

Mountain Pine Beetle epidemics and damages were dramatically visible during the August 2011, Aerial Detection Survey of the Black Hills National Forest. *Photo by J. Backsen, 2011.*



2011 Forest Insect and Disease Conditions in the Rocky Mountain Region (R2)



USDA Forest Service • Rocky Mountain Region • Renewable Resources

Data and information provided by Forest Health specialists in CO, KS, NE,
SD, WY, and USFS R2; Compiled by J.L. Harris, June 2012

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Information shown is based upon data compiled as of June 2012. For more information, contact R2 Forest Health Protection. www.fs.usda.gov/goto/r2/fh.

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**These diseases rarely change in population size each year so they are not usually reported annually. However in 2011, all of these data (all diseases and insects damages) were submitted to a national Forest Health Protection database called Pest Event Reporter (PER).*

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***The Aerial Detection Survey (ADS) report was written in Nov. 2011. Page numbers in Appendix A (copy of the 2011 ADS report) were listed according to the original report. Consecutive page numbers then resume for Appendices B, C, & D in the R2 Conditions Report*

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Major Damage Agents

Douglas-fir Beetle (*Dendroctonus pseudotsugae*)

Host tree: Douglas-fir

Range in R2: Colorado & Wyoming

Colorado

Numerous small infestations of Douglas-fir beetle (DFB) were identified in stands of Douglas-fir throughout northern Colorado. The most affected counties included Douglas (6,800 acres), El Paso (240 acres), Jackson (200 acres), Jefferson (1,400 acres), and Routt (120 acres) Counties. Other northern Colorado counties affected by the Douglas-fir beetle include Grand (20 acres), Park (7 acres), and Summit (80 acres). Douglas-fir trees killed by DFB in Douglas and El Paso counties were often associated with prior severe defoliation by the western spruce budworm or the Douglas-fir tussock moth.

Throughout Colorado's south central mountains, DFB activity was higher than usual. Drought-induced stress occurred nearly a decade ago and was partly responsible for the initiation of the current outbreak. Levels of host mortality varied widely with some areas experiencing only scattered mortality, while other stands were greatly affected resulting in almost the total loss of mature Douglas-fir.

Wyoming

Tree mortality caused by DFB declined in northern Wyoming in recent years with many areas depleted of the host trees. Very little new DFB-caused tree mortality was recorded in the Bighorn Mountains in 2011. DFB activity in the Absaroka Mountains and Wind River Range on the Shoshone NF continued at relatively low levels. MCH pheromones continued to be used to protect high value Douglas-fir in developed recreation sites where DFB activity persists. No new DFB activity was reported on the Medicine Bow National Forest in Southeastern Wyoming but small pockets of Douglas-fir beetle were noted in Carbon County (10 acres).

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Dwarf Mistletoes (*Arceuthobium spp.*)

Host trees: Douglas-Fir, Pine species: Limber, Lodgepole, Piñon, Ponderosa, Rocky Mountain Bristlecone, Southwestern White and Whitebark

Range in R2: Colorado and Wyoming

Dwarf mistletoes are rarely detected in aerial survey and do not change rapidly from year to year. Yet these parasites chronically affect trees and stands, slowly increasing over time, reducing tree growth and longevity, increasing susceptibility to drought, and generally leading to deteriorating stand conditions. Different species of dwarf mistletoes occur in lodgepole pine, ponderosa pine, Douglas-fir, limber pine, other 5-needle (white) pines, and piñon pine. Infections of lodgepole pine with *A. americanum*, ponderosa pine with *A. vaginatum ssp. cryptopodum* and Douglas-fir with *A. douglasii* are the most common and easily identified during ground surveys in the Rocky Mountain Region. Over 50% of the lodgepole pine stands in the Region are infested by dwarf mistletoe. The 5-needle (white) pines are infected to varying degrees by *A. cyanocarpum* and occasionally by the other tree mistletoe species that usually infest other pines.

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Mountain Pine Beetle (*Dendroctonus ponderosae*)

Host Trees: Lodgepole Pine, Ponderosa Pine, & 5-needle Pines: Rocky Mountain Bristlecone, Southwestern White, and Whitebark

Range in R2: Colorado, Nebraska, South Dakota, and Wyoming

Mountain pine beetle (MPB) activity is reported by forested areas of the Rocky Mountain Region.

South Dakota, Black Hills National Forest, & Eastern Wyoming

Mountain pine beetle continued to kill ponderosa pines throughout the Black Hills in 2011. All land ownerships were affected. The epidemic concentrated in the Central and Northern Hills with a few pockets of MPB activity south of Custer, SD. Notable MPB tree killing occurred along the northern border of Custer State Park adjacent to the Black Elk Wilderness Area. This area experienced almost 100% mortality of the susceptible ponderosa pines.

Sanitation treatments were used throughout the Black Hills of SD and WY. Thinning stands to reduce susceptibility, removing infested trees, and bucking infested trees into short pieces to dry the wood appeared as successful treatments to reduce pine mortality in the adjacent Custer State Park. Continued treatment was also necessary as new spot infestations occurred in the Black Hills. MPB infestations on private lands in suburban areas near Rapid City caused increased concern. The state, in cooperation with the local conservation districts, marked infested trees on private property at the request of landowners. Cost-share funding was available through the South Dakota Dept. of Agriculture Resource Conservation & Forestry Division to assist landowners in removal and/or bucking the infested trees.

Relic stands of limber pine in the Cathedral Spires area of Custer State Park continue to be threatened by MPB, white pine blister rust, and encroachment by white spruce trees. The MPB anti-aggregation pheromone, verbenone, continued to be used as part of the management of these limber pines. The efforts were successful with loss of less than 1 percent of the limber pines to MPB, despite the high beetle populations in the immediate vicinity. MPB activity also occurred in Eastern Wyoming, in Weston and Crook Counties, along the Wyoming & South Dakota state line primarily in the Black Hills National Forest.

Nebraska

MPB caused scattered ponderosa pine mortality in Nebraska's Wildcat Hills and the Pine Ridge, in both urban and rural areas of Scotts Bluff and Dawes Counties. In an effort to slow the spread of mountain pine beetle and limit its impact, a cost-share program was implemented to help public and private landowners in Western Nebraska manage the insect. Monitoring continued in 2011 through trapping, aerial, and ground surveys.

Colorado

There were several sites in Southern Colorado with mountain pine beetle activity in ponderosa and lodgepole pines but most of the active infestation continued in the northern half of Colorado. MPB populations rapidly declined west of the Continental Divide (Grand, Jackson, Routt, and Summit Counties in Colorado) due to host depletion or declining populations. However, high value recreation sites, especially near the resort communities of Aspen and Vail, continued to lose trees to MPB and caused public concern.

East of the Continental Divide, Front Range counties in Colorado experienced a range of epidemic MPB conditions; populations declined in several Front Range areas, including Boulder (56,000 acres), Clear Creek (15,000 acres), Gilpin (13,000 acres), and Park (2,200 acres) Counties. For southern Boulder, Gilpin, and Park Counties, mountain pine beetle populations declined in spite of abundant host trees. This decline may be due to

the low reproductive success of MPB associated with attacking small-diameter lodgepole pines in these stands. Populations continued to increase in Jefferson (3,000 acres) and Larimer (587,000 acres) Counties where suitable host trees still remain.

Spread of mountain pine beetle from high elevation lodgepole pine forests into lower elevation ponderosa pine forests occurred readily in northern Boulder and Larimer Counties of Colorado. Acres affected in ponderosa pine for Boulder County declined from 36,000 acres in 2010 to 18,000 acres in 2011; acres affected in ponderosa pine for Larimer County increased from 182,000 acres in 2010 to 254,000 acres in 2011. Ornamental pine plantings were lost to mountain pine beetle in the cities of Boulder, Denver, and Fort Collins.

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Wyoming:

MPB populations rapidly declined in southeastern Wyoming in Carbon, Albany and Laramie Counties, due to host tree depletion. However, in some of Albany and Laramie Counties, MPB readily spread from the higher elevation lodgepole pine forests to lower elevation ponderosa pine forests. Consequently, the mountain pine beetle infestations in ponderosa pine impacted more densely populated wildland-urban-interface communities' natural pine stands and ornamental pine plantings. Several ponderosa and ornamental pines around the town of Cheyenne were killed by mountain pine beetle.

Five needle pines across Wyoming suffered high levels of mortality due to MPB. Stands with dead limber and whitebark pines occurred across their ranges in northwest and southeast Wyoming. MPB activity decreased in five needle pines because most of the five-needle pines were depleted.

MPB also caused outbreaks on the Shoshone National Forest and in the Big Horn mountain ranges. Localized heavy lodgepole pine mortality due to mountain pine beetle occurred throughout the southern Absaroka Mountains and the Wind River Range in the Shoshone National Forest. Lodgepole pine mortality declined in the Hazelton Peak Pyramid areas south of the Big Horn Mountains in Johnson County. Widespread pockets of ponderosa pine mortality caused by mountain pine beetle were observed on the eastern slopes of the Big Horn Mountains in northern Johnson County and into Sheridan County. Scattered beetle activity in ponderosa pine was noted near the small town of Story, and on E K & Gardner Mountains of southwestern Johnson County.

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Pine Wilt in the Great Plains (*Bursaphelenchus xylophilus*, *Monochamus* spp.) (life cycle described below)

Host Trees: Austrian, Eastern White, Mugo, Ponderosa, & Scotch Pines

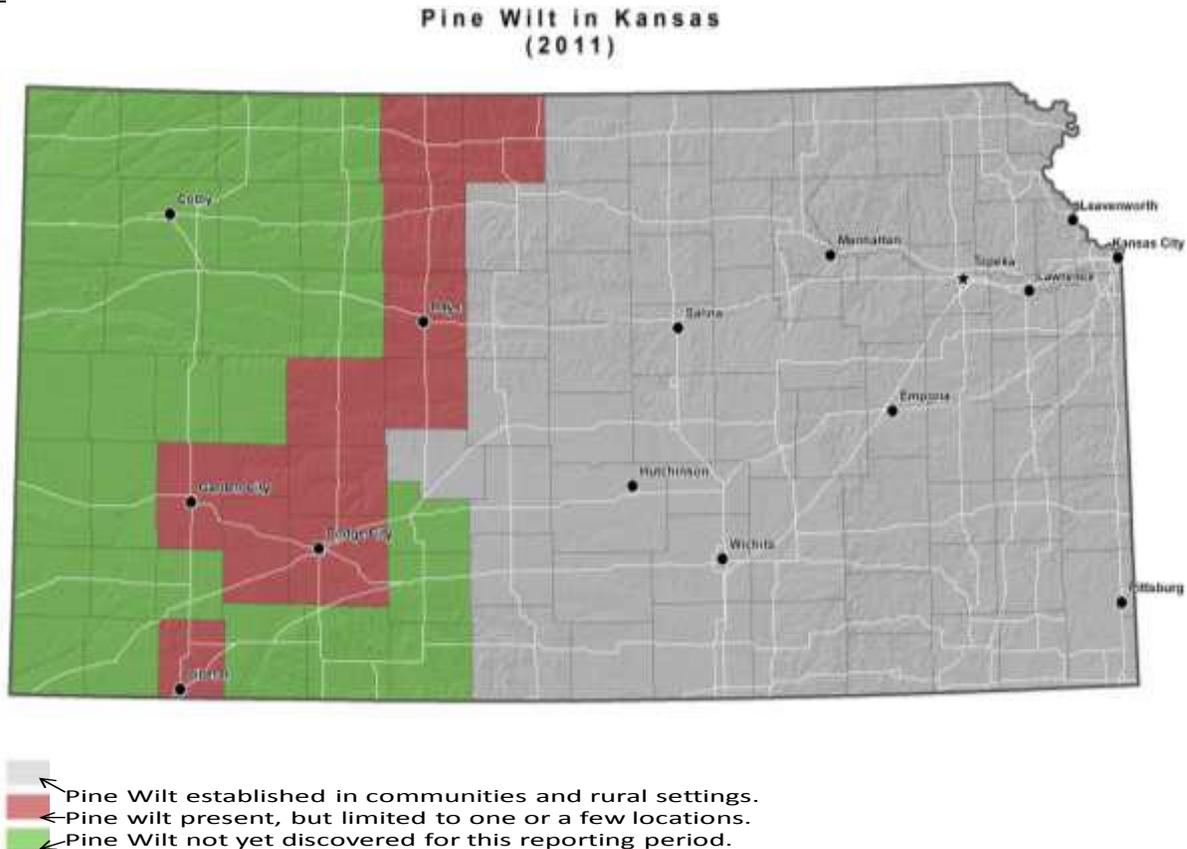
Range in R2: Kansas, Nebraska, and South Dakota

The nematodes causing pine wilt reproduce rapidly with each generation taking only 5-6 days to complete a life cycle. In four to six weeks following feeding, the nematode becomes systemic throughout the tree and symptoms of "wilting" begin to develop. At first, needles turn a dull green. If weather conditions are hot and dry, the tree rapidly dies with needles turning brown and no resin flows. Some trees die slowly if there are no other tree stresses; this may take up to three months after the first symptoms of pine wilt infection. Overall, symptoms include flagging of branches, wilting of needles, absence of resin in branches, and rapid death of the tree. Pines affected in the Great Plains include Scotch, Austrian, Japanese Black (Mugo), and white pines. Scotch and Japanese Black pines are considered highly susceptible to the nematode.

Pine sawyer insects emerge from infected wood through the summer months resulting in new infections of nearby trees over the summer and into the fall. To complete the infection cycle, the pine sawyer insects lay their eggs into these dead and dying nematode infested trees. Inside the tree, sawyer larvae develop and

overwinter in the wood. In the Spring, the sawyer larvae develop into pupae which the nematodes migrate into these feeding wounds before the emergence of the adult sawyer. The presence of pinewood nematodes in wood does not always indicate that the tree died of pine wilt. When the pine sawyer lays its eggs in dead or dying pines, it can transmit the nematode also at that time and the nematode is considered secondary to the death of the tree.

Kansas



Nebraska

Pine wilt killed thousands of Scotch pine in Nebraska annually since the late 1990's. The disease occurs in scattered locations throughout much of the state, but was prevalent in the east and south-central parts of Nebraska. The Nebraska Forest Service no longer recommends using Scotch pine in long-term plantings in the southeast portion of Nebraska.

South Dakota

Pinewood nematode was found throughout South Dakota in shelterbelts and windbreaks. It causes a rapid decline in Austrian and Scotch pines. In southwestern South Dakota, there were pines colonized and killed by this nematode. Many shelterbelt and community plantings with Austrian and Scotch pines disappeared during the past decade due to pine wilt disease. Now the disease has occurred in Mugo pines in this same region of the state.

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Root Rot Diseases (*Armillaria spp.*, *Heterobasidion spp.*, *Leptographium spp.*, *Coniophora spp.*, *Onnia spp.*)

Host Trees: Multiple host tree species

Range in R2: Surveyed/monitored with ground surveys in Colorado, Nebraska, South Dakota, and Wyoming

The fungal pathogens that cause root and butt rot diseases in the Rocky Mountain Region have complex disease cycles. These fungi move through the Region's soils along decaying roots and cause disease pockets with dead and dying trees throughout the Region. Sometimes these fungal pathogens are distributed by wind-blown spores to injured roots and trees, where they will colonize the tree's root system and create more root disease centers. Below are findings from some of the Region's most recent root disease surveys in southern Colorado.

Root and butt rots and stem decays are diseases in which the wood of the roots or stem is decayed. These diseases share several features that make their detection and quantification difficult:

1. Unlike fire and many insect pests, these diseases are not highly aggregated in time and space.
2. They work inside trees, with symptoms and consequences that often take many years to develop.
3. Because of the first two features, root and butt rots are rarely detected in aerial surveys. These forest health problems are often difficult to detect in ground surveys, stand exams and cruise plots until the tree declines or dies.
4. These fungi are stable elements in mature forests and their frequency remains consistent year after year, changing slowly only as stand conditions change. In most cases the fungi become more frequent as stands age.
5. Root diseases occur in every tree species in the Region and across millions of acres.
6. Root diseases cause important effects such as:
 - A substantial (but not quantified) volume loss, growth loss and mortality that decrease timber productivity and cause difficulty in management of timber sales;
 - They create hazard trees in developed recreation sites and administration sites which pose a threat to human health and safety;
 - They create cavity habitat for hiding and nesting of wildlife, and
 - They contribute to the development of forest canopy gaps caused by groups of trees dying from root rots. This can promote structural and species diversity in forests.

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Colorado

In Engelmann spruce, except when spruce beetle populations are epidemic, the root and butt rots cause the most important tree mortality. Other than annosus root disease in white fir, *Armillaria* is usually cited as the most important root disease in the Rocky Mountain Region. Other root rotting pathogens found in Colorado and Wyoming are:

<i>Armillaria spp.</i>	<i>Laurilia sulcata</i>
<i>Armillaria solidipes</i>	<i>Onnia tomentosa</i>
<i>Coniophora olivacea</i>	<i>Onnia sp.</i>
<i>Coniophora puteana</i>	<i>Phellopilus nigrolimitatus</i>
<i>Coniophora sp.</i>	<i>Porodaedalea pini</i>
<i>Fomitiporia hartigii</i>	<i>Veluticeps fimbriata</i>
<i>Heterobasidion sp.</i>	<i>Vesiculomyces citrinus</i>

Informal root disease surveys in spruce-fir forests, mostly on the Gunnison National Forest, revealed a diverse community of pathogens involved including the pathogens listed above. Samples included trees that died

standing with root disease or trees that failed at the roots or lower stem. At least 11 pathogens were noted to have caused decay in the roots and/or butts of trees. The most common was *Onnia* sp.; *O. tomentosa* was the species in all cases where it could be identified. Second most common was *Coniophora* spp., mostly *C. puteana* but also *C. olivacea*. Third was *Porodaedalea pini*, a stem-decay fungus that commonly grows down to ground line and even into roots a short distance, and frequently results in stem failure just above ground line. Although *Armillaria* root disease was only fourth most common, sampling was not rigorous enough to draw firm conclusions about relative frequency. This preliminary sampling shows that many fungi cause root diseases in spruce-fir forests.

Nebraska

Evidence of *Armillaria* was confirmed in the root crown area of a bur oak that died recently. This suggests the fungus might be causing the decline of bur oaks in eastern and north central Nebraska. Other causes probably include human activities and grazing around the native bur oak forests.

Heterobasidion annosum occurs in pine plantations in the Nebraska National Forest near the Charles E. Bessey Tree Nursery. Annosus root disease was found in plantations of both jack and ponderosa pine, and on eastern red cedar.

South Dakota

Armillaria root disease was seen on oaks along floodplains and in grazed areas in South Dakota and Wyoming. The combination of stresses between flooding in the 1990's and drought in more recent years promoted root disease growth in these areas. *Armillaria* spp. was found on various tree species throughout Wyoming and is quite common in the Black Hills National Forest. This disease contributes to mountain pine beetle-caused pine mortality.

Wyoming

Results of recent survey and species testing of *Armillaria* in Wyoming indicate that *A. solidipes* (*A. ostoyae*) is the most common *Armillaria* species in Wyoming. This species was frequently associated with conifer hosts and cover types, which are the predominant forest cover type in Wyoming, and was found mainly in the south and northeast parts of the state. *A. sinapina* was associated with conifer and hardwood hosts and cover types, and was widely distributed, but not in the central area of the state. *A. gallica* was found mostly in oak and other hardwood hosts and cover types, and only in northeast Wyoming. *A. cepistipes* was found in both hardwoods and in conifers. It was also found in both hardwood and conifer cover types, but only in west-central Wyoming. All four species cause root disease.

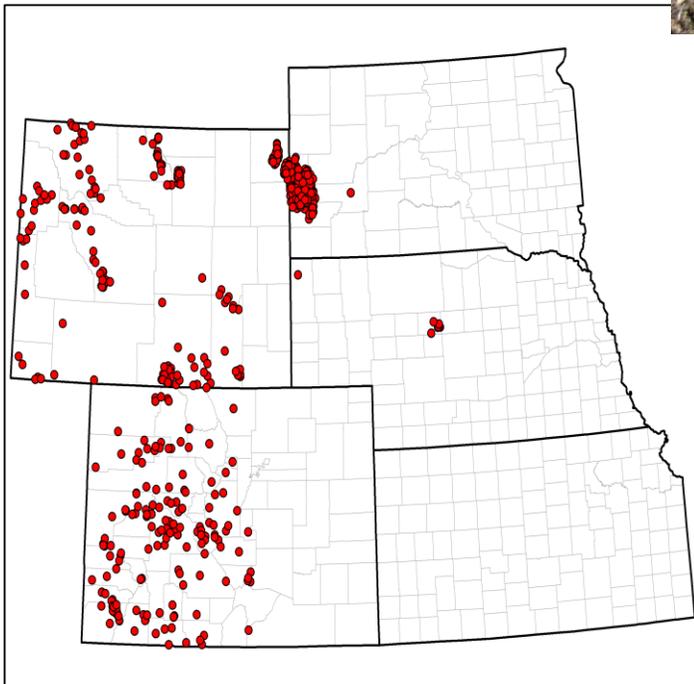
Armillaria root diseases were found at 30% of the locations examined and confirmed to be pathogenic 66% of the time. Although *Armillaria* root disease was the most common root disease detected, other root diseases detected during the Wyoming survey included white mottled rot (*Ganoderma applanatum*), *Coniophora* spp. root and butt rot, red root rot (*Onnia* spp.), and schweinitzii root and butt rot (*Phaeolus schweinitzii*). For locations, host tree species, and lists of other root and decay fungi occurring in the Rocky Mountain Region, please contact the R2 Forest Health Protection group (www.fs.usda.gov/goto/r2/fh).



**Birch stand declining because of root disease.
Photo by J. Blodgett.**



Armillaria spp. fungus rotting a birch tree root. Photo by J. Blodgett.



**Locations of root disease centers in the Region.
These were found in special root disease surveys;
pathogens were frequently identified to species level.**

Spruce beetle (*Dendroctonus rufipennis*)

Host trees: Englemann spruce, Blue spruce

Range in R2: Colorado and Wyoming

Colorado/Wyoming

Spruce beetle epidemics continue to causing decline of high elevation Englemann spruce forests in Colorado and Wyoming within the Rocky Mountain Region. In south central Colorado, ongoing epidemics expanded, in drought stressed spruce for nearly a decade. Along with windthrow events in spruce stands, this often initiates current spruce beetle outbreaks. Throughout most of the affected area, beetles appear to have a two-year life cycle. Spruce beetle populations were rapidly expanding in some areas where entire drainages were infested in 2011.

Outbreaks in southern Colorado were ongoing on the Grand Mesa, incipient in the Wet Mountains, and declined in the Weiminuche Wilderness due to spruce host tree depletion. Outbreaks also expanded into new areas in the eastern San Juan/Rio Grande National Forests.

Outbreaks were first detected in 2004 in the San Juan Mountains and Weiminuche Wilderness Area and killed most of the mature spruce in the eastern San Juan Mountains. This outbreak continued into the headwaters of the Rio Grande drainage and now has moved north and started to impinge on the southern portions of the Gunnison National Forest. The epidemic on the Gunnison National Forest was particularly striking in the intensity of the beetle activity. Every mature spruce above pole size was killed in multiple drainages, from the creek bottoms to the high elevation “krumholz-types” of spruce stands.

The spruce beetle epidemic in northern Colorado and southeastern Wyoming continued in high elevation Engelmann spruce forests. New mortality was most conspicuous along the Medicine Bow and Rabbit Ears Mountain Ranges in Grand (9,600 acres), Jackson (9,500 acres), and Larimer (24,000 acres) Counties. Scattered pockets of spruce mortality caused by spruce beetle occurred along various mountain ranges in Clear Creek (5 acres), Jefferson (60 acres), Routt (500 acres), and Summit (550 acres) Counties of Colorado. Scattered spruce mortality also occurred in the adjacent Mt. Zirkel Wilderness area in Routt County. Much of the mature spruce was lost to spruce beetles in the early 2000’s following the Routt Divide blowdown event in 1997.

In south central Wyoming, the spruce beetle continued at epidemic levels on the Sierra Madre, Snowy Range, and Medicine Bow Mountains in Albany (8,900 acres) and Carbon (32,000 acres) Counties. The spruce forests in northwestern and north central Wyoming, adjacent to the Shoshone National Forest, spruce beetle attacks continued in areas not already host-depleted in the Absaroka Mountains. Spruce beetle was slightly increasing in portions of the Wind River Range. Spruce beetle also caused spruce tree mortality in localized areas in the northern Big Horn Mountains in Big Horn, Sheridan and Johnson Counties.

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White pine blister rust (*Cronartium ribicola*)

Host trees: 5-needle pines - Limber, Rocky Mountain Bristlecone, Southwestern White, & Whitebark

Range in R2: Colorado, South Dakota, and Wyoming

Colorado

Due to this introduced disease, decline and mortality are occurring in limber pine populations on the Arapaho-Roosevelt, the Pike-San Isabel National Forests, and within the Great Sand Dunes National Park and Preserve (GSRA). An isolated population of bristlecone pine was also impacted within GSRA. The combined impacts of

white pine blister rust and mountain pine beetles remain a management concern for limber pine populations in some locations in northern Colorado and southern Wyoming.

South Dakota

This disease was discovered in some of the relic stands of limber pine in the Cathedral Spires area of Custer State Park back in the 1990's. The cankers from this fungus were present in some of the stems of these trees and limber pine mortality occurred in recent years.

Wyoming

Most mature limber pine across the Rattlesnake Hills, Crooks Mountain, Green Mountain, and Ferris Mountain in Central Wyoming has been killed by mountain pine beetle and also white pine blister rust. Ten Sleep Canyon and in mountain ranges in northern Natrona County have high volumes of standing dead limber pine caused by both the mountain pine beetle and the white pine blister rust disease. Whitebark pines in the Shoshone National Forest were weakened by this rust disease and easily succumbed to mountain pine beetle attacks.

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Other Occurring Damage Agents in R2 during 2011:

Ash rust - (*Puccinia sparganioides*) – (Host Tree: green ash) – (Eastern South Dakota)

Ash rust disease was reported throughout much of the eastern half of South Dakota; it was not as severe as reported in 2008. Many ash trees were defoliated by the disease.

Comandra blister rust – (*Cronartium comandrae*) – (Host Trees: lodgepole and ponderosa pines) – (Colorado, South Dakota, & Wyoming)

Comandra blister rust is an important disease of lodgepole pine and occasionally ponderosa pine in Wyoming. It causes stem deformities, growth reduction, and cankers that girdle branches or stems resulting in top-kill. Trees may survive several decades with "spiked" tops. Cankers continue to grow down the stem and occasionally cause tree mortality. Heavily infected stands have high volume losses, poor form and lumber quality, and reduced growth. On large trees, stem cankers often result in non-merchantability of infected logs. Infected seedlings and young trees are frequently killed. Although there were no major increases in this disease in 2011, it is a persistent problem in Fremont (north-west), Albany, Johnson, and Sheridan Counties in Wyoming.

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Diplodia Canker – (*Sphaeropsis sapinea*) – (Host Trees: Austrian, Ponderosa, Scotch, & Mugo pines) – (Kansas, Nebraska, & South Dakota)

Kansas:

Tip blight (*Sphaeropsis/Diplodia*) infected many Austrian, ponderosa, Scotch, and mugo pines, and continued as a problem throughout the state. Diplodia blight left many windbreaks in poor condition. The disease is most severe on mature trees over 20 years of age. Repeated infections over many years killed large sections of trees or entire trees. Disease levels in 2011 were higher than normal because of increased precipitation levels in the spring. This led to a higher number of reports of this disease across the state.

Nebraska:

Diplodia blight increased in Nebraska in both urban and rural landscapes. Stressed trees were more susceptible, such as those in overcrowded stands. In 2011 several acres of native ponderosa pine in the Pine Ridge area sustained extensive crown damage caused by Diplodia blight following hail storms.

South Dakota:

Diplodia tip blight was commonly reported throughout South Dakota on Austrian and ponderosa pines in shelterbelts and community plantings. While the disease typically results in stunted and dying shoot tips, it was more recently associated with branch dieback in infected trees. This disease was very apparent on ponderosa pine trees along the highway between Hill City and Rapid City in Pennington County.

Dothistroma needle blight – (*Dothistroma septospora, Mycosphaerella pini*) – (Host Trees: Austrian and Ponderosa Pines) – (South Dakota and Kansas)

South Dakota:

This disease was reported in ponderosa pine shelterbelts in many areas of the state in 2011. The symptoms generally occurred in the fall of 2010 and by the spring of 2011 infected trees were found with significant needle loss. This has become an increasingly common disease over the past several years.

Douglas-fir Tussock Moth – (*Orgyia pseudotsugata*) – (Host Tree: Douglas-fir) – (Colorado)

Colorado

Light defoliation by Douglas-fir tussock moth was observed in small areas along the Rampart Range of northern Douglas and southern Jefferson Counties on the Pike National Forest. This general area experienced modest

sized epidemics of this insect from 1993 through 1996 and in 2004 through 2007. Early detection Douglas-fir tussock moth trapping results at three sites along Rampart Range caught 7, 10, and 11 moths per trap site (5 traps per site). These numbers were an increase from the single Douglas-fir tussock moth caught across all of the trap sites in 2010.

Dutch Elm Disease – (*Ophiostoma novo-ulmi*) – (Host Tree: American Elm) – (occurs throughout the Region, but reported in 2011 by Kansas and Nebraska)

Kansas and Nebraska

Drought conditions in parts of the state increased Dutch elm disease, causing wilting, cankers, and the associated root disease. In towns and parks throughout Nebraska, Dutch elm disease continued to cause mortality in American elm, particularly in riparian areas and communities. Vectors include the smaller European elm bark beetle (*Scolytus multistriatus*), the native elm bark beetle (*Hylurgopinus rufipes*) and potentially a new exotic species, the banded elm bark beetle (*S. schevyrewi*).

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Fir Engraver – (*Scolytus ventralis*) – (Host Trees: White & Subalpine Firs) – (Colorado)

Colorado

Fir engraver beetles were found in areas containing the primary hosts (white fir and corkbark fir) in southern portions of the state including Archuleta, Custer, Fremont, Las Animas, and Pueblo Counties. Fir engraver populations are currently at reduced levels after a number of years of high activity. It is active primarily in stands where the trees have reached mature to overmature status, particularly where fire exclusion policies have allowed white fir to expand beyond their normal range. The one area with significant fir engraver activity is southwest of Pueblo in the Wet Mountains.

Flooding-high water – (Occurred in the Missouri River floodplains of Kansas, Nebraska, and South Dakota) (Pictures of floods in NE on next page)

Kansas:

As a result of the high water flows in the Missouri River this past summer, flooding was experienced in Doniphan, Atchison, and Wyandotte Counties. Discharge levels were reduced for many of the federal reservoirs in Kansas that ultimately feed into the Missouri River but not sure of the overall flooding impact this had. Because of having to hold water back, Melvern Lake had a severe Blue Green Algae Bloom.

Nebraska:

Record flooding of the Missouri River inundated forested lands in eastern Nebraska in 2011. The flooding impacted several urban areas and agricultural land as well. Much of the area was submerged for two to three months during the summer. The flooding resulted from snow melt from record snowfall in the Rocky Mountains plus heavy spring rains. The long-term effects on flooded trees may be difficult to ascertain. Trees that survive the flooding may be stressed for many years and therefore more susceptible to pests and other problems.

South Dakota:

There was significant season-long summer flooding along the Missouri River during 2011. The communities of Dakota Dunes, Fort Pierre and Pierre have been particularly impacted by the flooding with the loss of many conifers and fruit trees by the end of the summer. Many mature trees, most commonly cottonwoods and elms, were uprooted during the flooding. Ash, boxelder and cottonwoods appear the least affected by the flood, with bur oaks, hackberries and silver maples that were standing in flood waters during the summer exhibiting dieback and premature coloration last fall. We may still see significant mortality from the 2011 flood in 2012.

Three pictures showing the severity of flooding in Nebraska



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Grasshopper - (*Melanoplus* spp.) - (multiple Host Trees in urban areas & shelterbelts) – (South Dakota)

South Dakota

High grasshopper populations in the western part of the state were also having an impact on trees and shrubs. Seedling trees were killed during mid-season defoliation by grasshoppers in shelterbelts throughout western South Dakota.

Gypsy Moth – (*Lymantria dispar*) – (multiple Host Trees) – (Nebraska)

Nebraska

Annual detection trapping for gypsy moth is conducted each year throughout the Region. Traps are placed among potential hosts in parks, rest areas and nurseries. In 2011, a single moth was trapped in Douglas County.

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Lophodermella needle cast of pines – (*Lophodermella* spp.) – (Host Trees: Lodgepole Pine) – (Colorado)

Colorado

An epidemic of needle cast, causing discoloration and defoliation of lodgepole pine, was observed on the Gunnison, White River, and San Isabel National Forests on both sides of the Continental Divide in the southern and central mountains. In this general area, most stands were apparently unaffected, but the disease was locally severe.

Evidence indicates the epidemic was active for at least four years, from 2008 through 2011. Two species of *Lophodermella* caused the epidemic, *L. montivaga* and *L. concolor*. Generally only one species was found at each site, but in one area both pathogens were identified. Substantial growth loss of severely infected trees may be expected during the epidemic and for several years afterwards. Mortality is unlikely except for trees that are highly susceptible, small, suppressed, or otherwise compromised.

Marssonina blight – (*Drepanopeziza punctiformis*) – (Host Trees: Narrowleaf Cottonwood, Quaking Aspen) – (Southwest Colorado Counties: Delta, Gunnison, & Montrose)

Colorado

Marssonina leaf blight continued to cause spotting, browning, blighting, and defoliation of aspen in localized areas this year. In some stands along Gunnison County Rd. 12 (Kebler Pass Rd.) between Paonia and Crested Butte, the disease has been moderate to severe in 3 of the last 5 years. One effect is that colors were muted in some areas along this corridor which is popular for viewing fall foliage. Growth reduction and increased susceptibility to winter injury may also result from this disease.

In samples from this area and from Terror Creek, Delta County, the pathogen was identified as *Marssonina brunnea*. *Marssonina populi* was identified in samples from severely diseased narrowleaf cottonwoods in drainages along the southwestern slopes of Uncompahgre Plateau, east-northeast of Norwood in Montrose County. Foliar damage was severe in most individuals in affected drainages, and in many the entire canopy was affected. The disease was active here for multiple years, as many trees had dead terminals. In Good Enough Draw, some tree mortality resulted.

Oak Gall Wasp – (*Callirhytis quercusfutilis*) – (Bur Oak) - (Nebraska Counties: Furnas, Seward, & Valley)
Nebraska

In spring of 2011, bark shredding on young bur oak trees was reported in multiple locations in the state. A gall wasp (possibly *Loxaulus* sp.) was found in a few undamaged cells and downy woodpeckers are suspected of feeding on the larvae during winter, shredding the bark in the process. Affected branches failed to leaf out in spring and in some instances the entire tree died.

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Young Bur Oak with shredded bark caused by the Oak Gall Wasp in Nebraska.

Pine Engraver – (*Ips pini*) – (Host Tree – Ponderosa Pine) - (South Dakota and Colorado)

Colorado

A report from the Front Range of Colorado indicated losses to the pine engraver beetle increased in El Paso County in 2011. Increased losses were observed in low elevation ponderosa pine forests along the Front Range south of Colorado Springs. On Fort Carson, the pine engraver population built up in ponderosa pine injured during a wildfire in 2008 and then the pine engraver beetle spread into adjacent healthy pines, causing increasing losses this year.

Southern Front Range ponderosa pine forests continue to experience elevated losses from the pine engraver as drought conditions persist throughout the area. Pine engraver mortality in ponderosa pine also occurred in scattered instances in Boulder, Douglas, Jefferson and Larimer Counties, Colorado.

South Dakota

Pine engraver beetle populations were beginning to increase and caused some ponderosa pine mortality in the Black Hills of South Dakota. Pine engraver beetles are typically found in dead and dying trees, as well as slash piles, but the populations were expanding and becoming a major cause of tree mortality.

The population increased in the early 2000's due to an increase in susceptible host material as a result of wildfires and weather events. Hail and snow -breakage of trees resulted in a tremendous build-up of dead, weakened and damaged tree material. The population was increasing again due to the number of trees killed by the mountain pine beetle.

Piñon Ips – (*Ips confuses*) – (Host Trees: Common and Two-Needle Piñon) – (Colorado)

Colorado

Piñon *Ips* activity declined significantly since the major outbreak of 2003-2004 which killed large numbers of piñon trees over a huge expanse of the Southwest. Currently, notable activity was observed west of Cañon City and on the northern edge of the Uncompahgre Plateau in Colorado. Piñon mortality occurred in scattered groups of trees in southwestern El Paso County and northwestern Pueblo County and continued to cause significant mortality on Fort Carson. Drought conditions have contributed to this situation over the past two years.

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Red Turpentine Beetle – (*Dendroctonus valens*) – (Host Tree: Ponderosa Pine) – (South Dakota Counties: Custer, Fall River, Lawrence, Pennington)

South Dakota

Reports of populations of red turpentine beetle appeared to increase recently. The number of infested trees may not be increasing as much as being reported however since infested trees were probably identified more often due to the intensive inspections for mountain pine beetle.



Rusty Tussock Moth cocoon on lodgepole pine needles. Photo by J. Backsen



Rusty Tussock Moth specimen.
Photo by J. Backsen

Rusty Tussock Moth – (*Orgyia antique*) (Host Tree: Lodgepole Pine) (Wyoming)

Wyoming

Aerial observations, followed by ground site visits, identified conspicuous defoliation and mortality of lodgepole pine due to an infestation of rusty tussock moth. Defoliation was mapped in the Big Horn Mountains, South Fork Clear Creek at U.S. Hwy 16 in Johnson County. Only some of this defoliation was identified as caused by Rusty Tussock Moth.

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Subalpine fir mortality – [Western Balsam Bark Beetle (*Dryocoetes confuses*) and *Armillaria spp.* Root Disease] (Host Tree – (Subalpine Fir)– (Colorado & Wyoming)

Colorado

Subalpine fir mortality was widely scattered throughout southern Colorado in the spruce/fir cover types. Outbreaks were closely associated with mid-successional stands containing mature and overmature subalpine fir host trees. Subalpine fir mortality primarily due to western balsam bark beetle continued at relatively low levels across high elevation fir stands in Colorado and Wyoming. Western balsam bark beetle activity occurs widely scattered throughout the range of the host. It was almost always present in suitable stands, and often associated with the presence of *Armillaria* root disease.

Mortality of subalpine fir increases were observed following years of decreased precipitation. Numbers of trees per acre killed were generally less than in pine or spruce types affected by bark beetle outbreaks but damage is widespread. This beetle kills mature and overmature subalpine fir in a distinctive pattern. Unlike other bark beetles, this insect selects individual hosts rather than killing clumps or stands of trees at one time. This results in a “salt and pepper” pattern of mortality, with dead trees scattered throughout the affected stand.

Wyoming

Mortality detected decreased in 2011. Improved conditions are most notable in the Big Horn Mountains where damage was extensive a few years ago. The western balsam bark beetle and root disease continue to cause mortality to subalpine fir throughout Colorado and southeastern Wyoming. In this area, losses caused by the western balsam bark beetle have occurred continuously for more than fifteen years.

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Walnut Thousand cankers Disease – (*Geosmithia morbida*) – (Host Tree: Black Walnut) – (Colorado)

Colorado

Thousand cankers disease continued to kill ornamental black walnut trees in urban forests and was found in sixteen counties in in 2011: Adams, Arapahoe, Boulder, Crowley, Delta, Denver, Douglas, El Paso, Fremont, Jefferson, Larimer, Mesa, Montrose, Otero, Pueblo, and Weld.

Western pine beetle – (*Dendroctonus brevicomis*) – (Host Tree: Ponderosa Pine) – (Colorado Counties: Archuleta, Dolores, Hinsdale, Huerfano, La Plata, Las Animas, Montezuma, Saguache, & San Miguel)

Colorado

Western pine beetle attacked mature ponderosa pines in the southwestern and southern portions of the state. Although western pine beetle activity is currently at a low level throughout the state, it was active in a wide range of areas. Activity was very scattered, but widespread. Within this rather narrow zone of activity, the western pine beetle attacks mature ponderosa pine in “mixed broods” consisting of roundheaded pine beetle (*Dendroctonus adjunctus*) and *Ips* species (primarily *Ips pini*).

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Western spruce budworm – (*Choristoneura occidentalis*) – (Host Trees: Douglas-Fir, Engelmann Spruce, Subalpine Fir, White Fir) – (Colorado & Wyoming) (Photos of damage on next page)

Colorado

In northern Colorado small patches of defoliation of Douglas-fir were noted in Douglas and El Paso Counties, Colorado. Most of these areas occurred along the southern Front Range, between Denver and Colorado Springs where defoliation has been chronic for the past ten years but declined significantly in 2011. A small amount of defoliation also was noted in Grand County, Colorado.

Heavier defoliation occurred in Colorado's southern forests. Western spruce budworm occurred widely throughout the south-central Rocky Mountains in shade tolerant, mixed conifer, late successional stands. Douglas-fir, white, corkbark and subalpine fir, and Engelmann spruce were all affected.

Western spruce budworm defoliation damage continued to be detected across portions of the Wet Mountains, the Sangre de Cristo and Culebra Ranges, the Spanish Peaks and the San Juan Mountains but at lower levels than in the recent past. Forests in portions of the Culebra Range have extensive top kill and tree mortality due to weakening of trees by repeated defoliation by western spruce budworm.

Wyoming

Heavy western spruce budworm defoliation of Douglas- fir was observed during visits to the Clarks Fork Yellowstone River drainage and aerial detection of defoliation increased most notably in Fremont and Park counties in northwestern Wyoming. Patchy defoliation was noted in Albany County in southeastern Wyoming.

Western Tent Caterpillar – (*Malacosoma californicum*) – (Host Tree – Quaking Aspen) – (Colorado)

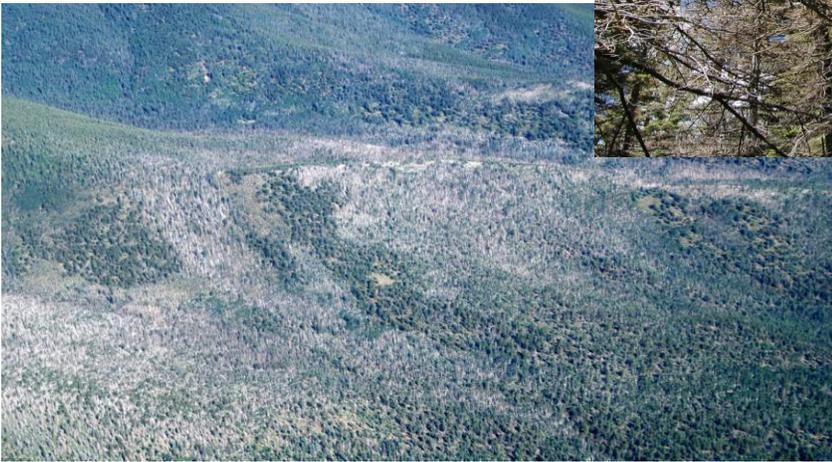
Western tent caterpillar has a wide range of deciduous hosts, however outbreaks noted here were occurring in stands of aspen. There were currently 3 areas where this insect occurs at outbreak levels: near Vallecito Reservoir, Beaver Mountain (south of South Fork), and in the southern Huerfano Mountains.



Close-up view of western spruce budworm damage



Western spruce budworm damage on mature Douglas-fir trees.



Repeated defoliation by western spruce budworm on the Sangre de Cristo Range.

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Appendix A – This aerial survey report was written in Nov. 2011.

The 2011 Aerial Detection Survey Summary for the Rocky Mountain Region (R2) of the US Forest Service



Aspen defoliation by western tent caterpillar in southwestern Colorado.

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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 2010 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 acres within the R2 portion of Wyoming. The acres for Fremont, Park, Sublette, Teton counties include only the portion of the county which falls in R2.

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 2011 Aerial Detection Survey Summary Tables

The 2011 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 (2010 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 (1996-2011 Cumulative Acres Affected) for a given area from the prior year’s cumulative acres (1996-2010 Cumulative 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.

There are several small updates to the prior year’s numbers (2010) in the table due to the results of ground checking conducted after the release of the 2010 tables.

2011 Mountain Pine Beetle Activity

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State	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Colorado				
Lodgepole Pine	716,000	523,000	2,519,000	2,594,000
Ponderosa Pine	234,000	275,000	775,000	898,000
5-Needle Pines	14,000	7,100	115,000	121,000
All Hosts	878,000	752,000	3,188,000	3,328,000
Wyoming – R2				
Lodgepole Pine	477,000	446,000	994,000	1,086,000
Ponderosa Pine	53,000	55,000	151,000	181,000
5-Needle Pines	195,000	141,000	872,000	928,000
All Hosts	617,000	582,000	1,790,000	1,923,000
CO plus S. WY				
Lodgepole Pine	1,035,000	844,000	3,186,000	3,306,000
Ponderosa Pine	286,000	329,000	853,000	1,004,000
5-Needle Pines	42,000	19,000	233,000	246,000
All Hosts	1,257,000	1,130,000	3,999,000	4,207,000
South Dakota				
Lodgepole Pine	0	0	0	0
Ponderosa Pine	44,000	66,000	369,000	389,000
5-Needle Pines	0	0	0	0
All Hosts	44,000	66,000	369,000	389,000
Nebraska				
Ponderosa Pine	5	300	5	310

Due to the nature of aerial surveys, this data 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 in the data because these agents are not detectable from aerial surveys. The data presented 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. The insect and disease data is available digitally from the USDA Forest Service, Region Two Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this data for purposes other than those for which it was intended may yield inaccurate or misleading results.

Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 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	2	1	3
	Ponderosa Pine	10	0	16,000	16,000
	5-Needle Pines	0	0	0	0
	All Hosts	10	2	16,000	16,000
Boulder	Lodgepole Pine	57,000	44,000	102,000	110,000
	Ponderosa Pine	36,000	18,000	54,000	67,000
	5-Needle Pines	5,200	1,200	15,000	16,000
	All Hosts	68,000	56,000	123,000	139,000
Chaffee	Lodgepole Pine	770	300	5,600	5,600
	Ponderosa Pine	60	90	77,000	77,00
	5-Needle Pines	0	0	1,700	1,700
	All Hosts	830	390	83,000	83,000
Clear Creek	Lodgepole Pine	32,000	15,000	73,000	76,000
	Ponderosa Pine	4,400	400	8,500	8,900
	5-Needle Pines	770	430	9,000	9,400
	All Hosts	33,000	15,000	78,000	82,000
Conejos	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	3	0	4,800	4,800
	5-Needle Pines	0	0	0	0
	All Hosts	3	0	4,800	4,800

Due to the nature of aerial surveys, this data 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 in the data because these agents are not detectable from aerial surveys. The data presented 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. The insect and disease data is available digitally from the USDA Forest Service, Region Two Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this data for purposes other than those for which it was intended may yield inaccurate or misleading results.

Mountain Pine Beetle 7

Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Costilla	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	6	4,600	4,600
	5-Needle Pines	0	0	7	7
	All Hosts	0	6	4,600	4,600
Custer	Lodgepole Pine	0	0	160	160
	Ponderosa Pine	2	20	34,000	35,000
	5-Needle Pines	70	0	850	850
	All Hosts	70	20	35,000	35,000
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	0	0
	Ponderosa Pine	0	1	550	550
	5-Needle Pines	0	0	0	0
	All Hosts	0	1	550	550
Douglas	Lodgepole Pine	0	0	270	270
	Ponderosa Pine	200	410	34,000	34,000
	5-Needle Pines	0	0	0	0
	All Hosts	200	410	34,000	34,000
Eagle	Lodgepole Pine	44,000	27,000	181,000	187,000
	Ponderosa Pine	1,200	0	4,600	4,600
	5-Needle Pines	0	0	190	190
	All Hosts	45,000	27,000	185,000	191,000
El Paso	Lodgepole Pine	0	0	2	2
	Ponderosa Pine	20	3	13,000	13,000
	5-Needle Pines	0	0	0	0
	All Hosts	20	3	13,000	13,000

Due to the nature of aerial surveys, this data 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 in the data because these agents are not detectable from aerial surveys. The data presented 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. The insect and disease data is available digitally from the USDA Forest Service, Region Two Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this data for purposes other than those for which it was intended may yield inaccurate or misleading results.

Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Elbert	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	40	390	430
	5-Needle Pines	0	0	0	0
	All Hosts	0	40	390	430
Fremont	Lodgepole Pine	0	0	170	170
	Ponderosa Pine	20	40	32,000	32,000
	5-Needle Pines	200	20	1,900	1,900
	All Hosts	220	60	34,000	34,000
Garfield	Lodgepole Pine	2,700	1,800	9,300	10,000
	Ponderosa Pine	0	1	60	60
	5-Needle Pines	0	0	480	480
	All Hosts	2,700	1,800	9,800	11,000
Gilpin	Lodgepole Pine	33,000	13,000	50,000	52,000
	Ponderosa Pine	7,800	50	10,000	10,000
	5-Needle Pines	1,100	1,000	15,000	16,000
	All Hosts	35,000	13,000	54,000	56,000
Grand	Lodgepole Pine	27,000	1,300	578,000	579,000
	Ponderosa Pine	7	0	500	500
	5-Needle Pines	10	0	3,700	3,700
	All Hosts	27,000	1,300	581,000	581,000
Gunnison	Lodgepole Pine	100	0	2,800	2,800
	Ponderosa Pine	20	30	1,300	1,400
	5-Needle Pines	0	1	0	1
	All Hosts	120	30	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

Due to the nature of aerial surveys, this data 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 in the data because these agents are not detectable from aerial surveys. The data presented 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. The insect and disease data is available digitally from the USDA Forest Service, Region Two Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this data for purposes other than those for which it was intended may yield inaccurate or misleading results.

Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Huerfano	Lodgepole Pine	0	0	50	50
	Ponderosa Pine	0	0	26,000	26,000
	5-Needle Pines	0	0	220	220
	All Hosts	0	0	26,000	26,000
Jackson	Lodgepole Pine	49,000	11,000	362,000	362,000
	Ponderosa Pine	320	20	1,200	1,200
	5-Needle Pines	240	9	13,000	13,000
	All Hosts	49,000	11,000	364,000	364,000
Jefferson	Lodgepole Pine	1,800	2,900	5,200	7,700
	Ponderosa Pine	1,900	830	28,000	29,000
	5-Needle Pines	290	0	300	300
	All Hosts	2,900	3,700	32,000	35,000
La Plata	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	12,000	12,000
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	12,000	12,000
Lake	Lodgepole Pine	930	170	11,000	11,000
	Ponderosa Pine	0	0	320	320
	5-Needle Pines	0	0	560	560
	All Hosts	930	170	11,000	11,000
Larimer	Lodgepole Pine	367,000	373,000	530,000	576,000
	Ponderosa Pine	182,000	254,000	221,000	327,000
	5-Needle Pines	6,300	4,400	51,000	54,000
	All Hosts	510,000	587,000	682,000	783,000
Las Animas	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	0	0	12,000	12,000
	5-Needle Pines	0	0	6	6
	All Hosts	0	0	12,000	12,000

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Mountain Pine Beetle ¹⁰

Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Mesa	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	160	90	5,500	5,600
	5-Needle Pines	0	0	0	0
	All Hosts	160	90	5,500	5,600
Mineral	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	130	0	840	840
	5-Needle Pines	0	0	3	3
	All Hosts	130	0	840	840
Moffat	Lodgepole Pine	3,700	0	16,000	16,000
	Ponderosa Pine	60	0	440	440
	5-Needle Pines	0	0	100	100
	All Hosts	3,700	0	16,000	16,000
Montezuma	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	20	0	690	690
	5-Needle Pines	0	0	0	0
	All Hosts	20	0	690	690
Montrose	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	160	170	2,300	2,500
	5-Needle Pines	0	0	0	0
	All Hosts	160	170	2,300	2,500
Ouray	Lodgepole Pine	0	0	5	5
	Ponderosa Pine	10	6	250	260
	5-Needle Pines	0	0	0	0
	All Hosts	10	6	260	260
Park	Lodgepole Pine	22,000	2,100	47,000	47,000
	Ponderosa Pine	450	160	90,000	90,000
	5-Needle Pines	80	20	380	410
	All Hosts	22,000	2,200	136,000	137,000

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Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Pitkin	Lodgepole Pine	10,000	3,100	21,000	22,000
	Ponderosa Pine	0	0	90	90
	5-Needle Pines	0	0	4	4
	All Hosts	10,000	3,100	21,000	22,000
Pueblo	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	1	0	21,000	21,000
	5-Needle Pines	0	0	0	0
	All Hosts	1	0	21,000	21,000
Rio Blanco	Lodgepole Pine	16,000	12,000	39,000	42,000
	Ponderosa Pine	2	0	40	40
	5-Needle Pines	0	0	100	100
	All Hosts	16,000	12,000	39,000	42,000
Rio Grande	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	10	0	3,400	3,400
	5-Needle Pines	0	0	0	0
	All Hosts	10	0	3,400	3,400
Routt	Lodgepole Pine	30,000	13,000	343,000	345,000
	Ponderosa Pine	150	30	380	390
	5-Needle Pines	0	0	540	540
	All Hosts	30,000	13,000	344,000	345,000
Saguache	Lodgepole Pine	0	0	790	790
	Ponderosa Pine	260	0	39,000	39,000
	5-Needle Pines	0	7	330	340
	All Hosts	260	7	40,000	40,000
San Miguel	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	6	10	2,900	2,900
	5-Needle Pines	0	0	10	10
	All Hosts	6	10	2,900	3,000

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Colorado County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Summit	Lodgepole Pine	20,000	4,000	141,000	142,000
	Ponderosa Pine	0	0	40	40
	5-Needle Pines	5	40	580	630
	All Hosts	20,000	4,000	142,000	143,000
Teller	Lodgepole Pine	0	0	10	10
	Ponderosa Pine	6	60	9,700	9,700
	5-Needle Pines	0	0	20	20
	All Hosts	6	60	9,700	9,800

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Nebraska County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Banner	Ponderosa Pine	0	150	0	150
Dawes	Ponderosa Pine	0	20	0	20
Morrill	Ponderosa Pine	0	4	0	4
Scotts Bluff	Ponderosa Pine	5	110	5	110
Sheridan	Ponderosa Pine	0	20	0	20

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Wyoming County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Albany	Lodgepole Pine	127,000	161,000	185,000	211,000
	Ponderosa Pine	35,000	37,000	47,000	67,000
	5-Needle Pines	13,000	9,600	51,000	56,000
	All Hosts	163,000	201,000	251,000	292,000
Big Horn	Lodgepole Pine	50	20	1,500	1,500
	Ponderosa Pine	0	0	1,200	1,200
	5-Needle Pines	300	10	21,000	21,000
	All Hosts	350	30	24,000	24,000
Campbell	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	0	180	180
	5-Needle Pines	0	0	0	0
	All Hosts	0	0	180	180
Carbon	Lodgepole Pine	190,000	157,000	474,000	490,000
	Ponderosa Pine	4,900	3,900	10,000	13,000
	5-Needle Pines	11,000	1,300	28,000	29,000
	All Hosts	199,000	160,000	497,000	514,000
Converse	Lodgepole Pine	2,400	2,800	5,200	7,600
	Ponderosa Pine	860	900	4,200	5,100
	5-Needle Pines	1,200	40	4,700	4,700
	All Hosts	4,300	3,800	13,000	16,000
Crook	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	250	1,300	31,000	32,000
	5-Needle Pines	0	0	0	0
	All Hosts	250	1,300	31,000	32,000
Fremont	Lodgepole Pine	127,000	110,000	220,000	257,000
	Ponderosa Pine	1,300	2	1,400	1,400
	5-Needle Pines	120,000	112,000	312,000	356,000
	All Hosts	173,000	173,000	407,000	461,000
Goshen	Lodgepole Pine	10	0	10	10
	Ponderosa Pine	40	20	60	70
	5-Needle Pines	0	0	0	0
	All Hosts	50	20	70	80

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Wyoming County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Hot Springs	Lodgepole Pine	3,000	2,300	5,600	6,800
	Ponderosa Pine	10	0	860	860
	5-Needle Pines	2,300	2,000	41,000	42,000
	All Hosts	3,500	4,300	44,000	46,000
Johnson	Lodgepole Pine	230	20	3,600	3,600
	Ponderosa Pine	240	60	22,000	22,000
	5-Needle Pines	160	30	35,000	35,000
	All Hosts	630	110	59,000	59,000
Laramie	Lodgepole Pine	0	0	20	20
	Ponderosa Pine	8,500	10,000	9,700	14,000
	5-Needle Pines	260	550	580	1,000
	All Hosts	8,500	11,000	9,900	14,000
Natrona	Lodgepole Pine	380	290	3,300	3,600
	Ponderosa Pine	1,100	110	4,900	5,000
	5-Needle Pines	1,900	200	34,000	34,000
	All Hosts	2,900	600	40,000	40,000
Niobrara	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	10	10	100	110
	5-Needle Pines	0	0	0	0
	All Hosts	10	10	100	110
Park	Lodgepole Pine	28,000	13,000	91,000	99,000
	Ponderosa Pine	4	0	40	40
	5-Needle Pines	42,000	14,000	306,000	310,000
	All Hosts	58,000	24,000	355,000	364,000
Platte	Lodgepole Pine	0	30	9	30
	Ponderosa Pine	1,000	1,700	1,100	2,400
	5-Needle Pines	110	3	120	130
	All Hosts	1,100	1,700	1,200	2,500

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Wyoming County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Sheridan	Lodgepole Pine	90	0	2,100	2,100
	Ponderosa Pine	460	260	6,600	6,700
	5-Needle Pines	190	10	2,500	2,600
	All Hosts	730	270	11,000	11,000
Sublette	Lodgepole Pine	0	140	0	140
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	770	700	1,700	1,900
	All Hosts	770	700	1,700	1,900
Teton	Lodgepole Pine	220	0	390	390
	Ponderosa Pine	0	0	0	0
	5-Needle Pines	220	60	2,400	2,400
	All Hosts	450	60	2,400	2,400
Washakie	Lodgepole Pine	60	20	2,200	2,200
	Ponderosa Pine	0	5	1,800	1,800
	5-Needle Pines	230	30	32,000	32,000
	All Hosts	290	50	35,000	35,000
Weston	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	150	80	8,000	8,100
	5-Needle Pines	0	0	0	0
	All Hosts	150	80	8,000	8,100

South Dakota County	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Butte	Ponderosa Pine	0	0	120	120
Custer	Ponderosa Pine	2,700	4,300	43,000	44,000
Fall River	Ponderosa Pine	0	0	1,400	1,400
Lawrence	Ponderosa Pine	9,300	20,000	135,000	141,000
Meade	Ponderosa Pine	6	70	26,000	26,000
Pennington	Ponderosa Pine	32,000	42,000	164,000	176,000

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National Forest	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Arapaho National Forest	Lodgepole Pine	48,000	12,000	450,000	452,000
	Ponderosa Pine	1,900	0	3,500	3,500
	5-Needle Pines	1,100	700	12,000	12,000
	All Hosts	49,000	13,000	454,000	456,000
Bighorn National Forest	Lodgepole Pine	160	20	5,400	5,400
	Ponderosa Pine	290	170	6,100	6,200
	5-Needle Pines	390	20	15,000	15,000
	All Hosts	830	210	26,000	26,000
Black Hills National Forest	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	44,000	67,000	384,000	405,000
	5-Needle Pines	0	0	0	0
	All Hosts	44,000	67,000	384,000	405,000
Grand Mesa National Forest	Lodgepole Pine	0	0	2	2
	Ponderosa Pine	5	0	10	10
	5-Needle Pines	0	0	0	0
	All Hosts	5	0	20	20
Gunnison National Forest	Lodgepole Pine	80	0	3,400	3,400
	Ponderosa Pine	40	30	2,100	2,100
	5-Needle Pines	0	0	0	0
	All Hosts	120	30	5,500	5,500

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National Forest	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Medicine Bow National Forest	Lodgepole Pine	286,000	296,000	598,000	637,000
	Ponderosa Pine	17,000	18,000	28,000	38,000
	5-Needle Pines	6,000	2,200	33,000	35,000
	All Hosts	303,000	313,000	634,000	676,000
Nebraska National Forest	Lodgepole Pine	0	0	0	0
	Ponderosa Pine	0	20	0	20
	5-Needle Pines	0	0	0	0
	All Hosts	0	20	0	20
Pike National Forest	Lodgepole Pine	22,000	2,200	46,000	47,000
	Ponderosa Pine	640	330	101,000	101,000
	5-Needle Pines	80	20	280	300
	All Hosts	22,000	2,500	147,000	148,000
Rio Grande National Forest	Lodgepole Pine	0	0	90	90
	Ponderosa Pine	220	0	35,000	35,000
	5-Needle Pines	0	5	300	300
	All Hosts	220	5	36,000	36,000
Roosevelt National Forest	Lodgepole Pine	383,000	371,000	558,000	606,000
	Ponderosa Pine	188,000	223,000	232,000	328,000
	5-Needle Pines	9,400	4,300	59,000	63,000
	All Hosts	512,000	554,000	697,000	790,000
Routt National Forest	Lodgepole Pine	65,000	14,000	610,000	611,000
	Ponderosa Pine	10	0	350	350
	5-Needle Pines	220	6	10,000	10,000
	All Hosts	66,000	14,000	612,000	613,000

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National Forest	Host Tree	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
San Isabel National Forest	Lodgepole Pine	1,300	320	13,000	13,000
	Ponderosa Pine	70	140	134,000	134,000
	5-Needle Pines	270	20	5,100	5,100
	All Hosts	1,600	480	150,000	151,000
San Juan National Forest	Lodgepole Pine	0	2	1	3
	Ponderosa Pine	20	0	27,000	27,000
	5-Needle Pines	0	0	3	3
	All Hosts	20	2	27,000	27,000
Shoshone National Forest	Lodgepole Pine	100,000	81,000	229,000	263,000
	Ponderosa Pine	7	0	40	40
	5-Needle Pines	119,000	92,000	494,000	524,000
	All Hosts	167,000	139,000	605,000	649,000
Uncompahgre National Forest	Lodgepole Pine	0	0	20	20
	Ponderosa Pine	290	240	8,000	8,200
	5-Needle Pines	0	0	0	0
	All Hosts	290	240	8,000	8,200
White River National Forest	Lodgepole Pine	88,000	46,000	365,000	376,000
	Ponderosa Pine	1,200	2	3,600	3,600
	5-Needle Pines	5	40	1,300	1,400
	All Hosts	89,000	46,000	369,000	380,000

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2011 Spruce Beetle Activity

	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Colorado	208,000	262,000	571,000	741,000
Wyoming – R2	77,000	75,000	422,000	476,000
CO plus S.WY	224,000	303,000	656,000	853,000
South Dakota	0	0	100	100

Colorado County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Archuleta	1,900	1,200	6,900	8,100
Boulder	10	0	50	50
Chaffee	3	40	20	60
Clear Creek	0	5	30	40
Conejos	6,700	10,000	16,000	20,000
Costilla	0	10	1,400	1,500
Custer	210	210	950	1,100
Delta	12,000	14,000	15,000	21,000
Dolores	0	3,200	1,800	5,000
Douglas	0	0	20	20
Eagle	830	110	5,800	5,800
El Paso	0	0	10	10
Fremont	30	5	80	90
Garfield	80	20	4,100	4,100
Gilpin	0	0	20	20
Grand	4,700	9,600	10,000	18,000
Gunnison	14,000	5,100	19,000	21,000
Hinsdale	38,000	42,000	86,000	110,000
Huerfano	1,000	300	1,700	1,800
Jackson	1,800	9,500	66,000	74,000

Colorado County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Jefferson	0	60	20	80
La Plata	860	6,400	5,300	11,000
Lake	10	10	50	50
Larimer	20,000	24,000	33,000	48,000
Las Animas	0	0	650	650
Mesa	14,000	24,000	24,000	36,000
Mineral	80,000	73,000	151,000	198,000
Moffat	150	0	750	750
Montezuma	0	2,300	290	2,600
Montrose	0	60	500	550
Ouray	0	0	1,400	1,400
Park	30	0	40	40
Pitkin	320	450	7,400	7,600
Pueblo	250	60	2,200	2,300
Rio Blanco	140	30	3,700	3,800
Rio Grande	6,500	18,000	15,000	29,000
Routt	3,000	500	85,000	85,000
Saguache	1,300	15,000	3,400	17,000
San Juan	60	2,200	1,800	4,000
San Miguel	60	0	950	950
Summit	120	550	780	1,300

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Wyoming County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Albany	5,300	8,900	21,000	27,000
Big Horn	370	310	11,000	11,000
Carbon	11,000	32,000	64,000	85,000
Converse	0	0	80	80
Fremont	39,000	8,300	53,000	59,000

Wyoming County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Hot Springs	3,300	11,000	4,700	14,000
Johnson	1,600	510	4,000	4,400
Natrona	0	0	40	40
Park	16,000	12,000	257,000	268,000
Sheridan	220	400	5,200	5,600
Sublette	0	200	0	200
Teton	900	0	1,100	1,100
Washakie	5	0	670	670

National Forest	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Arapaho National Forest	4,400	8,200	8,400	15,000
Bighorn National Forest	2,200	1,200	20,000	21,000
Black Hills National Forest	0	0	100	100
Grand Mesa National Forest	19,000	29,000	26,000	40,000
Gunnison National Forest	20,000	25,000	25,000	41,000
Medicine Bow National Forest	16,000	41,000	83,000	110,000
Pike National Forest	10	0	60	60
Rio Grande National Forest	103,000	120,000	196,000	276,000
Roosevelt National Forest	17,000	16,000	30,000	38,000
Routt National Forest	5,000	9,800	150,000	159,000
San Isabel National Forest	1,500	630	5,200	5,600
San Juan National Forest	32,000	43,000	86,000	111,000
Shoshone National Forest	53,000	26,000	278,000	299,000
Uncompahgre National Forest	60	60	7,700	7,700
White River National Forest	1,800	1,700	23,000	24,000

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2011 Douglas-fir Beetle Activity

State	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Colorado	37,000	25,000	306,000	321,000
Wyoming – R2	5,600	1,300	326,000	327,000
CO plus S. WY	37,000	25,000	320,000	335,000

Colorado County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Alamosa	0	2	20	20
Archuleta	4,400	2,600	33,000	34,000
Boulder	0	0	280	280
Chaffee	40	60	2,900	2,900
Clear Creek	220	0	1,100	1,100
Conejos	200	8	5,700	5,800
Costilla	20	9	1,600	1,600
Custer	10	10	6,200	6,200
Delta	230	250	3,000	3,100
Dolores	440	350	3,400	3,700
Douglas	9,700	6,800	33,000	36,000
Eagle	70	480	6,500	7,000
El Paso	60	240	4,500	4,700
Fremont	80	190	14,000	14,000
Garfield	550	940	26,000	27,000
Gilpin	0	0	60	60
Grand	90	20	900	920
Gunnison	3,300	2,800	19,000	20,000
Hinsdale	2,200	1,400	8,200	9,100
Huerfano	0	4	2,100	2,100

Colorado County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Jackson	0	200	240	440
Jefferson	2,400	1,400	7,900	9,200
La Plata	2,900	880	12,000	12,000
Lake	0	0	80	80
Larimer	0	0	2,500	2,500
Las Animas	3	0	5,900	5,900
Mesa	640	990	5,800	6,500
Mineral	1,300	1,300	7,300	8,300
Moffat	70	0	970	970
Montezuma	370	160	7,600	7,800
Montrose	860	1,700	4,900	6,300
Ouray	1,300	980	2,600	3,200
Park	140	7	1,600	1,600
Pitkin	830	230	5,300	5,500
Pueblo	20	0	3,700	3,700
Rio Blanco	170	100	7,600	7,700
Rio Grande	580	110	7,900	7,900
Routt	100	120	4,100	4,200
Saguache	820	260	30,000	30,000
San Juan	20	7	190	190
San Miguel	2,700	180	15,000	15,000
Summit	0	80	300	380
Teller	6	1	1,600	1,600

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Wyoming County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Albany	0	0	5,300	5,300
Big Horn	250	100	33,000	33,000
Carbon	0	10	8,900	8,900

Wyoming County	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Crook	0	1	0	1
Converse	0	0	10	10
Fremont	490	190	49,000	49,000
Hot Springs	0	40	25,000	26,000
Johnson	40	30	1,500	1,500
Natrona	10	0	150	150
Park	4,300	830	195,000	196,000
Sheridan	140	40	970	980
Washakie	320	50	6,200	6,200

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National Forest	2010 Acres Affected	2011 Acres Affected	1996-2010 Cumulative Acres Affected	1996-2011 Cumulative Acres Affected
Arapaho National Forest	0	0	490	490
Bighorn National Forest	600	140	26,000	26,000
Grand Mesa National Forest	230	230	1,600	1,700
Gunnison National Forest	3,000	2,700	17,000	18,000
Medicine Bow National Forest	0	0	11,000	11,000
Pike National Forest	9,700	6,700	39,000	42,000
Rio Grande National Forest	1,200	190	37,000	37,000
Roosevelt National Forest	0	0	1,800	1,800
Routt National Forest	10	20	2,100	2,100
San Isabel National Forest	70	80	16,000	16,000
San Juan National Forest	11,000	6,700	61,000	65,000
Shoshone National Forest	4,400	810	203,000	204,000
Uncompahgre National Forest	2,900	3,200	12,000	15,000
White River National Forest	1,300	1,000	17,000	17,000

2011 Western Balsam Bark Beetle Activity

State	2010 Acres Affected	2011 Acres Affected
Colorado	265,000	180,000
Wyoming – R2	67,000	35,000
CO plus S.WY	270,000	184,000

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Colorado County	2010 Acres Affected	2011 Acres Affected
Alamosa	20	20
Archuleta	20	20
Boulder	6,400	3,500
Chaffee	6,300	2,900
Clear Creek	5,100	11,000
Conejos	3,300	1,300
Costilla	870	1,900
Custer	2,700	1,300
Delta	4,300	2,700
Dolores	80	3,300
Eagle	14,000	10,000
Fremont	50	140
Garfield	9,100	10,000
Gilpin	5,000	2,700
Grand	12,000	9,100
Gunnison	44,000	33,000
Hinsdale	6,800	1,900
Huerfano	1,700	1,400
Jackson	3,300	1,600
Jefferson	30	110
La Plata	680	230
Lake	1,300	1,100
Larimer	17,000	13,000
Las Animas	1,000	1,100

Colorado County	2010 Acres Affected	2011 Acres Affected
Mesa	4,800	3,000
Mineral	6,000	1,800
Moffat	260	420
Montezuma	1,000	470
Montrose	2,100	970
Ouray	1,200	700
Park	6,900	6,300
Pitkin	31,000	25,000
Pueblo	20	2
Rio Blanco	9,200	8,100
Rio Grande	5,300	890
Routt	5,400	2,000
Saguache	7,500	4,000
San Juan	6,300	2,400
San Miguel	22,000	7,100
Summit	11,000	4,200

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Wyoming County	2010 Acres Affected	2011 Acres Affected
Albany	1,700	4
Big Horn	9,000	4,200
Carbon	3,200	3,300
Converse	100	40
Fremont	22,000	12,000
Johnson	7,400	5,200
Natrona	2	140
Park	17,000	7,500
Sheridan	6,000	2,800
Washakie	90	10

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National Forest	2010 Acres Affected	2011 Acres Affected
Arapaho National Forest	16,000	18,000
Bighorn National Forest	22,000	12,000
Grand Mesa National Forest	5,700	3,300
Gunnison National Forest	32,000	28,000
Medicine Bow National Forest	4,900	3,300
Pike National Forest	7,100	6,800
Rio Grande National Forest	18,000	5,200
Roosevelt National Forest	16,000	12,000
Routt National Forest	12,000	7,700
San Isabel National Forest	16,000	8,500
San Juan National Forest	6,400	5,000
Shoshone National Forest	37,000	17,000
Uncompahgre National Forest	34,000	14,000
White River National Forest	76,000	55,000

2011 Western Spruce Budworm Activity

State	2010 Acres Affected	2011 Acres Affected
Colorado	213,000	90,000
Wyoming- R2	4,400	15,000
CO plus S.WY	216,000	91,000

Colorado County	2010 Acres Affected	2011 Acres Affected
Alamosa	3,200	0
Archuleta	4,800	1,900
Chaffee	90	0
Conejos	1,900	1,200
Costilla	38,000	9,800
Custer	12,000	9,900
Dolores	4,700	4,400
Douglas	11,000	770
El Paso	3,500	1,100
Fremont	3,000	40
Grand	0	60
Gunnison	2,800	500
Hinsdale	820	1,400
Huerfano	22,000	14,000
Jefferson	800	0
La Plata	7,200	9,700
Las Animas	17,000	12,000
Mineral	26,000	200
Montezuma	6,600	3,300
Ouray	4,000	740
Pueblo	1,200	4,400

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Colorado County	2010 Acres Affected	2011 Acres Affected
Rio Blanco	0	40
Rio Grande	5,900	30
Routt	30	10
Saguache	28,000	2,000
San Juan	7,900	12,000
San Miguel	850	1,300

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Wyoming County	2010 Acres Affected	2011 Acres Affected
Albany	350	450
Big Horn	200	0
Fremont	1,500	6,000
Johnson	0	320
Park	2,200	7,900
Washakie	70	550

National Forest	2010 Acres Affected	2011 Acres Affected
Bighorn National Forest	200	320
Gunnison National Forest	1,300	440
Medicine Bow National Forest	350	430
Pike National Forest	13,000	1,400
Rio Grande National Forest	56,000	4,300
Routt National Forest	30	50
San Isabel National Forest	32,000	27,000
San Juan National Forest	28,000	28,000
Shoshone National Forest	3,600	12,000
Uncompahgre National Forest	6,000	2,300

2011 Aspen Dieback and Mortality

	Acres Affected
Colorado	46,000
Wyoming – R2	80
CO. plus S. WY	46,000
South Dakota	10

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Colorado County	2011 Acres Affected
Archuleta	40
Conejos	100
Costilla	7
Custer	400
Delta	3,700
Dolores	3,700
Eagle	980
Fremont	250
Garfield	1,100
Grand	120
Gunnison	2,900
Hinsdale	20
Huerfano	1,000
Jackson	100

Colorado County	2011 Acres Affected
La Plata	580
Larimer	8
Las Animas	80
Mesa	9,100
Moffat	1,800
Montezuma	3,700
Montrose	2,300
Ouray	1,300
Park	3,300
Pitkin	1,300
Pueblo	30
Rio Blanco	30
Rio Grande	6
Routt	4,500
Saguache	1,100
San Miguel	2,400
Summit	140

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Wyoming County	2011 Acres Affected
Big Horn	8
Crook	40
Fremont	20
Sheridan	5

South Dakota County	2011 Acres Affected
Pennington	10

National Forest	2011 Acres Affected
Bighorn National Forest	5
Black Hills National Forest	10
Grand Mesa National Forest	3,700
Gunnison National Forest	3,600
Pike National Forest	1,900
Rio Grande National Forest	140
Roosevelt National Forest	8
Routt National Forest	4,000
San Isabel National Forest	1,200
San Juan National Forest	6,200
Shoshone National Forest	8
Uncompahgre National Forest	4,100
White River National Forest	2,600

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Appendix B

Aerial Detection Survey Maps showing the Progressions of Bark Beetle Epidemics in the Rocky Mountain Region (R2) from 1996 – 2011

How to study these maps:

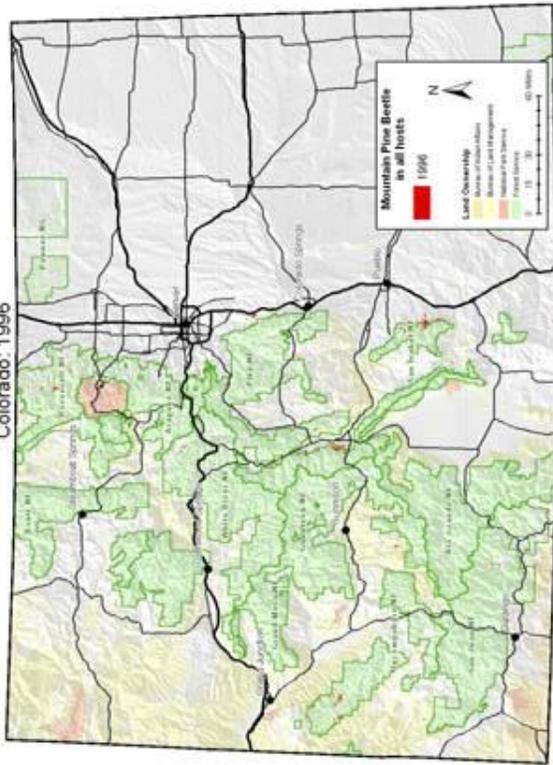
1. If this report is viewed in a PDF, then each of these maps may be enlarged several hundred times for closer observations. Pages can also be rotated for easier viewing.
2. Select an area of a state on the first map of each page.
3. Enlarge each of the other maps of that page and observe your selected state area.
4. This will show the beginning of the bark beetle activity starting in 1996.
5. The second map shows the bark beetle outbreak from 1996 – 2001.
6. The third map indicates the beginning of the bark beetle epidemic (1996 – 2005).
7. The fourth map shows the most recent progression of the bark beetle epidemic (1996 – 2011)

The “Footprint” of Bark Beetle Activity”:

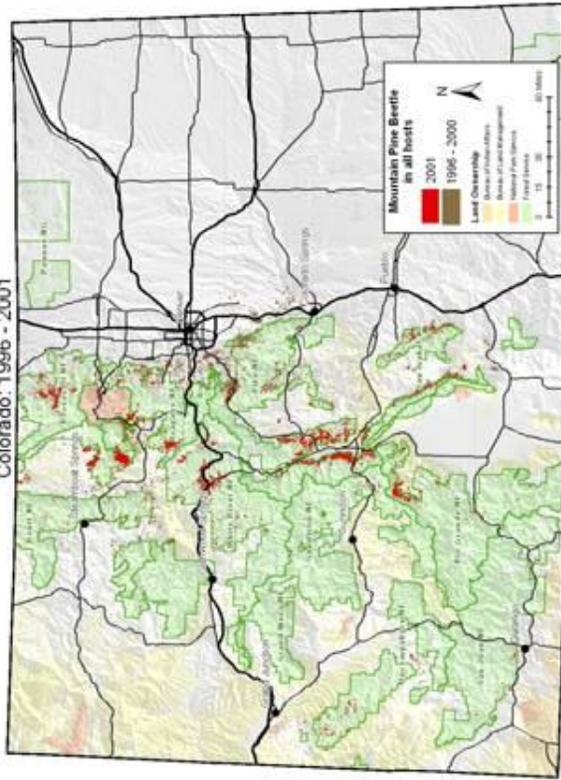
- Many areas of bark beetle activity have been colored “Brown” on the maps to indicate the previous locations of the bark beetle activity.
- These “Brown” areas combined with the “Red” and/or “Blue” are frequently called the “Footprint” of the bark beetle activity and document the geographic extent of the insect activity through the years. Refer to Appendix A, 2011 Aerial Detection Survey Summary Report for the estimated acreage damaged by each bark beetle, in each state and county, and also for each national forest.
- Listed in Appendix A, are cumulative acres affected by these damage agents in the past (1996 – 2010) and current, cumulative impacts(1996 – 2011).
- For further information R2 Aerial Detection Survey data and contacts:
www.fs.usda.gov/goto/r2/fh

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Mountain Pine Beetle Activity in All Hosts
Colorado: 1996

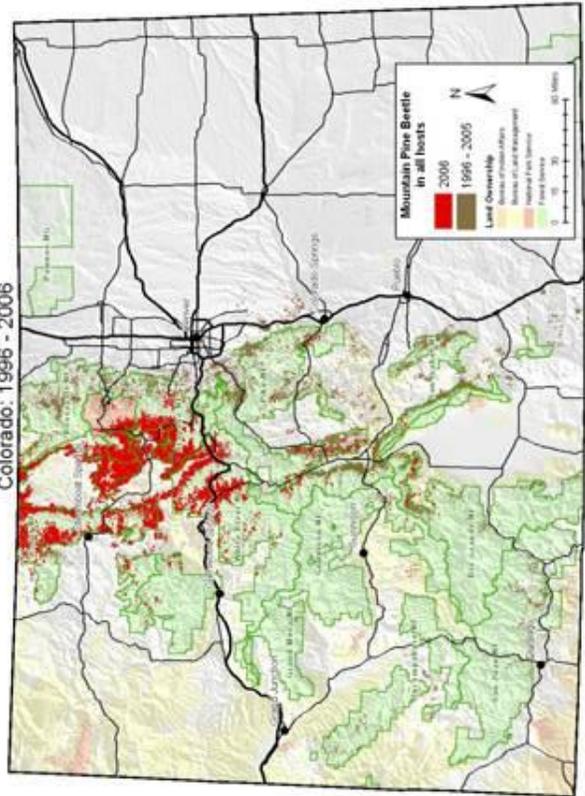


Mountain Pine Beetle Activity in All Hosts
Colorado: 1996 - 2001

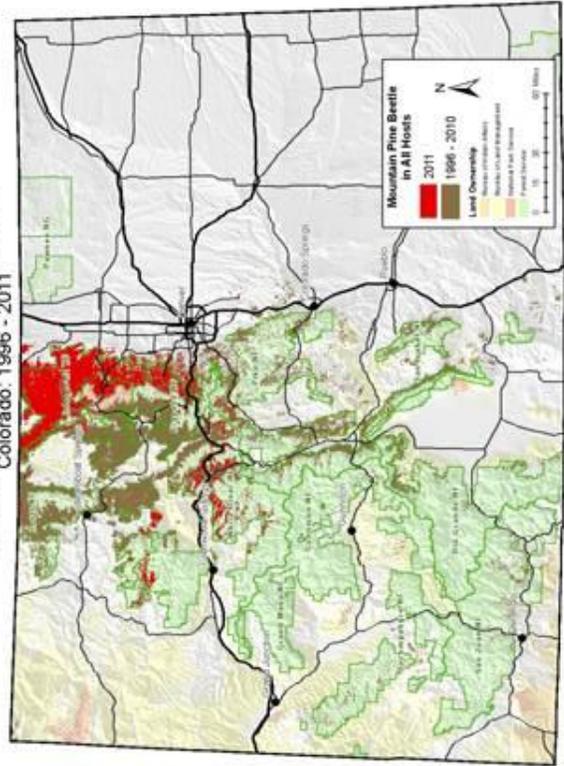


Epidemic Progression of Mountain Pine Beetle (in all hosts) from 1996 – 2011 in Colorado

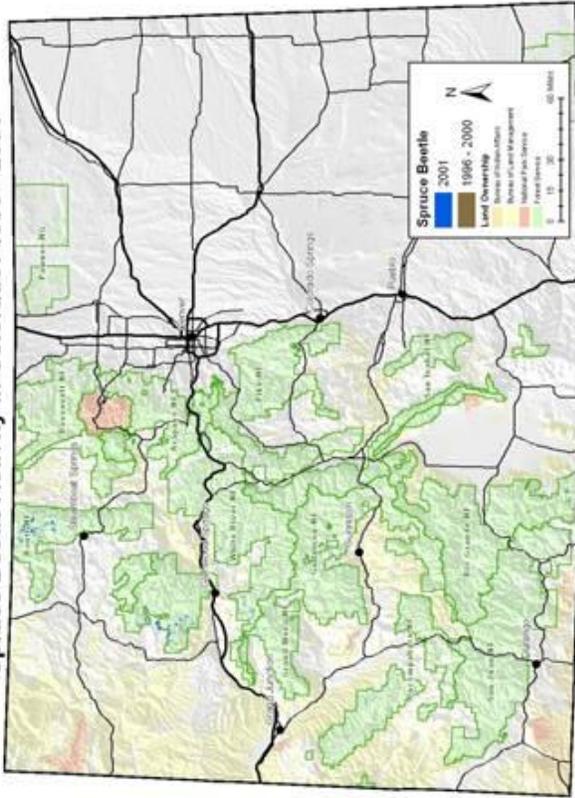
Mountain Pine Beetle Activity in All Hosts
Colorado: 1996 - 2006



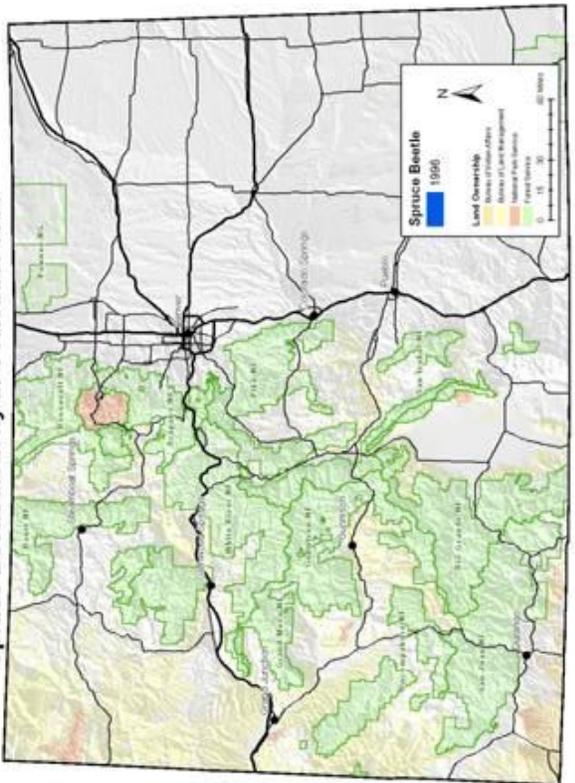
Mountain Pine Beetle Activity in All Hosts
Colorado: 1996 - 2011



Spruce Beetle Activity in Colorado: 1996 - 2001

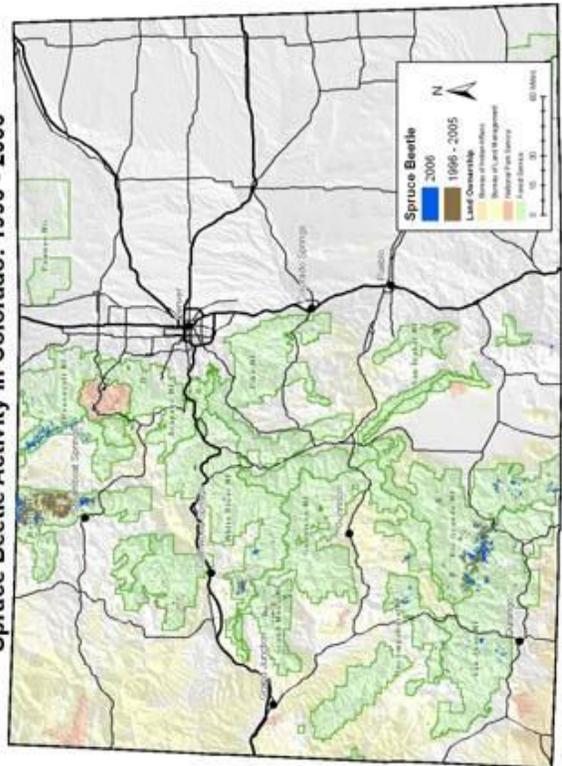


Spruce Beetle Activity in Colorado: 1996

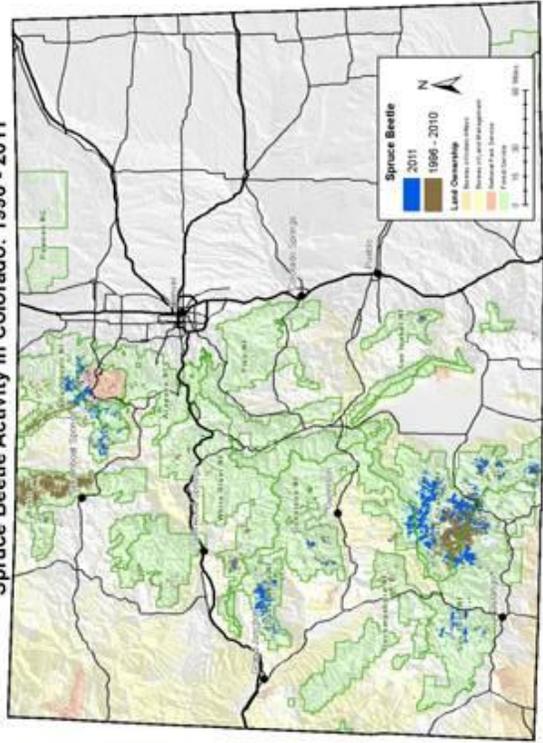


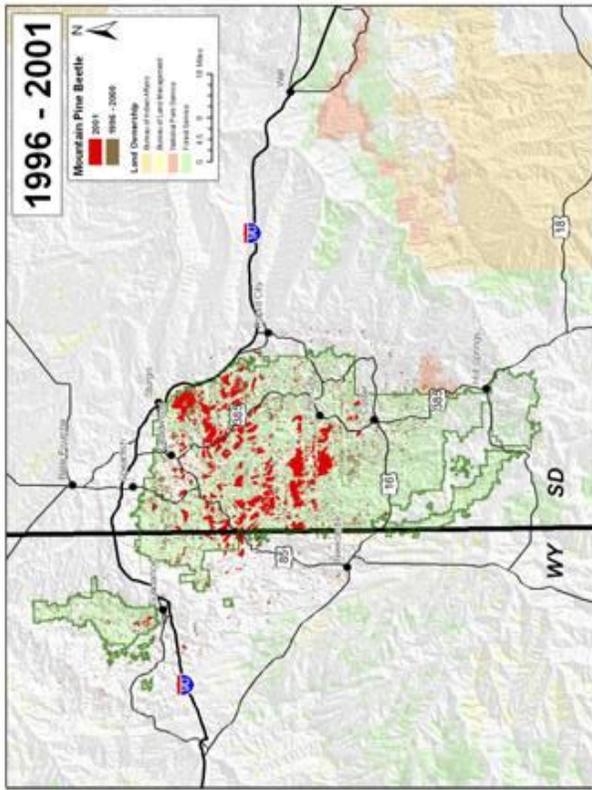
Epidemic Progression of Spruce Beetle from 1996 - 2011 in Colorado

Spruce Beetle Activity in Colorado: 1996 - 2006

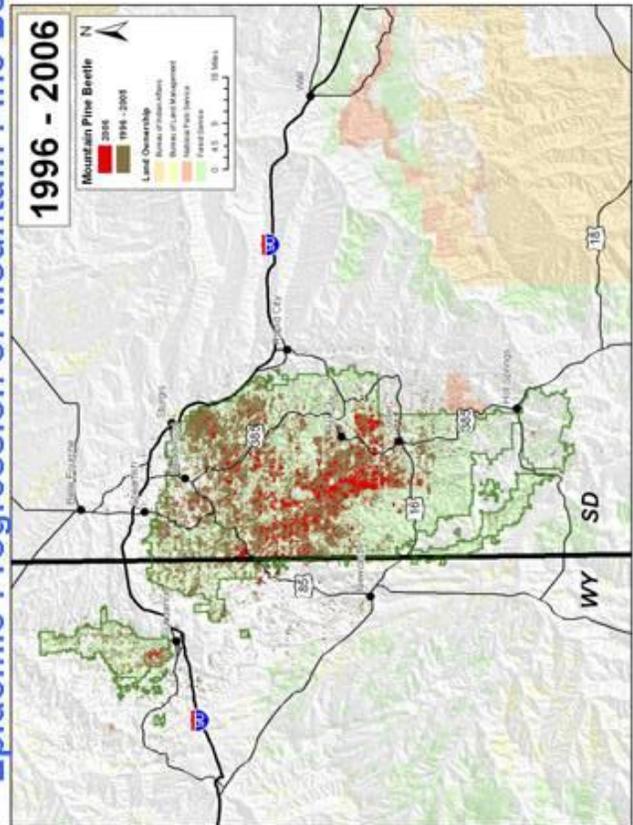
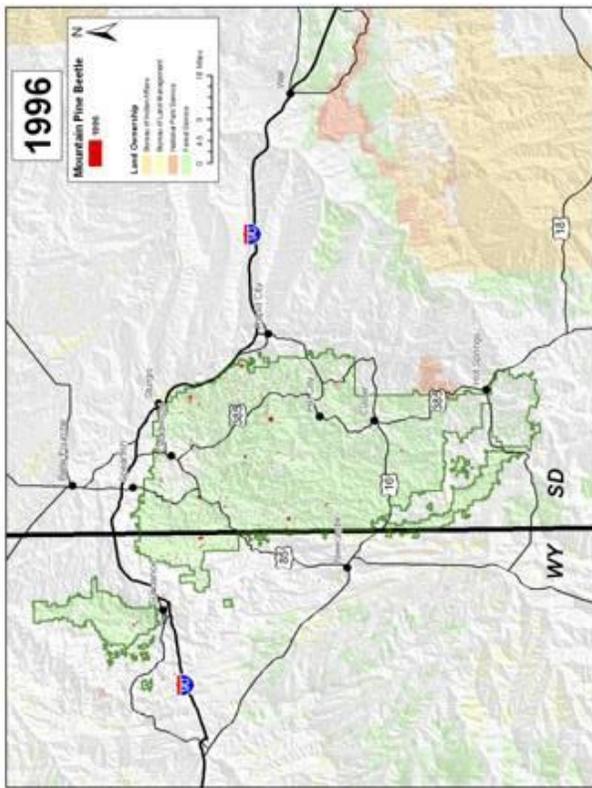
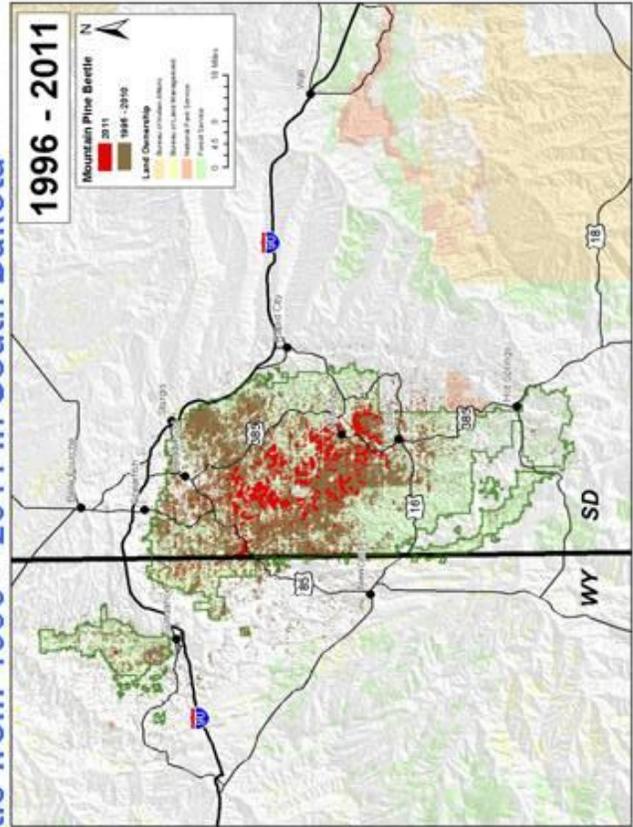


Spruce Beetle Activity in Colorado: 1996 - 2011

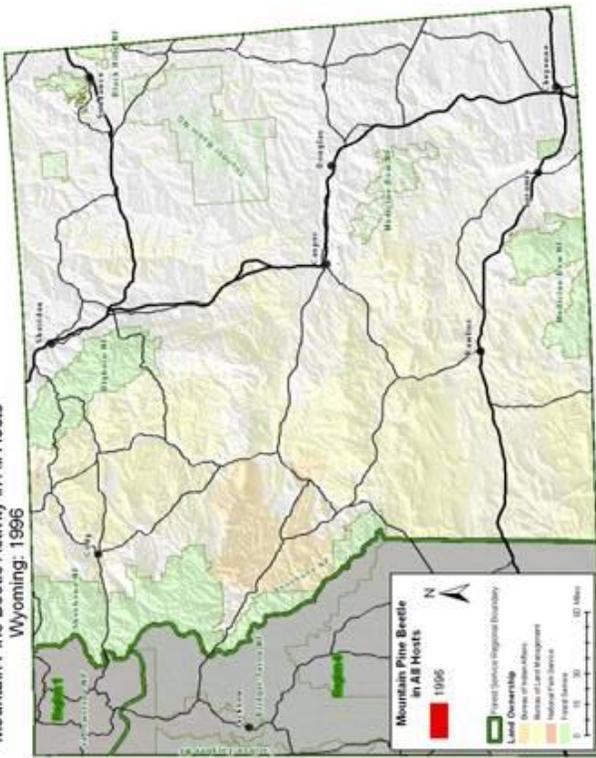




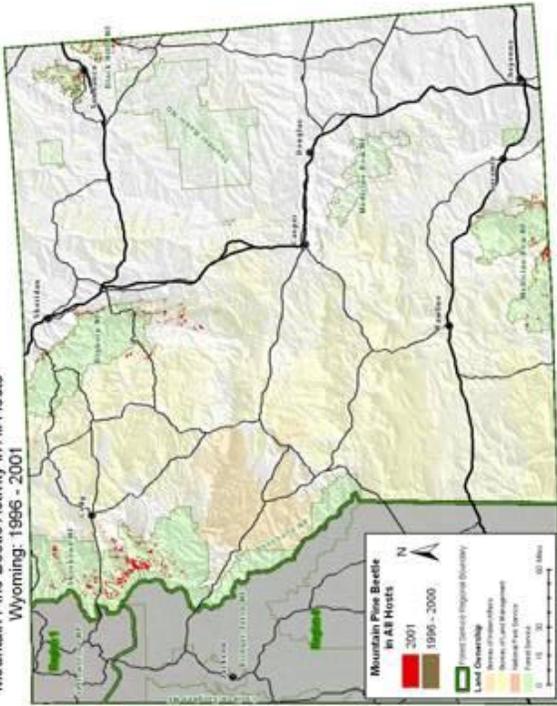
Epidemic Progression of Mountain Pine Beetle from 1996 – 2011 in South Dakota



Mountain Pine Beetle Activity in All Hosts
Wyoming: 1996

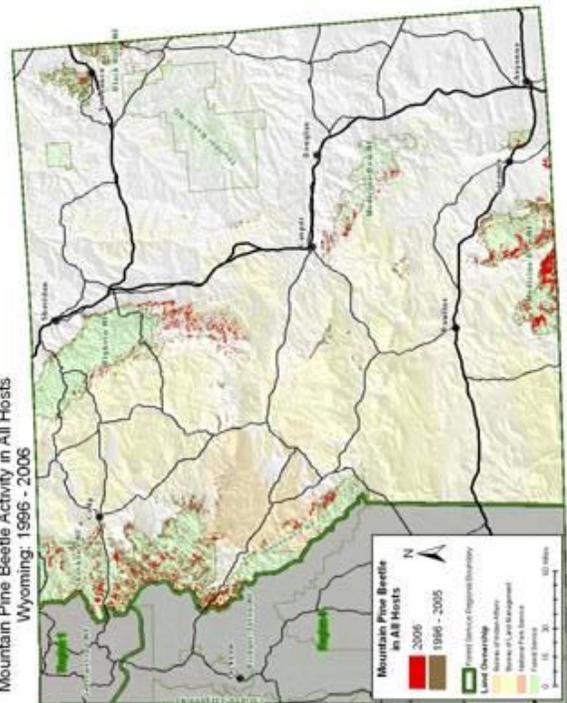


Mountain Pine Beetle Activity in All Hosts
Wyoming: 1996 - 2001



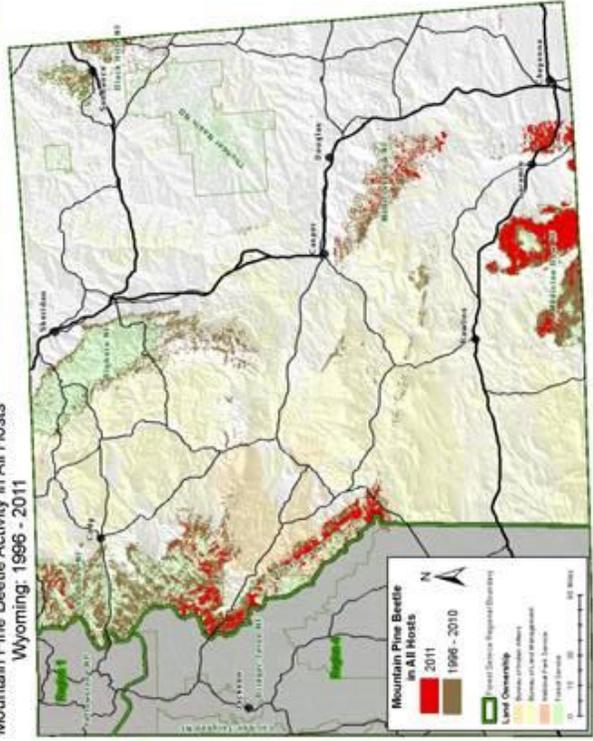
Epidemic Progression of Mountain Pine Beetle

Mountain Pine Beetle Activity in All Hosts
Wyoming: 1996 - 2006

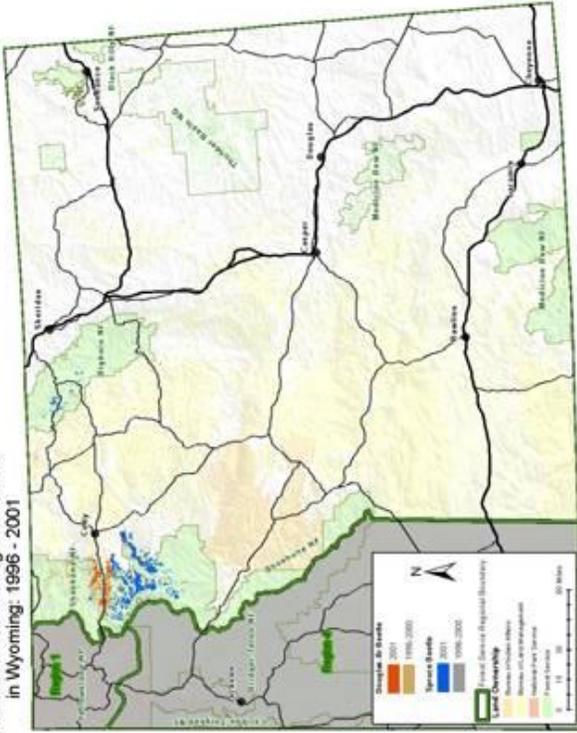


Mountain Pine Beetle Activity from 1996 - 2011 in R2-Wyoming

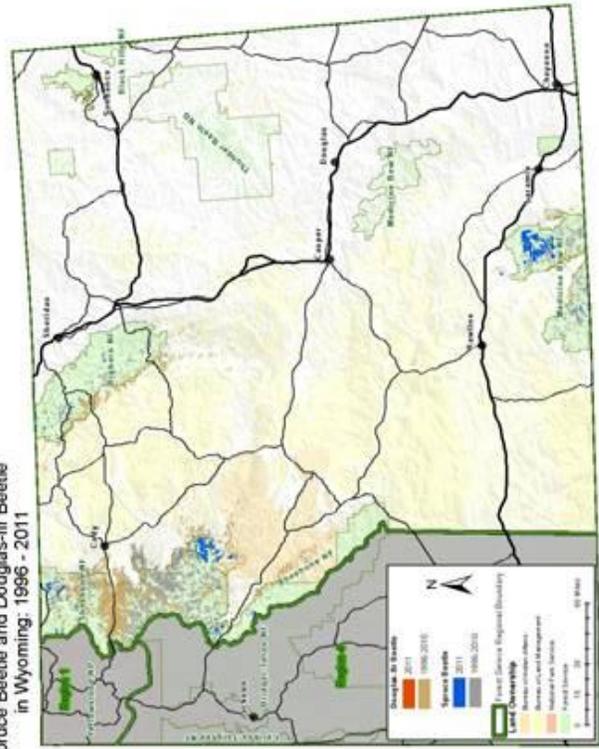
Mountain Pine Beetle Activity in All Hosts
Wyoming: 1996 - 2011



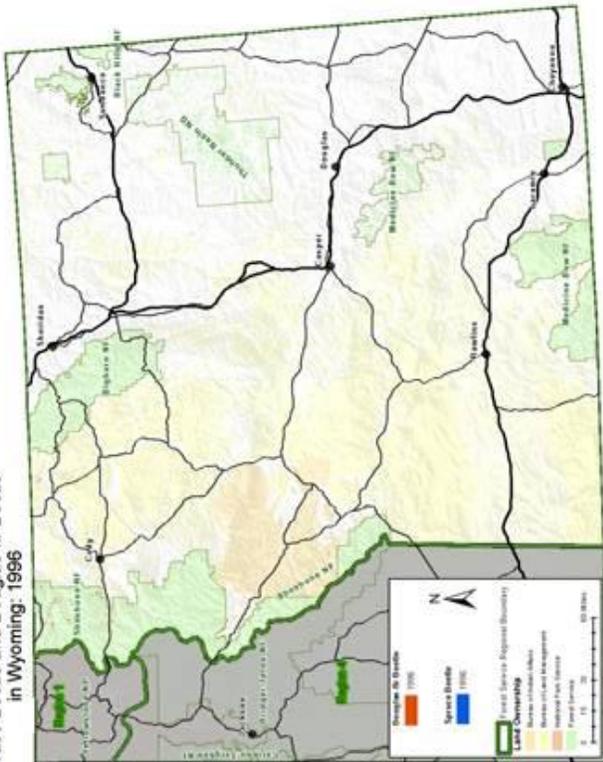
Spruce Beetle and Douglas-fir Beetle in Wyoming: 1996 - 2001



Spruce Beetle and Douglas-fir Beetle in Wyoming: 1996 - 2011

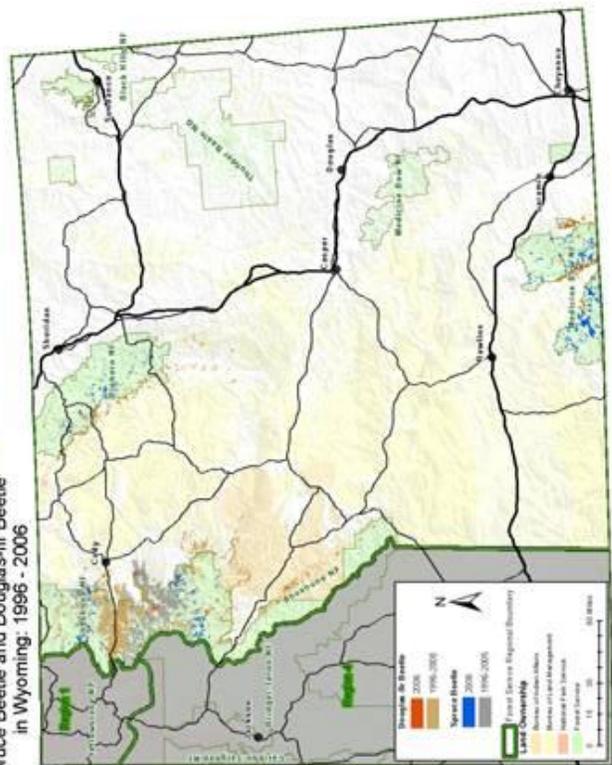


Spruce Beetle and Douglas-fir Beetle in Wyoming: 1996



Epidemic Progression of Spruce Beetle & Douglas-fir Beetle from 1996 – 2011 in R2-Wyoming

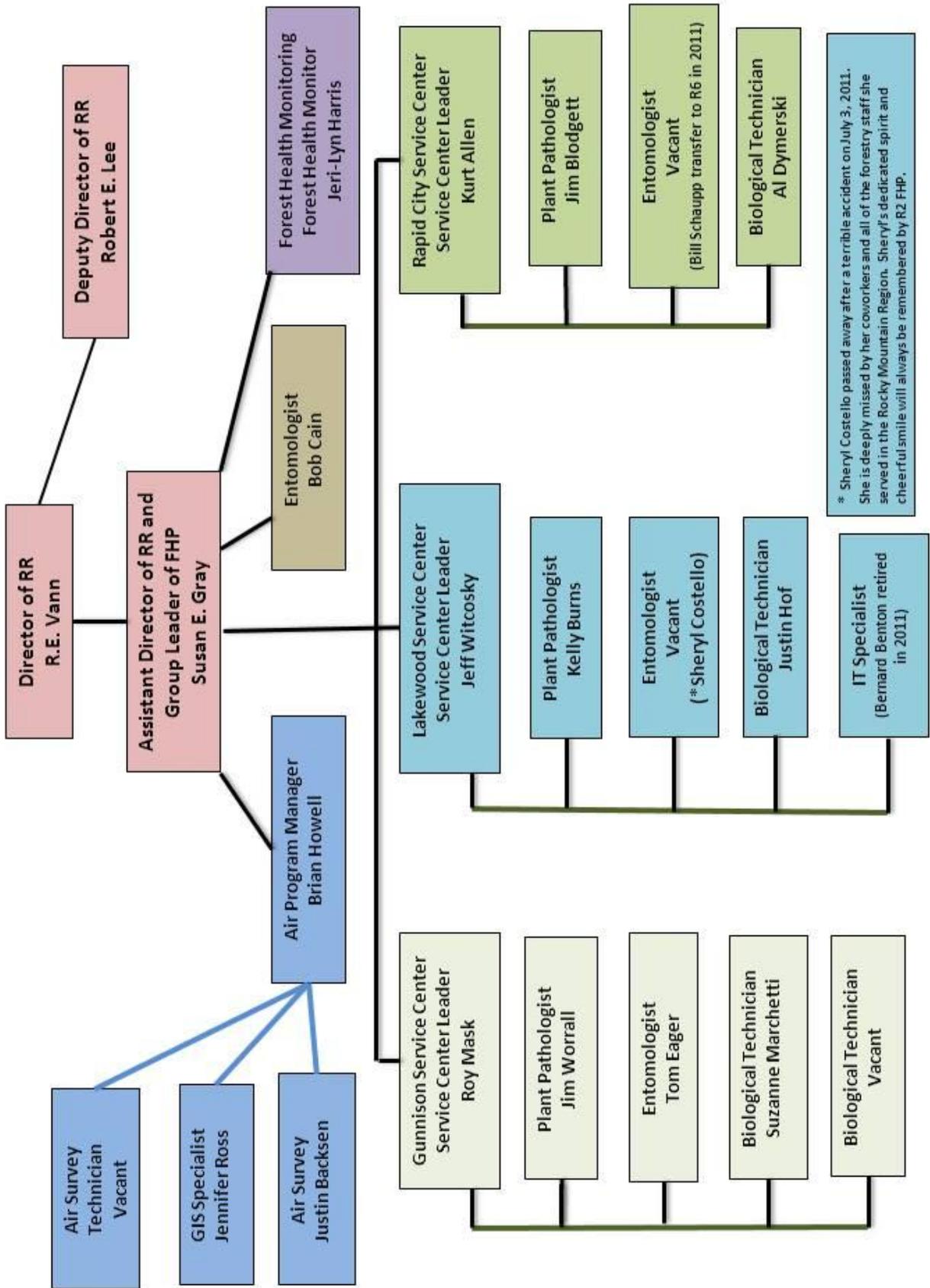
Spruce Beetle and Douglas-fir Beetle in Wyoming: 1996 - 2006



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Appendix C: Rocky Mountain Region (R2) - Renewable Resources (RR) - Forest Health Protection (FHP) staff – 2011 updates

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Appendix D: 20th Anniversary of R2 "Bugs & Crud" picture and game. This drawing of insect and diseases in R2 was made for a "Conditions" report cover in 1991. It was drawn by Curtis O'Neil, an entomologist and pesticide coordinator for the Rocky Mountain Region in the 1980's.

How many insects & disease - Causing fungi Can you identify?

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____
- 7. _____
- 8. _____

Do you see any other possible Insect-/Diseases?



Answers to the Identification of R2 Insects and Diseases Game

1. Dwarf Mistletoe seeds
2. Armillaria Mushroom
3. Dendroctonus beetle
4. Beetle larva
5. Wood-borer (Cerambycid) larva
6. Armillaria rhizomorph
7. Needle Blight or Needle Cast
8. Budworm larva