0	0	3,700	3,700
	All Hosts	490	0	581,000	581,000
Gunnison	Lodgepole Pine	0	0	2,800	2,800
	Ponderosa Pine	0	5	1,400	1,400
	5-Needle Pines	1	0	2	2
	All Hosts	1	5	4,200	4,200
Hinsdale	Lodgepole Pine	0	0	3	3
	Ponderosa Pine	0	0	3,200	3,200
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	3,200	3,200

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Huerfano	Lodgepole Pine	0	0	50	50
	Ponderosa Pine	0	10	26,000	26,000
	5-Needle Pines	0	0	220	220
	All Hosts	0	10	26,000	26,000
Jackson	Lodgepole Pine	60	0	362,000	362,000
	Ponderosa Pine	0	0	1,200	1,200
	5-Needle Pines	0	0	13,000	13,000
	All Hosts	60	0	364,000	364,000
Jefferson	Lodgepole Pine	220	140	8,000	8,100
	Ponderosa Pine	120	20	29,000	29,000
	5-Needle Pines	0	0	300	300
	All Hosts	340	160	35,000	35,000
La Plata	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	5	0	12,000	12,000
	5-Needle Pines	0	0	0	0
	All Hosts	5	0	12,000	12,000
Lake	Lodgepole Pine	0	20	11,000	11,000
	Ponderosa Pine	0	0	320	320
	5-Needle Pines	0	40	570	610
	All Hosts	0	60	11,000	11,000
Larimer	Lodgepole Pine	67,000	6,900	582,000	582,000
	Ponderosa Pine	27,000	2,900	380,000	380,000
	5-Needle Pines	1,500	540	57,000	58,000
	All Hosts	85,000	10,000	808,000	809,000
Las Animas	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	20	0	12,000	12,000
	5-Needle Pines	0	30	6	40
	All Hosts	20	30	13,000	13,000

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Mesa	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	260	200	5,900	6,100
	5-Needle Pines	0	0	0	0
	All Hosts	260	200	5,900	6,100
Mineral	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	840	840
	5-Needle Pines	0	0	3	3
	All Hosts	0	0	840	840
Moffat	Lodgepole Pine	0	0	16,000	16,000
	Ponderosa Pine	0	0	440	440
	5-Needle Pines	0	0	100	100
	All Hosts	0	0	16,000	16,000
Montezuma	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	690	690
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	690	690
Montrose	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	380	560	3,000	3,500
	5-Needle Pines	0	0	0	0
	All Hosts	380	560	3,000	3,500
Ouray	Lodgepole Pine	0	0	5	5
	Ponderosa Pine	1,500	310	1,800	2,000
	5-Needle Pines	0	4	0	4
	All Hosts	1,500	310	1,800	2,000
Park	Lodgepole Pine	60	200	47,000	47,000
	Ponderosa Pine	900	60	91,000	91,000
	5-Needle Pines	20	40	430	470
	All Hosts	980	300	137,000	138,000

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Pitkin	Lodgepole Pine	70	0	22,000	22,000
	Ponderosa Pine	0	0	90	90
	5-Needle Pines	0	0	4	4
	All Hosts	70	0	22,000	22,000
Pueblo	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	21,000	21,000
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	21,000	21,000
Rio Blanco	Lodgepole Pine	2	0	44,000	44,000
	Ponderosa Pine	0	0	40	40
	5-Needle Pines	0	0	100	100
	All Hosts	2	0	44,000	44,000
Rio Grande	Lodgepole Pine	4	0	4	4
	Ponderosa Pine	0	0	3,400	3,400
	5-Needle Pines	0	0	0	0
	All Hosts	4	0	3,400	3,400
Routt	Lodgepole Pine	80	30	345,000	345,000
	Ponderosa Pine	0	0	390	390
	5-Needle Pines	0	0	540	540
	All Hosts	80	30	345,000	345,000
Saguache	Lodgepole Pine	0	0	790	790
	Ponderosa Pine	0	1	39,000	39,000
	5-Needle Pines	300	0	640	640
	All Hosts	300	1	40,000	40,000
San Miguel	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	1,100	150	4,000	4,000
	5-Needle Pines	0	0	10	10
	All Hosts	1,100	150	4,000	4,000

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Colorado County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Summit	Lodgepole Pine	0	0	142,000	142,000
	Ponderosa Pine	0	0	40	40
	5-Needle Pines	0	0	630	630
	All Hosts	0	0	143,000	143,000
Teller	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	60	7	9,800	9,800
	5-Needle Pines	0	0	20	20
	All Hosts	60	7	9,900	9,900

Nebraska County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Banner	Ponderosa Pine	80	0	230	230
Dawes	Ponderosa Pine	0	0	20	20
Morrill	Ponderosa Pine	5	0	9	9
Scotts Bluff	Ponderosa Pine	60	0	170	170
Sheridan	Ponderosa Pine	0	0	20	20
	5-Needle	0	0	1	1
	All Hosts	0	0	20	20

South Dakota County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Butte	Ponderosa Pine	0	0	120	120
Custer	Ponderosa Pine	3,900	2,800	49,000	51,000
Fall River	Ponderosa Pine	0	0	1,400	1,400
Lawrence	Ponderosa Pine	7,100	4,300	148,000	150,000
Meade	Ponderosa Pine	60	40	26,000	26,000
Pennington	Ponderosa Pine	22,000	8,500	190,000	194,000

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Wyoming County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Albany	Lodgepole Pine	1,900	60	214,000	214,000
	Ponderosa Pine	1,700	20	70,000	70,000
	5-Needle Pines	920	390	57,000	57,000
	All Hosts	2,600	470	296,000	296,000
Big Horn	Lodgepole Pine	0	0	1,500	1,500
	Ponderosa Pine	0	0	1,200	1,200
	5-Needle Pines	4	6	22,000	22,000
	All Hosts	4	6	24,000	24,000
Campbell	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	3	6	190	190
	5-Needle Pines	0	0	0	0
	All Hosts	3	6	190	190
Carbon	Lodgepole Pine	290	430	495,000	495,000
	Ponderosa Pine	20	10	14,000	14,000
	5-Needle Pines	170	410	39,000	39,000
	All Hosts	480	850	527,000	528,000
Converse	Lodgepole Pine	210	50	8,300	8,300
	Ponderosa Pine	130	30	5,600	5,600
	5-Needle Pines	6	40	4,800	4,800
	All Hosts	240	120	17,000	17,000
Crook	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	620	800	33,000	34,000
	5-Needle Pines	0	0	0	0
	All Hosts	620	800	33,000	34,000
Fremont	Lodgepole Pine	8,900	21,000	270,000	280,000
	Ponderosa Pine	5	1	1,400	1,400
	5-Needle Pines	38,000	76,000	380,000	414,000
	All Hosts	43,000	82,000	486,000	520,000
Goshen	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	5	20	80	100
	5-Needle Pines	0	0	0	0
	All Hosts	5	20	90	110

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Wyoming County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Hot Springs	Lodgepole Pine	0	800	9,600	10,000
	Ponderosa Pine	0	0	860	860
	5-Needle Pines	0	3,700	43,000	45,000
	All Hosts	0	4,500	49,000	52,000
Johnson	Lodgepole Pine	0	0	3,600	3,600
	Ponderosa Pine	20	50	22,000	22,000
	5-Needle Pines	20	340	35,000	36,000
	All Hosts	40	390	59,000	59,000
Laramie	Lodgepole Pine	3	0	20	20
	Ponderosa Pine	260	5	14,000	14,000
	5-Needle Pines	0	0	1,100	1,100
	All Hosts	260	5	15,000	15,000
Lincoln	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	0	6	0	6
	All Hosts	0	6	0	6
Natrona	Lodgepole Pine	30	50	3,600	3,700
	Ponderosa Pine	30	90	5,200	5,200
	5-Needle Pines	730	890	43,000	43,000
	All Hosts	800	1,000	49,000	50,000
Niobrara	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	7	30	170	200
	5-Needle Pines	0	0	0	0
	All Hosts	7	30	170	200
Park	Lodgepole Pine	800	1,600	103,000	104,000
	Ponderosa Pine	0	0	40	40
	5-Needle Pines	2,600	740	314,000	314,000
	All Hosts	3,400	2,300	371,000	372,000
Platte	Lodgepole Pine	330	0	400	400
	Ponderosa Pine	400	20	2,900	3,000
	5-Needle Pines	0	0	460	460
	All Hosts	400	20	3,100	3,100

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Wyoming County	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Sheridan	Lodgepole Pine	200	0	2,300	2,300
	Ponderosa Pine	240	230	6,900	7,000
	5-Needle Pines	20	20	2,600	2,600
	All Hosts	470	250	12,000	12,000
Sublette	Lodgepole Pine	0	280	270	550
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	430	720	2,200	2,400
	All Hosts	430	990	2,200	2,700
Sweetwater	Lodgepole Pine	0	6	2,400	2,400
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	1,100	10	1,500	1,500
	All Hosts	1,100	20	3,900	3,900
Teton	Lodgepole Pine	0	0	390	390
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	0	0	2,400	2,400
	All Hosts	0	0	2,400	2,400
Uinta	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	0	1	0	1
	All Hosts	0	1	0	1
Washakie	Lodgepole Pine	4	0	2,200	2,200
	Ponderosa Pine	1	0	1,800	1,800
	5-Needle Pines	80	60	32,000	32,000
	All Hosts	80	60	35,000	35,000
Weston	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	140	90	8,300	8,400
	5-Needle Pines	0	0	0	0
	All Hosts	140	90	8,300	8,400

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National Forest	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Arapaho National Forest	Lodgepole Pine	140	110	453,000	453,000
	Ponderosa Pine	1	20	3,500	3,500
	5-Needle Pines	20	20	12,000	12,000
	All Hosts	160	150	456,000	456,000
Bighorn National Forest	Lodgepole Pine	200	0	5,600	5,600
	Ponderosa Pine	100	90	6,200	6,300
	5-Needle Pines	20	30	15,000	15,000
	All Hosts	320	120	26,000	27,000
Black Hills National Forest	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	34,000	16,000	430,000	438,000
	5-Needle Pines	0	0	0	0
	All Hosts	34,000	16,000	430,000	438,000
Grand Mesa National Forest	Lodgepole Pine	0	0	2	2
	Ponderosa Pine	0	0	10	10
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	20	20
Gunnison National Forest	Lodgepole Pine	0	0	3,400	3,400
	Ponderosa Pine	0	0	2,100	2,100
	5-Needle Pines	0	0	4	4
	All Hosts	0	0	5,500	5,500

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National Forest	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Medicine Bow National Forest	Lodgepole Pine	2,200	510	639,000	639,000
	Ponderosa Pine	1,500	20	40,000	40,000
	5-Needle Pines	650	350	36,000	36,000
	All Hosts	2,700	880	680,000	681,000
Nebraska National Forest	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	20	20
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	20	20
Pike National Forest	Lodgepole Pine	60	190	47,000	47,000
	Ponderosa Pine	930	80	102,000	102,000
	5-Needle Pines	20	20	320	340
	All Hosts	1,000	290	149,000	149,000
Rio Grande National Forest	Lodgepole Pine	4	0	90	90
	Ponderosa Pine	0	1	35,000	35,000
	5-Needle Pines	210	0	520	520
	All Hosts	220	1	36,000	36,000
Roosevelt National Forest	Lodgepole Pine	56,000	7,500	612,000	612,000
	Ponderosa Pine	26,000	2,900	374,000	374,000
	5-Needle Pines	1,100	360	65,000	66,000
	All Hosts	74,000	11,000	810,000	810,000
Routt National Forest	Lodgepole Pine	110	30	611,000	611,000
	Ponderosa Pine	0	0	350	350
	5-Needle Pines	0	0	10,000	10,000
	All Hosts	110	30	613,000	613,000
San Isabel National Forest	Lodgepole Pine	0	5	13,000	13,000
	Ponderosa Pine	10	660	134,000	135,000
	5-Needle Pines	270	560	5,400	5,900
	All Hosts	280	1,200	151,000	152,000

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National Forest	Host Tree	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
San Juan National Forest	Lodgepole Pine	0	0	330	330
	Ponderosa Pine	3	200	28,000	28,000
	5-Needle Pines	0	0	3	3
	All Hosts	3	200	28,000	28,000
Shoshone National Forest	Lodgepole Pine	6,600	16,000	278,000	286,000
	Ponderosa Pine	0	0	40	40
	5-Needle Pines	31,000	54,000	543,000	566,000
	All Hosts	35,000	58,000	672,000	694,000
Thunder Basin National Grassland	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	2	4	300	310
	5-Needle Pines	0	0	0	0
	All Hosts	2	4	300	310
Uncompahgre National Forest	Lodgepole Pine	0	0	20	20
	Ponderosa Pine	1,600	840	9,900	11,000
	5-Needle Pines	0	4	0	4
	All Hosts	1,600	840	9,900	11,000
White River National Forest	Lodgepole Pine	3,700	6	382,000	382,000
	Ponderosa Pine	0	5	3,600	3,600
	5-Needle Pines	0	0	1,400	1,400
	All Hosts	3,700	10	386,000	386,000

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2014 Spruce Beetle Activity

	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Colorado	398,000	485,000	1,144,000	1,397,000
Wyoming – R2	28,000	55,000	504,000	535,000
CO plus S.WY	404,000	494,000	1,262,000	1,607,000
South Dakota	0	0	100	100

Colorado County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Alamosa	2	420	2	420
Archuleta	26,000	18,000	33,000	40,000
Boulder	0	800	50	860
Chaffee	30	11,000	90	11,000
Clear Creek	7	90	40	130
Conejos	51,000	40,000	62,000	76,000
Costilla	140	650	1,600	2,200
Custer	3,700	9,100	5,100	12,000
Delta	5,500	12,000	28,000	33,000
Dolores	10,000	3,900	20,000	22,000
Douglas	0	10	20	30
Eagle	0	0	5,900	5,900
El Paso	0	0	10	10
Fremont	2,300	5,600	2,400	6,500
Garfield	80	480	4,200	4,700
Gilpin	1	60	30	80
Grand	15,000	19,000	32,000	44,000
Gunnison	670	29,000	22,000	48,000
Hinsdale	79,000	97,000	186,000	234,000

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Colorado County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Huerfano	1,900	2,100	3,400	4,400
Jackson	9,100	14,000	82,000	88,000
Jefferson	0	0	80	80
La Plata	5,300	9,400	16,000	23,000
Lake	0	20	50	80
Larimer	16,000	24,000	61,000	70,000
Las Animas	6	0	660	660
Mesa	13,000	20,000	46,000	51,000
Mineral	39,000	15,000	232,000	235,000
Moffat	0	0	750	750
Montezuma	2,700	860	5,600	6,300
Montrose	0	20	560	570
Ouray	0	20	1,400	1,400
Park	2	190	50	240
Pitkin	1,900	6,800	8,400	12,000
Pueblo	370	810	2,400	2,900
Rio Blanco	0	10	3,800	3,800
Rio Grande	42,000	39,000	69,000	81,000
Routt	60	0	85,000	85,000
Saguache	64,000	96,000	108,000	170,000
San Juan	7,000	8,700	10,000	15,000
San Miguel	2,100	570	3,100	3,500
Summit	0	0	1,300	1,300
Teller	0	1	0	1

Wyoming County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Albany	940	620	29,000	29,000
Big Horn	20	0	12,000	12,000

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Wyoming County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Carbon	5,500	9,000	89,000	90,000
Converse	0	0	80	80
Fremont	20,000	37,000	73,000	98,000
Hot Springs	0	6,700	19,000	21,000
Johnson	9	0	4,400	4,400
Natrona	2	0	40	40
Park	1,500	1,200	270,000	270,000
Sheridan	290	0	6,500	6,500
Sublette	0	260	200	430
Sweetwater	0	2	3	6
Teton	470	1,000	1,300	1,800
Uinta	0	20	0	20
Washakie	0	0	670	670

National Forest	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Arapaho National Forest	12,000	11,000	25,000	33,000
Bighorn National Forest	320	0	23,000	23,000
Black Hills National Forest	0		100	
Grand Mesa National Forest	13,000	25,000	54,000	61,000
Gunnison National Forest	34,000	79,000	96,000	150,000
Medicine Bow National Forest	6,400	9,600	116,000	118,000
Pike National Forest	2	200	60	270
Rio Grande National Forest	205,000	192,000	476,000	554,000
Roosevelt National Forest	11,000	9,300	46,000	48,000
Routt National Forest	9,100	13,000	167,000	173,000
San Isabel National Forest	8,600	31,000	14,000	40,000
San Juan National Forest	75,000	53,000	183,000	209,000
Shoshone National Forest	21,000	41,000	317,000	343,000
Uncompahgre National Forest	2,200	3,700	9,900	13,000
White River National Forest	3,300	9,400	25,000	30,000

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2014 Douglas-fir Beetle Activity

State	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Colorado	43,000	34,000	374,000	397,000
Wyoming – R2	760	3,400	328,000	330,000
CO plus S. WY	43,000	35,000	389,000	412,000

Colorado County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Alamosa	60	40	80	130
Archuleta	1,800	1,400	37,000	38,000
Boulder	0	0	280	280
Chaffee	60	30	3,000	3,100
Clear Creek	0	0	1,100	1,100
Conejos	40	20	5,900	5,900
Costilla	570	50	2,400	2,500
Custer	90	50	6,400	6,400
Delta	330	550	3,500	3,900
Dolores	640	270	4,300	4,500
Douglas	7,700	3,300	44,000	45,000
Eagle	890	370	8,500	8,700
El Paso	130	630	4,800	5,400
Elbert	0	0	1	1
Fremont	280	170	15,000	15,000
Garfield	2,300	2,600	29,000	31,000
Gilpin	0	0	60	60
Grand	150	60	1,200	1,200
Gunnison	3,900	3,300	26,000	29,000
Hinsdale	1,400	1,500	11,000	13,000

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Colorado County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Huerfano	150	80	2,200	2,300
Jackson	10	20	540	560
Jefferson	970	390	10,000	11,000
La Plata	1,800	1,600	14,000	16,000
Lake	30	0	110	110
Larimer	0	0	2,500	2,500
Las Animas	0	0	5,900	5,900
Mesa	1,000	1,200	7,800	8,600
Mineral	570	540	9,900	10,000
Moffat	0	0	970	970
Montezuma	80	60	7,900	7,900
Montrose	1,300	990	8,700	9,300
Ouray	8,800	7,600	12,000	18,000
Park	40	30	1,600	1,600
Pitkin	3,900	2,200	8,900	10,000
Pueblo	0	530	3,700	4,300
Rio Blanco	380	480	8,400	8,800
Rio Grande	200	180	8,300	8,400
Routt	240	280	4,600	4,900
Saguache	960	1,900	32,000	33,000
San Juan	1,400	1,500	1,700	2,000
San Miguel	380	300	16,000	16,000
Summit	30	0	500	500
Teller	90	4	1,800	1,800

Wyoming County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Albany	3	20	5,400	5,400
Big Horn	30	1	33,000	33,000
Carbon	4	310	9,200	9,500

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Wyoming County	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Converse	2	0	10	10
Crook	0	0	1	1
Fremont	20	110	49,000	49,000
Hot Springs	0	2,500	26,000	27,000
Johnson	6	1	1,500	1,500
Lincoln	0	350	0	350
Natrona	4	0	160	160
Park	50	90	196,000	196,000
Sheridan	10	0	990	990
Sublette	0	2	0	2
Sweetwater	620	0	670	670
Uinta	0	40	0	40
Washakie	4	1	6,300	6,300

National Forest	2013 Acres Affected	2014 Acres Affected	1996-2013 Cumulative Acres Affected	1996-2014 Cumulative Acres Affected
Arapaho National Forest	3	0	500	500
Bighorn National Forest	30	1	27,000	27,000
Grand Mesa National Forest	180	450	2,000	2,300
Gunnison National Forest	2,500	2,000	23,000	24,000
Medicine Bow National Forest	0	10	12,000	12,000
Pike National Forest	7,500	3,600	50,000	51,000
Rio Grande National Forest	400	1,300	38,000	39,000
Roosevelt National Forest	0	0	1,800	1,800
Routt National Forest	110	170	2,200	2,300
San Isabel National Forest	170	360	16,000	17,000
San Juan National Forest	7,200	5,600	75,000	78,000
Shoshone National Forest	60	90	204,000	204,000
Uncompahgre National Forest	8,900	8,000	25,000	31,000
White River National Forest	5,900	4,000	24,000	26,000

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2014 Western Balsam Bark Beetle Activity

State	2013 Acres Affected	2014 Acres Affected
Colorado	178,000	173,000
Wyoming – R2	24,000	28,000
CO plus S.WY	181,000	180,000

Colorado County	2013 Acres Affected	2014 Acres Affected
Alamosa	80	0
Archuleta	0	70
Boulder	4,000	9,100
Chaffee	1,500	1,200
Clear Creek	7,200	12,000
Conejos	130	410
Costilla	2,700	760
Custer	2,100	1,100
Delta	3,500	1,700
Dolores	7,300	1,800
Eagle	13,000	8,500
ElPaso	0	1
Fremont	160	0
Garfield	15,000	14,000
Gilpin	2,900	4,900
Grand	12,000	7,800
Gunnison	21,000	14,000
Hinsdale	1,100	790
Huerfano	2,800	790
Jackson	2,000	4,300
Jefferson	7	0
La Plata	830	380
Lake	2,500	3,400
Larimer	4,500	8,400
Las Animas	1,300	610

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Colorado County	2013 Acres Affected	2014 Acres Affected
Mesa	8,900	5,300
Mineral	290	630
Moffat	710	3,200
Montezuma	400	0
Montrose	320	490
Ouray	2,600	1,500
Park	8,800	12,000
Pitkin	16,000	29,000
Rio Blanco	13,000	10,000
Rio Grande	0	10
Routt	4,300	7,500
Saguache	1,200	350
San Juan	3,100	450
San Miguel	4,000	2,100
Summit	7,200	3,000
Teller	6	8

Wyoming County	2013 Acres Affected	2014 Acres Affected
Albany	950	660
Big Horn	2,000	730
Carbon	2,300	5,500
Converse	100	80
Fremont	6,000	5,000
Hot Springs	0	1,000
Johnson	5,800	2,300
Lincoln	0	3,600
Natrona	380	1,200
Park	1,400	4,500
Sheridan	850	330
Sublette	0	320
Sweetwater	4,000	1,800
Uinta	0	1,100
Washakie	3	40

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National Forest	2013 Acres Affected	2014 Acres Affected
Arapaho National Forest	17,000	19,000
Bighorn National Forest	8,600	3,300
Grand Mesa National Forest	8,900	4,900
Gunnison National Forest	18,000	9,400
Medicine Bow National Forest	3,100	4,600
Pike National Forest	9,100	13,000
Rio Grande National Forest	600	1,400
Roosevelt National Forest	7,200	16,000
Routt National Forest	11,000	14,000
San Isabel National Forest	9,500	6,800
San Juan National Forest	10,000	2,600
Shoshone National Forest	5,300	9,000
Uncompahgre National Forest	9,900	6,000
White River National Forest	59,000	62,000

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2014 Western Spruce Budworm Activity

State	2013 Acres Affected	2014 Acres Affected
Colorado	156,000	178,000
Wyoming- R2	26,000	27,000
CO plus S.WY	156,000	178,000

Colorado County	2013 Acres Affected	2014 Acres Affected
Alamosa	310	1,100
Archuleta	1,000	2,000
Chaffee	0	0
Conejos	290	120
Costilla	30,000	12,000
Custer	15,000	24,000
Dolores	6,800	4,200
Douglas	0	80
El Paso	0	14,000
Fremont	300	15,000
Grand	30	0
Gunnison	0	320
Hinsdale	1,300	0
Huerfano	22,000	34,000
Jackson	0	0
Jefferson	0	10
La Plata	17,000	2,800
Las Animas	27,000	33,000
Mineral	0	0
Montezuma	10,000	2,100
Ouray	80	780
Park	0	8
Pueblo	2,900	3,700
Rio Grande	0	20
Routt	50	30
Saguache	8,900	15,000

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Colorado County	2013 Acres Affected	2014 Acres Affected
San Juan	12,000	4,400
San Miguel	540	660
Teller	560	7,400

Wyoming County	2013 Acres Affected	2014 Acres Affected
Albany	0	0
Carbon	0	0
Fremont	1,100	460
Johnson	20	20
Park	24,000	26,000
Washakie	470	30

National Forest	2013 Acres Affected	2014 Acres Affected
Gunnison National Forest	0	210
Medicine Bow National Forest	0	0
Pike National Forest	280	15,000
Rio Grande National Forest	7,700	12,000
Routt National Forest	50	0
San Isabel National Forest	33,000	56,000
San Juan National Forest	47,000	14,000
Shoshone National Forest	25,000	26,000
Uncompahgre National Forest	620	1,400

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2014 Aspen Dieback and Mortality

	Acres Affected
Colorado	1,200
Wyoming – R2	0
CO. plus S. WY	1,200
South Dakota	0

Colorado County	2014 Acres Affected
Custer	3
Eagle	7
Grand	70
Gunnison	7
Mesa	790
Montrose	260
Ouray	110

National Forest	2014 Acres Affected
Grand Mesa National Forest	250
Gunnison National Forest	6
Uncompahgre National Forest	320
White River National Forest	70

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Section 4

Other Required Documentation & Acknowledgements

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Information shown is based upon data compiled as of March 2014. References and GPS data provided upon request. For more information, contact R2 FHP. www.fs.usda.gov/goto/r2/fh

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