Montana Forest Insect and Disease Conditions and Program Highlights - 2012

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MONTANA

Forest Insect and Disease Conditions and Program Highlights – 2012

Report 13-02

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Mountain pine beetle-killed lodgepole pine in Lewis and Clark National Forest, courtesy of Chris Hayes, USDA Forest Service

Mountain pine beetle larvae, courtesy of Brytten Steed, USDA Forest Service

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ABBREVIATIONS

The following abbreviations are used throughout this document:

Beetles	BWA	=	Balsam woolly adelgid, *Adelges piceae* Ratzeburg
	DFB	=	Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins
	ESB	=	Spruce beetle, *Dendroctonus rufipennis* (Kirby)
	FE	=	Fir engraver, *Scolytus ventralis* LeConte
	IPS	=	Pine engraver, *Ips pini* (Say)
	MPB	=	Mountain pine beetle, *Dendroctonus ponderosae* Hopkins
	RTB	=	Red turpentine beetle, *Dendroctonus valens* LeConte
	WBBB	=	Western balsam bark beetle, *Dryocoetes confuses* Swaine
	WPB	=	Western pine beetle, *Dendroctonus brevicomis* LeConte
Defoliators	DFTM	=	Douglas-fir tussock moth, *Orygia pseudotsugata* McDunnough
	GM	=	Gypsy moth, *Lymantria dispar* L.
	LCB	=	Larch casebearer, *Coleophora laricella* Hübner
	PB	=	Pine butterfly, *Neophasia menapia* (Felder & Felder)
	WSBW	=	Western spruce budworm, *Choristoneura occidentalis* Freeman
Hosts	DF	=	Douglas-fir
	ES	=	Engelmann spruce
	GF	=	Grand fir
	LP	=	Limber pine
	LPP	=	Lodgepole pine
	PP	=	Ponderosa pine
	SAF	=	Subalpine fir
	WBP	=	Whitebark pine
	WL	=	Western larch
	WWP	=	Western white pine
Other	ADS	=	Aerial Detection Survey
	BLM	=	Bureau of Land Management
	FIA	=	Forest Inventory and Analysis
	FS	=	Forest Service
	NF	=	National Forest
	NP	=	National Park
	IR	=	Indian Reservation
	RA	=	Reporting Area
	RD	=	Ranger District
	TPA	=	Trees per acre

HIGHLIGHTS

- Approximately 24.3 million acres of forested lands in Montana were surveyed from the air for tree mortality, defoliation, and other damage in 2012. This is an increase from the area flown in 2011, but was limited by wildfire smoke inhibiting visibility and preventing ADS surveys in some areas.

- Mountain pine beetle continues to be the primary mortality agent observed. The amount of activity continues to decline from over 1 million acres affected in 2011 to over 660,000 acres in 2012. In addition to reduced acreage, on average the intensity of the infestation decreased from 3.5 trees per acre in 2011 to 2.2 trees per acre in 2012. In many lodgepole pine and high elevation 5-needle pine stands that experienced recent high levels of mountain pine beetle-caused mortality, mountain pine beetle activity has decreased due to host depletion. While there were significant reductions in activity within lodgepole pine and 5-needle pine stands, activity detected in ponderosa pine continued at 2011 levels. The area of most mountain pine beetle activity involved Granite and Ravalli Counties.

- Defoliation by western spruce budworm increased in 2012 to nearly 1.5 million acres. Defoliation from budworm was recorded in almost every county in Montana with host trees in 2012, with repeated heavy defoliation east of the Continental Divide. The amount of Douglas-fir beetle-caused tree mortality in areas with repeated heavy defoliation from budworm appears to be increasing.

- Root disease fungi cause damage and mortality on well over 8 million acres in western Montana, killing more than 30 million trees annually.

- Larch needle cast was mapped on nearly 48,000 acres in western Montana. Counties mainly affected included Flathead, Lincoln, Mineral, and Sanders.

SUMMARY OF CONDITIONS

Bark Beetles

Mountain pine beetle

Mountain pine beetle continued to be an important tree killer in Montana. Overall, number of acres with mountain pine beetle-caused mortality in 2012 (666,336 acres) was down from 2011 (1,033,791 acres). In many lodgepole pine and high elevation 5-needle pine stands that experienced recent high levels of mountain pine beetle-caused mortality, mountain pine beetle activity has decreased due to host depletion. While there were significant reductions in activity within lodgepole and 5-needle pine stands, activity detected in ponderosa pine continued at 2011 levels, with mortality found on over 150,000 acres with an estimated 224,000 ponderosa pine trees killed. Despite the decrease in area of lodgepole pine forests impacted, lodgepole pine continues to have the highest level of mountain pine beetle-caused tree mortality (≈490,000 acres and ≈1,443,00 trees killed). Areas that continued to have significant mortality included Bitterroot NF (≈190,000 acres, over 1/4 in ponderosa), Lewis and Clark NF (≈129,000 acres, over 1/2 in ponderosa), Deerlodge NF (≈112,000 acres, mostly lodgepole) and the Big Hole area of the Beaverhead NF (not flown, mostly lodgepole). Most of the over 22,000 acres of high elevation 5-needle pine mortality detected were in the Beaverhead (8,500 acres), Gallatin (4,800 acres), and Lewis and Clark (6,200 acres) National Forest areas.

Although overall mortality has decreased, areas with sufficient host material have seen an upsurge of MPB activity—especially in areas where an early freeze in 2009, along with wet, cool spring weather in 2010 and 2011 had caused populations to drop off for a period. Barring a major weather event or management activities aimed at reducing availability of susceptible hosts, high mountain pine beetle populations and resultant tree mortality will likely continue in many areas.

Douglas-fir beetle

Recorded acres of Douglas-fir beetle-caused mortality decreased state-wide from 2011 to 2012. Tree mortality was primarily detected in isolated pockets that were scattered throughout the state. Majority of Douglas-fir beetle-caused mortality was detected on federally-managed lands in Montana and, to a lesser extent, on state, tribal and private lands.

Douglas-fir beetle-caused mortality was observed in association with prior western spruce budworm defoliation in Montana, especially within the Gallatin and Bitterroot National Forests through ground surveys. Acres of Douglas-fir beetle-caused mortality decreased for these areas in 2012 relative to 2011; this may be due to differences in total areas surveyed or difficulties associated with assessing Douglas-fir beetle-caused mortality in trees with prior western spruce budworm defoliation.

Overall, Douglas-fir beetle populations are at near-normal levels in most Douglas-fir and mixed-species stands except for a few isolated areas where higher populations continued to cause low to moderate levels of Douglas-fir mortality. While Douglas-fir beetle continued to decline across the state in 2012, much of the Douglas-fir host type has experienced severe western spruce budworm defoliation in recent

years. This defoliation, if coupled with unusually warm and dry weather, could promote a resurgence of Douglas-fir beetle activity in subsequent years.

Other Bark Beetles

Pine engraver, Engelmann spruce beetle, western pine beetle, western balsam bark beetle and fir engraver beetle populations and associated tree mortality were found at low, endemic levels in 2012. Localized outbreak populations of Engelmann spruce beetle continued at slightly reduced rates on federally managed lands in the Gravelly Mountains, Beaverhead-Deerlodge National Forest and within the Rock Creek drainage, Custer National Forest.

Defoliators

Western spruce budworm remained the most active and damaging insect defoliator in Montana. Number of acres defoliated by western spruce budworm remained high and similar to 2011 levels, especially east of the Continental Divide and impacted primarily Douglas-fir. Almost 1.5 million acres in Montana were mapped with western spruce budworm-caused defoliation. Defoliation from budworm was recorded in almost every county survey in Montana in 2012, and defoliation intensity increased on some forests, especially east of the Continental Divide where budworm has been recorded for several years. Areas with significant budworm defoliation were the Helena, Gallatin, Flathead and Lewis & Clark National Forests. This includes National Forest and surrounding lands of other ownerships. Also, extensive defoliation from budworm was once again recorded in Glacier National Park.

In 2011 and 2012, Douglas-fir beetle-caused tree mortality was recorded in areas that experienced consecutive, heavy budworm defoliation over the past few years. The amount of Douglas-fir beetle-caused tree mortality in areas with repeated heavy defoliation from budworm appears to be increasing in Montana, especially east of the Continental Divide. Much of this beetle-caused mortality is likely not being detected by aerial detection, however, because beetle-killed trees that have very little remaining foliage are hard to detect from the air—aerial surveyors use foliage discoloration to detect tree mortality.

Other defoliators, including Douglas-fir tussock moth, pine butterfly, and larch casebearer were also recorded but at low levels.

Root Diseases

Root diseases are diseases of the site and do not change drastically from one year to the next. Root disease fungi cause damage and mortality on well over 8 million acres in western Montana, killing more than 30 million trees annually. Root disease-caused mortality is more common west of the Continental Divide. Large areas of root disease can be found east of the Divide, but it tends to occur in more discrete patches, rather than being ubiquitous throughout an area. Also, root diseases can be commonly found in riparian areas east of the Continental Divide, often in spruce and subalpine fir. The most impacting root diseases are armillaria root disease (over 6 million acres), laminated root disease (almost 200,000 acres), annosus root disease (almost 2 million acres of fir annosus and over 100,000

acres of pine annosus), schweinitzii root and butt rot (acreage unknown), and to a lesser extent tomentosus root disease (acreage unknown).

Foliage Diseases and Tip Blights

There was a slight increase in larch needle diseases from 2011. Larch needle diseases were mapped on thousands of acres in western Montana and in neighboring north Idaho. Nearly 48,000 acres of larch needle diseases were mapped in Lincoln (13,074 acres), Mineral (12,459 acres), Sanders (11,511 acres), Flathead (8986 acres), Missoula (1167 acres), Lake (323 acres), Powell (42 acres), and Granite (30 acres) Counties. These acreages represent a slight increase from 2011 ADS.

Rhabdocline needle cast was reported on over 300 acres. All of this occurred in Sanders County on the Flathead Indian Reservation. Rhabdocline needle cast was also found to be a continuing problem at the Plains Tree Improvement Area (MFO-TR-12-15). Over 300 acres of diplodia tip blight were identified by ADS; affected acreages were concentrated in Lincoln County (274 acres), with the remaining acreages in Sanders County (45 acres). Diplodia tip blight was found to have a significant presence in ponderosa pine on Wild Horse Island (MFO-TR-12-48).

Dwarf Mistletoes

Historical assessments of dwarf mistletoe stands in Montana show that about 16% of Douglas-fir, 33% of lodgepole pine, and 30% of western larch stands are infected with dwarf mistletoe. More recent assessments using Forest Inventory and Analysis data collected on over 50,000 trees across Montana show that only about 1% of Douglas-fir, 3.2% of lodgepole pine, and 3.9% of western larch trees were infected. The clumpy nature and protracted disease-cycle of dwarf mistletoes allow for impacts across an individual stand to range from none to severe. The clumpy nature of dwarf mistletoe is likely the reason for a discrepancy between these two measurements; the first is measuring infected stands and the second is measuring infected trees.

White Pine Blister Rust

Western white pine, whitebark pine, and limber pine are all susceptible to white pine blister rust.

Western white pine

Mature western white pine continues to be lost due to a combination of blister rust and mountain pine beetle. Lack of suitable sites, either man-made or natural, limits natural regeneration, and white pine blister rust may kill a high proportion of natural seedlings. Rust-resistant stock is planted operationally on suitable western white pine sites on federal, state, industrial, and private forest lands throughout northwestern Montana. In addition to planting rust-resistant stock, pruning of the lower bole is an important tool used in blister rust management.

Whitebark pine

White pine blister rust has been impacting whitebark pine ecosystems for many decades. In addition, recent outbreaks of mountain pine beetle have caused widespread mortality in many whitebark pine

stands already impacted by white pine blister rust. The combination of white pine blister rust, bark beetle outbreaks, and lack of natural regeneration due to fire suppression has raised concerns about the long-term viability of whitebark pine ecosystems.

Standardized methodology is now being used to establish monitoring plots in whitebark pine stands throughout the West. These plots are designed to provide a statistically-based assessment of the incidence of white pine blister rust in the ecosystem and the condition of whitebark pine. Whitebark and Limber Pine Information System, WLIS, is a database which was developed (http://www.fs.fed.us/r1-r4/spf/fhp/prog/programs2.html) to compile and provide results of surveys in both whitebark and limber pine. WLIS was expanded to include 4 other high elevation 5-needle pines during 2011 and 2012, and will be available in its new format in 2013.

Limber pine

Limber pine is found at elevations ranging from 2,700 feet near the community of Terry in far eastern Montana to around 9,000 feet in and around the Beaverhead-Deerlodge National Forest in southwestern Montana. West of the Continental Divide, limber pine is largely confined to limited areas adjacent to the Divide, while scattered populations of limber pine can be found across much of eastern Montana. White pine blister rust is found throughout the distribution of limber pine, but there are a few areas where limber pine remains apparently free of the disease, including locations southwest of Ennis and south of Billings. More detailed information about the current amount, distribution, and condition of limber pine in Montana can be found in “Current Status of Limber Pine in Montana” (Jackson and others 2010).

Abiotic Damage

Less than 200 acres of windthrow were mapped in 2012. These acres were distributed among 4 counties: Lake (81 acres), Meagher (50 acres), Ravalli (30 acres), and Fergus (27 acres) counties. Minor acreages were mapped for flooding (193 acres total) and avalanche damage (91 acres) and are noted in county insect and disease conditions below.

ANNUAL AERIAL DETECTION SURVEY

Aerial detection surveys are an overview assessment designed to locate and document forest change events, as seen from the air. It is a form of data collection that allows the observer to survey large tracts of forested land in a relatively short period of time. Single engine, high-wing aircraft flying at speeds of approximately 90 to 130 mph at an average altitude of 1,500 feet above ground level are used to fly either contour or grid patterns within a Reporting Area (RA). The damage extents or polygons of the aerially detected signatures of recently killed or defoliated trees are marked on a digital sketch mapping system or on paper 1:100,000 scale topographic maps. These polygons are given a code for the agent that likely caused the damage; inferred from the size and species of trees affected, as well as the color and pattern of the damage. The agent code is followed by the total number of trees affected, trees per acre (TPA) affected, or an intensity of the damage (L for light and H for heavy). Areas burned by wildfire are not surveyed until the third year following a fire, as it can be difficult to distinguish mortality caused by fire from that caused by insect or disease activity. The actual amount of mortality from tree diseases, dwarf mistletoes, and white pine blister rust are greatly underestimated with aerial detection surveys because symptoms from these agents can be difficult and, in some instances, impossible to identify from the air.

The annual aerial detection survey in Montana was conducted from July 2 to September 21, 2012. The survey encompassed approximately 24.35 million acres of mixed ownership forested lands, excluding most designated wilderness areas (Figure 2). Four FHP observers, using two contract aircraft, conducted the 2012 aerial detection survey and identified 2.24 million acres of forest damage within Montana. Historically, Region 1 utilized contour flight patterns as the principal survey method to document forest change events within the survey areas. 2012 served as a milestone, with the conversion to the use of grid flight patterns as the primary survey method. In the future, contour flight patterns will only be employed in locations where grid flights are not feasible due to high winds or extreme terrain.

The data summarized in this report are a product of annual aerial detection surveys, as well as ground surveys and biological evaluations. The digital data files, data summaries, and aerial detection survey damage maps are available from the Missoula FHP Field Office in both paper and digital GIS format. Data may also be downloaded at http://www.fs.usda.gov/detail/r1/forest-grasslandhealth/?cid=stelprdb5182976.

INSECT AND DISEASE CONDITIONS BY COUNTY

County Results

For each county, damage by ownership is noted and, to the extent possible, we have indicated areas affected and estimated extent of damage. Counties that are not included had no reported information. Forestland data in the following tables are from the annualized surveys performed by USDA Forest Service Forest and Inventory Analysis (http://www.fia.fs.fed.us). In some of our tables, you will observe acres of damage on some ownership where there is no forestland reported. Because of the limited forestland within ownerships of some counties, the density of FIA plots may not have been sufficient at the county level to identify forested acres (i.e. forestland exists but was missed in the FIA sample resulting in an estimate of zero acres). This discrepancy is within their standard of error. Other Federal lands include tribal ownership.

Beaverhead County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	1,087,089	121,922	40,145	29,442	1,278,598
DFB	61	14	6	0	81
ESB	20	0	0	0	20
MPB-LPP	59,912	1,484	1,678	716	63,789
MPB-High Elevation	7,991	40	9	4	8,044
SAF Mortality	38	0	0	0	38
WSBW	57,031	14,048	5,212	3,122	79,413

Smoke from wildfires limited aerial survey conducted in Beaverhead County in 2012. Nevertheless, most of the Pioneer Mountains, sections of the Beaverhead Mountains northeast and southwest of Bannock Pass, and a small area along the border with Ravalli County were surveyed. This is an increase in acreage and a change in survey locations from land surveyed in 2011, the result being less BLM and State lands and more USFS lands were surveyed.

Data suggests a more than doubling of MPB activity in lodgepole pine, but a decrease in mortality of high elevation 5-needle pines. Much of the increased activity was noted in the northern 2/3 of the Pioneer Range. Increases in lodgepole pine mortality within the county would have been even higher if lodgepole pine stands along the northern Beaverhead and Anaconda Ranges could have been surveyed (MFO-TR-12-33). Spruce beetle remains at low levels, as does subalpine fir mortality complex.

Defoliation caused by WSBW showed a sharp increase (≈4 fold) due partly to differences in survey area. Ground visits in areas around Wise River found a mosaic of high and low intensity defoliation. Douglas-fir beetle-caused mortality in areas with large Douglas-fir and high defoliation levels was observed during ground surveys (MFO-TR-12-22), which may not have been readily visible to aerial surveyors. This suggests that although DFB-caused mortality remained low, it may be higher than what survey numbers suggest.

Whitebark pine stands at Medicine Lodge and Upper Horse Prairie on BLM lands were also visited by FHP (MFO-TR-12-16). White pine blister rust appeared to intensify over the previous year at Medicine

Lodge. Whitebark pine in Upper Horse Prairie is also infected with white pine blister rust, but shows some indications of possible genetic resistance.

In early September, FHP visited several BLM project sites in the county, including sites in the Shale Creek, Bean Creek, and Price Creek drainages (MFO-TR-12-10). At the 200+ acre fuels reduction project at Shale Creek, schweinitzii root and butt rot symptoms were associated with older Douglas-fir, and witches'-brooming in lodgepole pine was associated with stem rust infections and/or lodgepole pine dwarf mistletoe. Nearby, good aspen regeneration was observed in a stand where old aspen were falling out due to decay. At Bean Creek, although very few stumps contained brown cubical decay, schweinitzii root and butt rot was confirmed on a recently killed relic Douglas-fir and, at Price Creek, both schweinitzii and tomentosus root disease were concerns.

White pine blister rust is common in whitebark pine, and limber pine dwarf mistletoe is present in this county.

Big Horn County

No aerial or ground surveys occurred within Big Horn County in 2012. In 2011, the Crow and Northern Cheyenne Indian Reservations were surveyed with aerial flights. Pest agents observed in 2011 included low levels of MPB in lodgepole pine, DFB, subalpine fir mortality, and an unknown defoliator in the Pryor Mountains. The Bighorn Mountains had larger pockets of these agents and the Wolf Mountains had an unknown agent causing large patches of defoliation as well as small pockets of MPB activity within ponderosa pine. As no surveys occurred in 2012, the status of these agents is not known.

White pine blister rust is present in limber pine in this county. Lodgepole pine dwarf mistletoe and limber pine dwarf mistletoe are present in this county.

Blaine County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	0	71,085	59,888	5,079	136,051
DFB	0	8	0	2	10
MPB-LPP	0	143	0	6	149
MPB-PP	0	542	2	7	551
WSBW	0	20	108	0	128

The southeastern portions of Blaine County where forested areas within the Fort Belknap Indian Reservation occur were surveyed in 2012. In this location, MPB activity continued at moderate or incipient levels throughout lodgepole pine and ponderosa pine host types. Limited WSBW defoliation of Douglas-fir trees was detected as well.

Western gall rust and comandra blister rust are common in ponderosa pine on the Fort Belknap Indian Reservation (MFO-TR-12-13) causing stem deformities, branch mortality, top kill, and occasional whole tree mortality. Armillaria root disease can also be found on the Fort Belknap IR, in the Mission Canyon

area, with large pockets developing in Douglas-fir and aspen (MFO-TR-12-13). Marssonina leaf spot and aspen heart rot were prevalent in many aspen locations (MFO-TR-12-13).

Lodgepole pine dwarf mistletoe is present in the county.

Broadwater County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	151,813	27,911	98,548	0	278,272
DFB	6	0	2	0	8
MPB-LPP	4,813	0	574	0	5,386
MPB-PP	62	28	199	6	296
MPB-High Elevation	189	0	0	0	189
SAF	2	0	0	0	2
WSBW	56,323	6,079	22,354	1,375	86,132

Most all forested area in Broadwater County was surveyed in 2012. While only the northern portion of the Elkhorn Mountains was surveyed in 2011, nearly all of Elkhorn and Big Belt Mountains were surveyed in 2012 (≈4 fold increase). In the Elkhorn Range in 2012, MPB-caused mortality greatly decreased with only scattered large patches remaining. Similar large patches were noted in higher elevations of the Big Belts. Most of this MPB mortality was in lodgepole pine, but some ponderosa pine and high elevation 5-needle pines were also noted. Very low levels of DFB and subalpine fir mortality complex were detected. Defoliation by WSBW remained high and significant wherever host trees were found.

White pine blister rust has been found in limber pine in this county. Armillaria root disease is present in the county, and schweinitzii root and butt rot is quite common, especially causing significant decay in the butt logs of larger, older Douglas-fir. Lodgepole pine dwarf mistletoe is present in the county.

Carbon County

No aerial surveys and limited ground surveys were conducted within Carbon County in 2012. MPB-caused mortality continued in lodgepole pine and high elevation whitebark pines within the Beartooth Mountains and was ground surveyed in the Hellroaring Gulch stands. Mortality levels in this location increased in 2012, with pockets ranging from 30-200 trees/group scattered throughout the area (MFO-TR-12-21). Engelmann spruce beetle-caused mortality continued at epidemic-levels within the Rock Creek Drainage in 2012, although rates of mortality decreased slightly relative to 2011. Defoliation caused by fall webworm occurred within understory species, especially chokecherry shrubs, throughout Woodbine Campground in the Beartooth Mountains in 2012; damage to understory vegetation occurred in ≈ 10% of all available shrubs present and averaged 20% foliage consumption (range 0-80%) in affected hosts (MFO-TR-12-21).

Spruce broom rust and tomentosus root disease in spruce are prevalent in various campgrounds in this county. White pine blister rust is common in whitebark pine and limber pine, and lodgepole pine dwarf mistletoe and limber pine dwarf mistletoe are present in the county.

Cascade County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	191,929	14,555	91,076	15,428	312,988
DFB	14	0	16	0	30
ESB	4	0	0	0	4
MPB-LPP	5,807	1,237	1,548	236	8,829
MPB-PP	2,104	401	3,443	294	6,242
MPB-High Elevation	545	0	0	0	545
IPS	2	0	0	0	2
SAF Mortality	10	0	0	0	10
WSBW	7,577	3,080	17,589	3,781	32,027

Most all of the forested area in Cascade County was surveyed in 2012. Much of the Little Belt Range was surveyed in 2011 and 2012, with additional areas along the southern 1/3 of the county surveyed in 2012 (≈2 fold increase in total area). Despite greater area surveyed, levels of MPB activity across the county (described as either acres affect or estimated number of trees killed) were down 1.5-3 fold in ponderosa pine, 2.5-5 fold in lodgepole pine, and 5 fold in high elevation 5-needle pines. In the northern Little Belts in 2012, MPB-caused mortality detected in lodgepole pine, ponderosa pine, and high elevation 5-needle pines decreased significantly, although significant patches remained in all host types. Similar levels of activity in lodgepole pine and ponderosa pine were also detected in the southwest portion of the county in 2012. Also surveyed in 2012 was a portion of the Highwood Mountains; significant levels of MPB in lodgepole pine were detected in the upper elevations.

Only a few scattered instances of DFB, ESB, IPS, and subalpine fir-mortality were noted. Patches of defoliation by WSBW were detected throughout area surveyed. However, in the northern Little Belts where both 2011 and 2012 survey occurred, defoliation appears to have decreased.

A late spring site visit (MFO-TR-12-05) to Malmstrom Air Force Base was completed to address issues that may not have been fully addressed in earlier- and later-season visits. Secondary diseases and insects responding to environmentally stressed trees are the primary tree health concerns at the base. In addition, Dutch elm disease continues to cause mortality and has nearly eliminated elms from the base.

White pine blister rust is common in limber pine in this county. Armillaria root disease is present in the southeastern portion of the county, and schweinitzii root and butt rot is quite common, causing significant decay in the butt logs of larger, older Douglas-fir.

Chouteau County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	14,934	6,597	38,185	1,504	61,221
DFB	0	6	6	0	12
MPB-LPP	8,083	0	1,171	0	9,254
MPB-PP	0	40	272	129	441
WSBW	3,971	3,216	11,027	713	18,926

In 2012, most forested area in Chouteau County was aerial surveyed and included the northeast and southwest corners of Chouteau County, and some ground surveys were also conducted. Only limited northeast surveys occurred in 2011. The northeast location contains forested area within the Rocky Boy's Indian Reservation. In this location, MPB activity continued to cause mortality at moderate or incipient levels that ranged from 5-40 trees/group (MFO-TR-12-14). Additionally, WSBW continued to cause defoliation primarily in Douglas-fir.

In the southwest corner of Chouteau County, MPB activity continued to cause primarily lodgepole pine mortality in large groups across approximately 9,000 acres. Within Douglas-fir, WSBW-caused defoliation occurred throughout this area as well.

Schweinitzii root and butt rot and low levels of armillaria root disease were found in stands near Bailey Mountain and in the general area of West Fork Beaver Creek in the southern portion of the Rocky Boy's Indian Reservation. Red ray rot was found to be very common in ponderosa pine on private lands bordering the reservation. Lodgepole pine dwarf mistletoe is common in many stands. Elytroderma needle blight was found in lodgepole pine in the West Fork Beaver Creek drainage—this is only the second time this disease has been identified on this host in Montana. Aspen stands are suffering from a number of insects and diseases, including aspen shoot blight and black canker, in localized areas. (MFO-TR-12-14)

Armillaria root disease is present in the northern portion of the county on the Rocky Boy's Indian Reservation, but appears to be uncommon. Also, butt rot and breakage caused by *Ganoderma applanatum* has been observed in quaking aspen on the Rocky Boy's IR.

Deer Lodge County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	200,661	7,079	43,542	33,513	284,795
Aspen Damage	0	0	44	0	44
DFB	4	0	4	2	10
MPB-LPP	4,976	27	2,854	8,705	16,562
MPB-PP	43	0	2	30	76
MPB High Elevation	204	0	187	2	394
SAF	2	0	0	0	2
WSBW	144	0	254	37	436

In 2012, approximately 2/3 of the county was flown with the exception of the southwest corner (between Chief Joseph pass and Wisdom, and south of the Continental Divide) and a small piece of the

very northeast corner. The majority of tree mortality in the county was caused by MPB. Although the number of acres killed by MPB almost doubled in 2012, so did the number of acres flown. MPB is still active south of Anaconda and east of Georgetown Lake.

Low and scattered amounts of defoliation from WSBW were found in the county in 2012.

ADS detected 44 acres of aspen damage about 1.5 miles north of Anaconda.

White pine blister rust has been found in limber pine in this county. Schweinitzii root and butt rot is common in Douglas-fir, causing decay in the butt logs but not acting as an aggressive root pathogen. Lodgepole pine dwarf mistletoe and limber pine dwarf mistletoe are also present in the county.

Fergus County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	81,324	170,469	265,345	13,058	530,197
DFB	10	2	12	0	24
Larch Needle Diseases	0	0	275	0	275
MPB-LPP	2,812	544	1,056	73	4,484
MPB-PP	7,865	1,924	13,937	1,490	25,217
MPB High Elevation	4	0	0	0	4
SAF	4	0	0	0	4
WSBW	39,810	14,782	46,715	3,454	104,761
Windthrow	0	27	0	0	27

Most lands from Hilger and Kendall south were surveyed in 2012; only the eastern border pertaining to the Wildlife Refuge was surveyed in 2011. Mountain pine beetle activity noted in 2012 was principally in ponderosa pine and was heaviest in the Little Snowy and SW Big Snowy Mountains. However, mortality in ponderosa pine was noted throughout the surveyed area. Patches of lodgepole pine mortality were noted in the Big Snowy and Judith Mountains and around Kendall. Few trees were found dead due to DFB or subalpine fir mortality complex. Western spruce budworm was actively defoliating host trees throughout the surveyed area.

About 275 acres of trees affected by an undetermined problem were detected by ADS in four polygons: a 111 acre polygon between Beaver Creek and Cottonwood Creek (southern portion of Section 5, T. 13 N., R. 18 E.); a 44 acre polygon is between Castle Creek and Hansen Creek (Sections 17&18, T. 14 N., R. 19 E.); a 46 acre polygon is about a mile north of Marcott Creek (Section 32, T. 14 N., R. 19 E.); and a 72 acre polygon is between Marcott Creek and the Middle Fork of Big Spring Creek (north area of Sections 8&9, T. 13 N., R. 19 E.). Since the cause of this damage could not be confirmed in 2012, FHP will attempt to ground truth at least one of these polygons to determine the cause of the damage.

About 27 acres of windthrown lodgepole pine (about 50 trees) were detected about 1/3 to 1/2 mile south of Judith Peak.

Armillaria root disease was positively identified in the Moccasin Mountains north of Lewistown, and root disease patches, assumed to be armillaria root disease, have been noted in the Big Snowy Mountains. Lodgepole pine dwarf mistletoe is present in this county.

Flathead County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	1,730,421	489,558	419,980	131,393	2,771,351
Avalanche	0	19	0	0	19
DFB	127	312	84	15	538
DFTM	396	0	3,202	262	3,860
ESB	2	4	4	0	10
FE	2	2	8	4	16
Flooding	0	0	59	0	59
LCB	7	0	0	21	28
Larch Needle Diseases	6,628	0	1,486	872	8,986
MPB-LPP	4,830	3,927	263	8	9,028
MPB-PP	16	16	512	101	645
MPB-WP	2	0	4	0	6
MPB-High Elevation	6	0	0	0	6
SAF	253	32	8	8	301
WSBW	99,401	92,515	21,472	8,988	222,377

Most of the county was flown in 2012, including the southwest portion that was not flown in 2011. Defoliation from WSBW was extensive and similar to damage levels recorded in 2011. Western spruce budworm activity remained high along the western edge of Glacier National Park, especially near Kintla and Bowman Lakes and west of the north fork of the Flathead River. In addition, defoliation from DFTM was recorded just to the west of Kalispell and at the Bigfork Tree Improvement Area (MFO-TR-12-04).

MPB activity in 2012 was at similar levels as in 2011. In lodgepole pine in some areas, the intensity or number of trees per acre infested increased. However, MPB-caused mortality was found at relatively low levels in all species of pines across the county. The majority of the area where MPB was detected was in the Swan Valley and on the west side of Glacier National Park.

Douglas-fir tussock moth egg mass surveys were conducted as a follow-up to the high levels of defoliation apparent in 2011. Despite some areas with high numbers of viable egg masses (Lone Pine State Park and town of Somers), little to no defoliation was apparent in 2012.

During the 2012 ADS, large areas of larch needle diseases (about 9,000 acres) were mapped throughout the county, being heaviest in the western half of the county, especially midway along the boundary with Lincoln County. Over 6,600 of these acres were on USFS lands, over 800 acres on state lands, and nearly 1,500 acres on private lands. One 19-acre polygon of avalanche damage was mapped in Glacier National Park above Avalanche Lake. Also, several small polygons of flooding damage were mapped on private land: one 19-acre polygon was found just east of Echo Lake; another 19-acre polygon was noted southwest of Kalispell in the headwaters of Ashley Creek, on the west side of Potter Creek; and a 2-acre polygon was found on the east side of the Stillwater River southwest of Boyle Lake.

White pine blister rust is common in both WWP and whitebark pine in this county. Root diseases are common in counties west of the Continental Divide. The more common ones known to occur in this county are s-type annosus root disease, armillaria root disease, and schweinitzii root and butt rot. Armillaria and annosus root diseases were noted in the Flathead Range on the east side of Hungry Horse Reservoir (MFO-TR-12-51). Schweinitzii root and butt rot is contributing to blow down of Douglas-fir in

the Lost Mountain area. In this same area, brown trunk rot is common in western larch (MFO-TR-12-51). A visit to Upper Stillwater Campground revealed Indian Paint fungus to be common in subalpine fir, armillaria root disease causing symptoms and mortality in Douglas-fir and Engelmann spruce, annosus root disease causing decline and mortality in subalpine fir, and dwarf mistletoe is infecting lodgepole pine and western larch (MFO-TR-12-51). The tree species most affected by all root diseases are Douglas-fir and true firs. P-type annosus root disease is known to occur in ponderosa pine in this county. Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are present and common in this county.

Gallatin County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	582,653	60,036	218,178	16,609	877,475
Avalanche	72	0	0	0	72
DFB	132	2	29	2	165
ESB	8	0	0	0	8
MPB-LPP	1,251	2	513	82	1,848
MPB-PP	2	0	6	0	8
MPB-High Elevation	2,909	0	39	10	2,958
SAF	168	0	20	0	188
WSBW	52,215	2,064	74,369	3,240	131,888

In Gallatin County in 2012, pest activity was observed for most all forested acres through ADS and with limited ground surveys. Mountain pine beetle-caused mortality significantly declined (≈20 fold) within lodgepole pine host and was only mapped in limited areas throughout the county. Mountain pine beetle-caused mortality also continued at reduced rates within high elevation white pines. Western spruce budworm defoliation increased significantly throughout the county as approximately 132,000 acres were mapped with defoliation in 2012, compared to only 28,000 mapped in 2011. Douglas-fir host were primarily defoliated. Western spruce budworm-caused damage increased dramatically within the Goose Creek drainage, as high levels of defoliation occurred in recent years to cause 40-100% total crown defoliation and direct mortality in some pockets (MFO-TR-12-12). Defoliation also increased dramatically to moderate and high levels in Johnson Canyon (10-40% new foliage defoliation), near Hyalite Reservoir (10-90% new growth defoliation), and in the Bridger Mountains (20-90% total crown defoliation) (MFO-TR-12-11).

Douglas-fir beetle activity occurred at low levels (up to 5 trees/group) near Hyalite Reservoir and was scattered throughout the Bridger Mountains near Battle Ridge in individual trees and small groups (2-5 trees/group). Douglas-fir beetle-caused mortality is often hard to detect in defoliated trees; thus, the aerial surveyed acres and trees reported for DFB in this county are likely underestimated.

Aerial detection survey detected about 100 lodgepole pine affected by an avalanche in a 72-acre polygon approximately one mile east of Lincoln Mountain and 3/4 mile north of Taylor Creek.

Forest Health Protection visited Bridger Bowl (MFO-TR-12-35) and determined that root and butt rot impacts will become more apparent in coming years. Attempts to plant 5-needled pines around the ski area have experienced varied success and are expected to continue.

White pine blister rust is common in whitebark pine and limber pine in this county. Black stain root disease has been identified from Douglas-fir, but is considered of minor importance, and limber pine dwarf mistletoe is present in the county.

Glacier County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	36,999	213,564	145,864	0	396,427
Aspen Damage	0	13,423	6,404	0	19,827
DFB	0	37	7	0	44
ESB	0	166	4	0	170
MPB-LPP	0	471	86	0	557
SAF	0	691	0	0	691
WSBW	0	78,805	2,497	0	81,302

In 2012, most all forested acres in Glacier County were surveyed by ADS. A large increase in WSBW activity occurred within western portions of the county that include forested areas within Glacier National Park and the Blackfeet Indian Reservation. Acres mapped significantly grew from 683 in 2011 to over 81,000 in 2012. The most severe damage occurred within Douglas-fir host type in this area.

Aerial detection survey detected nearly 20,000 acres of aspen damage along the Rocky Mountain front in mid-July. These aspen have not yet been assessed on the ground.

White pine blister rust is common in whitebark pine and limber pine. Armillaria root disease is known to be a significant pathogen in Douglas-fir in the western portion of the county on the Blackfeet IR, and lodgepole pine dwarf mistletoe and western larch dwarf mistletoe are present in this county.

Golden Valley County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	18,822	6,274	53,398	0	78,494
MPB-LPP	3	291	187	0	481
MPB-PP	3,112	1,590	3,584	66	8,352
WSBW	6,555	2,124	1,452	177	10,308

The northern portion of Golden Valley County was surveyed through ADS in 2012, while little area within the county was surveyed in 2011. Mountain pine beetle-caused mortality occurred primarily within ponderosa pine host, and to a lesser extent lodgepole pine, in this portion of the county. Western spruce budworm activity continued and caused defoliation throughout the northern portion of the county, primarily in Douglas-fir host types.

Granite County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	600,007	27,980	161,370	33,141	822,498
DFB	95	12	22	5	134
EBS	2	0	0	0	2
Larch Needle Diseases	0	0	0	30	30
MPB-LPP	85,159	3,199	10,384	711	99,453
MPB-PP	1,734	412	1,167	207	3,521
MPB-High Elevation	554	0	42	0	596
IPS	2	0	0	0	2
SAF	112	0	0	0	112
Unidentified Defoliator	35	0	0	0	35
WSBW	300	1,120	2,381	92	3,893

The majority of the county was surveyed by ADS in 2012. Mountain pine beetle activity remained at similar levels between 2011 and 2012, however, the intensity or trees per acre killed declined in some areas due to host depletion. Mountain pine beetle activity increased in the southern portion of the county. Ground surveys confirmed that MPB is still active near the East Fork reservoir and, if mortality continues at a similar rate, most of the susceptible lodgepole pine could be killed within the next few years. Weather patterns in 2012 will, in part, determine if MPB continues to decline or increase again in these areas in 2013. Fairly contiguous areas of MPB-caused tree mortality were also recorded along Rock Creek, especially south of Quigley.

Western spruce budworm activity decreased in many of the areas flown. A 30 acre polygon of larch needle diseases was detected by ADS in the northwest portion of the county about 3 miles west of Rock Creek on Montana state land (Section 16, T. 11 N., R. 16 W.).

Tomentosus root disease and schweinitzii root and butt rot were identified as problems during visits to Flint Creek Campground (MFO-TR-12-28) and a stand in the Dunkleberg analysis area (MFO-TR-12-27).

Common root diseases found in this county include s-type annosus, armillaria root disease, schweinitzii root and butt rot, and tomentosus root disease. Douglas-fir and true firs are most affected by the first three root diseases and Engelman spruce, subalpine fir, and Douglas-fir are most affected by tomentosus. P-type annosus is known to occur in ponderosa pine. Elytroderma needle disease is a significant agent in ponderosa pine in localized areas. Lodgepole pine dwarf mistletoe and western larch dwarf mistletoe are present in this county.

Hill County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	0	0	34,285	0	34,285
DFB	0	2	0	0	2
MPB-LPP	0	946	283	118	1,347
MPB-PP	0	63	18	0	81
WSBW	0	2,625	3,411	227	6,263

An area in the southeast corner of Hill County had aerial and ground surveys in 2012. This location contains forested area within the Rocky Boy's Indian Reservation. In this location, MPB activity continued to cause mortality at moderate or incipient levels that ranged from 5-40 trees/group (MFO-TR-12-14).

Schweinitzii root and butt rot and low levels of armillaria root disease were found in stands near Bailey Mountain and in the general area of West Fork of Beaver Creek in the southern portion of Rocky Boy's Indian Reservation. Red ray rot is very common in ponderosa pine on private lands bordering the reservation. Lodgepole pine dwarf mistletoe is common in many stands. Elytroderma needle blight was found in lodgepole pine in the West Fork Beaver Creek drainage; this is only the second time this disease has been identified on this host in Montana. Aspen stands suffering from a number of insects and diseases, including aspen shoot blight and black canker, were found in localized areas (MFO-TR-12-14).

Jefferson County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	422,971	71,840	135,441	13,909	644,161
DFB	4	0	2	0	6
MPB-LPP	7,682	129	565	0	8,375
MPB-PP	167	45	76	11	299
MPB-High Elevation	4	0	2	0	6
SAF	10	0	0	0	10
WPB	0	2	0	0	2
WSBW	26,183	5,093	15,625	544	47,446

Most of Jefferson County was surveyed in both 2011 and 2012, with slightly more area covered in 2012. Mortality of lodgepole pine caused by MPB was noted in scattered patches throughout the county with somewhat larger polygons noted along the northern half of the eastern border with Broadwater County. Few small, scattered areas of ponderosa pine mortality were also noted. This represents a 3 to 4+ fold decrease in mortality of lodgepole pine, and a 25 to 50 fold decrease in ponderosa pine from the previous year, dependent on whether assessed as acres affected or number of trees killed. Very low levels of DFB, WPB, and subalpine fir mortality were noted. Of greatest importance is continued defoliation of Douglas-fir, subalpine fir, and Engelmann spruce by WSBW throughout the eastern 2/3 of the county.

White pine blister rust has been found on limber pine in this county.

Judith Basin County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	276,919	0	23,816	6,430	307,164
DFB	30	4	2	0	36
MPB-LPP	10,753	155	551	2	11,461
MPB-PP	6,099	10	1,235	8	7,352
MPB-High Elevation	4,436	0	39	0	4,475
IPS	109	0	0	0	109
SAF	62	0	0	0	62
WSBW	40,439	1,660	8,616	460	51,175

In 2011 and 2012, much of the same area was surveyed–the SW half of the county pertaining to the Little Belt Mountains. Aerial detection survey numbers suggest 2 to 5 fold decreases from 2011 to 2012 in MPB-caused tree mortality depending on whether estimated as acres affected or numbers of trees killed and host species. Decreases were also noted in already low levels of DFB, IPS, and SAF-complex caused mortality. Area affected by WSBW, however, nearly doubled and was found across the surveyed area.

White pine blister rust is common in limber pine. Tomentosus root disease is known to be significant in some campgrounds. Lodgepole pine dwarf mistletoe is present in this county.

Lake County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	159,359	0	340,063	44,761	544,183
DFB	12	114	13	4	143
DFTM	0	19	0	0	19
Elytroderma	0	853	188	65	1,106
Flooding	2	0	20	41	63
Larch Needle Diseases	300	0	22	1	323
MPB-LPP	796	35	228	43	1,101
MPB-PP	22	150	98	35	305
SAF	6	36	2	2	46
WSBW	10,927	13,594	8,000	8,393	40,914
Wind throw	81	0	0	0	81

The majority of Lake County was flown in 2012. Western spruce budworm was the most common insect found in the county, and a small number of acres were also defoliated by DFTM. Number of acres defoliated by WSBW in the north-east portion of the county (Missoula Range) remains at similar levels between 2011 and 2012. However, defoliation from WSBW was also detected in the east-central and southeastern portion of the county as well.

In 2012, MPB was most active in Swan Valley just south of Bigfork. Mountain pine beetle activity decreased in lodgepole pine in both number of acres and number of trees per acre killed. Mountain pine beetle activity also decreased in ponderosa pine.

Douglas-fir tussock moth egg mass surveys were conducted as a follow-up to the high levels of defoliation apparent in 2011. Despite some areas with high numbers of viable egg masses (Jette Lake), little to no defoliation was apparent in 2012.

Over 300 acres of larch needle diseases were mapped, mostly on USFS lands, concentrated in the northeast portion of the county. One 21 acre polygon is on private lands about 5 ½ miles north of Dayton. Over 1,100 acres of elytroderma needle blight were mapped; over 850 acres were on tribal lands west of Big Arm in the Salish Mountains. Most of the remaining acres of elytroderma needle blight are in the northwest portion of the county, with close to 200 acres on private lands and 65 acres on state lands. Flooding damage was mapped on over 60 acres, with one 44-acre polygon northeast of Woodard Point on the Swan Lake State Forest, and one 15-acre polygon just south of Metcalf Lake, also on the Swan Lake State Forest. A 2-acre area of flooding was noted along Piper Creek, about 3 miles northwest of Salmon Prairie.

White pine blister rust is common in both western white pine and whitebark pine. Root diseases are common in counties west of the Continental Divide. The more common ones known to occur in this county are s-type annosus root disease, armillaria root disease, and schweinitzii root and butt rot. The tree species most affected are Douglas-fir and true firs. P-type annosus root disease is known to occur in ponderosa pine. Armillaria root disease was found impacting the Weed Hill Douglas-fir Test Plantation just east of Swan Lake (MFO-TR-12-07). Elytroderma needle disease is a significant agent in ponderosa pine in localized areas in this county. Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are present in this county.

A visit to Wild Horse Island documented heavy dwarf mistletoe infections contributing to mortality in Douglas-fir. Western gall rust is causing branch mortality and comandra blister rust is causing top kill and sectional crown mortality in ponderosa pine. Diplodia tip blight is causing branch tip death in numerous ponderosa pine, and light to moderate infections from elytroderma needle blight are causing obvious brooming in ponderosa pine (MFO-TR-12-48).

One 81-acre polygon of windthrow was mapped just south of Swan Lake, in the southern half of Section 11 in T24N, R18W.

Lewis and Clark County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	947,318	59,141	347,581	32,071	1,386,110
DFB	55	0	6	6	67
MPB-LPP	881	35	547	30	1,493
MPB-PP	3,304	377	1,568	341	5,590
MPW-High Elevation	2	0	0	0	2
WSBW	48,077	1,422	12,797	2,480	64,775

In 2012, only a portion (< 50%) of the forested area in Lewis and Clark County was surveyed. Slightly less total area and some different locations were surveyed in 2012 compared with 2011; both year's survey focused mainly on the southern half of the county. In 2012, MPB activity was concentrated in ponderosa pine stands between York and Gates of the Mountain Wilderness, although patches were

also noted W-SW of Helena and scattered throughout the survey area. Overall, numbers suggest a 5-12 fold decrease in lodgepole pine mortality and 3-7 fold decrease in ponderosa pine and high elevation 5-needle pine mortality due to MPB (dependent on whether assessed as acres affected or number of trees killed), as well as lower levels of DFB, ESB, WPB, IPS and SAF-mortality. However, WSBW-caused defoliation continues with significant levels detected in the northern Big Belts (in and around the Gates of the Mountain Wilderness). Increased defoliation in Douglas-fir may have resulted in decreased ability to detect DFB activity.

Armillaria root disease is present in the southeastern portion of the county, and schweinitzii root and butt rot is quite common, causing significant decay in the butt logs of larger, older Douglas-fir. White pine blister rust is common in whitebark pine and limber pine. Lodgepole pine dwarf mistletoe is present and common in the county.

Liberty County

No aerial survey was conducted in 2012. White pine blister rust occurs in whitebark pine and limber pine. Lodgepole pine dwarf mistletoe is present in this county.

Lincoln County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	1,729,899	0	401,054	47,984	2,178,937
Aspen Damage	488	0	0	0	488
Diplodia Canker	176	0	99	0	275
DFB	426	2	59	20	507
ESB	86	0	0	0	86
FE	38	0	6	0	44
Flooding	51	0	0	0	51
LCB	392	0	0	0	392
Larch Needle Diseases	11,773	0	997	304	13,074
MPB-LPP	878	0	563	11	1,452
MPB-PP	393	0	61	6	4,600
MPB-WP	1,148	0	48	2	1,198
MPB-High Elevation	69	0	0	0	69
SAF	725	0	4	5	734
WSBW	10,998	0	3,297	763	15,058

Most all forested area in Lincoln County was surveyed by ADS in 2012. Insect and disease activity was fairly low throughout the county. Mountain pine beetle was the most significant insect causing tree mortality. Mountain pine beetle activity appears to have decreased in 2012, especially in lodgepole and ponderosa pine. The highest level of MPB-caused mortality occurred in the southern portion of the county. Although fewer acres of MPB-caused tree mortality were mapped, the number of trees killed per acre, or the intensity, increased in some locations. Mountain pine beetle activity was also recorded in western white pine in 2012 and confirmed by ground surveys.

Western spruce budworm decreased between 2011 and 2012. Douglas-fir beetle activity and subalpine fir mortality remained at similar levels between 2011 and 2012.

During the 2012 ADS, over 13,000 acres of larch needle diseases were mapped along the western and eastern portions of the county. This is a two-fold increase in larch needle diseases from 2011. Nearly 12,000 of the 13,000 acres are on USFS lands, while nearly 1,000 acres are on private lands, and just over 300 acres were mapped on state lands. One large polygon, almost 300 acres in size, of diplodia tip blight was mapped approximately 7 miles due south of Libby at the landing strip just east of Highway 2. About 2/3 of the polygon is on USFS lands, and the remaining is on private lands. A 51-acre polygon of flooding damage was noted in the northwest portion of the county, about 2 miles east of Cross Mountain in the headwaters of Red Top Creek.

Root diseases are common in counties west of the Continental Divide. The more common ones known to occur in this county are s-type annosus root disease, armillaria root disease, laminated root disease, and schweinitzii root and butt rot. The tree species most affected are Douglas-fir and true firs. P-type annosus root disease is known to occur in ponderosa pine. Annosus root disease was causing notable damage in subalpine fir in the Lake Creek Campground south of Libby (MFO-TR-12-08) and in subalpine fir and Engelmann spruce on the east side of Lake Koocanusa (MFO-TR-12-25). Armillaria root disease was contributing to decline and mortality in a WWP genetic test plantation in Quartz Creek outside of Libby (MFO-TR-12-46), decline of western white pine plus trees in Meadow Creek (MFO-TR-12-38), and creating small openings in Douglas-fir on private lands near Lake Creek Camp Ground (MFO-TR-12-08). Schweinitzii root and butt rot was found in two stands on the east side of Koocanusa Reservoir contributing to the overall attraction of DFB to Douglas-fir (MFO-TR-12-50), and contributing to blow down of Douglas-fir (MFO-TR-12-25).

A needle disease, likely caused by *Lophodermium nitens*, was impacting a WWP plantation in Quartz Creek west of Libby (MFO-TR-12-46) and western white pine in a Meadow Creek plantation (MFO-TR-12-38). Larch needle blight was affecting western larch in the same Meadow Lake stand. Heartwood decays, including red ring rot in Engelmann spruce and Indian paint fungus in subalpine fir, were common in Lake Creek CG (MFO-TR-12-08).

Atropellis cankers are present in many lodgepole pine east of Lake Koocanusa, reducing vigor of individual trees, and contributing to stem failure (MFO-TR-12-25).

White pine blister rust is common in both western white pine and whitebark pine. A western white pine plantation established in 1989 in Hellroaring Creek now has about 70% infection rate from white pine blister rust (MFO-TR-12-38). Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are present in this county.

Madison County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	592,485	103,957	175,620	13,957	886,020
DFB	6	0	2	0	8
MPB-LPP	1,204	429	40	46	1,719
MPB-High Elevation	1,148	2	415	0	1,565
SAF	60	0	6	0	66
WSBW	11,733	7,952	2,580	494	22,759

In 2012, only a small portion of Madison County was surveyed; less than ¼ of the area surveyed in 2011 with no new areas covered. Areas surveyed include most of the Gravelly Range and areas between Lee Metcalf Wilderness and Madison County's eastern border.

Although MPB continues to kill lodgepole pine and high elevation 5-needle pines, activity has greatly diminished over the last several years due to host depletion. However, large patches of high elevation 5-needle pines mortality were mapped in the area between the Lee Metcalf Wilderness and the county's eastern border (SW of Big Sky Mountain). Some DFB activity and subalpine fir mortality were noted at low levels, and ground observations confirm continued ESB activity in the Gravelly Range.

During a visit (MFO-TR-12-48) to the Middle Ruby project area managed by the BLM, tomentosus root disease and schweinitzii root and butt rot were identified as problems in Douglas-fir. Also, whitebark pine plus trees (putatively resistant to white pine blister rust) were examined for rust cankers and risk from bark beetles during that visit. White pine blister rust is common in whitebark pine and limber pine. Limber pine dwarf mistletoe is present in this county.

Meagher County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	445,927	6,816	200,709	13,472	666,924
DFB	8	0	12	0	20
MPB-LPP	24,504	69	2,005	94	26,672
MPB-PP	7,145	486	7,672	212	15,514
MPW-High Elevation	1,417	0	8	0	1,425
SAF	50	0	2	0	52
WSBW	91,059	3,490	95,960	5,733	196,242
Wind throw	50	0	0	0	50

The vast majority of this county was surveyed with aerial flights in 2012 while virtually none was surveyed in 2011. Western spruce budworm was the most significant damage agent and was mapped throughout the county across almost 200,000 acres. Defoliation was primarily within Douglas-fir host types. Mountain pine beetle activity continued within lodgepole pine and ponderosa pine host types as well as within high elevation white pines, with most damage observed within the central portion of the county.

About 50 acres of windthrown lodgepole pine were detected in the north part of Section 18, T. 12 N., R. 7 E. by ADS. Lodgepole pine dwarf mistletoe is present in this county.

Mineral County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	630,827		68,591	20,604	720,022
DFB	207	0	22	15	244
ESB	6	0	0	0	6
FE	10	0	0	0	10
Larch Needle Diseases	12,288	0	133	38	12,459
MPB-LPP	3,834	0	54	2	3,890
MPB-PP	1,490	0	76	22	1,588
SAF	116	0	2	0	118
WSBW	374	0	0	0	374

All of the forested areas of Mineral County were surveyed in 2012. Mountain pine beetle remains active at low and scattered levels throughout the county, but overall number of acres recorded decreased from 2011 for both lodgepole and ponderosa pine. However, large groups of MPB-killed lodgepole pine were recorded just north of Lolo Pass and, in some areas, the number of trees per acre killed increased. Other bark beetles species were recorded at similar low levels between 2011 and 2012.

Western spruce budworm defoliation was recorded on almost twice as many acres in 2012 as in 2011, but remained very low.

Nearly 12,500 acres of larch needle diseases were detected by ADS across the county, with most damage in the northwestern portion. Forest Health Protection visits occurred in Cabin City Campground (MFO-TR-12-43) and Slowey Campground (MFO-TR-12-44) to support development of vegetation management plans for those two recreation sites.

White pine blister rust is common in western white pine and whitebark pine. The more common root diseases known to occur in this county are s-type annosus root disease, armillaria root disease, laminated root disease, and schweinitzii root and butt rot. The species most affected are Douglas-fir and true firs. Tomentosus root disease has been found impacting western larch trees heavily infected with larch dwarf mistletoe. P-type annosus root disease is known to occur in ponderosa pine. Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are also present in this county.

Missoula County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	651,948	21,044	605,829	126,487	1,405,307
DFB	119	24	57	11	211
ESB	0	0	2	0	2
Larch Needle Diseases	470	144	464	90	1,168
MPB-LPP	20,415	935	4,874	416	26,640
MPB-PP	4,928	85	4,766	2,614	12,392
MPB-High Elevation	2	2	0	2	6
IPS	0	0	0	2	2
SAF	137	40	20	4	201
WPB	2	2	0	0	4
WSBW	28,903	1,481	26,844	4,827	62,055

A majority of forested areas in Missoula County were surveyed in 2012. Western spruce budworm increased and became more widespread in 2012, especially in the northeast part of the county. Ground surveys confirmed that in areas north of Seeley Lake WSBW caused significant defoliation and damage to overstory Douglas-fir and outright killed understory trees (MF0-TR-12-37).

Mountain pine beetle activity continued in both lodgepole and ponderosa pine, at some level, throughout most of the county. Areas with significant levels of MPB-caused mortality included: along the west-side of county between Lolo Hot Springs and Alberton; along the Blackfoot river from Bonner east to the County line; and in the northeastern portion of the county. Other bark beetles remained at low and scattered levels throughout the county. Subalpine fir mortality was recorded again on a few hundred acres.

During the 2012 ADS, over 1,100 acres of larch needle diseases were mapped across the county, with many polygons in the northwest leg of the county in the Ninemile drainage and in Bales Creek drainage southwest of Seeley Lake. One 213-acre polygon was mapped just north of Cottonwood Lakes near Seeley Lake. Almost 500 acres of the larch needle disease polygons were on USFS lands, nearly 500 acres on private lands, and the rest distributed between BLM, state, and tribal lands.

White pine blister rust is common in both western white pine and whitebark pine. Root diseases are common in counties west of the Continental Divide. The more common ones known to occur in this county are s-type annosus root disease, armillaria root disease, laminated root disease, and schweinitzii root and butt rot. The tree species most affected are Douglas-fir and true firs. P-type annosus root disease is known to occur in ponderosa pine. Armillaria root disease was causing significant openings and infecting regeneration in Heyer's Gulch, northeast of Bonner Mountain (MFO-TR-12-47); tree species mainly affected were Douglas-fir and subalpine fir. Schweinitzii root and butt rot was also found infecting the larger Douglas-fir in the area. Large pockets of armillaria root disease were found on the hillsides east of Lindberg Lake in the Swan Valley (MFO-TR-12-26), and annosus root disease was common and causing openings in subalpine fir along the main Beaver Creek Road (MFO-TR-12-26).

Elytroderma needle disease is a significant agent in ponderosa pine in localized areas in this county. Comandra blister rust is common in ponderosa pine in this county. Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are present in this county.

Following a wind event in June, several areas of windthrow were found near several campgrounds north of Seeley Lake.

Musselshell County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	0	16,218	279,834	10,986	307,038
MPB-PP	0	0	294	0	294

Only a small area in the northwest portion of Musselshell County had aerial survey and no ground survey occurred in 2012. In this small area, sporadic MPB activity was detected in ponderosa pine host.

Park County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	717,518	73,375	190,718	26,794	1,008,405
DFB	14	0	10	0	24
MPB-LPP	1,047	0	980	2	2,029
MPB-PP	0	0	2	2	4
MPB-High Elevation	295	5	176	0	476
SAF	49	0	11	0	60
WSBW	19,854	1,337	51,391	723	73,305

The northern and western portions of Park County were flown in 2012, compared to most all forested area in 2011. Mountain pine beetle activity continued to decline and occurred in limited areas within lodgepole pine and high elevation white pine hosts. Western spruce budworm-caused defoliation continued as the primary pest agent throughout the county, as over 73,000 acres were mapped in 2012; Douglas-fir was primarily defoliated. Western spruce budworm activity increased in 2012 within the Pine Creek drainage area and caused damage at moderate levels (20-70% new growth defoliation). Vegetation throughout the Main Boulder Canyon area also had continued light defoliation; northern portions of the canyon had 5-10% new growth defoliation while southern portions had 10-30% (MFO-TR-12-12).

Douglas-fir beetle has been active within WSBW-defoliated trees within the Main Boulder Canyon of the Beartooth Mountains (MFO-TR-12-12) and the Mill Creek drainage of the Absaroka Range in small pockets up to 5-10 trees/group (MFO-TR-12-48). Douglas-fir beetle-caused mortality is often hard to detect in defoliated trees, thus the aerial surveyed acres and trees reported for DFB in this county are likely underestimated.

In Snowbank Campground, spruce was affected by tomentosus root disease and Douglas-fir was affected by schweinitzii root and butt rot due to the aging of the stand (MFO-TR-12-42). White pine blister rust is common in whitebark pine and limber pine stands. Tomentosus root disease is known to be significant in some campgrounds, and lodgepole pine dwarf mistletoe is present in the county.

Phillips County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	0	96,621	40,352	3,363	140,336
DFB	0	6	0	0	6
MPB-LPP	0	14	0	0	14
MPB-PP	0	646	28	16	690
WSBW	0	144	78	0	222

The western forested portions of Phillips County located on the Fort Belknap Indian Reservation were surveyed in 2012. In this location, MPB activity continued at moderate or incipient levels throughout lodgepole pine and ponderosa pine host types. Specifically, mass-attacked trees were observed within numerous groups in White Cow Canyon (up to 15 trees/group) and to a lesser extent in Mission Canyon (up to 4 trees/group) (MFO-TR-12-13).

Western gall rust and comandra blister rust are common in ponderosa pine on the Fort Belknap Indian Reservation (MFO-TR-12-13) causing stem deformities, branch mortality, top kill, and occasional whole tree mortality. Also, armillaria root disease can be found on the Fort Belknap IR, Mission Canyon area, with large pockets developing in Douglas-fir and aspen (MFO-TR-12-13), and marssonina leaf spot and aspen heart rot are also prevalent in many aspen locations (MFO-TR-12-13).

Lodgepole pine dwarf mistletoe is present in this county.

Pondera County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	121,991	0	6,386	0	128,377
Aspen Damage	0	1,172	494	0	1,665
MPB-LPP	0	316	0	0	316
MPB-High Elevation	0	0	2	0	2
SAF	0	4	0	0	4
WSBW	12	2,975	568	0	3,555

The western end of Pondera County was surveyed in both 2011 and 2012. However, the 2011 survey was largely within National Forest Service boundaries while the 2012 survey was largely over tribal, private, and FWS lands. These lower elevation lands have different forest types, accounting for much of the difference in damage agent activity despite similar total area surveyed. Although MPB remains present, mortality levels are low.

Also noted were areas of aspen damage and WSBW defoliation on tribal lands. Aspen damage was noted across the northern Rocky Mountain Front; however, the cause of this damage has not been identified on the ground.

White pine blister rust is common in whitebark pine and limber pine in this county.

Powell County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	635,503	74,015	243,278	29,496	982,293
DFB	130	12	17	4	163
ESB	0	0	2	0	2
Larch Needle Diseases	26	0	16	0	42
MPB-LPP	9,031	7,592	2,984	467	20,074
MPB-PP	470	719	2,088	270	3,547
MPB-High Elevation	16	0	0	0	16
SAF	68	0	0	0	68
WSBW	25,725	4,052	18,706	2,474	50,957

A majority of Powell County was surveyed in 2012. Mountain pine beetle activity continued in both lodgepole and ponderosa pine across the county. The level and intensity of the outbreak, however, appears to continue to decline across most of the county in both lodgepole pine and ponderosa pine. Larger polygons of MPB-caused tree mortality were mapped northeast of Ovando in the Garnet Range; on Mt. Powell in the southeast corner of the county; and along the Continental Divide near Nevada Lake.

Western spruce budworm-caused damage decreased in number of acres defoliated and intensity of defoliation in 2012 compared to 2011. However, significant defoliation from WSBW was recorded along the eastern border of the county. Douglas-fir beetle-caused mortality was low and decreased between 2011 and 2012.

Ravalli County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	1,071,976	0	120,837	27,009	1,219,822
DFB	41	0	152	0	193
MPB-LPP	138,398	0	4,328	616	143,342
MPB-PP	38,232	0	4,987	2,372	45,591
MPB-High Elevation	1,425	0	0	0	1,425
Pine Butterfly	0	0	2	0	2
SAF	26	0	0	0	26
WSBW	11,784	0	671	97	12,552
Windthrow	30	0	0	0	30

Most all Ravalli County was surveyed in 2012, with slightly more acres flown in 2012 versus 2011. Mountain pine beetle continued to be the most prevalent tree killing insect. Number of acres affected by MPB almost doubled for lodgepole pine and ponderosa pine, and increased nearly 12 fold in high elevation five-needle pines. Large (500-2000 acre) polygons of MPB-killed trees were mapped throughout the county in both lodgepole pine and ponderosa pine. Mountain pine beetle caused tree mortality at landscape epidemic levels and numerous pockets of mortality (20-300 trees/group) were observed throughout the West Fork, Bitterroot River and Lake Como areas, and to a lesser extent in the East Fork, Bitterroot River. Mountain Pine beetle-caused mortality continued in ponderosa pines at moderate levels (typically 5-10 trees/group) (MF0-TR-12-17). Mountain pine beetle also continues to increase in lodgepole pine stands on and adjacent to Lost Trail Powder Mountain (MF0-TR-12-06). Mountain pine beetle is attacking ponderosa pine trees as small as 3 inches in diameter and as large as

40. Mountain pine beetle is expected to continue on this increasing trajectory as long as suitable host trees remain and barring any unusual weather event. Other bark beetles remained at low and scattered levels throughout the county, including DFB.

Acres defoliated by WSBW almost doubled between 2011 and 2012. Large areas of WSBW-caused defoliation in primarily Douglas-fir and true firs were mapped east of Corvallis, while number of acres of ponderosa pine defoliated by pine butterfly fell significantly.

Areas that had epidemic levels of pine butterfly in 2011 were revisited in August of 2012. Visual surveys indicated no defoliation. Skalkaho Pass was the only site where pine butterfly defoliated trees in 2011, and surveys of the area in 2012 indicated new growth of the affected ponderosa pine and no apparent defoliation in 2012.

One 30-acre polygon of windthrow was mapped on USFS lands on the east side of Painted Rocks Reservoir, about 1 ½ miles upstream from the campground on a small fork of Slate Creek.

White pine blister rust is common in whitebark pine. Root diseases are common in counties west of the Continental Divide. The more common ones known to occur in this county are: s-type annosus root disease, armillaria root disease, laminated root disease, and schweinitzii root and butt rot. The tree species most affected are Douglas-fir and true firs. P-type annosus root disease is known to occur in ponderosa pine in the foothills of both the Bitterroot and Sapphire Mountains.

Elytroderma needle disease is a significant agent in ponderosa pine in localized areas in this county; high levels continue to exist in the area around Lake Como. Notable levels of comandra blister rust cause top kill in ponderosa pine in the foothills of the Bitterroot Mountains.

Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are present in this county, with Douglas-fir dwarf mistletoe being quite common in the lower elevations of the Sapphire and Bitterroot Mountains.

Sanders County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	941,349	6,656	423,104	55,697	1,426,805
Diplodia Canker	0	0	45	0	45
DFB	148	22	74	36	280
Elytroderma	0	31	4	0	35
ESB	12	0	0	0	12
FE	10	0	4	0	14
Flooding	5	0	15	0	20
Larch Needle Diseases	10,241	173	959	138	11,511
MPB-LPP	10,603	150	463	2	11,218
MPB-PP	184	419	93	33	729
MPB-WP	61	0	0	0	61
MPB-High Elevation	43	0	0	0	43
IPS	2	2	0	0	4
SAF	70	10	2	0	82
WSBW	10,335	3,258	779	290	14,662
BWA	41	0	0	0	41

A majority of Sanders County was surveyed in 2012; approximately 30% more acres were surveyed by ADS in 2012 versus 2011. Mountain pine beetle is the most significant insect found in the county. It is especially active in the northwest corner of the county. Acres of MPB-killed lodgepole pine were similar between 2011 and 2012, but the intensity (trees per acre killed) increased in some areas, while in other areas MPB decreased because of host depletion. The number of acres of ponderosa pine killed by MPB slightly decreased and MPB-caused mortality remained low in western white pine and high elevation 5-needle pines. Other bark beetle activity remained at low and scattered levels throughout the county.

Number of acres defoliated and the intensity of defoliation from WSBW significantly decreased in 2012. However, polygons of WSBW caused-defoliation were found further south in the county than in the previous year.

Subalpine fir mortality was noted in the county, as well as balsam woolly adelgid; both at low and scattered levels.

Over 11,000 acres of larch needle diseases were mapped during the 2012 ADS, up from 4,000 acres in 2011. Most of the polygons are in the northwest corner of the county along the border with Idaho and a few are in the southeast leg of the county. Two polygons of Rhabdocline needle cast, adding up to just over 300 acres, were also mapped on the Flathead Indian Reservation: a 225-acre polygon at the head of Wilcox Creek just northeast of Perma; and a 79-acre polygon just southeast of the larger polygon, but on the east side of the ridge. Rhabdocline needle cast also continues to be a significant agent in Douglas-fir in the Plains Tree Improvement Area (MFO-TR-12-15). Elytroderma needle disease is a significant agent in ponderosa pine in localized areas in this county. A number of areas of elytroderma needle blight were identified, mostly on the Flathead IR: a 29-acre polygon about 2 ½ miles northwest of the junction of Valley Creek and North Fork Valley Creek; two small polygons, 2 acres each, about 2 ½ miles northwest and 2 ½ miles northeast of Upper Dry Fork Reservoir; and a third 2-acre polygon located right on the western edge of Hot Springs. Two polygons of diplodia tip blight, adding up to 45 acres, were also mapped in the county: a 28-acre polygon southwest of Dixon, near Revais Canal between Revais Creek and Selow Creek; and a 17-acre polygon along North Fork Valley Creek, about one mile upstream from its junction with Valley Creek. One 18-acre polygon of flooding damage was mapped, mostly on private lands along the Little Thompson River upstream from its confluence with Nancy Creek.

Root diseases are common in counties west of the Continental Divide. The more common ones known to occur in this county are s-type annosus root disease, armillaria root disease, laminated root disease, and schweinitzii root and butt rot. The tree species most affected are Douglas-fir and true firs. P-type annosus root disease is known to occur in ponderosa pine, while tomentosus root disease is known to occur in localized areas in the county, affecting Douglas-fir and spruce. Armillaria root disease was found contributing to the decline and mortality of ponderosa pine in a plantation northwest of Trout Creek in the McKay Creek drainage (MFO-TR-12-09). In this same drainage, dothistroma needle blight was causing thinning of the ponderosa pine crowns. Armillaria root disease and black stain root disease were found contributing to the selection of (i.e. attacks on) ponderosa pine trees by MPB in the Minton Creek drainage west of Trout Creek (MFO-TR-12-09), and armillaria root disease was found impacting Douglas-fir in the Clear Creek Project Area on the Lolo National Forest (MFO-TR-12-34). Also in the Clear

Creek Project Area, two top rotting fungi, *Fomitopsis rosea* and *Stereum sanguinolentum* were found contributing to stem breakage in Douglas-fir (MFO-TR-12-34).

Western larch dwarf mistletoe, armillaria root disease and tomentosus root disease continue to contribute to the decline of western larch along Montana State Highway 135 between St. Regis and Paradise.

White pine blister rust is common in both western white pine and whitebark pine. Douglas-fir dwarf mistletoe, lodgepole pine dwarf mistletoe, and western larch dwarf mistletoe are present and common in this county.

Silver Bow County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	149,885	22,340	70,365	6,275	248,865
DFB	3	1	0	2	6
MPB-LPP	5,807	28	142	128	6,105
MPB-PP	10	13	2	0	25
MPB-High Elevation	76	0	0	0	76
SAF	10	0	0	0	10
WSBW	494	371	1,429	204	2,498

Except for the Highland Mountains, most of Silver Bow County was surveyed in 2012. This is nearly 5 times more area than surveyed in 2011, when only stands north of Butte were flown. The 15 to 48 fold increase in MPB trees-killed and acres-affected (respectively) is due partly to this increase in area surveyed. Much of this MPB activity occurred in lodgepole pine in the Fleecer Mountains (west of I-15); very little activity was noted elsewhere. Very little DFB activity or subalpine fir mortality were noted in the county, and low levels of WSBW were detected and occurred mostly in isolated, large patches north of the Continental Divide.

White pine blister rust is common in whitebark pine and limber pine.

Sweet Grass County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	253,917	11,016	145,038	4,108	414,078
DFB	14	0	10	0	24
MPB-LPP	30	0	18	0	48
MPB-High Elevation	11	0	9	0	20
SAF	7	0	5	0	12
WSBW	8,670	50	15,791	304	24,815

Within Sweetgrass County in 2012, aerial surveys were limited to the northwestern area and limited ground surveys occurred. Western spruce budworm-caused defoliation, primarily in Douglas-fir and to a lesser extent in subalpine fir and Engelmann spruce, was detected throughout the portion of the Crazy Mountains that lies within county borders. This defoliation continued since 2011 and was mapped in twice as many acres as detected in 2011. Areas within Big Timber Canyon were surveyed with a field

visit. In this location defoliation continued, although damage was slightly less within affected trees in 2012 relative to 2011. Within Douglas-fir in this canyon, damage levels averaged 30% total crown defoliation (range 0-90%), and multiple pockets of DFB-caused mortality were observed within defoliated trees (MFO-TR-12-42). DFB-caused mortality is often hard to detect in defoliated trees; thus, the aerial surveyed acres and trees reported for DFB in this county are likely underestimated.

Tomentosus root disease, schweintizii root and butt rot, and stem decays are affecting the aging trees in Halfmoon Campground (MFO-TR-12-42). White pine blister rust has been found in whitebark pine and limber pine in this county.

Teton County

No aerial survey was conducted in 2012; survey is available from 2011.

Armillaria root disease is actively killing Douglas-fir, spruce, and aspen within Cave Mountain Campground (MFO-TR-12-30). Evidence of tomentosus root disease and schweinitzii root and butt rot was observed directly above the campground. White pine blister rust is common in whitebark pine and limber pine in this county.

Toole County

No aerial or ground surveys occurred within Toole County in 2012.

White pine blister rust occurs in whitebark pine and limber pine in this county.

Wheatland County

Forestland, Mortality, and Defoliation Acres by Ownership

	National Forest	*Other Federal*	*Private*	*State*	*Total*
Forestland	55,823	0	24,423	0	80,245
DFB	14	0	2	0	16
MPB-LPP	4,039	0	61	0	4,100
MPB-PP	6,559	127	4,893	90	11,669
MPB-High Elevation	27	0	0	0	27
SAF	8	0	2	0	10
WSBW	20,470	91	8,238	780	29,579

Most all of the forested area in Wheatland County was surveyed in 2012 with over twice the area surveyed than in 2011. Both years concentrated on the northwest and southwest corners of the county corresponding with the Little Belt and Crazy Mountains, respectively. High levels of MPB activity continued in the Little Belts in both ponderosa pine and lodgepole pine, with high elevation 5-needle pine mortality occurring in high elevations along the border with Judith Basin. Despite an increase in acres-affected by MPB, total number of estimated trees-killed actually decreased, suggesting that intensity of activity decreased some. In neither 2011 nor 2012 was there much MPB activity noted in non-FS lands around the Crazy Mountains. Very little mortality attributed to DFB and SAF-complex was detected in the county. However, defoliation by WSBW remained high, perhaps increasing in area affected, with WSBW being the principle insect damage agent in the Crazy Mountain area.

White pine blister rust occurs in limber pine in this county.

Table 1. Forest Mortality, Defoliation, and Other Damage on Montana National Forests, National Parks, and Tribal Lands, 2011

BEAVERHEAD NF

DILLON RD	Acres	Trees
Douglas-fir Beetle	47	35
Engelmann Spruce Beetle	4	7
Mountain Pine Beetle (LPP)	12,792	25,524
Subalpine Fir Mortality	32	68
MPB (High Elev 5-needle Pines)	4,593	11,901
Western Spruce Budworm	47,291	0
MADISON RD		
MPB (High Elev 5-needle Pines)	88	94
SHERIDAN RD		
Douglas-fir Beetle	4	8
Mountain Pine Beetle (LPP)	1,192	2,804
Subalpine Fir Mortality	2	10
MPB (High Elev 5-needle Pines)	150	643
Western Spruce Budworm	8,584	0
WISDOM RD		
Douglas-fir Beetle	6	15
Engelmann Spruce Beetle	14	19
Mountain Pine Beetle (LPP)	19,308	91,376
MPB (High Elev 5-needle Pines)	462	2,213
Western Spruce Budworm	1,155	0
WISE RIVER RD		
Douglas-fir Beetle	8	9
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (PP)	54	26
Mountain Pine Beetle (LPP)	34,647	103,988
Subalpine Fir Mortality	14	25
MPB (High Elev 5-needle Pines)	3,120	4,862
Western Spruce Budworm	9,166	0

BITTERROOT NF

DARBY RD	Acres	Trees
Douglas-fir Beetle	2	2
Mountain Pine Beetle (PP)	17,376	11,913
Mountain Pine Beetle (LPP)	29,388	35,862
Subalpine Fir Mortality	4	3
MPB (High Elev 5-needle Pines)	224	77
Western Spruce Budworm	3,320	0

STEVENSVILLE RD	Acres	Trees
Mountain Pine Beetle (PP)	2,644	752
Mountain Pine Beetle (LPP)	11,874	9,813
MPB (High Elev 5-needle Pines)	438	223
Western Spruce Budworm	3,475	0
SULA RD		
Mountain Pine Beetle (PP)	4,168	2,680
Mountain Pine Beetle (LPP)	35,850	64,287
Subalpine Fir Mortality	2	5
MPB (High Elev 5-needle Pines)	576	406
Western Spruce Budworm	4,212	0
WEST FORK RD		
Douglas-fir Beetle	2	1
Mountain Pine Beetle (PP)	18,000	27,078
Mountain Pine Beetle (LPP)	64,984	94,233
Subalpine Fir Mortality	20	25
MPB (High Elev 5-needle Pines)	188	115
Western Spruce Budworm	1,143	0
Windthrow	30	0

DEERLODGE NF

BUTTE RD		
Douglas-fir Beetle	4	4
Mountain Pine Beetle (LPP)	1,712	3,502
Subalpine Fir Mortality	4	10
MPB (High Elev 5-needle Pines)	68	24
Western Spruce Budworm	643	0
DEER LODGE RD		
Douglas-fir Beetle	14	21
Mountain Pine Beetle (PP)	56	145
Mountain Pine Beetle (LPP)	15,174	27,428
MPB (High Elev 5-needle Pines)	512	690
Western Spruce Budworm	363	0
JEFFERSON RD		
Douglas-fir Beetle	4	3
Mountain Pine Beetle (PP)	70	325
Mountain Pine Beetle (LPP)	5,067	8,763
MPB (High Elev 5-needle Pines)	2	1

	Acres	Trees
Western Spruce Budworm	15,757	0
PHILIPSBURG RD		
Douglas-fir Beetle	14	28
Engelmann Spruce Beetle	2	3
Mountain Pine Beetle (PP)	830	1,478
Mountain Pine Beetle (LPP)	75,183	244,553
Subalpine Fir Mortality	2	5
MPB (High Elev 5-needle Pines)	255	438
Western Spruce Budworm	333	0
FLATHEAD NF		
GLACIER VIEW RD		
Douglas-fir Beetle	12	12
Mountain Pine Beetle (LPP)	1,214	1,683
Fir Engraver Beetle	2	1
Subalpine Fir Mortality	208	157
MPB (High Elev 5-needle Pines)	4	2
Western Spruce Budworm	22,511	0
Larch Needle Diseases	557	0
HUNGRY HORSE RD		
Douglas-fir Beetle	50	66
Mountain Pine Beetle (PP)	2	1
Mountain Pine Beetle (LPP)	1,252	5,172
Subalpine Fir Mortality	14	19
Western Spruce Budworm	44,163	0
SPOTTED BEAR RD		
Douglas-fir Beetle	40	52
Engelmann Spruce Beetle	2	1
Mountain Pine Beetle (PP)	2	1
Mountain Pine Beetle (LPP)	2,351	3,740
Subalpine Fir Mortality	4	6
MPB (High Elev 5-needle Pines)	2	1
Western Spruce Budworm	24,682	0
SWAN LAKE RD		
Douglas-fir Beetle	79	73
Mountain Pine Beetle (PP)	136	215
Mountain Pine Beetle (LPP)	1,540	3,011
Subalpine Fir Mortality	16	15
Western Spruce Budworm	22,996	0
Douglas-fir Tussock Moth	48	0

	Acres	Trees
Larch Needle Diseases	1,469	0
Windthrow	81	0
Flooding - High Water	2	5
TALLY LAKE RD		
Douglas-fir Beetle	16	17
Mountain Pine Beetle (PP)	4	2
Mountain Pine Beetle (LPP)	20	50
Subalpine Fir Mortality	17	24
Western Spruce Budworm	11,892	0
Douglas-fir Tussock Moth	1,219	0
Larch Needle Diseases	5,923	0
GALLATIN NF		
BIG TIMBER RD		
Douglas-fir Beetle	14	21
Mountain Pine Beetle (LPP)	86	300
Subalpine Fir Mortality	11	39
MPB (High Elev 5-needle Pines)	20	27
Western Spruce Budworm	15,468	0
BOZEMAN RD		
Douglas-fir Beetle	153	276
Mountain Pine Beetle (PP)	6	6
Mountain Pine Beetle (LPP)	2,137	6,434
Subalpine Fir Mortality	43	146
MPB (High Elev 5-needle Pines)	2,867	7,981
Western Spruce Budworm	88,873	0
GARDINER RD		
Douglas-fir Beetle	8	13
Mountain Pine Beetle (LPP)	67	185
Subalpine Fir Mortality	32	110
MPB (High Elev 5-needle Pines)	90	168
Western Spruce Budworm	6,285	0
HEBGEN LAKE RD		
Douglas-fir Beetle	8	9
Engelmann Spruce Beetle	8	15
Mountain Pine Beetle (LPP)	305	812
Subalpine Fir Mortality	158	290
MPB (High Elev 5-needle Pines)	482	753
Western Spruce Budworm	12,909	0
Avalanche	72	100

	Acres	Trees
LIVINGSTON RD		
Douglas-fir Beetle	12	16
Mountain Pine Beetle (LPP)	1,313	2,818
Subalpine Fir Mortality	62	180
MPB (High Elev 5-needle Pines)	1,223	3,401
Western Spruce Budworm	17,355	0
HELENA NF		
HELENA RD		
Douglas-fir Beetle	51	31
Mountain Pine Beetle (PP)	3,496	9,598
Mountain Pine Beetle (LPP)	5,045	10,901
Subalpine Fir Mortality	20	73
MPB (High Elev 5-needle Pines)	8	18
Western Spruce Budworm	64,998	0
LINCOLN RD		
Douglas-fir Beetle	10	12
Mountain Pine Beetle (PP)	95	195
Mountain Pine Beetle (LPP)	484	1,698
Subalpine Fir Mortality	2	5
Western Spruce Budworm	22,650	0
TOWNSEND RD		
Douglas-fir Beetle	8	11
Mountain Pine Beetle (PP)	1,937	6,158
Mountain Pine Beetle (LPP)	9,351	24,621
Subalpine Fir Mortality	14	28
MPB (High Elev 5-needle Pines)	495	509
Western Spruce Budworm	111,929	0
KOOTENAI NF		
CABINET RD		
Douglas-fir Beetle	94	123
Pine Engraver Beetle (PP)	2	1
Mountain Pine Beetle (WP)	61	32
Mountain Pine Beetle (PP)	72	71
Mountain Pine Beetle (LPP)	10,183	27,159
Fir Engraver Beetle	4	6
Subalpine Fir Mortality	20	15
MPB (High Elev 5-needle Pines)	43	32
Balsam Wooly Adelgid	41	0
Western Spruce Budworm	4,194	0

	Acres	Trees
White Pine Blister Rust	51	0
Larch Needle Diseases	7,990	0
FISHER RIVER RD		
Douglas-fir Beetle	167	156
Engelmann Spruce Beetle	6	3
Mountain Pine Beetle (WP)	182	151
Mountain Pine Beetle (PP)	135	163
Mountain Pine Beetle (LPP)	1,101	2,909
Fir Engraver Beetle	10	7
Subalpine Fir Mortality	28	21
Western Spruce Budworm	9,383	0
Larch Casebearer	7	0
White Pine Blister Rust	137	0
Larch Needle Diseases	351	0
FORTINE RD		
Douglas-fir Beetle	74	71
Engelmann Spruce Beetle	28	20
Mountain Pine Beetle (WP)	14	13
Mountain Pine Beetle (PP)	2	1
Mountain Pine Beetle (LPP)	30	133
Fir Engraver Beetle	4	2
Subalpine Fir Mortality	184	186
Western Spruce Budworm	368	0
Larch Needle Diseases	505	0
LIBBY RD		
Douglas-fir Beetle	110	119
Engelmann Spruce Beetle	18	10
Mountain Pine Beetle (WP)	199	59
Mountain Pine Beetle (PP)	97	65
Mountain Pine Beetle (LPP)	49	141
Fir Engraver Beetle	10	7
Subalpine Fir Mortality	50	54
Western Spruce Budworm	1,686	0
White Pine Blister Rust	191	0
Diplodia Canker	274	0
Larch Needle Diseases	1,568	0
REXFORD RD		
Douglas-fir Beetle	48	48
Engelmann Spruce Beetle	2	1

	Acres	Trees
Mountain Pine Beetle (WP)	695	325
Mountain Pine Beetle (PP)	177	28
Mountain Pine Beetle (LPP)	21	88
Fir Engraver Beetle	12	7
Subalpine Fir Mortality	114	113
Western Spruce Budworm	955	0
White Pine Blister Rust	667	0
Larch Needle Diseases	155	0
THREE RIVERS RD		
Douglas-fir Beetle	112	173
Engelmann Spruce Beetle	30	35
Mountain Pine Beetle (WP)	110	87
Mountain Pine Beetle (PP)	46	51
Mountain Pine Beetle (LPP)	285	646
Fir Engraver Beetle	10	11
Subalpine Fir Mortality	322	575
MPB (High Elev 5-needle Pines)	69	30
Balsam Wooly Adelgid	2	0
Western Spruce Budworm	5,315	0
Larch Casebearer	392	0
White Pine Blister Rust	284	0
Larch Needle Diseases	12,321	0
Flooding – High Water	51	0
LEWIS and CLARK NF		
JUDITH RD		
Douglas-fir Beetle	36	23
Pine Engraver Beetle (PP)	109	130
Mountain Pine Beetle (PP)	6,397	4,461
Mountain Pine Beetle (LPP)	23,309	50,065
Subalpine Fir Mortality	67	77
MPB (High Elev 5-needle Pines)	4,718	3,961
Western Spruce Budworm	71,638	0
KINGS HILL RD		
Douglas-fir Beetle	14	9
Engelmann Spruce Beetle	4	4
Pine Engraver Beetle (PP)	2	1
Mountain Pine Beetle (PP)	4,613	7,121
Mountain Pine Beetle (LPP)	14,703	38,908

	Acres	Trees
Subalpine Fir Mortality	19	20
MPB (High Elev 5-needle Pines)	981	1,506
Western Spruce Budworm	24,748	0
Windthrow	50	0
MUSSELSHELL RD		
Douglas-fir Beetle	36	54
Mountain Pine Beetle (PP)	22,821	36,088
Mountain Pine Beetle (LPP)	14,711	51,733
Subalpine Fir Mortality	55	119
MPB (High Elev 5-needle Pines)	468	786
Western Spruce Budworm	103,193	0
ROCKY RD		
Western Spruce Budworm	21	0
LOLO NF		
MISSOULA RD		
Douglas-fir Beetle	140	190
Engelmann Spruce Beetle	2	2
Pine Engraver Beetle (PP)	2	1
Mountain Pine Beetle (PP)	7,389	4,758
Mountain Pine Beetle (LPP)	32,567	63,704
Western Pine Beetle	2	1
Subalpine Fir Mortality	146	58
MPB (High Elev 5-needle Pines)	2	3
Western Spruce Budworm	4,052	0
Unidentified Defoliator	35	0
Larch Needle Diseases	112	0
NINEMILE RD		
Douglas-fir Beetle	90	82
Mountain Pine Beetle (PP)	2,530	1,341
Mountain Pine Beetle (LPP)	4,661	7,155
Subalpine Fir Mortality	24	17
Western Spruce Budworm	323	0
Larch Needle Diseases	453	0
PLAINS RD		
Douglas-fir Beetle	34	29
Mountain Pine Beetle (PP)	100	90
Mountain Pine Beetle (LPP)	655	1,362
Subalpine Fir Mortality	29	23

	Acres	Trees
Western Spruce Budworm	1,447	0
Larch Needle Diseases	858	0
Flooding - High Water	18	0
SEELEY LAKE RD		
Douglas-fir Beetle	142	71
Mountain Pine Beetle (PP)	720	1,442
Mountain Pine Beetle (LPP)	4,510	16,100
Subalpine Fir Mortality	159	132
MPB (High Elev 5-needle Pines)	2	3
Western Spruce Budworm	46,285	0
Larch Needle Diseases	383	0
SUPERIOR RD		
Douglas-fir Beetle	180	162
Engelmann Spruce Beetle	6	4
Mountain Pine Beetle (PP)	228	241
Mountain Pine Beetle (LPP)	1,030	3,144
Fir Engraver Beetle	10	6
Subalpine Fir Mortality	106	75
Western Spruce Budworm	51	0
Larch Needle Diseases	12,355	0
THOMPSON FALLS RD		
Douglas-fir Beetle	46	45
Engelmann Spruce Beetle	12	7
Mountain Pine Beetle (PP)	40	29
Mountain Pine Beetle (LPP)	266	1,266
Fir Engraver Beetle	8	6
Subalpine Fir Mortality	35	30
Western Spruce Budworm	5,408	0
Larch Needle Diseases	3,304	0
BLACKFEET IR		
Aspen Damage	21,493	0
Douglas-fir Beetle	20	41
Engelmann Spruce Beetle	32	45
Mountain Pine Beetle (LPP)	572	2,006
MPB (High Elev 5-needle Pines)	2	3
Subalpine Fir Mortality	63	188
Western Spruce Budworm	28,598	0

	Acres	Trees
FLATHEAD IR		
Diplodia Canker	45	0
Douglas-fir Beetle	171	217
Douglas-fir Tussock Moth	19	0
Elytroderma	1,140	0
Flooding – High Water	2	6
Larch Needle Diseases	230	0
Mountain Pine Beetle (LPP)	947	1,067
Mountain Pine Beetle (PP)	819	845
MPB (High Elev 5-needle Pines)	4	2
Pine Engraver Beetle (LPP)	2	3
Rhabdocline pseudotsugae	304	0
Subalpine Fir Mortality	89	142
Western Pine Beetle	2	1
Western Spruce Budworm	20,472	0
FORT BELKNAP IR		
Douglas-fir Beetle	16	19
Mountain Pine Beetle (LPP)	163	332
Mountain Pine Beetle (PP)	1,241	1,415
Western Spruce Budworm	242	0
ROCKY BOY'S IR		
Douglas-fir Beetle	8	10
Mountain Pine Beetle (LPP)	1,451	5,752
Mountain Pine Beetle (PP)	522	1,207
Western Spruce Budworm	14,523	0
GLACIER NP		
Avalanche	19	100
Douglas-fir Beetle	364	830
Engelmann Spruce Beetle	142	281
Fir Engraver Beetle	2	3
Mountain Pine Beetle (LPP)	4,346	20,796
Mountain Pine Beetle (PP)	2	1
Subalpine Fir Mortality	664	1,254
Western Spruce Budworm	151,568	0
YELLOWSTONE NP		
Mountain Pine Beetle (LPP)	0	1

Table 2. Host Type Infested by Bark Beetles on All Ownerships Statewide, 2012 (Acres)[2]

Insect[1]	USFS	Other Fed	Private	State	Total
DFB	1,681	579	628	124	3,012
ESB	140	170	12	0	322
FE	60	2	18	4	84
IPS	115	2	0	2	119
MPB-LPP	417,547	22,158	39,000	12,513	491,218
MPB-PP	83,942	8,095	51,082	8,365	151,484
MPB-High Elevation	21,374	49	928	18	22,369
MPB-WWP	1,211	0	52	2	1,265
MPB-ALL	524,074	30,302	91,062	20,898	666,336
SAF	1,992	813	84	19	2,908
WPB	2	4	0	0	6

[1]DFB = Douglas-fir beetle; ESB = spruce beetle; FE = fir engraver beetle; IPS = pine engraver beetle; MPB LPP = mountain pine beetle in lodgepole pine; MPB PP = mountain pine beetle in ponderosa pine; MPB 5-NP = mountain pine beetle in 5-Needle pines (WBP & LP); MPB WP = mountain pine beetle in western white pine; MPB All = mountain pine beetle in all pines; SAF = Subalpine fir mortality complex; WPB = western pine beetle

[2]Includes areas surveyed in Yellowstone NP within WY

Table 3. Bark Beetle Infestations Statewide, 2010 – 2012[1]

	2010		2011		2012	
Insects[2]	**Acres**	**Trees**	**Acres**	**Trees**	**Acres**	**Trees**
DFB	16,052	31,219	8,989	15,175	3,012	3,651
ESB	5,827	44,390	3,113	1,182	323	465
FE	286	393	212	326	84	72
MPB	2,159,602	10,910,673	1,033,791	3,653,433	666,336	1,443,184
IPS	197	1,459	115	288	119	141
SAF	23,899	75,793	29,991	41,731	2,908	4,392
WPB	108	57	16	9	6	3
Total	2,205,971	11,063,984	1,076,227	3,712,144	672,788	1,451,908

[1]Includes areas surveyed in Yellowstone NP within WY

[2]DFB = Douglas-fir beetle; ESB = Engelmann spruce beetle; FE = fir engraver beetle; IPS = pine engraver beetle; MPB = mountain pine beetle; SAF = subalpine fir mortality complex; WPB = western pine beetle.

Table 4. Douglas-fir Beetle-Caused Mortality on All Ownerships Statewide, 2010 − 2012

	2010		2011		2012	
Reporting Area	**Acres**	**Trees**	**Acres**	**Trees**	**Acres**	**Trees**
Beaverhead	56*	280*	230*	118*	87*	97*
Bitterroot	1,345	3,415	151*	233*	194*	6*
Bull Mountains	★	★	0	0	★	★
Custer	★	★	154	543	★	★
Deerlodge	206*	402*	251*	386*	60*	87*
Flathead	1,160*	1,506*	1,092*	1,300*	223	251
Fort Peck Lake	★	★	2	1	★	★
Gallatin	5,313*	13,072*	672*	2,394*	209*	354*
Garnets	36*	84*	757*	20*	44	64
Helena	105*	103*	851*	2,483*	101*	93*
Kootenai	373*	682*	953*	1,104*	653	752
Lewis and Clark	5,091*	9,680*	1,908*	4,925*	122*	137*
Lolo	129*	167*	771*	812*	736	689
Blackfeet IR	213	605	★	★	20	41
Crow IR	★	★	575	459	★	★
Flathead IR	10*	16*	108	117	171	217
Fort Belknap IR	0	0	8*	11*	16	19
No. Cheyenne IR	★	★	0	0	★	★
Rocky Boy's IR	2	15	4*	8*	8	10
Glacier NP	362	344	518*	244*	364	830
Yellowstone NP[1]	1,651	4,407	120*	189*	★	★
Total	**16,052**	**34,778**	**9,123**	**15,346**	**3,008**	**3,648**

★ = Not surveyed *= Partially surveyed

[1]Yellowstone NP includes acres in MT, ID, and WY

Table 5. Mountain Pine Beetle-Caused Mortality on State and Private Lands, Statewide, 2010 − 2012(Acres)

	2010				2011				2012			
Reporting Area	**LPP**	**PP**	**5-NP**	**WWP**	**LPP**	**PP**	**5-NP**	**WWP**	**LPP**	**PP**	**5-NP**	**WWP**
Beaverhead	14,912*	0*	970*	0*	5,579*	8*	1,191*	0*	9,090*	32*	27*	0*
Bitterroot	1,385	1,073	6	0	1,382*	1,495*	0*	0*	4,944*	7,397*	0*	0*
Bull Mountains	★	★	★	★	0	377	0	0	★	★	★	★
Custer	★	★	★	★	33	129	2	0	★	★	★	★
Deerlodge	43,923*	686*	7,988*	0*	15,687*	4,869*	430*	0*	16,417*	1,298*	217*	0*
Flathead	3,904*	498*	4*	0*	3,714*	1,110*	2*	0*	531	623	0	2
Fort Peck Lake	★	★	★	★	0	191	0	0	★	★	★	★
Gallatin	49,652*	4*	7,991*	0*	10,018*	4*	3,652*	0*	1,662*	12*	650*	0*
Garnets	25,546*	19,809*	0	0	18,922*	29,044*	0*	0*	3,615	5,238	0	0
Helena	62,367*	137,965*	2,336*	0*	25,120*	23,353*	1*	0*	4,020*	8,999*	2*	0*
Kootenai	1,938*	45*	0*	8*	1,598*	220*	32*	0*	1,025	107	0	52
Lewis and Clark	26,505*	29,185*	937*	0*	7,513*	11,307*	465*	0*	4,401*	30,528*	46*	0*
Lolo	9,785*	6,308*	177*	0*	10,607*	5,679*	0*	0*	5,147	4,583	0	0
Blackfeet IR	680	0	0	0	★	★	★	★	86	0	2	0
Crow IR	★	★	★	★	4	74	2	0	★	★	★	★
Flathead IR	41*	173*	0*	0*	631	243	0	0	44	156	2	0
Fort Belknap IR	61	697	0	0	35*	48*	0*	0*	6	53	0	0
No. Cheyenne IR	★	★	★	★	0	7	0	0	★	★	★	★
Rocky Boy's IR	1,505	2,225	0	0	179*	606*	0*	0*	504	419	0	0
Glacier NP	91	0	0	0	39*	2*	2*	0*	22	0	0	0
Yellowstone NP[1]	0	0	0	0	0*	0*	0*	0*	★	★	★	★
Total	**242,295**	**198,968**	**20,409**	**8**	**101,231**	**78,198**	**5,779**	**0**	**51,514**	**59,445**	**946**	**54**

[1]LPP = lodgepole pine; PP = ponderosa pine; 5-NP = 5-needle pines (WBP & LP); WWP = western white pine

★ = Not surveyed; * = Partially surveyed; [1]Yellowstone NP includes MT, ID, and WY acres

Table 6. Mountain Pine Beetle-Caused Mortality on All Federal Ownerships, Statewide, 2010 − 2012(Acres)

	2010				2011				2012			
Reporting Area	**LPP**	**PP**	**5-NP**	**WWP**	**LPP**	**PP**	**5-NP**	**WWP**	**LPP**	**PP**	**5-NP**	**WWP**
Beaverhead	235,848*	0*	54,069*	0*	91,811*	47*	32,498*	0*	69,551*	67*	8,447*	0*
Bitterroot	69,343	1,648	2,651	0	78,626*	20,262*	118*	0*	138,396*	38,232*	1,425*	0*
Bull Mountains	★	★	★	★	0	358	0	0	★	★	★	★
Custer	★	★	★	★	2,416	564	2,169	0	★	★	★	★
Deerlodge	220,921*	2,061*	18,829*	0*	83,703*	2,415*	146*	0*	92,093*	1,047*	668*	0*
Flathead	73,260*	854*	3,581*	2*	6,063*	1,674*	26*	77*	5,876	118	6	0
Fort Peck Lake	★	★	★	★	0	0	0	0	★	★	★	★
Gallatin	98,259*	0*	37,264*	0*	29,821*	2*	16,059*	0*	2,416*	2*	4,134*	0*
Garnet	47,093*	3,727*	0*	0*	36,600*	4,963*	0*	0*	8,151	968	0	0
Helena	295,815*	63,308*	11,578*	0*	181,007*	12,683*	77*	0*	14,319*	6,209*	503*	0*
Kootenai	11,911*	174*	4*	8*	15,003*	1,182*	32*	0*	10,639	451	112	1,211
Lewis and Clark	289,956*	17,286*	22,181*	0*	94,411*	24,589*	11,859*	0*	52,792*	35,129*	6,120*	0*
Lolo	55,567*	2,106*	0*	0*	54,163*	8,262*	112*	0*	38,651	7,858	4	0
Blackfeet IR	2,412	0	10	0	★	★	★	★	486	0	0	0
Crow IR	★	★	★	★	2,082	438	24	0	★	★	★	★
Flathead IR	1,739*	712*	0*	0*	6,339	1,200	6	2	904	662	2	0
Fort Belknap IR	679	449	4	0	138*	423*	0*	0*	157	1,189	0	0
No. Cheyenne IR	★	★	★	★	0	106	0	0	★	★	★	★
Rocky Boy's IR	3,775	502	0	0	722*	292*	0*	0*	946	103	0	0
Glacier NP	11,450	0	0	0	5,740*	2*	2*	0*	4,325	2	0	0
Yellowstone NP[1]	12,164	0	19,722	0	26,312*	0*	6,362*	0*	★	★	★	★
Total	**1,430,192**	**97,827**	**169,893**	**10**	**715,069**	**79,104**	**69,490**	**79**	**439,702**	**92,037**	**21,421**	**1,211**

[1] LPP = Lodgepole pine; PP = Ponderosa pine; 5-NP = 5-needle pines (WBP & LP); WWP = Western white pine

★ = Not surveyed; * = Partially surveyed; [1]Yellowstone NP includes MT, ID, and WY acres

Table 7. Additional Bark Beetle-Caused Mortality on All Ownerships, Statewide, 2009 − 2011(Acres)

	Spruce Beetle			Fir Engraver			Pine Engraver			Subalpine Fir Mortality			Western Pine Beetle		
Reporting Area	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Beaverhead	5,785*	3,075*	20*	0*	0*	0*	0*	0*	0*	3,582*	18,984*	48*	0*	0*	0*
Bitterroot	2	0*	0*	0	0*	0*	2	0*	0*	2,126	46*	26*	20	0*	0*
Bull Mountains	★	0	★	★	0	★	★	0	★	★	0	★	★	0	★
Custer	★	8	★	★	0	★	★	2	★	★	368	★	★	0	★
Deerlodge	0*	0*	2*	0*	0*	0*	0*	0*	0*	425*	10*	6*	2*	0*	0*
Flathead	22*	8*	2	163*	80*	6	0*	4*	0	7,410*	2399*	274	0*	0*	0
Fort Peck Lake	★	0	★	★	0	★	★	0	★	★	0	★	★	0	★
Gallatin	0*	0*	8*	0*	0*	0*	0*	0*	0*	1,492*	1531*	307*	0*	0*	0*
Garnets	0*	0*	2	0*	4*	0	0*	2*	2	4*	2*	0	6*	0*	0
Helena	0	2*	0*	0*	0*	0*	64*	2*	0*	39*	16*	38*	0*	8*	2*
Kootenai	12*	2*	86	40*	30*	58	0*	0*	2	2,257*	643*	702	16*	0*	0
Lewis and Clark	0*	4*	4*	0*	26*	0*	42*	24*	111*	4,054*	3413*	141*	0*	0*	0*
Lolo	4*	4*	22	73*	14*	0	22*	5*	2	165*	279*	501	40*	2*	2
Blackfeet IR	0	★	32	0	★	0	0	★	0	235	★	63	0	★	0
Crow IR	★	0	★	★	0	★	★	0	★	★	1601	★	★	0	★
Flathead IR	0*	0	0	4*	56	0	67*	0	2	10	160	89	24*	6	2
Fort Belknap IR	0	0*	0	0	0*	0	0	0*	0	0	0*	0	0	0*	0
No. Cheyenne IR	★	0	★	★	0	★	★	0	★	★	0	★	★	0	★
Rocky Boy's IR	0	0*	0	0	0*	0	0	0*	0	0	0*	0	0	0*	0
Glacier NP	2	10*	142	6	2*	2	0	0*	0	2,038	474*	664	0	0*	0
Yellowstone NP[1]	0	8*	★	0	0*	★	0	0*	★	62	466*	★	0	0*	★
Total	**5,827**	**3,121**	**320**	**286**	**212**	**66**	**197**	**39**	**119**	**23,899**	**30,394**	**2,859**	**108**	**16**	**6**

★ = Not surveyed * = Partially surveyed

[1]Yellowstone NP includes MT, ID, and WY acres

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COMMON AND SCIENTIFIC NAMES

Common Name	Pathogens	Primary Hosts
Annosus root disease		
(S-Type)	*Heterobasidion occidentale* sp. nov. Otrosina & Garbelotto	DF, GF, SAF
(P-Type)	*Heterobasidion irregulare* nom. nov. Garbelotto & Otrosina	PP
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink	DF, GF, SAF, saplings of all conifers
Aspen heart rot	*Phellinus tremulae* (Bond.) Bond. & Borisov.	QA
Aspen shoot blight	*Venturia macularis* (Fr.) E. Muller & Arx	QA
Atropellis canker	*Atropellis piniphila* (Weir) Lohman & Cash	LPP
Black canker	*Ceratocystis fimbriata* Ellis & Halst.	QA
Black stain root disease	*Ophiostoma wageneri (*Goheen & F.W. Cobb) Harrington	DF, PP
Comandra rust	*Cronartium comandrae* Pk.	LPP, PP
Diplodia shoot blight	*Diplodia pinea (*Desmaz.) J. Kickx fil.	PP
Dothistroma needle blight	*Mycosphaerella pini* Rost. In Munk	PP, LPP, LP
Dutch Elm Disease	*Ophiastoma ulmi (*Buisman) Nannf.	Elms
Dwarf mistletoes	*Arceuthobium* spp.	DF, LP, LPP, WL
Elytroderma needle cast	*Elytroderma deformans* (Weir) Darker	PP
Ganoderma	*Ganoderma applanatum* (Pers.) Pat.	QA
Indian paint fungus	*Echinodontium tinctorium* (Ell. & Ev.) Ell. & Ev.	GF, WH
Laminated root rot	*Phellinus weirii* (Murrill) R.L. Gilbertson.	DF, GF, SAF, WH
Larch needle blight	*Hypodermella laricis* Tub.	WL
Larch needle cast	*Meria laricis* Vuill.	WL
Marsonnina leaf spot	*Marsonnina populi* (Lib.) Magn.	QA
Red ray rot	*Dichomitus squalens* (P. Karst.) D.A. Reid	PP
Red ring rot	*Phellinus pini* (Thore :Fr.) A.Ames	DF, ES, PP, WL
Rhabdocline needle blight	*Rhabdocline pseudotsugae* Syd.	DF
Schweinitzii root and butt rot	*Phaeolus schweinitzii* (Fr. :Fr.) Pat.	Mainly DF, all conifers
Spruce broom rust	*Chrysomyxa arctostaphyli* Diet.	ES
Tomentosus root disease	*Inonotus tomentosus* (Fr.) Teng.	ES, DF, LPP, WL
Western gall rust	*Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka	PP, LPP
White pine blister rust	*Cronartium ribicola* J.C. Fisch.	LP, WBP, WWP

Common Name	Insects	Primary Hosts
Balsam woolly adelgid	*Adelges piceae* Ratzeburg	GF, SAF
Douglas-fir beetle	*Dendroctonus pseudotusugae* Hopkins	DF
Douglas-fir tussock moth	*Orygia pseudotsugata (*McDunnough*)*	DF, ES, TF
Fall webworm	*Hyphantria cunea* (Drury)	CC
Fir engraver beetle	*Scolytis ventralis* LeConte	GF, SAF
Larch casebearer	*Coleophora laricella (*Hubner*)*	WL
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins	All pines
Pine butterfly	Pine butterfly, *Neophasia menapia* (Felder & Felder)	PP

Pine engraver beetle	*Ips pini* (Say)	LPP, PP
Spruce beetle	*Dendroctonus rufipennis* Swaine	ES
Western balsam bark beetle	*Dryocoetes confuses* Swaine	SAF
Western pine beetle	*Dendroctonus brevicomis* LeConte	PP
Western spruce budworm	*Choristoneura occidentalis* Freeman	DF, GF, SAF, ES, WL

CC = chokecherry; DF = Douglas-fir; ES = Engelmann spruce; GF = grand fir; LP = limber pine; LPP = lodgepole pine; PP = ponderosa pine; QA = quaking aspen; SAF = subalpine fir; TF = true firs; WWP = western white pine; WH = western hemlock; WL = western larch; WBP = whitebark pine

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Figure 1. Reporting Areas and County Boundaries in Montana

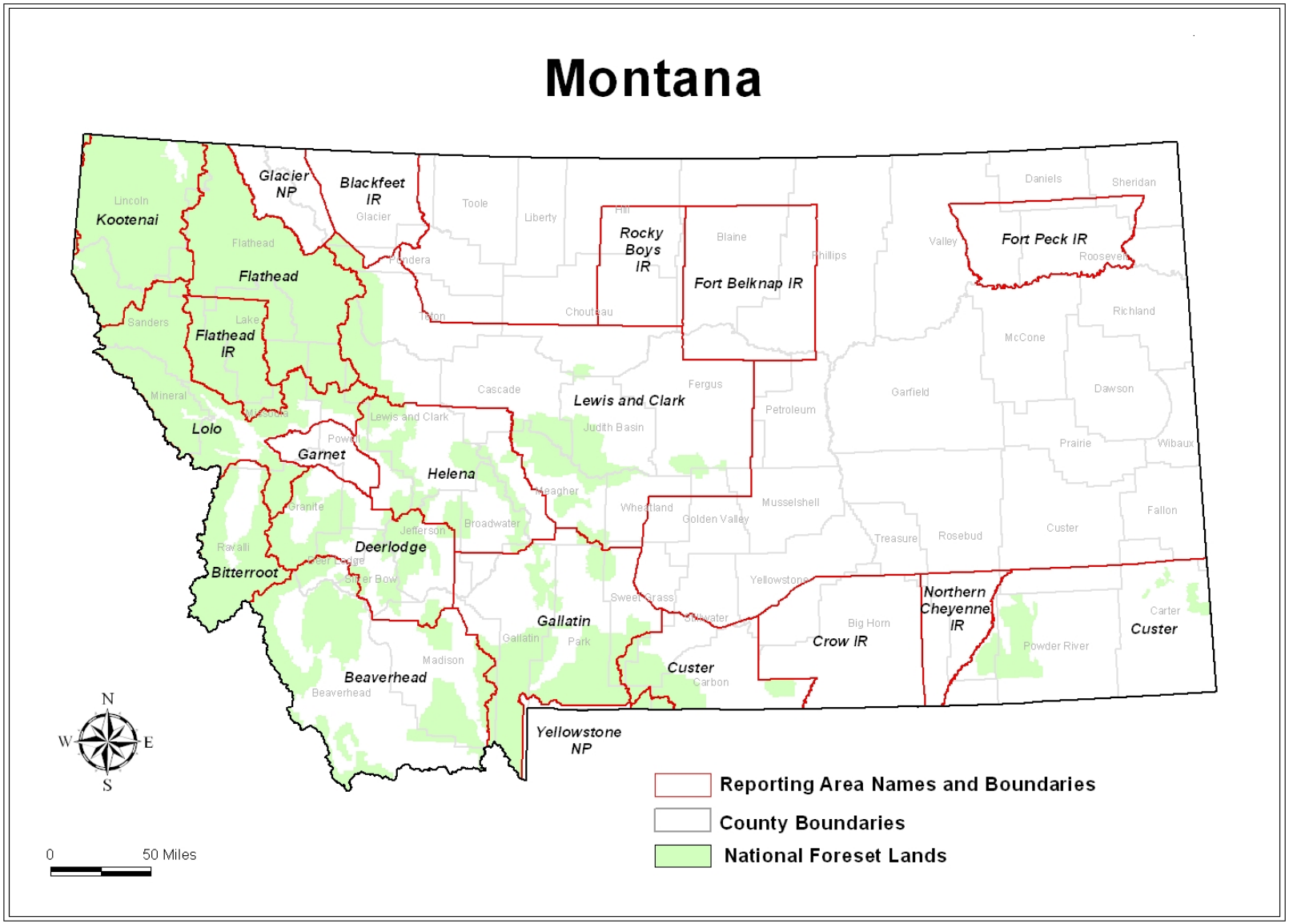

Figure 2. Areas Surveyed In 2012 Forest Health Protection Aerial Detection Survey in Montana

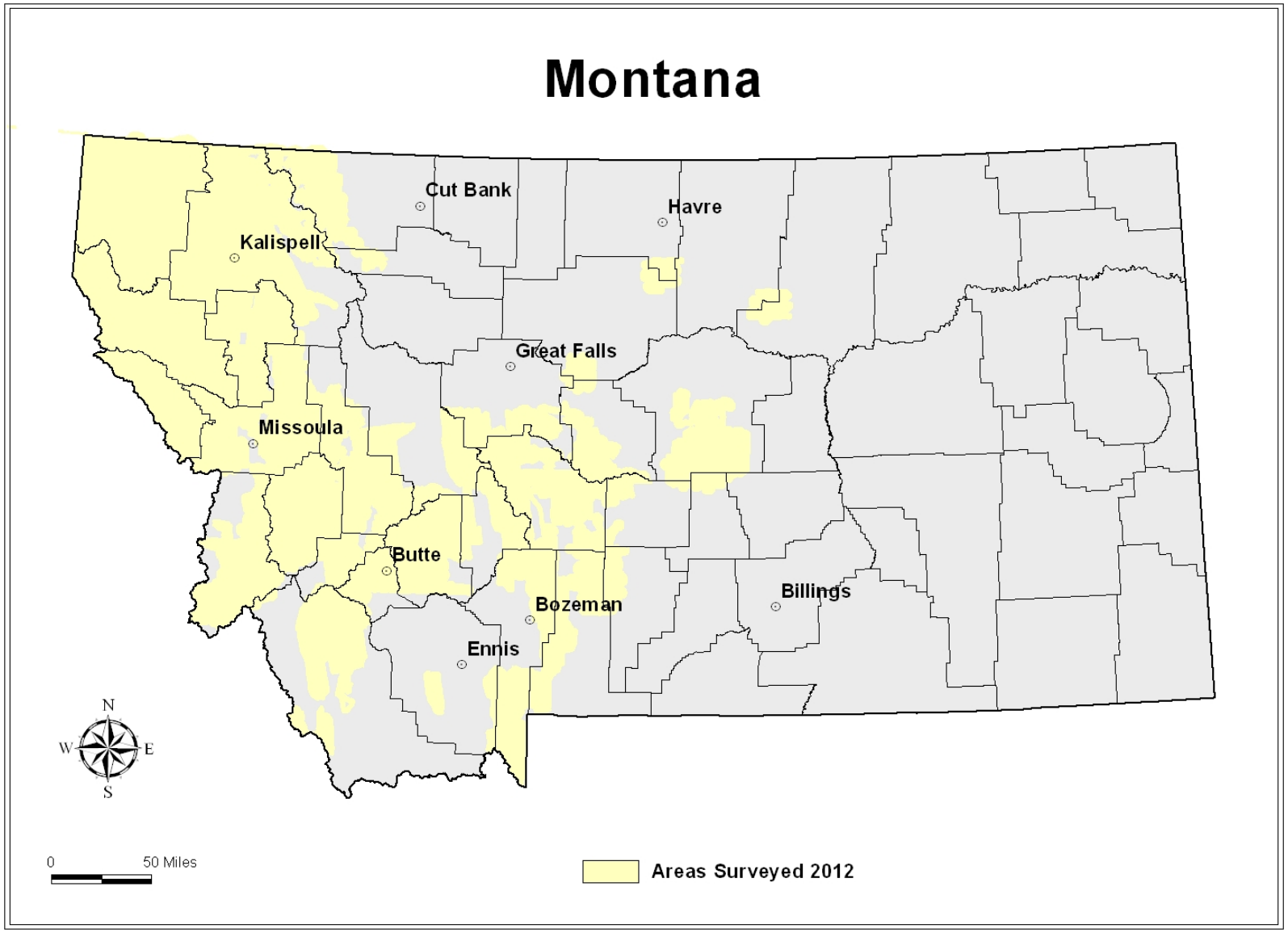

Figure 3. 2012 Mountain Pine Beetle Infestations in Montana

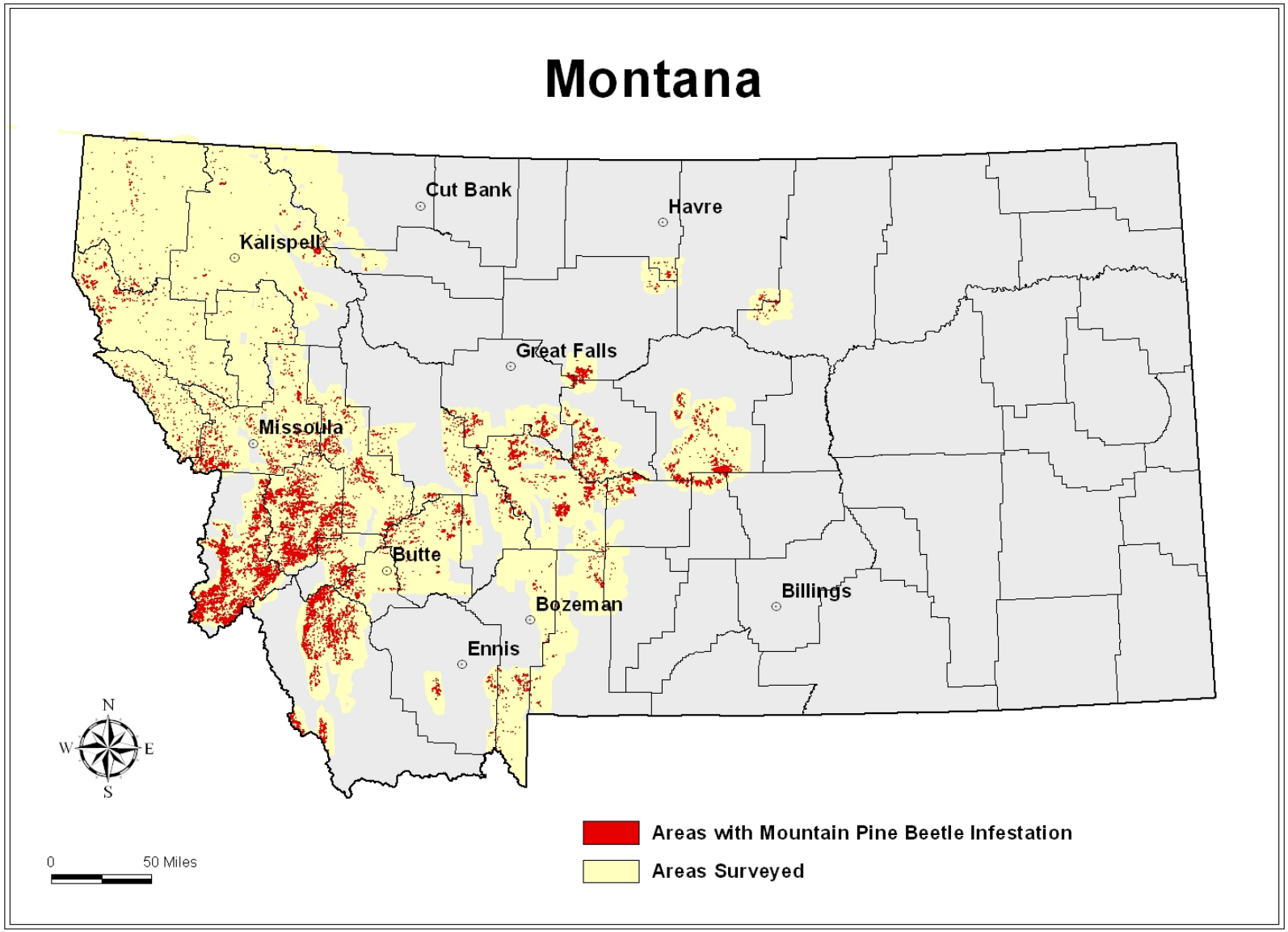

Figure 4. 2012 Douglas-fir Beetle Infestations in Montana

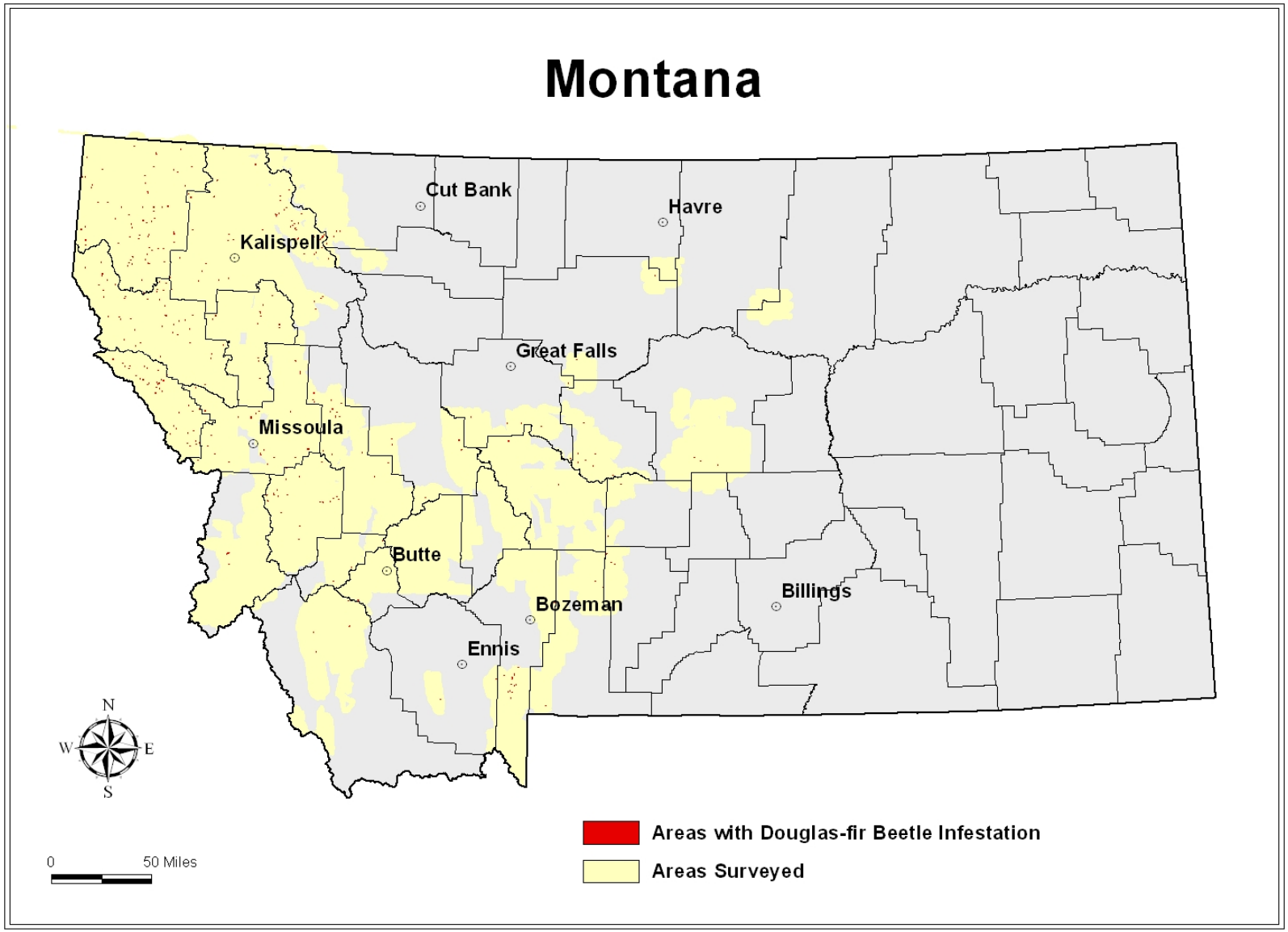

Figure 5. 2012 Fir Engraver Beetle Infestations in Montana

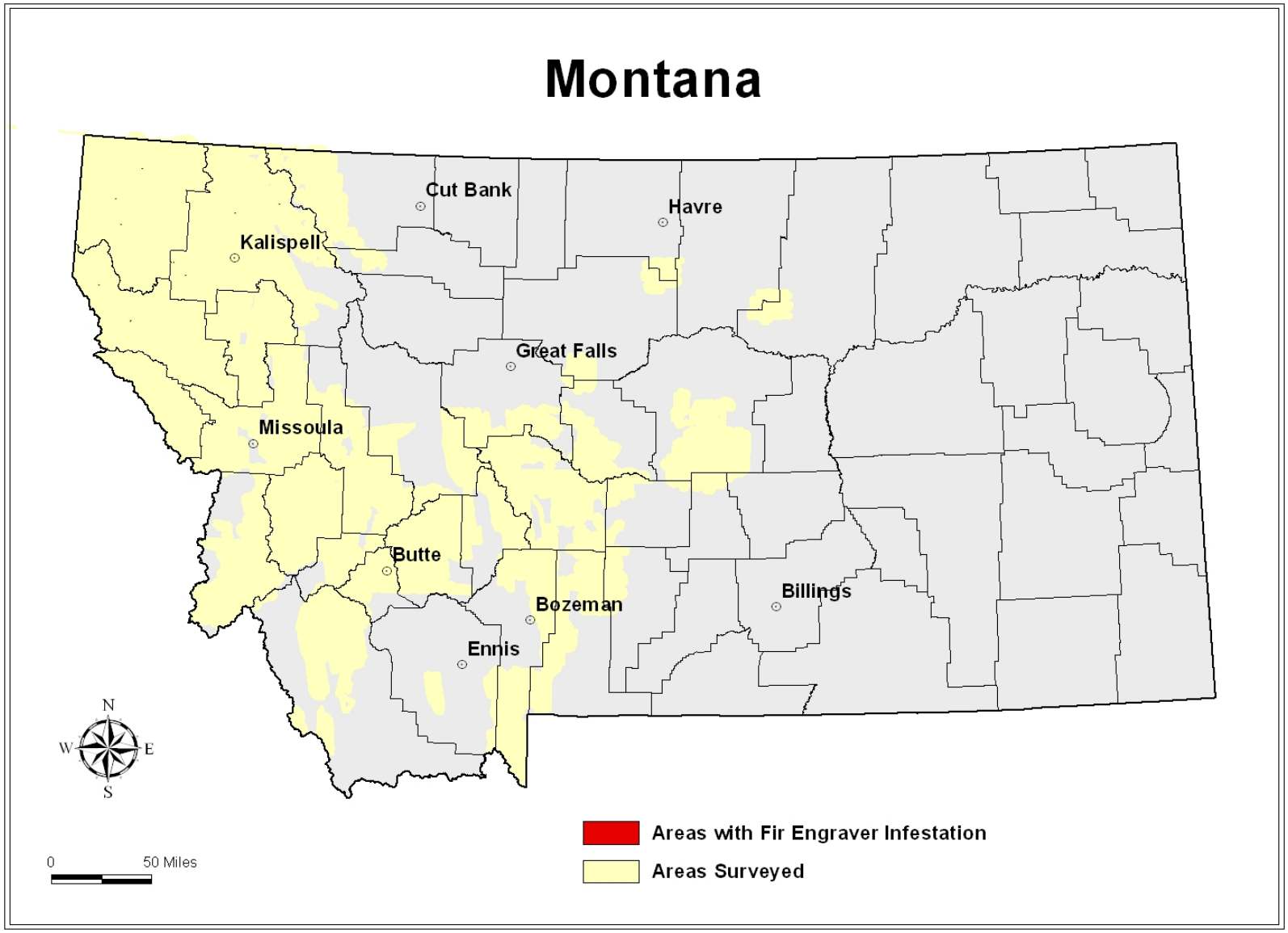

Figure 6. 2012 Subalpine Fir Mortality Complex in Montana

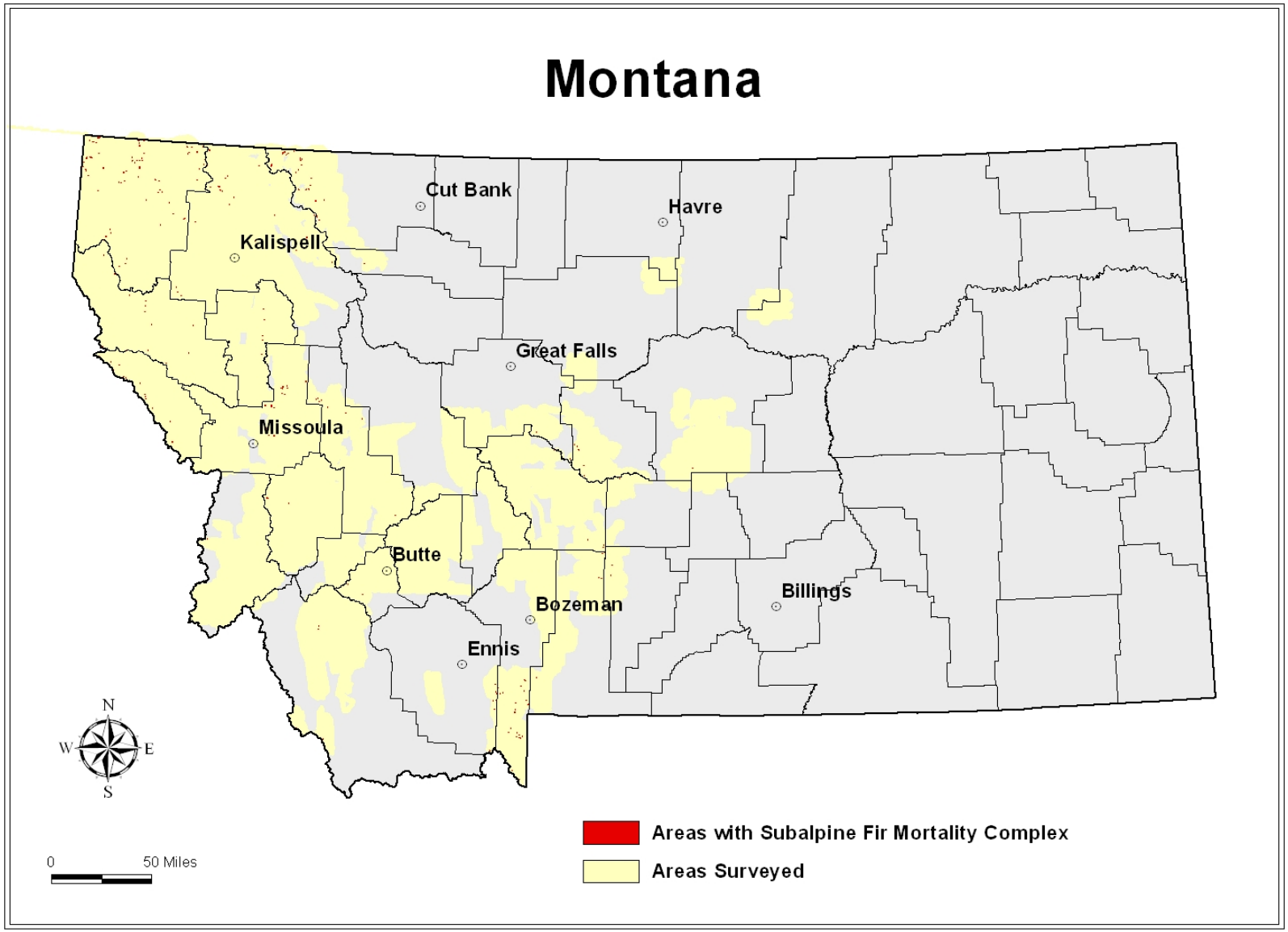
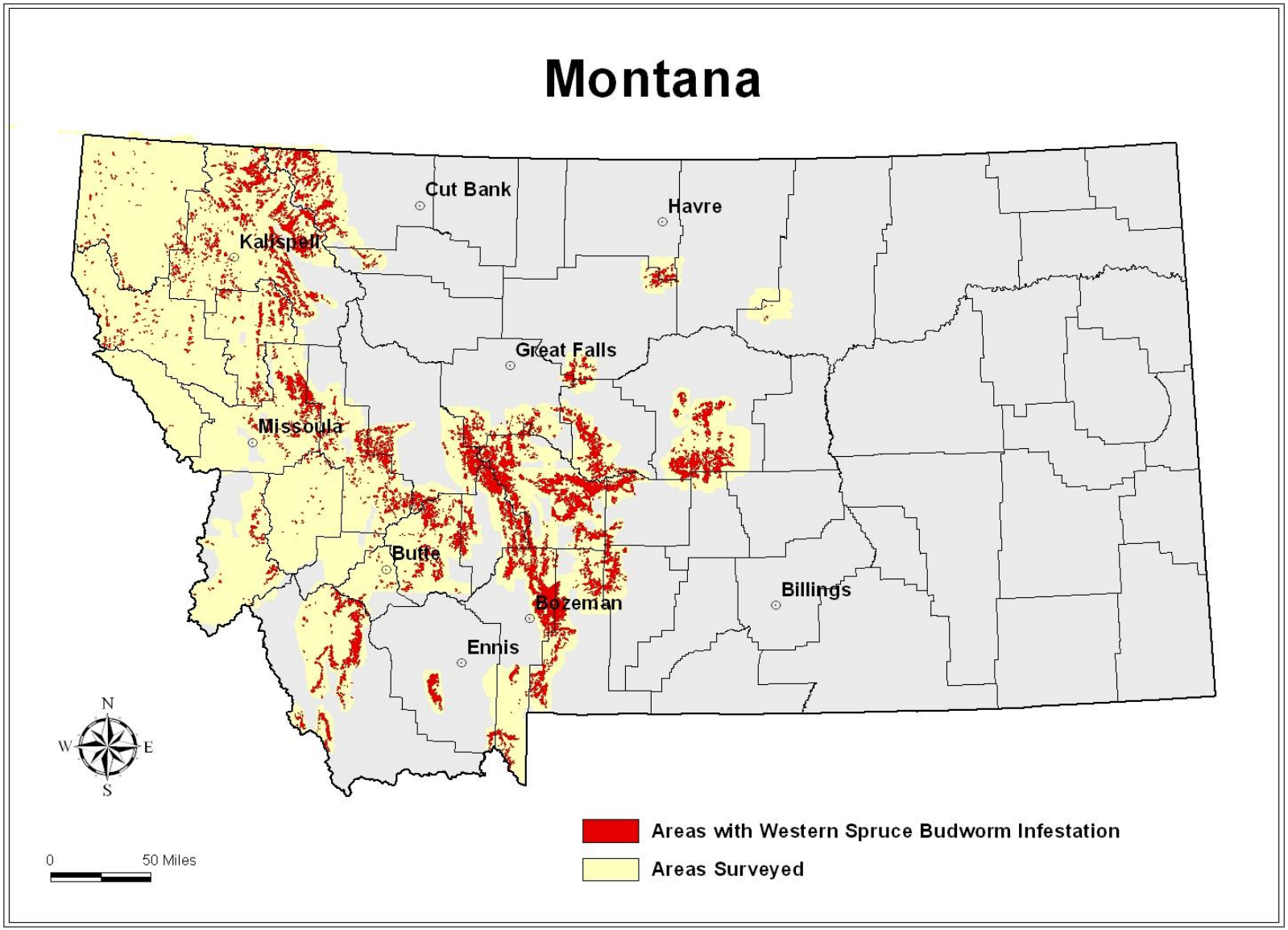
Figure 7. 2012 Western Spruce Budworm Infestations in Montana