Montana Forest Insect and Disease Conditions and Program Highlights

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Bio Control: Mecinus janthinus on Dalmatian Toadflax.

Special Survey: One of many Aspen stands surveyed for insect and disease activity

Montana Department of Natural Resources and Conservation Forestry Division

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MONTANA

Forest Insect and Disease Conditions and Program Highlights – 2008

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ABBREVIATIONS

The following abbreviations are used throughout this document:

Beetles	DFB	=	Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins
	ESB	=	Spruce beetle, *D. rufipennis* (Kirby)
	IPS	=	Pine engraver, *Ips pini* (Say)
	MPB	=	Mountain pine beetle, *D. ponderosae* Hopkins
	WPB	=	Western pine beetle, *D. brevicomis* LeConte
	FE	=	Fir engraver, *Scolytus ventralis* LeConte
	WBBB	=	Western balsam bark beetle, *Dryocoetes confuses* Swaine
	RTB	=	Red turpentine beetle, *D. valens* LeConte
Defoliators	WSBW	=	Western spruce budworm, *Choristoneura occidentalis* Freeman
	LCB	=	Larch casebearer, *Coleophora laricella* Hübner
	DFTM	=	Douglas-fir tussock moth, *Orygia pseudotsugata* McDunnough
	PTM	=	Pine tussock moth, *Dasychira pinicola*
Hosts	LPP	=	Lodgepole pine
	PP	=	Ponderosa pine
	WWP	=	Western white pine
	WBP	=	Whitebark pine
	LP	=	Limber pine
	DF	=	Douglas-fir
	WL	=	Western larch
	GF	=	Grand fir
	SAF	=	Subalpine fir
	ES	=	Engelmann spruce
Other	NF	=	National Forest
	RD	=	Ranger District
	IR	=	Indian Reservation
	NP	=	National Park
	BLM	=	Bureau of Land Management
	FIA	=	Forest Inventory and Analysis
	RA	=	Reporting Area

INTRODUCTION

This report summarizes the major forest insect and disease conditions in Montana during 2008 and was jointly prepared by the Montana Department of Natural Resources and Conservation, Forestry Division and USDA Forest Service (FS), Forest Health Protection (FHP), State and Private Forestry, Northern Region.

Information for this report was derived from ground and aerial surveys within Reporting Areas (RA) across parts of Montana. A Reporting Area includes all federal, state, and private land ownerships within a particular geographic boundary (Figure 1).

SUMMARY OF CONDITIONS

Bark Beetles

A relatively wet winter in 2007-2008, coupled with another dry summer, influenced bark beetle conditions in different ways depending on species. Wetter conditions in the spring have probably kept Douglas-fir beetle and pine engraver beetle activity at relatively low levels; however, there were increases in both in 2008. But a warm and dry summer benefited other bark beetle populations.

Mountain pine beetle populations, already high in the west-central portion of Montana, increased at rates not recorded in a quarter-century. On parts of the Helena National Forest (NF), we recorded new attacks to previous-year attacks at a ratio of 10 to 1. In other infested areas, populations are finally declining due to host depletion. In all, mountain pine beetle-infested areas more than doubled from ones recorded in 2007.

While beetle populations expanded nearly exponentially in some areas, at least part of the overall increase was a result of having surveyed more infested areas in 2008 than in 2007. In total, we flew more than 24.5 million acres in 2008, compared to about 24 million in 2007. Most forested areas in western Montana were flown. Some exceptions were a few wilderness areas, northern and western portions of the Kootenai, eastern part of the Flathead, and small portions of the Gallatin and Helena RAs. Too, the eastern half of the Flathead IR RA and none of the Crow IR and Northern Cheyenne IR RAs were surveyed.

Mountain pine beetle-infested areas increased significantly in many locations, and populations expanded into some previously un-infested areas—notably ones on the Deerlodge, Beaverhead, and Helena RAs. The infestation increased at an incredible rate on the Helena, western Deerlodge and Beaverhead RAs. In those areas, infestation levels in 2008 were 3-4 times ones recorded in 2007. In some stands, where beetles have been located for a few years, intensity has declined markedly. Such decreases were recorded in some infested areas on the Flathead, Lolo, and eastern portion of the Deerlodge RAs. In summary, mountain pine beetle-infested acres in logdepole pine stands nearly tripled, more than doubled in ponderosa pine stands, and almost doubled in 5-needle pines stands in 2008; but some of that increase resulted from much more area being surveyed. Because aerial detection surveys (ADS) are not always complete, and record year-old data, we supplemented ADS data with ground-collected data in as many areas as we practicably could.

A significant increase in beetle-caused mortality was once again noted in whitebark pine stands. As a result of increased surveys, particularly on the Gallatin, Helena, Lewis & Clark, and Beaverhead NFs and in Yellowstone National Park (NP), beetle-killed whitebark pines were recorded on almost twice the number of acres in 2008 as recorded in 2007. In the Park and on Forests where infestations in whitebark pine have been extreme, ground-collected data has shown in excess of 90% of the whitebark pine has been killed within the past several years in some areas. Infestations in whitebark pine stands continued to expand in most areas surveyed, and in 2008, extended to nearly 205,000 acres. More than 790,700 5-needle pines (whitebark and limber pines) were killed in 2007.

DFB-infested acres decreased somewhat in western Montana. At a few locations in northwestern and central Montana, populations remained at higher-than-normal levels; however, in other areas they have declined substantially. Increases were noted in Glacier NP, Flathead, and Helena RAs. In most areas, DFB populations remain at nearly endemic levels. Western spruce budworm (WSBW) activity remained high in many parts of central Montana. Severe defoliation coupled with unusually warm and dry weather could see a resurgence of DFB activity. Beetle-caused mortality in defoliated stands has already been observed on the Helena NF.

Grand fir mortality attributable to FE also decreased slightly in 2008. Few stands in western Montana showed levels higher than would be considered endemic.

Subalpine fir mortality was mapped on considerably fewer acres than in 2007; but a few of the more-often infested areas were not surveyed. Still, notable beetle-caused mortality was found in some areas. There may, in fact, be several factors involved in subalpine fir mortality, such as root diseases and warmer, drier conditions. The Gallatin RA, where beetle-caused mortality has been high in recent years was not flown in its entirety in 2008; still, more than 14,000 infested acres were reported. The most heavily affected areas were the Flathead and Gallatin RAs, with more than 16,300 and 14,000 acres infested, respectively.

Mortality in ponderosa pine stands, attributed to pine engraver increased to higher levels than recorded in 2007. Almost 10,000 acres of ponderosa pine with pine engraver were recorded in the Helena RA. MPB populations are so extreme in the Helena RA (37,000 acres in ponderosa pine stands) that it is likely there were many stands infested by both beetles, or many small-diameter trees that from the air appear to be the size usually attacked by IPS the aerial observer made that assumption. Under the best of conditions it is difficult to distinguish trees killed by IPS from those affected by MPB. Likely, many trees were killed by both, either singly or in combination. We believe, throughout the state, IPS populations have remained fairly static within the past couple of years. .

ESB populations remained at endemic levels throughout Montana and in Yellowstone NP. The large outbreak in the Park, mapped at 8,700 acres in 2003 has totally subsided.

Defoliators

WSBW continues to be the most significant defoliator in the state. In 2008, 577,622 acres were mapped as defoliated by budworm in Montana. Most of this defoliation was on the Beaverhead (124,225 acres), Deerlodge (22,096 acres), Gallatin (111,733), Helena (198,960 acres), Lewis and Clark (57,256 acres), and Kootenai (34,148 acres) RAs.

Defoliation by DFTM and LCB were not reported in Montana in 2008.

Another tussock moth, the pine tussock moth, continued to defoliate ponderosa pine in eastern Montana. Over 2,300 acres were defoliated on the Custer RA. Additional areas were flown around Roundup and Miles City to determine the extent of the PTM outbreak. Nearly 8,000 acres with defoliation were detected in these two areas.

Cooperative detection monitoring continued for the gypsy moth, *Lymantria dispar*, in 2008 with Animal and Plant Health Inspection Service (APHIS), State Department of Agriculture (MDA), State Department of Natural Resources and Conservation (DNRC) and U.S. Forest Service. A network of more than 1000 pheromone-baited traps were placed throughout Montana. No traps contained gypsy moths. Trapping will continue in 2009.

Root Diseases

Root diseases are diseases of the site and do not change drastically from one year to the next. Root disease fungi caused damage and mortality on more than 7 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 discret 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.

Foliage Diseases

Aerial detection surveys identified larch needle disease on only 42 acres on the Flathead RA in 2008. Both *Hypodermella laricis* and *Meria laricis*-caused needle diseases are included in these acres reported. Lodgepole pine needlecast, caused by *Lophodermella concolor*, was recorded on nearly 13,000 acres. Most of this was on Glacier NP RA (8,792 acres) and the Blackfeet IR RA (3,637 acres).

Dwarf Mistletoes

Forest Inventory and Analysis (FIA) data were queried to provide an estimate of dwarf mistletoe infections in Montana National Forests. The R1-FIA Summary Database was used to conduct this query. One percent of the Douglas-fir, 3.2% of the lodgepole pine, 0.2% of the whitebark pine, 0.1% of the limber pine, and 3.9% of the western larch trees were reported to be infected with dwarf mistletoe in the National Forests of Montana.

White Pine Blister Rust

Western white pine

White pine blister rust was introduced to North America in 1910 and spread throughout the range of our native 5-needle pines (western white, whitebark, and limber). This disease, along with bark beetles, fire suppression, and harvesting reduced western white pine-dominated stands in western Montana.

The ecological impacts of blister rust have been severe. Western white pine has been replaced by species such as grand fir, Douglas-fir, and hemlock, species that are more susceptible to native bark beetles and root diseases. Residual, mature 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 where it occurs blister rust may kill a high proportion of the seedlings.

Fortunately, natural resistance occurs at low levels in white pine populations, and an intense breeding program was initiated in the 1950's for western white pine. This program is now producing seedlings with

increased levels of resistance (F2 stock). The resistant stock is planted operationally on suitable white pine sites on the Kootenai, Lolo, and Flathead National Forests; the Stillwater State Forest, Swan State Forest, and other state lands; as well as on both industry and private forest lands.

In addition to planting rust-resistant stock, pruning has been shown to be an important tool in blister rust management; removing the lower branches of white pine has been found to double the survival of white pine in areas with high infection.

Whitebark & Limber pines

As the fungus that causes blister rust has moved into high-elevation ecosystems the normal successional pathways of limber pine and whitebark pine have been greatly altered. The recent outbreaks of mountain pine beetle have caused additional widespread mortality in many whitebark pine stands. Although mountain pine beetle is a native insect and has historically helped recycle and regenerate pine stands, the combination of beetle-caused mortality, fire suppression, and blister rust are raising concerns about the long-term sustainability of whitebark pine ecosystems.

A comprehensive assessment of whitebark health and restoration opportunities is available online (http://www.fs.fed.us/r1-r4/spf/fhp/whitebark_pine/WBPCover_3.htm) or in hardcopy.

Abiotic Damage

Surveys detected considerable hail damage across part of the Flathead IR RA. Nearly 3,400 acres were identified with this damage in the RA. An additional 479 acres with *Diplodia pinea* in ponderosa pine were also reported. This fungus is often associated with branch and tip wounds and may have been associated with hail damage. Most of this damage was west of the Ronan to Polson corridor and is believed to have occurred from a storm in 2007.

Foliage of western larch turned brown in mid-summer in a number of areas scattered across western Montana. Most of the discoloration was limited to the upper parts of tree crowns and was believed to be caused by a cold period in mid-June as foliage was expanding. Most of this injury occurred on the Flathead IR RA, with lesser amounts on the Flathead, Kootenai, and Lolo RAs.

ANNUAL AERIAL SURVEY

The annual aerial detection survey in Montana was conducted from June 30 thru September 26, 2008. The survey covered approximately 24.5 million acres of mixed ownership, forested lands, excluding most wilderness areas (Figure 2). Four FHP sketchmappers, using three airplanes, conducted the 2008 aerial survey.

Much of the data summarized in this report is a product of the aerial surveys, as well as ground surveys and biological evaluations. Along with the data summaries, aerial survey 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.fed.us/r1-r4/spf/fhp/aerial/index.html

The annual aerial detection survey is an overview survey designed to cover large

areas in a relatively short period of time. Aerially detected signatures include tree mortality, defoliation and windthrow. If forest disturbance activities are low, secondary disturbances such as diseases, needle casts, high-water damage and previous fire damage are sketchmapped. The intent of the survey is to cover each area once a year during which time the observer sketchmaps as many disturbances and damage as possible. The survey is conducted using single-engine, high-wing aircraft, flying at speeds of approximately 90 to 130 mph, at an average altitude of approximately 1,000 to 2,000 feet above ground level.

The aerial survey data are estimates made from airplanes and though not as many areas were ground checked as we would like, enough were checked to lend confidence to the areas for which we only have aerial survey data. Together, aerial and ground surveys provide information relative to bark-beetle-caused mortality, as well as other damage agents pertinent to land managers charged with the responsibility of maintaining forest health.

INSECT AND DISEASE CONDITIONS BY COUNTY

County Areas in Detail

County summaries follow. For each, damage effects on their respective ownership are noted. To the extent possible, we have indicated areas affected and an estimate of extent. Counties not listed had no reported information. Forestland data in the following are from the annualized surveys performed by USDA Forest Service Forest and Inventory Analysis (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 in ownerships in some counties, FIA data may indicate no foresteland acres at the county level. This is a resurlt of the intensity of the inventory performed. This discrepency is within their standard of error. Other Ferderal lands include tribal ownerrship.

Beaverhead County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	1,056,906	137,408	20,202	48,412	1,262,928
DFB	105	79	28	36	248
MPB-LPP	97,372	11,011	1,502	2,758	112,649
MPB-High Elevation	17,391	2,821	254	190	20,656
SAF Mortality	315	2	0	0	317
WSBW	29,115	20,765	6,311	5,400	61,941

Mountain pine beetle is a major tree-killing agent in Beaverhead County. Lodgepole pine and whitebark pine are being attacked aggressively in the Beaverhead Mountains and Pioneer Mountains. Populations of MPB are starting to increase in lodgepole pine in the Big Hole. Western spruce budworm defoliation was high in the Beaverhead Mountains and Pioneer Mountains.

Blaine County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	68,719	0	102,207	170,926
MPB-LPP	0	47	0	0	49
MPB-PP	0	161	0	0	161
Pine Engraver	0	12	0	0	12

Scattered lodgepole pine and ponderosa pine mortality from MPB were observed in the Little Rocky Mountains on the Ft. Belknap Indian Reservation.

Broadwater County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	149,035	12,383	0	117,516	278,933
DFB	1,657	0	0	31	1,688
MPB-LPP	8,863	16	0	626	9,504
MPB-High Elevation	316	0	0	0	316
WSBW	12,687	3,439	138	2,594	18,859

Only the western portion of the County, on which most forested lands are administered by the Helena NF, was surveyed. As in most adjacent counties, MPB was by far the biggest single mortality-causing agent. LPP stands within that portion of the County have been heavily infested and likely will experience high levels of mortality for the next few years. WSBW-caused defoliation was also common in DF stands throughout the County. Other insect activity was relatively minor; however, MPB killed a significant amount of high-elevation 5-needle pines, and a large group of DFB-killed DF was mapped in the northern part of the County on Helena NF lands.

Carbon County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	115,335	114,197	10,597	51,159	291,288
DFB	26	0	4	14	45
MPB-LPP	44	0	6	6	56
MPB-High Elevation	308	0	0	3	311
SAF Mortality	551	0	0	14	566
Pine Tussock Moth	0	0	2	133	135

Little forested land within the County was affected by insect pests except in the Pryor and Beartooth Mountains, on lands administered by the Custer NF and Crow IR. In both of those mountain ranges, MPB has killed moderate amounts of high-elevation pines and WBBB has contributed to SAF mortality. On privately-owned land in the northwest portion of the County, pine tussock moth defoliated a minor amount of PP.

Carter County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	59,979	0	0	66,587	126,567
MPB-PP	167	3	2	37	209
Pine Engraver	63	4	4	48	119

Small and widely scattered groups of PP, killed by MPB and IPS were observed in the Chalk Buttes, Ekalaka Hills, and on forested lands southeast of Ekalaka, close to the South Dakota border. Little other forested land in the County was affected by forest insects in 2008.

Cascade County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	184,931	12,686	13,296	96,987	307,899
DFB	7	2	8	24	41
MPB-LPP	1,110	4,273	1,110	11,670	17,329
MPB-High Elevation	225	0	0	0	225
MPB-PP	0	153	140	2,771	3.065
WSBW	0	680	1,893	7,532	10,106
Hail	0	554	382	969	1905

In 2008, much of the forested area in Cascade County was flown. MPB continues to be the major mortality agent in lodgepole, ponderosa and whitebark pine. DFB was only reported on a total of 41 acres in the county. WSBW activity increased, mostly on private land. Hail damage was detected in the southwest corner of the county. Tree species affected was not determined.

Chouteau County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	14,915	0	2,691	29,506	47,112
DFB	16	13	0	37	67
MPB-LPP	215	543	37	511	1,306
MPB-PP	2	95	51	58	206
WSBW	881	37	0	628	1,546

Numerous groups of MPB-killed LPP were mapped throughout LPP stands on the RockyBoys Indian Reservation. Minor amounts of MPB- and IPS-killed PP were also noted. Some of the larger groups of beetle-killed LPP were mapped near Centennial Mountain, Black Mountain, and along Twomile Ridge. A very minor amount of DFB-caused mortality was recorded.

Custer County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	37,541	15,642	173,731	226,914
MPB-PP	0	18	8	63	89
Pine Engraver	0	6	0	28	34
Pine Tussock Moth	0	226	112	636	1,097

Special surveys were conducted on mostly private land, about 35 miles east of Miles City to monitor ongoing pine tussock moth outbreaks. East of Miles City, the outbreak extends to just less than 1,000 acres. In conducting those surveys, infestations of mountain pine beetle and Ips species in ponderosa pine were noted (90 acres and 35 acres, respectively).

Deer Lodge County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	234,109	0	21,543	53,764	309,417
DFB	4	0	0	0	4
MPB-LPP	38,947	1,898	23,327	30,294	94,466
MPB-High Elevation	2,450	0	569	4,061	7,080
MPB-PP	0	0	0	253	253
WSBW	241	147	304	66	758

Mortality of LPP caused by MPB is high throughout the County, with areas estimated at 60 trees per acres killed N-NE of Wise River. Larger areas of current and past mortality give way to smaller spots of newer mortality as the outbreak heads into the Big Hole area. Mortality of higher elevation 5-needled pines, especially whitebark is also significant, with some localized areas of WSBW-caused defoliation present.

Fergus County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	88,897	186,235	10,855	283,540	569,525
DFB	0	8	2	10	20
MPB-LPP	34	85	8	90	217
MPB-PP	220	280	52	557	1,108
WSBW	3,499	2,344	354	3,912	10,109
Root Rot	169	0	0	0	169

In the Big Snowies WSBW was detected in large polygons of low and high-level defoliation. Scattered PP mortality caused by MPB was also noted along the periphery of the Range. The Little Snowies also had WSBW-caused defoliation, with scattered MPB noted in PP. Root diseases are not normally mapped with aerial detection surveys. But, this patch of disease stood out from the surrounding area. A site visit of the area is planned for 2009.

Flathead County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	1,601,110	558,723	162,350	457,849	2,780,033
DFB	5,674	1,596	218	133	7,621
MPB-LPP	6,498	18,217	240	1,364	6,498
MPB-PP	14	8	454	386	862
SAF Mortality	12,133	1,224	509	158	14,024
WSBW	120	0	2	1,480	1,601
Winter Injury	228	0	0	372	600
Larch Needle Disease	12	0	0	30	42
Western Larch needle Cast	1,497	247	146	139	2,029
Lodgepole pine needle cast	0	1,596	0	0	1,596

In 2008, three bark beetles accounted for most of the beetle-caused mortality reported. Small groups of MPB-killed LPP, DFB-killed DF and SAF killed by WBBB were recorded on both sides of Hungry Horse Reservoir. Several large groups of WBBB-killed SAF were noted in several tributaries of North Fork of the Flathead River. Similar amounts of SAF, killed by WBBB were recorded on the Stillwater State Forest. Small and scattered groups of WBBB-killed SAF, and minor amounts of DFB-killed DF were found in stands surrounding Tally Lake, WSBW continues to defoliate fir-spruce stands in parts of the county (1,601 acres across all ownerships).

Range-wide damage to western larch foliage was attributed to early June frosts, possibly a single frost event around June 10. Larger trees and tree tops were more heavily damaged than smaller trees and lower crowns. This was most notable in the southwest portion of the county. Larch needle diseases, both needle blight and needle cast were also noted in western larch. Areas as large as 100-200 acres in size were scattered throughout the range of western larch within the county. A large, but low level area of *Lophodermella concolor* (lodgepole pine needle cast) was noted in the southwest portion of Glacier National Park.

Gallatin County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	577,035	64,690	0	175,874	817,600
DFB	80	14	4	118	217
MPB-LPP	33,804	7,778	3,720	12,285	57,586
MPB-High Elevation	35,851	1,263	325	5,948	43,387
SAF Mortality	5,707	4	0	1,941	7,653
WSBW	20,428	1,469	2,122	33,110	57,130

MPB-caused mortality was extensive in LPP and high-elevation (mostly WBP) stands throughout the County in 2008. Most severely affected stands were on lands administered by the Gallatin NF. Ornamental pines were especially affected within Bozeman city limits and on MSU campus. Elsewhere in the County, DF stands were heavily defoliated by WSBW, especially so in the Bridger Canyon. There DFB has become more active, killing some of the more severely-defoliated DF. In high-elevation stands in both the Gallatin and Madison mountain ranges, WBBB has contributed to the death of significant amounts of SAF. MPB-caused mortality has extended into that portion of Yellowstone NP lying within County boundaries.

Glacier County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	33,998	237,106	0	152,203	423,307
DFB	0	597	0	6	603
MPB-LPP	0	3,190	0	44	3,233
SAF Mortality	0	2,402	0	0	2,402
WSBW	0	5,203	0	873	6,077
Lodgepole pine needle cast	0	10,562	0	271	10,833

All of Glacier National Park was surveyed for the first time in several years. MPB activity in LPP stands was the most prominent insect-related damage noted. Though small compared to past outbreaks, MPB-killed LPP was still significant in a few locations with numerous small and widely scattered groups throughout the LPP type. DFB activity generally declined, but DFB-killed DF was mapped as widely scattered small groups throughout the Park. Scattered areas of SAF mortality were also mapped. Relatively minor amounts of bark beetle activity were observed in the Blackfeet IR. Fewer than 700 total acres of MPB-killed LPP were noted in mostly small and scattered groups. Scattered large areas of *Lophodermella* needle disease on LPP in Glacier NP were of note. Large areas of low level *Lophodermella concolor* (lodgepole pine needle cast) were observed in the eastern portion of Glacier National park and the western portion of the Blackfeet Indian Reservation, around Lake Sherburne and St. Mary Lake.

Golden Valley County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	11,072	0	0	85,927	96,999
MPB-PP	193	20	4	32	250
WSBW	1,103	5	4	445	1,832

Most acres of damage were detected on Forest Service lands (~1.3 thousand acres) with a little on private (0.5 thousand acres) and traces on BLM (25 acres) and State (16 acres). Most problematic has been western spruce budworm caused defoliation on approximately 1.8 thousand acres.

At the south end of the Big Snowies large patches of light, WSBW-caused defoliation were noted. Scattered spots of 5-10 ponderosa pines were also noted as killed by MPB.

Granite County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	592,088	24,986	46,849	176,286	840,210
DFB	1,175	102	6	41	1,324
MPB-LPP	23,420	3,309	496	6,330	33,555
MPB-High Elevation	1,326	0	0	255	1,581
MPB-PP	26	24	10	139	199
SAF Mortality	8,366	0	0	132	8,498
WSBW	1,823	1,045	329	2,744	5,941

LPP stands within county boundaries were some of the most severely impacted by MPB in 2008. Host stands throughout the Flint Creek and Anaconda mountain ranges were heavily damaged by MPB. LPP stands in the vicinity of Georgetown Lake have been heavily infested by MPB and those outbreaks are continuing. In the Garnet Mountains, MPB and WSBW activity was also quite damaging. In most mountain ranges in the County, WBBB has been a factor in the decline and death of significant amounts of SAF. DFB-caused mortality was widely scattered throughout DF stands in the County.

Hill County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	0	0	36,540	36,540
MPB-LPP	0	1,244	16	251	1,511
MPB-PP	0	95	2	149	246

Minor and scattered amounts of MPB-killed LPP and PP were found in the county.

Jefferson County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	438,408	62,760	9,306	106,347	618,821
DFB	2,286	2	2	120	2,410
MPB-LPP	298,895	6,946	433	21,102	327,377
MPB-High Elevation	7,362	260	0	725	8,347
MPB-PP	5,538	2,494	478	10,377	18,887
Pine Engraver	1,307	1,458	218	5,203	8,185
WSBW	6,006	1,826	159	5,971	13,962

MPB-infested stands nearly tripled to over 300,000 acres of pine, mostly LPP. Very large polygons of MPB-killed LPP were noted South of Helena. MPB in high elevation 5-needle pines and PP have caused mortality ranging from small spots to large polygons. WSBW activity continued across thousands of acres in the county. DFB activity has been increasing, mostly on federal lands, but may increase on all lands if defoliation from WSBW continues.

Judith Basin County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	263,480	0	0	25,772	289,252
DFB	52	0	0	11	63
MPB-LPP	3,039	114	0	390	3,542
MPB-High Elevation	3,776	0	0	51	3,827
MPB-PP	358	2	0	17	377
SAF Mortality	1,253	0	0	24	1,277
WSBW	17,653	127	24	1,278	19,082
Windthrow	682	0	0	16	699

Areas of WSBW-caused defoliation can be found throughout the Little Belts with scattered spots (~5 trees) of DFB-killed DF found within. MPB in high elevation 5-needle pines and LPP have caused mortality ranging from small spots to large polygons. Some MPB-caused mortality of PP was also noted in the Blacktail Hills. Mortality of SAF is scattered but most notable south of Big Baldy Mountain. A large, continuous swath of blow down was detected in the Dry Wolf Creek area southeast of Niehart. A site visit revealed the main species affected were lodgepole pine and Douglas-fir.

Lake County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	134,706	0	45,113	370,583	550,401
DFB	699	24	125	31	879
MPB-LPP	6,982	59	139	303	7,483
MPB-PP	14	220	28	151	413
SAF Mortality	1,844	51	115	4	2,014
Diplodia	0	158	30	292	479
Hail	0	1,242	0	135	1,377

MPB activity continues to increase in all pine stands in the county. MPB-caused mortality in LPP was also found scattered throughout the Mission Mountains. On the Island Unit, to the west, very widely scattered and small groups of LPP, DF, and SAF were mapped that had been killed by MPB, DFB and WBBB respectively. LPP stands with noticeable amounts of MPB-killed LPP and PP were found scattered on the Flathead Indian Reservation. DFB was observed on only 51 acres, IPS-killed PP on 4 acres, and WBBB activity was noted on just under 100 acres on the reservation. Other bark beetle activity was recorded at endemic levels.

Several large areas of damage were detected in ponderosa pine just north of Polson. This was mapped as Diplodia, but the damage may also be attributed to Elytroderma needle disease. Both diseases are common and persistent in this area. Large areas of hail damage were noted southwest of Elmo. Tree species affected were not determined, but in a nearby area in Sanders County, species affected were Douglas-fir and ponderosa pine. In this same general area, several small pockets of windthrow were also noted. This may have occurred during the same weather event as the hail damage.

Lewis and Clark County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	975,300	24,384	27,083	372,278	1,399,045
DFB	353	50	37	410	850
MPB-LPP	116,973	5,349	2,754	16,976	142,052
MPB-High Elevation	1,872	0	0	7	1,879
MPB-PP	3,253	1,250	1,045	6,509	12,057
Pine Engraver	449	8	38	549	1,045
WSBW	46,411	4,181	5,610	37,345	93,547

Throughout the county on forested land especially northwest of Helena, WSBW is increasing significantly. Defoliation, along with prolonged drought, could result in increased levels of DFB activity over the next few years. In 2007-2008, DFB has been killing DF trees on Flesher Pass and towards Lincoln.

MPB-infested stands nearly tripled to over 100,000 acres of pine, mostly LPP. Ips has also been killing PP in parts of the county and in association with MPB.

Lincoln County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	1,764,422	0	46,630	364,322	2,175,374
DFB	140	0	15	26	181
MPB-LPP	903	0	10	546	1,459
MPB-PP	116	0	4	55	175
SAF Mortality	1,394	0	52	32	1,478
WSBW	19,915	0	20	3,111	23,046
Winter Injury	60	0	0	254	314

Although not all of the county was flown, MPB-killed pine was recorded on several thousand acres. WSBW defoliated about 23,000 acres in the spruce-fir forest type. Approximately 300 acres of larch frost damage was reported in the area. We believe that a late spring frost was responsible for the larch discoloration noted across the county. Winter Injury (tipped trees and stem bending) in mostly pole-sized western larch was most notable immediately west of Libby and immediately west of Yaak.

Madison County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	599,588	103,302	0	91,958	794,848
DFB	112	2	2	10	126
MPB-LPP	99,575	8,206	1,192	15,137	124,110
MPB-High Elevation	57,744	2,209	254	5,021	65,227
SAF Mortality	4,646	4	0	583	5,233
WSBW	37,931	10,475	1,504	13,528	63,438
Windthrow	1,142	0	0	168	1,310

Throughout the Tobacco Roots, across the Gravely Range, and along the west side of the Madison Range MPB in LPP and high elevation pines is causing large areas of tree mortality. WSBW-caused defoliation is also present in the DF with small patches of DFB-caused mortality scattered in or nearby. New areas of SAF mortality were also noted. Several large areas (300+ acres in size) of windthrow were noted northeast of Ennis. Tree species affected were not determined.

Meagher County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	435,689	0	21,092	246,309	703,089
DFB	622	46	0	352	1,020
MPB-LPP	44,404	18	200	8,697	53,320
MPB-High Elevation	7,056	0	0	237	7,293
MPB-PP	665	316	167	1,828	2,977
Pine Engraver	2	0	4	122	128
WSBW	15,409	1,470	1,250	46,037	64,166

MPB-killed LPP was recorded on 53,320 acres with less amounts of MPB-caused tree mortality in PP and WBP. In the Castle Mountains, southeast of White Sulphur Springs, very large groups of LPP, killed by MPB were mapped. Large groups of MPB-killed LPP and WBP were recorded near Kings Hill. Throughout the county, DF stands have been impacted by WSBW and DFB.

Mineral County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	628,839	0	25,461	88,948	743,248
MPB-LPP	23,731	0	4	928	24,663
MPB-PP	172	0	12	36	220

Many widely scattered groups of LPP, killed by MPB, were found south of I-90; from about Superior west to Lookout Pass. The most heavily impacted stands were forested lands administered by Lolo NF. North of the Interstate, in PP stands both east and west of Superior, MPB had killed trees in small and relatively widely scattered groups.

Missoula County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	683,568	12,222	148,052	566,057	1,409,899
DFB	1,500	37	87	225	1,848
MPB-LPP	59,411	2,930	5,812	10,120	78,273
MPB-PP	385	38	399	506	78,273
WSBW	333	110	406	327	1,176
Frost Injury	133	0	39	92	264

Many large groups of MPB-killed LPP were mapped south of Lolo Creek, on Lolo NF-administered lands. Other beetle-killed groups of trees were noted west of Missoula, towards Petty Mountain. Northeast of Missoula, large groups of LPP, killed by MPB, were observed throughout the Rattlesnake Wilderness. In that same area, WBBB has killed noticeable amounts of SAF, and DFB has caused scattered mortality in DF stands. Significant amounts of PP, some fairly small-diameter, were killed in several stands in Missoula and on surrounding private lands. In the Ninemile drainage, and east to Seeley Lake, MPB was also quite active in LPP stands—more so in the area around and north of Seeley Lake. WSBW defoliated DF stands, mostly in the eastern portion of the County. DFB activity was light and scattered. Two areas, each approximately 50 to 100 acres in size, of frost injury in western larch were noted immediately south of Missoula. This is likely part of the range-wide damage to western larch attributed to early June frosts, possibly a single frost event around June 10. Larger trees and tree tops were more heavily damaged than smaller trees and lower crowns.

Musselshell County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	28,858	19,675	256,432	304,965
MPB-PP	0	13	14	438	465
Pine Engraver	0	8	28	154	191
Pine Tussock Moth	0	238	350	6,223	6,811

Special surveys were conducted on mostly private land, about 10 miles southeast of Roundup to monitor ongoing pine tussock moth outbreaks. In the Roundup area, the infested area has expanded to cover more than 6,800 acres. In conducting those surveys almost 500 acres of ponderosa pine were observed to have some level of MPB-caused mortality with another 200 acres exhibited Ips species caused mortality.

Park County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	777,179	61,162	39,304	163,238	1,040,883
DFB	75	56	2	78	210
MPB-LPP	12,228	5,420	0	7,992	25,640
MPB-High Elevation	18,710	4,410	0	6,897	30,017
SAF Mortality	1,005	354	0	232	1,591
WSBW	13,278	12,704	1,082	17,168	44,231

MPB-caused mortality was extensive throughout the Gallatin, Absaroka, and Crazy Mountain ranges. Most of that mortality was found in LPP stands, but significant amounts of high-elevation 5-needle pines were also killed. MPB activity was especially intense in southwestern portions of the Crazy Mountains, on lands administered by Gallatin NF. SAF mortality, attributed to WBBB and DF mortality caused by DFB was more widely scattered, although SAF mortality in some high-elevation stands was substantial. WSBW-caused mortality was notable in portions of the Gallatin and Bridger mountain ranges.

Petroleum County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	69,956	12,613	24,076	106,644
MPB-PP	0	2	0	0	2

Only a small portion of Petroleum County was surveyed, where 2 acres of MPB were detected.

Phillips County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	65,099	0	66,716	131,814
MPB-LPP	0	89	0	0	89
MPB-PP	0	437	8	22	467
Pine Engraver	0	34	11	8	53
Lodgepole pine needle cast	0	228	0	0	228

Widely scattered bark beetle activity was recorded. Most of the recorded beetle activity was MPB in PP. No DFB activity was recorded in 2008. A number of small areas of *Lophodermella concolor* (lodgepole pine needle cast) were noted on the southern edge of Fort Belknap Indian Reservation.

Pondera County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	93,289	0	0	11,661	104,950
WSBW	0	73	0	0	73

Of the Blackfeet IR lands surveyed within Pondera County, only 74 acres of WSBW-caused defoliation were detected.

Powder River County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	260,335	72,983	12,060	174,897	520,276
MPB-PP	192	2	4	34	232
Pine Engraver	118	0	6	58	183
Pine Tussock Moth	540	0	0	102	642

Small and very widely scattered groups of MPB and IPS-killed PP were noted northeast and east of Ashland. Most groups contained fewer than 10 trees each. It is likely some groups of trees were affected by both beetles. A few small groups of PP, totaling fewer than 700 acres, were defoliated by pine tussock moth east and northeast of Ashland. Those outbreaks have been ongoing for a couple of years and are typically of short duration.

Powell County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	608,612	83,781	16,839	235,583	944,815
DFB	540	316	62	104	1,022
MPB-LPP	123,818	39,550	6,524	28,597	198,490
MPB-High Elevation	1,860	0	0	105	1,965
MPB-PP	4,171	216	342	3,290	4,171
Pine Engraver	19	0	81	367	467
SAF Mortality	116	5	2	0	123
WSBW	13,592	3,095	194	5,175	22,056

Very large groups of MPB-killed LPP were noted east of Boulder. To the west, numerous and large groups of LPP, killed by MPB, were mapped west of Anaconda and Deer Lodge, very broadly found throughout the county. WSBW activity continued across thousands of acres in the county. Limited DFB activity was recorded, mostly on federal lands, but may increase on all lands if defoliation from WSBW continues.

Ravalli County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	1,098,988	0	33,932	108,779	1,241,699
DFB	604	0	29	34	666
MPB-LPP	7,362	0	17	15	7,393
MPB-High Elevation	1,326	0	0	0	1,326
MPB-PP	297	0	33	20	350
SAF Mortality	2,848	0	0	0	2,848
WSBW	659	0	14	489	1,162

In 2008, MPB activity in LPP stands was the most often encountered bark beetle-caused mortality in the county. While much of the southern portion of the County was not surveyed, the part that was showed significantly less bark beetle activity than much of the rest of western Montana. Small groups of MPB-killed LPP and DF killed by DFB were mapped in the Sapphire Mountains east of Stevensville, and a relatively large group of MPB-killed WBP was mapped above Skalkaho Basin. Small groups of DFB-caused mortality were noted from Stevensville south to just east of Hamilton; and on DF stands surrounding Sula, DFB activity is much reduced from levels of just a few years ago. WSBW-caused defoliation was light in the southern part of the County, near Lost Trail Pass.

Sanders County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	929,570	13,916	36,115	466,983	1,446,585
DFB	20	12	14	19	55
MPB-LPP	35,469	2,252	609	1,607	39,937
MPB-PP	95	244	61	65	466
SAF Mortality	28	34	6	8	76
WSBW	8,902	0	319	1,882	11,103
Frost Injury	121	1,548	38	9	1,716
Hail	0	1,578	92	318	1,988

Small and widely scattered groups of MPB-killed LPP were mapped south of the Clark Fork River, south of Plains. Large groups were also noted in Prospect Creek drainage west of Thompson Falls. At higher elevations, small amounts of SAF were killed by WBBB. WSBW also defoliated DF stands. Several large groups of MPB-killed LPP were found in the Vermillion River drainage. In that same area, many DF stands have been lightly to moderately defoliated by WSBW. DF beetle may resurge in those areas in the future depending upon defoliation in the future and weather patterns.

Severe frost injury was noted west and southwest of Ravalli, mostly on the Flathead Indian Reservation. Species of trees affected was not determined, but most likely western larch. A large area of hail damage was noted northeast of Perma in Fairy Basin Gulch. Species affected was mostly Douglas-fir, but also western larch and ponderosa pine.

Silver Bow County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	191,713	29,101	4,648	15,475	240,937
MPB-LPP	116,154	864	4,944	8,401	130,363
MPB-High Elevation	6,413	0	247	57	6,717
WSBW	6,923	5,630	799	2,083	15,435

MPB was the principle tree killer in forested lands, with most activity occurring in LPP with additional mortality in 5-needled pines. WSBW-caused defoliation was scattered but notable in BLM and Forest Service lands southeast of Humbug Spires Wilderness Area (BLM).

Stillwater County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	120,206	0	0	110,543	230,749
DFB	30	0	0	4	31
MPB-LPP	685	0	0	51	735
MPB-High Elevation	116	0	0	0	116
MPB-PP	0	2	110	1,987	2,099
SAF Mortality	268	0	0	6	274
Pine Tussock Moth	0	0	144	1,446	1,590
Windthrow	459	0	27	0	486

MPB-caused mortality was observed in LPP and WBP stands administered by the Custer NF in the Beartooth Mountains. Minor amounts of SAF mortality, attributed to WBBB, were noted in that same area. Elsewhere, PP stands on largely privately owned lands, showed some MPB-killed trees, but that mortality was fairly light and widely scattered. PP stands south of Columbus continued to show defoliation caused by pine tussock moth larvae. That outbreak has existed for 2-3 years and likely is declining. An area about 10 miles north and an area about 7 miles northeast of Mystic Lake in the Rosebud Creek drainage each contained several patches of windthrown trees.

Sweet Grass County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	247,215	19,738	0	101,752	368,704
DFB	35	0	0	39	74
MPB-LPP	2,772	8	0	479	3,259
MPB-High Elevation	4,411	0	0	142	4,553
SAF Mortality	1,684	0	0	6	1,690
WSBW	5,915	45	580	15,367	21,907

Most bark beetle-caused mortality in the county was observed in LPP and WBP stands within the Beartooth and Crazy mountain ranges—lands administered by the Gallatin and Custer NFs. Some of that mortality was extensive—especially in the eastern Crazy Mountains and in the Boulder River drainage. WSBW-caused defoliation was light, but in a broadly scattered pattern throughout the southeastern portion of the Crazy Mountains, northwest of Big Timber. Elsewhere, little forest insect activity was noted.

Wheatland County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	37,058	0	0	27,794	64,852
DFB	108	0	0	8	110
MPB-LPP	234	0	0	17	251
MPB-PP	835	4	0	147	986
WSBW	2,229	0	1,101	4,239	7,568

Data for Wheatland County comes from the SE end of the Little Belts. Defoliation by WSBW was noted at higher elevations. MPB in PP was detected largely along the south edge of the Little Belts, especially in the headwaters of Hopely Creek.

Yellowstone County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	State	Private	Total
Forestland	0	35,384	0	169,590	204,974
MPB-PP	0	6	0	6	12

MPB-caused mortality in the county was noted primarily in PP stands within the confines of the Crow IR. Beetle-killed trees were few and very widely scattered.

Table 1. Mortality, Defoliation and Other Damage detected from the air on National Forests, National Parks and Tribal Lands in Montana, during 2008

Beaverhead-Deerlodge NF	Acres	Trees
BUTTE RD		
Douglas-fir Beetle	6	17
Mountain Pine Beetle (PP)	2	2
Mountain Pine Beetle (LPP)	122,340	1,224,391
MPB (High Elev 5-needle Pines)	2,209	13,986
Spruce Budworm	5,552	0
DEER LODGE RD		
Mountain Pine Beetle (PP)	367	491
Mountain Pine Beetle (LPP)	97,573	684,764
SAF Mortality	11	66
MPB (High Elev 5-needle Pines)	7,021	5,017
Spruce Budworm	404	0
DILLON RD		
Douglas-fir Beetle	14	86
Mountain Pine Beetle (LPP)	67,451	296,804
SAF Mortality	90	769
MPB (High Elev 5-needle Pines)	10,649	43,058
Spruce Budworm	22,090	0
JEFFERSON RD		
Douglas-fir Beetle	48	194
Mountain Pine Beetle (PP)	523	972
Mountain Pine Beetle (LPP)	266,670	1,977,516
MPB (High Elev 5-needle Pines)	13,406	73,232
Spruce Budworm	5,648	0
MADISON RD		
Douglas-fir Beetle	112	186
Mountain Pine Beetle (LPP)	66,892	228,632
SAF Mortality	157	1,167
MPB (High Elev 5-needle Pines)	48,637	222,438
Spruce Budworm	45,086	0
Aspen Decline	1	0
PINTLER RD		
Douglas-fir Beetle	264	799
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (PP)	6	15
Mountain Pine Beetle (LPP)	12,105	13,340
Western Pine Beetle	2	2
SAF Mortality	8,389	19,761
Pine Engraver Beetle (LPP)	2	10
MPB (High Elev 5-needle Pines)	242	346
Spruce Budworm	1,039	0
WISDOM RD		
Douglas-fir Beetle	78	408
Mountain Pine Beetle (LPP)	217	680
SAF Mortality	176	1,071
MPB (High Elev 5-needle Pines)	805	1,093
Spruce Budworm	6	0
WISE RIVER RD		
Douglas-fir Beetle	24	192
Mountain Pine Beetle (LPP)	66,589	279,689
SAF Mortality	34	546
MPB (High Elev 5-needle Pines)	7,203	27,209
Spruce Budworm	3,142	0

Bitterroot NF	Acres	Trees
DARBY RD		
Douglas-fir Beetle	48	160
Mountain Pine Beetle (PP)	4	4
Mountain Pine Beetle (LPP)	11	32
Western Pine Beetle	4	4
SAF Mortality	43	186
MPB (High Elev 5-needle Pines)	464	956
Spruce Budworm	139	0
STEVENSVILLE RD		
Douglas-fir Beetle	53	392
Engelmann Spruce Beetle	2	6
Mountain Pine Beetle (PP)	220	126
Mountain Pine Beetle (LPP)	1,033	2,752
Western Pine Beetle	3	3
SAF Mortality	339	1,158
MPB (High Elev 5-needle Pines)	726	1,593
Spruce Budworm	571	0
Lophodermella concolor	3	0
SULA RD		
Douglas-fir Beetle	123	146
Mountain Pine Beetle (PP)	24	24
Mountain Pine Beetle (LPP)	189	339
Western Pine Beetle	6	6
SAF Mortality	637	1,771
MPB (High Elev 5-needle Pines)	147	646
WEST FORK RD		
Douglas-fir Beetle	418	1,101
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (PP)	59	72
Mountain Pine Beetle (LPP)	6,877	42,673
Western Pine Beetle	4	4
SAF Mortality	1,819	7,877
MPB (High Elev 5 needle Pines)	47	76
Custer NF	**Acres**	**Trees**
ASHLAND RD		
Pine Engraver Beetle (PP)	153	206
Mountain Pine Beetle (PP)	202	193
Pine Tussock Moth	618	0
Windthrow	11	0
Avalanche/Mud Slide	20	0
BEARTOOTH RD		
Douglas-fir Beetle	69	138
Mountain Pine Beetle (PP)	6	14
Mountain Pine Beetle (LPP)	3,279	30,100
SAF Mortality	2,449	15,060
MPB (High Elev 5-needle Pines)	1,113	2,291
Lophodermella concolor	95	0
Windthrow	572	0
SIOUX RD		
Pine Engraver Beetle (PP)	165	305
Mountain Pine Beetle (PP)	269	260
Pine Tussock Moth	423	0
Windthrow	73	0

Flathead NF	Acres	Trees
Glacier View RD		
Douglas-fir Beetle	2,312	2,569
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (LPP)	131	255
Fir Engraver Beetle	37	72
SAF Mortality	10,038	13,439
MPB (High Elev 5-needle Pines)	2	2
Western larch nedle cast	67	0
HUNGRY HORSE RD		
Douglas-fir Beetle	1,289	2,038
Engelmann Spruce Beetle	4	4
Mountain Pine Beetle (LPP)	261	409
Fir Engraver Beetle	6	14
SAF Mortality	405	992
MPB (High Elev 5-needle Pines)	2	2
SPOTTED BEAR RD		
Douglas-fir Beetle	1,379	1,991
Mountain Pine Beetle (PP)	2	2
Mountain Pine Beetle (LPP)	5,389	5,883
Fir Engraver Beetle	2	2
SAF Mortality	350	875
MPB (High Elev 5-needle Pines)	4	4
SWAN LAKE RD		
Douglas-fir Beetle	1,894	3,896
Mountain Pine Beetle (PP)	40	63
Mountain Pine Beetle (LPP)	15,186	47,086
Fir Engraver Beetle	34	63
SAF Mortality	2,724	7,325
MPB (High Elev 5-needle Pines)	6	8
Larch Needle Disease	42	0
Frost injury	55	0
Western larch needle cast	841	0
Windthrow	21	0
TALLY LAKE RD		
Douglas-fir Beetle	702	1,582
Engelmann Spruce Beetle	12	10
Mountain Pine Beetle (PP)	10	10
Mountain Pine Beetle (LPP)	35	111
Fir Engraver Beetle	36	46
SAF Mortality	2,164	2,657
MPB (High Elev 5-needle Pines)	7	8
Frost injury	8	0
Western larch needle cast	772	0
Gallatin NF	**Acres**	**Trees**
BIG TIMBER RD		
Douglas-fir Beetle	41	146
Mountain Pine Beetle (PP)	4	4
Mountain Pine Beetle (LPP)	1,006	4,645
SAF Mortality	99	474
MPB (High Elev 5-needle Pines)	4,946	19,285
Spruce Budworm	9,930	0
BOZEMAN RD		
Douglas-fir Beetle	141	583
Mountain Pine Beetle (PP)	2	2
Mountain Pine Beetle (LPP)	48,103	243,749
SAF Mortality	10,673	45,832
MPB (High Elev 5-needle Pines)	25,777	73,329
Spruce Budworm	41,909	0
Windthrow	1,351	0

GARDINER RD		
Douglas-fir Beetle	25	223
Mountain Pine Beetle (LPP)	2,398	5,462
SAF Mortality	346	850
MPB (High Elev 5-needle Pines)	10,272	36,848
Spruce Budworm	2,203	0
HEBGEN LAKE RD		
Douglas-fir Beetle	26	106
Mountain Pine Beetle (PP)	2	4
Mountain Pine Beetle (LPP)	13,534	27,188
SAF Mortality	1,034	2,710
MPB (High Elev 5-needle Pines)	19,032	69,214
Spruce Budworm	928	0
Lophodermella concolor	900	0
LIVINGSTON RD		
Douglas-fir Beetle	253	1,424
Mountain Pine Beetle (LPP)	23,582	93,945
SAF Mortality	1,853	4,822
MPB (High Elev 5-needle Pines)	23,560	89,706
Spruce Budworm	10,742	0
Dieback	52	0
Helena NF	**Acres**	**Trees**
HELENA RD		
Douglas-fir Beetle	170	301
Pine Engraver Beetle (PP)	1,867	4,931
Mountain Pine Beetle (PP)	9,665	34,072
Mountain Pine Beetle (LPP)	170,179	5,449,798
SAF Mortality	2	20
MPB (High Elev 5-needle Pines)	1,596	22,841
Spruce Budworm	38,660	0
Windthrow	39	0
LINCOLN RD		
Douglas-fir Beetle	490	2,036
Pine Engraver Beetle (PP)	37	120
Mountain Pine Beetle (PP)	361	3,238
Mountain Pine Beetle (LPP)	77,884	1,711,743
SAF Mortality	14	48
MPB (High Elev 5-needle Pines)	1,319	11,753
Spruce Budworm	36,696	0
Windthrow	5	0
TOWNSEND RD		
Douglas-fir Beetle	4,048	141
Pine Engraver Beetle (PP)	57	150
Mountain Pine Beetle (PP)	685	2,574
Mountain Pine Beetle (LPP)	19,152	696,740
MPB (High Elev 5-needle Pines)	935	3,268
Spruce Budworm	36,997	0
Windthrow	71	0
Kootenai NF	**Acres**	**Trees**
CABINET RD		
Douglas-fir Beetle	20	48
Mountain Pine Beetle (PP)	2	2
Mountain Pine Beetle (LPP)	5,207	87,828
Western Pine Beetle	2	2
Spruce Budworm	9,287	0
Frost injury	136	0
FORTINE RD		
Douglas-fir Beetle	2	4
SAF Mortality	22	27

LIBBY RD		
Douglas-fir Beetle	169	216
Engelmann Spruce Beetle	10	12
Pine Engraver Beetle (PP)	8	20
Mountain Pine Beetle (PP)	169	175
Mountain Pine Beetle (LPP)	1,595	9,774
Fir Engraver Beetle	16	21
SAF Mortality	371	1,188
Spruce Budworm	23,291	0
THREE RIVERS RD		
Mountain Pine Beetle (PP)	2	2
Mountain Pine Beetle (LPP)	2	6
Winter injury	52	0
Lewis and Clark NF	**Acres**	**Trees**
JUDITH RD		
Douglas-fir Beetle	78	178
Pine Engraver Beetle (PP)	26	32
Mountain Pine Beetle (PP)	387	335
Mountain Pine Beetle (LPP)	3,594	9,499
SAF Mortality	1,158	3,190
MPB (High Elev 5-needle Pines)	3,878	12,597
Spruce Budworm	20,917	0
Unidentified Defoliator	12	0
Lophodermella concolor	141	0
Root Rot	169	0
Frost injury	675	0
Windthrow	699	0
BELT CREEK/WHITE SULPHUR SPRINGS RD		
Douglas-fir Beetle	34	73
Engelmann Spruce Beetle	2	2
Pine Engraver Beetle (PP)	10	25
Mountain Pine Beetle (PP)	100	200
Mountain Pine Beetle (LPP)	20,741	43,029
SAF Mortality	175	494
MPB (High Elev 5-needle Pines)	1,419	4,300
Spruce Budworm	2,917	0
MUSSELSHELL RD		
Douglas-fir Beetle	612	1,373
Mountain Pine Beetle (PP)	1,486	2,677
Mountain Pine Beetle (LPP)	16,212	40,050
SAF Mortality	7	59
MPB (High Elev 5-needle Pines)	4,817	18,365
Spruce Budworm	12,380	0
Windthrow	16	0
ROCKY MOUNTAIN RD		
Mountain Pine Beetle (LPP)	18	152
MPB (High Elev 5-needle Pines)	14	70
Spruce Budworm	5	0
Lolo NF	**Acres**	**Trees**
MISSOULA RD		
Douglas-fir Beetle	1,239	4,703
Pine Engraver Beetle (PP)	2	5
Mountain Pine Beetle (PP)	297	708
Mountain Pine Beetle (LPP)	41,647	155,907
Western Pine Beetle	10	10
Fir Engraver Beetle	2	2
SAF Mortality	1,459	2,049
MPB (High Elev 5-needle Pines)	4	8
Spruce Budworm	1,259	0

Lophodermella concolor	44	0
Frost injury	133	0
NINEMILE RD		
Douglas-fir Beetle	23	49
Mountain Pine Beetle (PP)	178	324
Mountain Pine Beetle (LPP)	4,032	21,588
Western Pine Beetle	12	12
SAF Mortality	60	134
Spruce Budworm	46	0
PLAINS RD		
Douglas-fir Beetle	10	34
Pine Engraver Beetle (PP)	10	44
Mountain Pine Beetle (PP)	53	274
Mountain Pine Beetle (LPP)	2,971	18,793
Western Pine Beetle	18	18
Fir Engraver Beetle	1	1
SAF Mortality	14	65
Spruce Budworm	436	0
Frost injury	4	0
Western larch needle cast	175	0
SEELEY LAKE RD		
Douglas-fir Beetle	734	1,525
Mountain Pine Beetle (PP)	124	131
Mountain Pine Beetle (LPP)	26,846	50,672
Fir Engraver Beetle	43	206
SAF Mortality	659	868
MPB (High Elev 5-needle Pines)	40	60
SUPERIOR RD		
Douglas-fir Beetle	4	12
Pine Engraver Beetle (PP)	4	16
Mountain Pine Beetle (PP)	213	1,125
Mountain Pine Beetle (LPP)	22,086	91,871
Western Pine Beetle	22	26
SAF Mortality	34	168
Frost injury	19	0
THOMPSON FALLS RD		
Pine Engraver Beetle (PP)	2	6
Mountain Pine Beetle (PP)	49	223
Mountain Pine Beetle (LPP)	28,496	132,753
Western Pine Beetle	14	26
SAF Mortality	22	110
Spruce Budworm	850	0
Blackfeet IR	**Acres**	**Trees**
Douglas-fir Beetle	49	56
Fir Engraver Beetle	4	8
High Water Damage	2	0
Lophodermella concolor	3,366	0
Mountain Pine Beetle (LPP)	623	4,106
Spruce Budworm	2,298	0
SAF Mortality	2	6
Flathead IR	**Acres**	**Trees**
Diplodia	158	0
Douglas-fir Beetle	37	53
Fir Engraver Beetle	2	4
Frost Injury	1,548	0
Hail	2,826	0
Mountain Pine Beetle (LPP)	2,371	3,076
Mountain Pine Beetle (PP)	537	903
Pine Engraver Beetle (PP)	4	16

Root Rot	4	6
SAF Mortality	95	177
Western Pine Beetle	22	22
Windthrow	103	0
Fort Belknap IR	**Acres**	**Trees**
Lophodermella concolor	234	0
Mountain Pine Beetle (LPP)	137	334
Mountain Pine Beetle (PP)	598	1,145
Pine Engraver Beetle (PP)	46	62
Rocky Boys IR	**Acres**	**Trees**
Douglas-fir Beetle	9	18
Mountain Pine Beetle (LPP)	1,719	9,319
Mountain Pine Beetle (PP)	190	461
Pine Engraver Beetle (PP)	7	36
Spruce Budworm	9	0
Windthrow	3	0

Glacier NP	**Acres**	**Trees**
Aspen Decline	3	10
Douglas-fir Beetle	2,144	3,948
Engelmann Spruce Beetle	2	2
Fir Engraver Beetle	62	73
Lophodermella concolor	8,792	0
Mountain Pine Beetle (LPP)	20,783	136,854
Mountain Pine Beetle (PP)	2	2
Needle Cast	247	0
Spruce Budworm	2,978	0
SAF Mortality	3,624	8,005
Yellowstone NP	**Acres**	**Trees**
Douglas-fir Beetle	63	79
Mountain Pine Beetle (LPP)	13,155	20,355
Mountain Pine Beetle (PP)	2	4
MPB (High Elev 5-needle Pines)	5,485	11,262
Spruce Budworm	12,673	0
SAF Mortality	357	446

COMMON AND SCIENTIFIC NAMES

Pathogens

Annosus root disease	*Heterobasidion annosum* (Fr.:Fr.) Bref.	Primary hosts: DF, GF, PP, SAF
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink	DF, GF, SAF, sapling pines
Black stain root disease	*Leptographium wageneri* (Kendrick) M.J. Wingfield	DF, PP
Brown cubical butt rot	*Phaeolus schweinitzii* (Fr.:Fr.) Pat.	DF
Dothistroma needle cast	*Dothistroma septospora* (Doroguine) Morelet	LP, PP, WWP, LPP, WBP
Dwarf mistletoes	*Arceuthobium* spp.	LPP, LP, DF, WL
Brown stringy rot	*Echinodontium tinctorium* (Ell. & Ev.) Ell. & Ev.	GF, WH
Elytroderma needle cast	*Elytroderma deformans* (Weir) Darker	PP
Laminated root rot	*Phellinus weirii* (Murrill) R.L. Gilbertson.	DF, GF, WH, SAF
Larch casebearer	*Coleophora laricella (*Hubner*)*	WL
Larch needle blight	*Hypodermella laricis* Tub.	WL
Larch needle cast	*Meria laricis* Vuill.	WL
Lodgepole pine needle cast	*Lophodermella concolor* (Dearn.) Darker	LPP
Western pine (Grizzled) tussock moth	*Dasychira grisefacta* (Dyar)	PP (DF,ES,SAF,GF,WL, LPP)
Diplodia shoot blight	*Diplodia pinea (Desmaz.) J. Kickx fil.*	PP
Western gall rust	*Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka	LPP, PP
White pine blister rust	*Cronartium ribicola* J.C. Fisch.	WWP, WBP, LP

Insects

Douglas-fir beetle	*Dendroctonus pseudotusugae* Hopkins	DF
Douglas-fir tussock moth	*Orygia pseudotsugata (*McDunnough*)*	DF, TF, ES
Gypsy moth	*Lymantria dispar (*Linaeus*)*	Most hardwoods
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins	All pines
Pine engraver beetle	*Ips pini* (Say)	PP, LPP
Spruce beetle	*Dendroctonus rufipennis* Swaine	ES
Western balsam bark beetle	*Dryocoetes confuses* Swaine	SAF
Western spruce budworm	*Choristoneura occidentalis* Freeman	DF, TF, ES, WI
Western pine beetle	*Dendroctonus brevicomis* LeConte	PP
Fir engraver beetle	*Scolytis ventralis* LeConte	GF, SAF
Hemlock looper	*Lambdina fiscellaria lugubrosa* (Hulst)	DF
False hemlock looper	*Nepytia canosaria* (Walker)	DF

DF = Douglas-fir; GF = Grand fir; TF = True fir; SAF = Subalpine fir; PP = Ponderosa pine; LP = Limber pine; LPP = Lodgepole pine; WWP = Western white pine; ES = Engelmann spruce; WH = Western hemlock; WL = Western larch; WBP = Whitebark pine

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Table 2. Acres of Host Type Infested by Bark Beetles In Montana, From 2006 Through 2008

	2006[2,3]		2007[2,3]		2008[2,3]	
Insect	**Acres**	**Trees**	**Acres**	**Trees**	**Acres**	**Trees**
DFB[1]	60,620	113,117	22,285	58,773	21,558	39,587
ESB[1]	119	143	403	572	54	60
FE[1]	2,417	4,338	1,657	1,634	359	803
IPS[1]	1,302	2,891	1,187	2,299	10,778	36,669
MPB[1]	805,595	2,167,382	807,334	2,559,859	1,819,245	16,903,542
WBBB[1]	129,784	182,451	115,250	286,757	53,194	149,802
WPB[1]	452	336	401	243	167	182
TOTAL	1,000,289	2,470,658	948,517	2,910,137	1,905,355	17,130,645

[1]DFB=Douglas-fir beetle; ESB= Spruce beetle; FE=Fir engraver beetle; IPS=Pine engraver beetle; MPB=Mountain pine beetle; WBBB=Western balsam bark beetle; WPB=Western pine beetle.

[2]Not all areas were flown due to fires, inclement weather or seasonal limitations.

[3]Yellowstone NP includes MT, ID and WY acres.

Table 3. Acres with Douglas-fir Beetle-Caused Mortality on All Ownerships In Montana, From 2006 Through 2008

	2006		2007		2008	
Reporting Area	**Acres**	**Trees**	**Acres**	**Trees**	**Acres**	**Trees**
Beaverhead	8,929*	2,488*	4,197*	11,138*	376	1,766
Bitterroot	27,071	49,444	1,835*	5,430*	674*	1,933*
Custer	0	0	1,086	4,302	85*	163*
Deerlodge	2,088	6,775	107*	386*	411	1,219
Flathead	8,006	18,316	5,450	9,020	7,899	12,844
Gallatin	1,088*	1,107*	2,058*	9,803*	722*	3,515*
Garnets	1,196	2,365	47*	154*	283	650
Helena	5,279	13,779	419*	1442*	5,166*	3,859*
Kootenai	701*	949*	724*	805*	205*	289*
Lewis & Clark	959*	1,162*	203*	630*	937*	2,075*
Lolo	5,114	16,356	1,261*	3,029*	2,364	6,772
Blackfeet IR	★	★	★	★	55	68
Crow IR	0	0	348	1,371	★	★
Flathead IR	177	346	552	1,102	51*	73*
Fort Belknap IR	0	0	13	57	0	0
No. Cheyenne IR	0	0	0	0	★	★
Rocky Boy's IR	0	0	2	25	18	56
Glacier NP	★	★	3,604*	8,814*	2,146	3,950
Yellowstone NP	12*	30*	379	1,265	166	355
TOTAL	60,620	113,117	22,285	58,773	21,558	39,587

★ = Not surveyed * = Partially surveyed

Yellowstone NP includes acres in MT, ID and WY

Table 4. Acres with Mountain Pine Beetle-Caused Mortality on State and Private Lands In Montana, From 2006 Through 2008

Reporting Area	LPP	PP	WBP	WWP	LPP	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead	1,641*	2*	852*	0*	6,074*	4*	918*	0*	26,874	0	3,064	0
Bitterroot	113	123	0	0	6*	45*	0*	0*	36*	61*	0*	0*
Custer	0	10	0	0	217	145	6	0	63*	527*	3*	0*
Deerlodge	33,933	138	402	0	16,529*	21*	302*	0*	79,935	834	5,435	0
Flathead	5,262	241	0	0	2,971	1,009	0	0	2,619	795	2	0
Gallatin	4,612*	14*	8,203*	0*	9,641*	56*	7,971*	0*	32,811*	21*	16,467*	0*
Garnets	5,424	814	2	0	1,430*	84*	0*	0*	25,712	1,922	105	0
Helena	2,720	2,544	111	0	14,886*	6,312*	0*	0*	55,354*	24,009*	105*	0*
Kootenai	359*	30*	0*	0*	4*	4*	0*	0*	951*	148*	0*	0*
Lewis & Clark	1,260*	1,252*	41*	0*	735*	2,922*	55*	0*	4,191*	1,899*	183*	0*
Lolo	18,909	2,403	0	0	5,309*	608*	0*	0*	11,079	531	0	0
Blackfeet IR	★	★	★	★	★	★	★	★	44	0	0	0
Crow IR	0	0	0	0	2	36	0	0	★	★	★	★
Flathead IR	2,117	244	0	0	1,399	109	0	0	431*	203*	0*	0*
Fort Belknap IR	★	★	★	★	0	2	0	0	2	30	0	0
No. Cheyenne IR	0	0	0	0	0	8	0	0	★	★	★	★
Rocky Boy's IR	★	★	★	★	593	62	0	0	561	258	0	0
Glacier NP	★	★	★	★	4*	0*	0*	0*	190	0	0	0
Yellowstone NP	0*	0*	0*	0*	0*	0*	0*	0*	0	0	0	0
TOTAL	76,350	7,815	9,611	0	59,800	11,427	9,252	0	240,853	31,238	25,364	0

[1]LPP = Lodgepole pine; PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine

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

Table 5. Acres with Mountain Pine Beetle-Caused Mortality on All Federal Ownerships In Montana, From 2006 Through 2008

	2006				2007				2008			
Reporting Area	**LPP**	**PP**	**WBP**	**WWP**	**LPP**	**PP**	**WBP**	**WWP**	**LPP**	**PP**	**WBP**	**WWP**
Beaverhead	26,178*	0*	59,240	0*	55,673*	6*	43,257*	0*	220,579	0	71,414	0
Bitterroot	2,591	204	3,005	0	2,491*	334*	180*	0*	8,083*	297*	1,384*	0*
Custer	0	85	265	0	1,151	476	3,334	0	3,277*	476*	1,110*	0*
Deerlodge	212,195	186	2,083	0	160,671*	78*	2,800*	0*	458,193	745	18,733	0
Flathead	37,610	181	632	2	40,148	62	16	0	19,058	39	21	0
Gallatin	13,523	16*	23,029	0*	20,659*	42*	44,989*	0*	66,374*	5*	67,135*	0*
Garnets	8,525	10	0	0	3,830*	21*	0*	0*	44,374	82	0	0
Helena	19,340	2,598	6,943	0	91,317*	5,235*	526*	0*	263,767*	13,054*	4,088*	0*
Kootenai	13,134*	320*	2*	6*	3,405*	48*	14*	4*	5,956*	116*	0*	0*
Lewis & Clark	10,932	7,222	12,736	0*	9,766*	3,331*	2,529*	0*	38,528*	2,248*	9,961*	0*
Lolo	190,890	12,743	726	0	123,274*	2,562*	58*	2*	119,425	775	44	0
Blackfeet IR	★	★	★	★	★	★	★	★	623	0	0	0
Crow IR	0	12	38	0	286	127	26	0	★	★	★	★
Flathead IR	42,563	1,948	19	0	26,413	929	16	0	2,371*	537*	0*	0*
Fort Belknap IR	★	★	★	★	28	104	0	0	137	598	0	0
No. Cheyenne IR	0	16	0	0	0	302	0	0	★	★	★	★
Rocky Boy's IR	★	★	★	★	1,281	75	0	0	1,718	190	0	0
Glacier NP	★	★	★	★	10,028*	4*	24*	0*	20,786	2	0	0
Yellowstone NP	6,908*	0*	286*	0*	28,085	0	36,838	0	25,535	2	29,950	0
TOTAL	584,389	25,541	109,004	8	578,506	13,736	134,607	6	1,298,784	19,166	203,840	0

[1]LPP = Lodgepole pine; PP = Ponderosa pine; WBP = Whitebark pine; WWP = Western white pine

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

Table 6. Acres with Additional Bark Beetle-Caused Mortality on All Ownerships In Montana, From 2006 Through 2008

	Engelmann Spruce			Fir Engraver Beetle			Pine Engraver Beetle			Western Balsam Bark Beetle			Western Pine Beetle		
Reporting Area	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**
Beaverhead	0*	0*	0	0*	0*	0	0*	0*	0	54,085*	21862*	464	0*	10*	0
Bitterroot	6	0*	4*	0	10*	0*	4	0*	2*	4,141	9547*	2,838	6	0*	24*
Custer	0	0	0*	0	0	0*	0	10	431*	1,123	5,485	2,449*	0	0	0*
Deerlodge	0	0*	2	0	0*	0	0	0*	0	692	120*	8,400	12	0*	2
Flathead	30	12	24	1,496	1,559	174	20	0	0	4,986	6,987	16,393	84	124	0
Gallatin	0*	0*	0*	2*	0*	0*	2*	5*	4*	46,054*	33350*	14,054*	0*	0*	0*
Garnets	0	0*	0	2	0*	31	203	33*	0	144	334*	9	12	0*	2
Helena	18	0*	4*	0	0*	0*	311	0*	9,995*	1,316	6*	16*	24	0*	0*
Kootenai	4*	5*	10*	195*	66*	36*	0*	0*	12*	381*	6732*	394*	0*	0*	4*
Lewis & Clark	0*	0*	2*	70*	0*	0*	0*	40*	176*	11,372*	1022*	1,341*	0*	2*	0*
Lolo	58	8*	0	215	18*	48	749	470*	45	1,177	457*	2,261	302	265*	107
Blackfeet IR	★	★	0	★	★	4	★	★	0	★	★	2	★	★	0
Crow IR	0	0	★	0	0	★	0	0	★	4,091	4,736	★	0	0	★
Flathead IR	0	0	0*	436	2	2*	13	610	4*	276	1,045	99*	12	124	28*
Fort Belknap IR	★	0	0	★	0	0	★	19	65	★	0	0	★	0	0
No. Cheyenne IR	0	0	★	0	0	★	0	0	★	0	0	★	0	0	★
Rocky Boy's IR	★	0	0	★	0	0	★	0	44	★	0	0	★	0	0
Glacier NP	★	4*	4	★	2*	64	★	0*	0	★	1580*	3,624	★	0*	0
Yellowstone NP	0*	374	4	0*	0	0	0*	0	0	451*	21,987	850	0*	0	0
TOTAL	116	403	54	2,416	1,657	359	1,302	1,187	10,778	130,289	115,250	53,194	452	401	167

★ = Not surveyed * = Partially surveyed

Yellowstone NP includes MT, ID and WY acres

Figure 1. Reporting Areas and County Boundaries in Montana

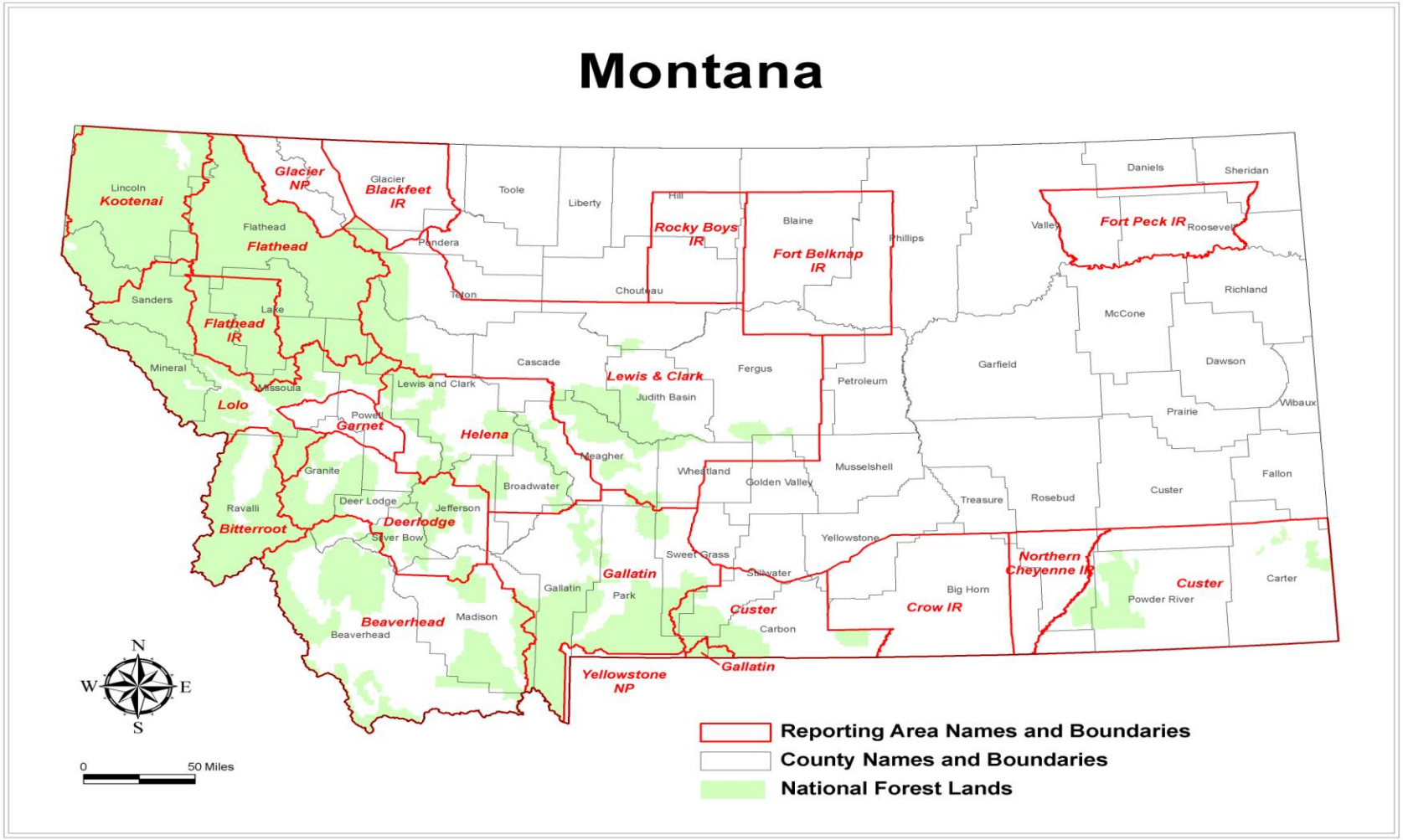

Figure 2. Areas Surveyed During the 2008 Forest Health Protection Aerial Detection Survey in Montana

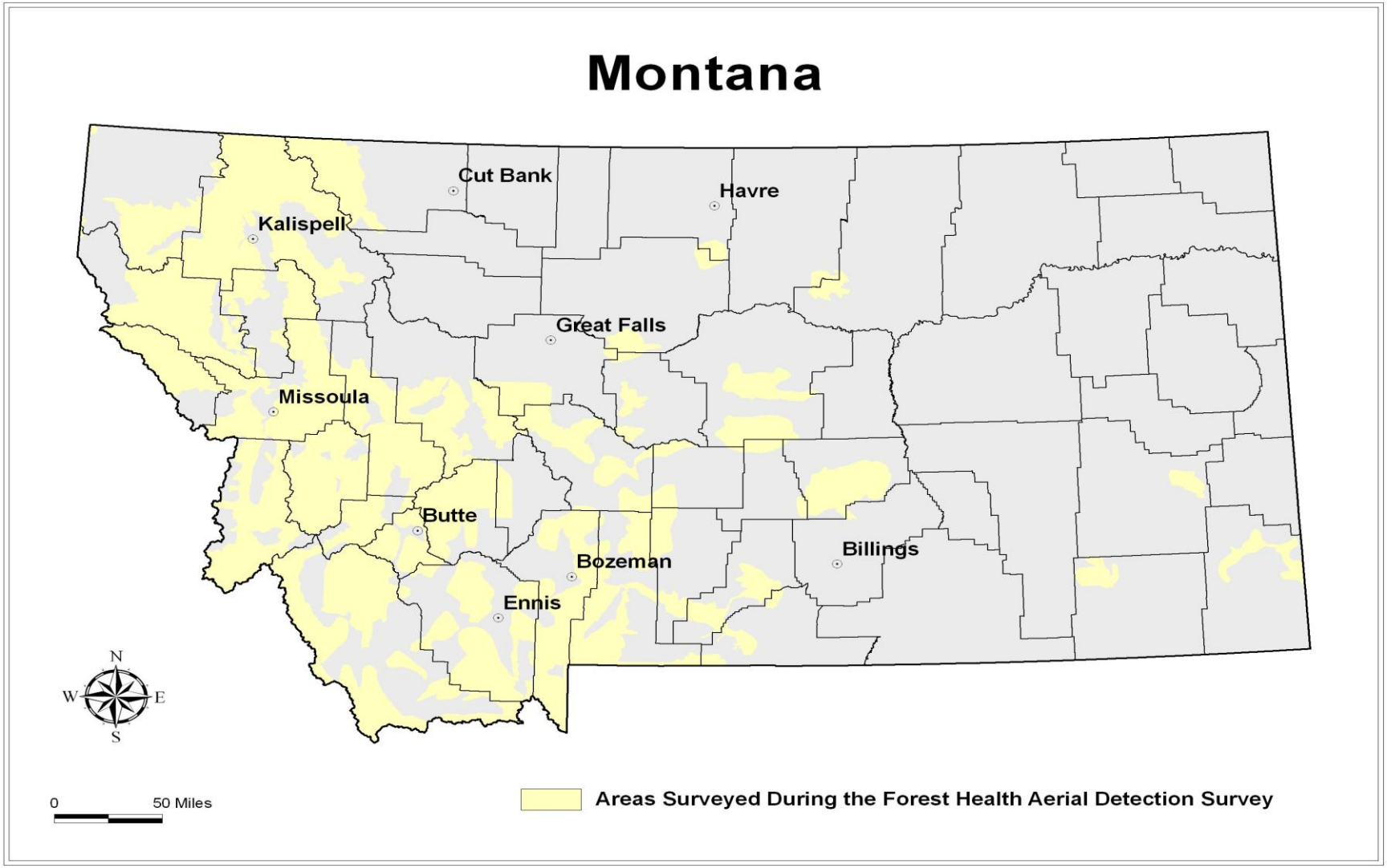

Figure 3. 2008 Mountain Pine Beetle Infestations in Montana

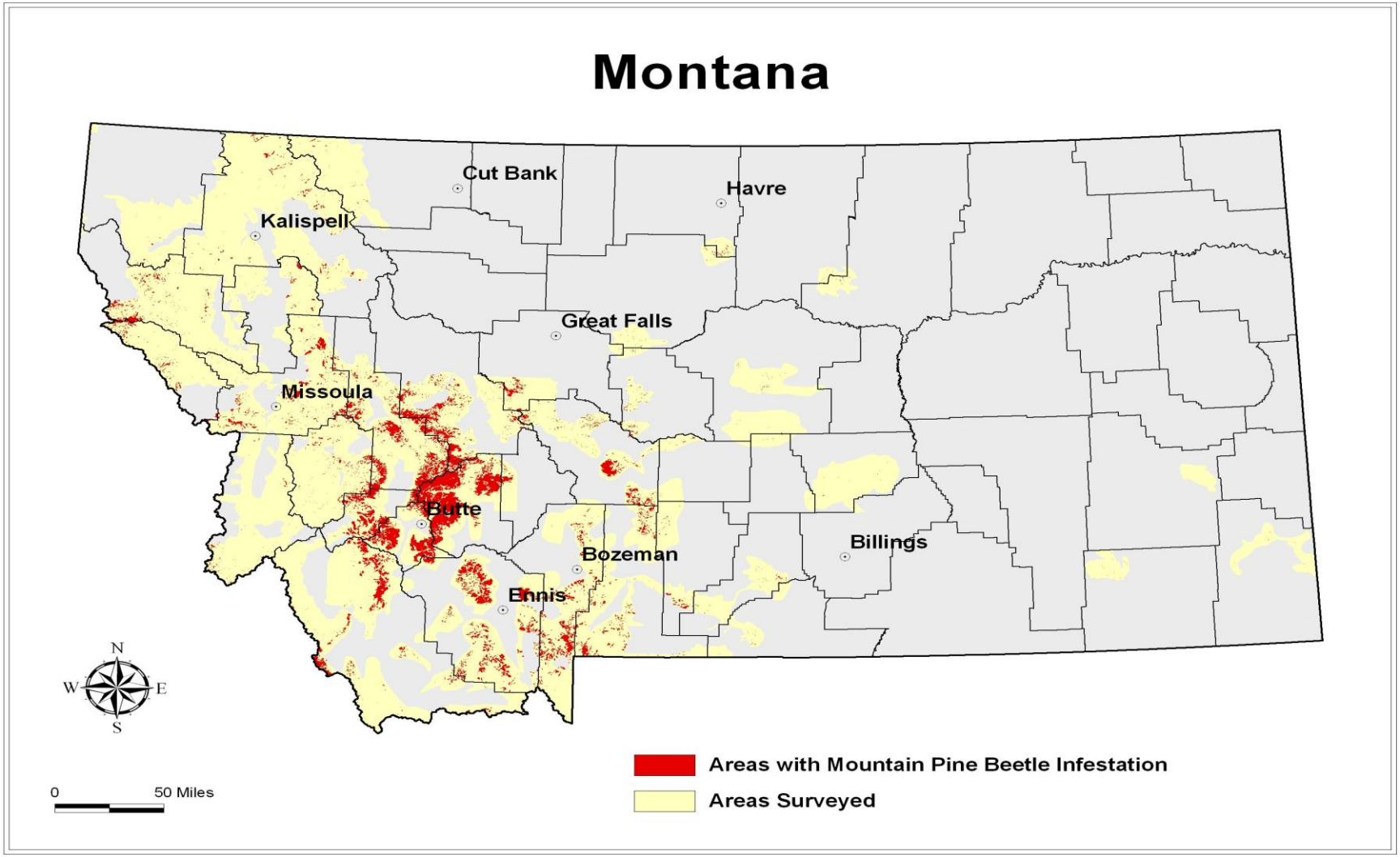

Figure 4. 2008 Douglas-fir Beetle Infestations in Montana

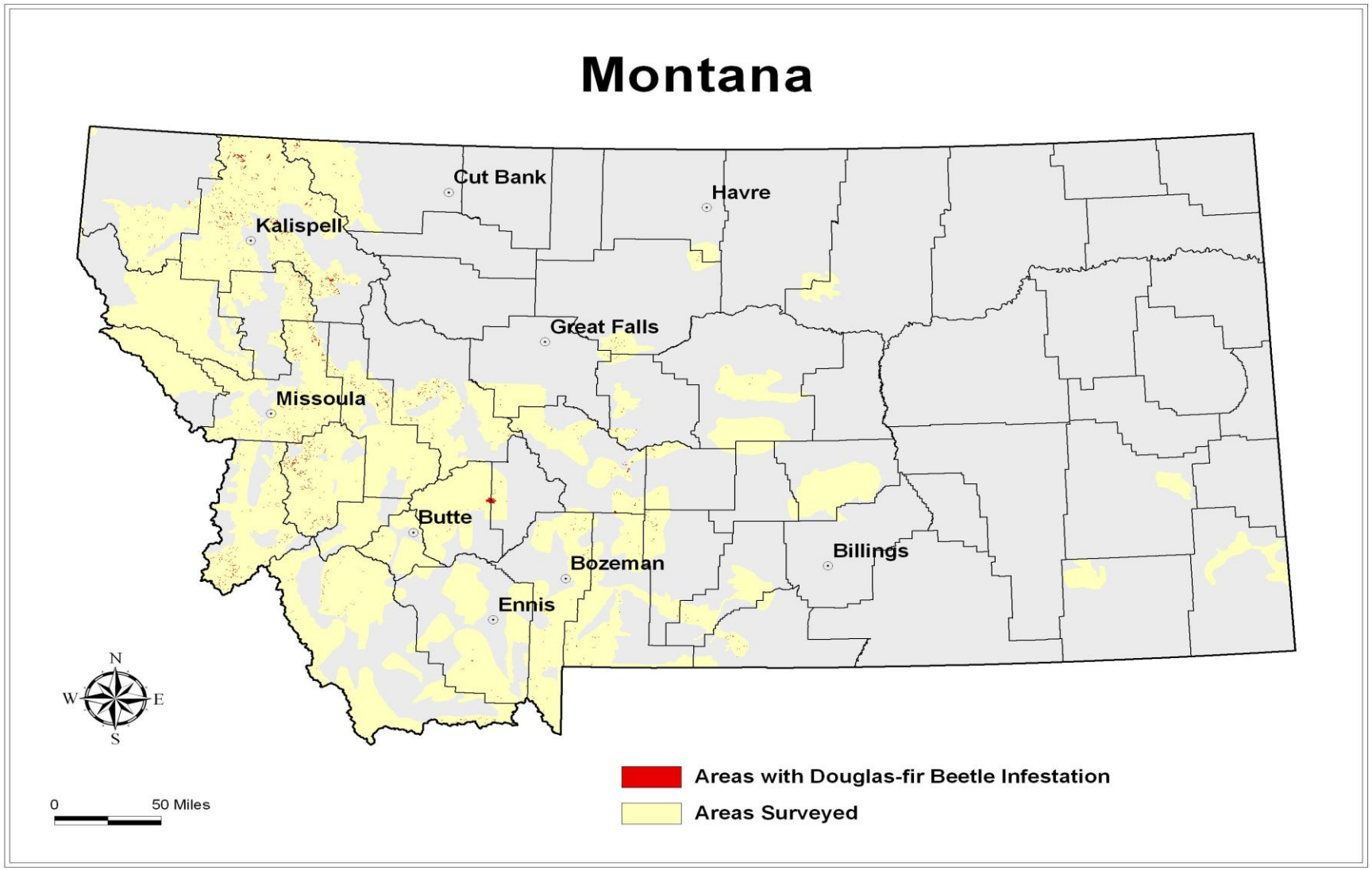

Figure 5. 2008 Fir Engraver Beetle Infestations in Montana

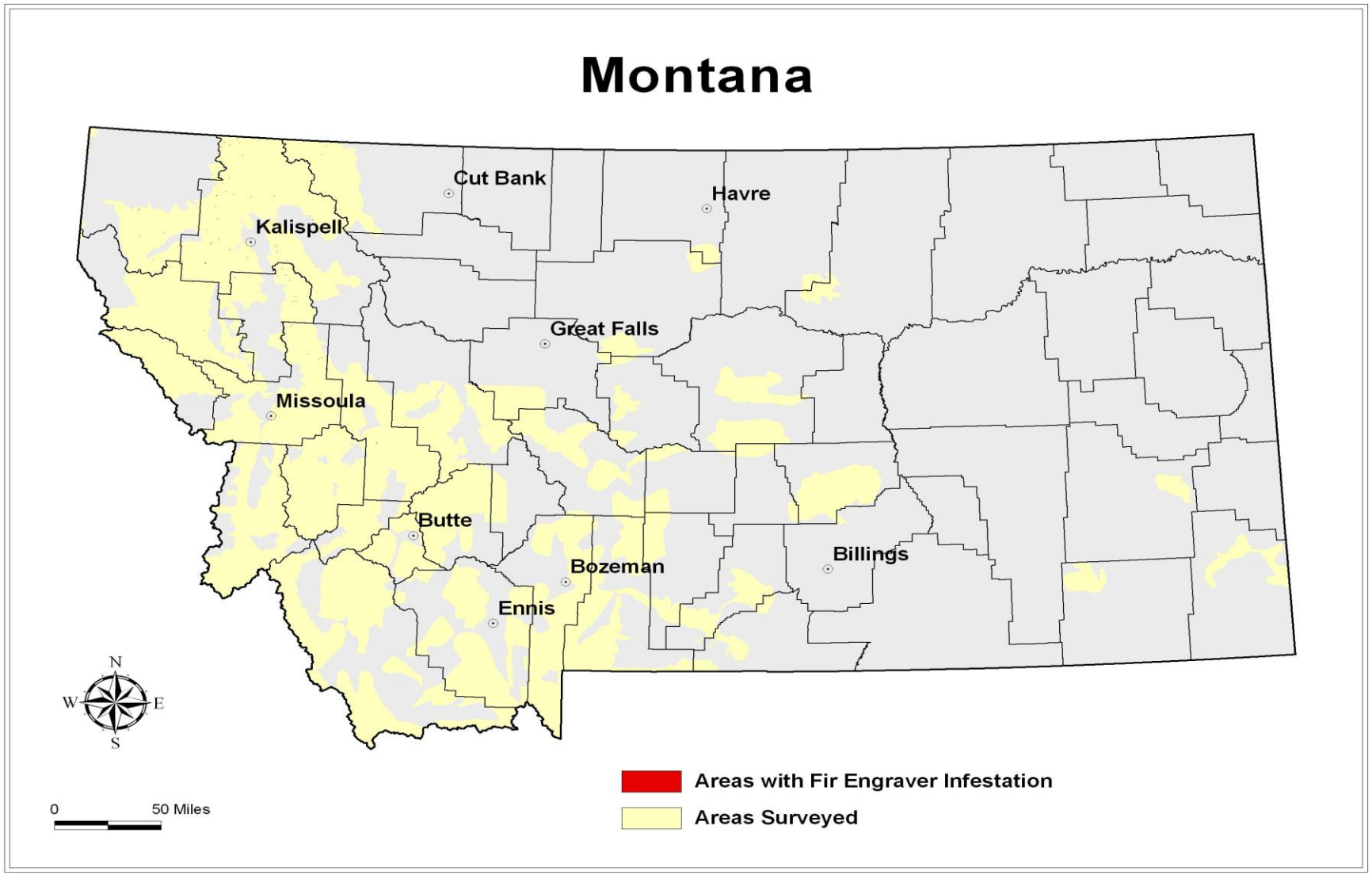

Figure 6. 2008 Western Balsam Bark Beetle Infestations in Montana

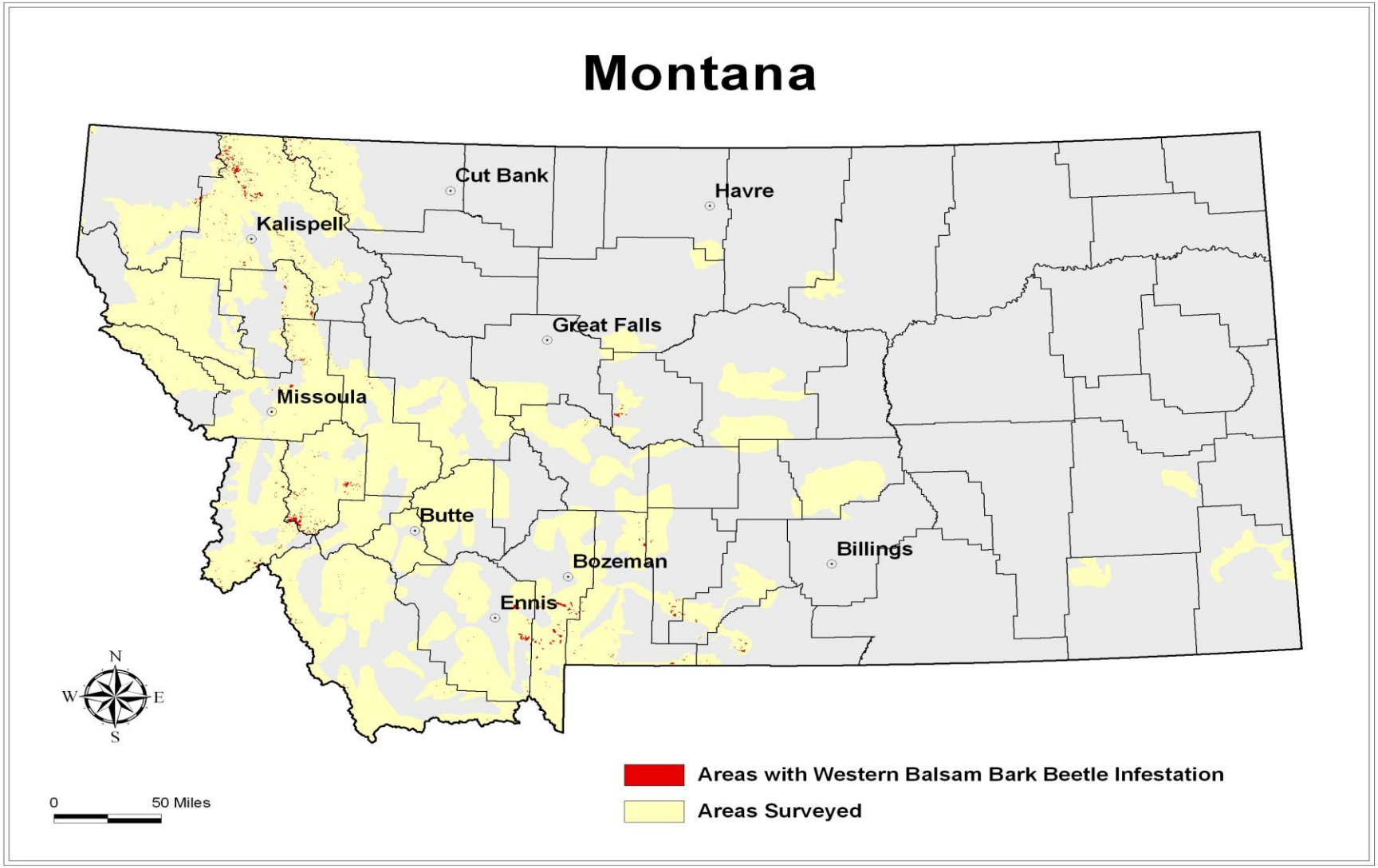
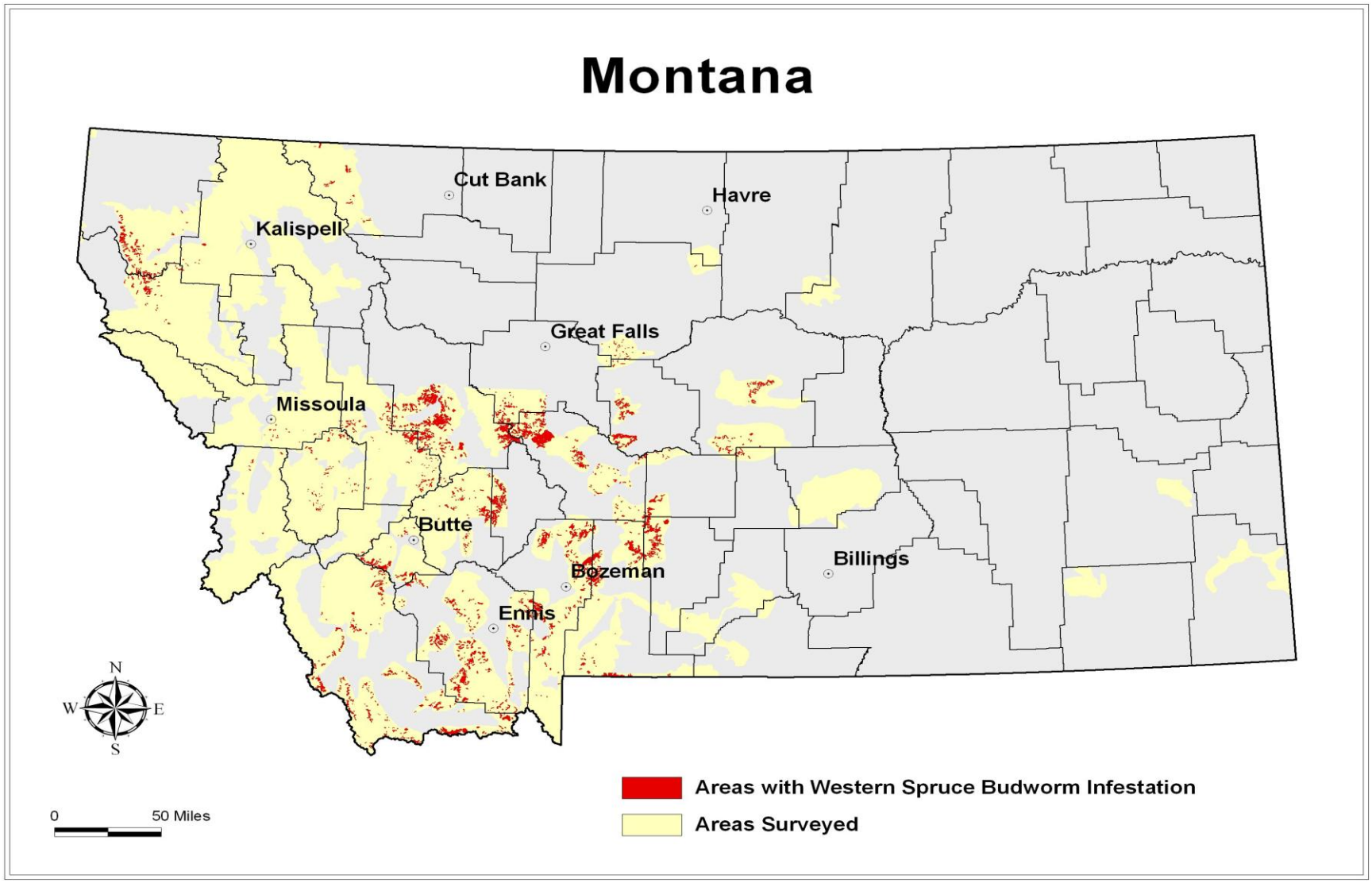
Figure 7. 2008 Western Spruce Budworm Infestations in Montana