Montana Forest Insect and Disease Conditions and Program Highlights

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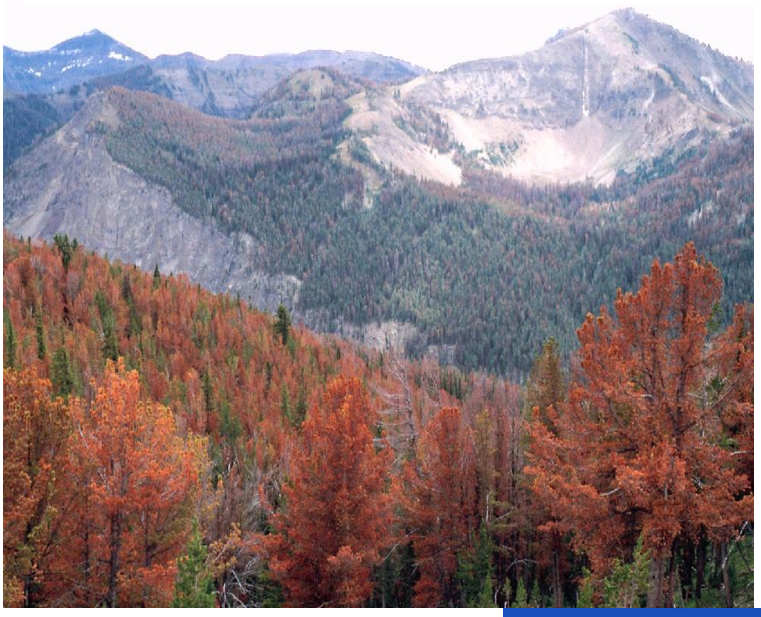

Mountain Pine Beetle in Whitebark Pine

Rhabdocline Needle Cast in Douglas-fir

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MONTANA

Forest Insect and Disease Conditions and Program Highlights – 2009

Report 10-01

2010

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Mountain Pine Beetle in Whitebark Pine, by Ken Gibson, USDA Forest Service

Rhabdocline Needle Cast in Douglas-fir, by Scott Sontag, USDA Forest Service

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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	=	Western Pine (Grizzled) tussock moth, *Dasychira pinicola (Dyar)*
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 2009 and was jointly prepared by the Montana Department of Natural Resources and Conservation, Forestry Division (DNRC) and the USDA Forest Service, State and Private Forestry, Forest Health Protection, Northern Region (FHP).

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

SUMMARY OF CONDITIONS

Bark Beetles

Weather conditions were near normal in 2009. Neither winter nor summer temperatures were extreme; and summer precipitation was only slightly less than normal. We did experience unusually cold temperatures in early October, but it is too early to tell if there were areas in the Region where overwintering beetle larvae were not yet prepared for such cold conditions. It is possible that some areas could experience a brief set-back in beetle population development. However, even should that occur, beetle populations will rebound so long as susceptible stand conditions remain. MPB populations remained high in most infested areas; SAF stands continued to be damaged by a host of factors—one being WBBB; mortality attributed to FE declined markedly; and DFB-infested stands increased in a few areas. Most other bark beetle species were found at relatively low levels throughout the state.

In 2009, we flew most of the forested areas in Montana, with the exception that most wilderness areas were not surveyed. Approximately 27.8 million acres were surveyed.

MPB populations, highest in the west-central portion of Montana, continued to increase in 2009; but not at rates suggested by acreage figures derived from aerial surveys. On parts of the Helena and Deerlodge NFs, beetle populations have begun or continued to decline because of host depletion. Beetle-infested areas increased significantly in a few locations, and populations expanded into some previously un-infested areas—notably ones on the western Deerlodge, Beaverhead, Lewis and Clark, southern Flathead, western parts of the Lolo, and Gallatin NFs. Considerably more acres of PP with MPB were detected in 2009, especially around Helena. Overall, decreases were recorded in infested stands on portions of the Flathead, Lolo, and Deerlodge NFs. In summary, MPB-infested acres in LPP stands increased dramatically in 2009—up from just over 1.5 million acres recorded in 2008, to slightly more than 2.7 million acres in 2009.

DFB-infested acres remained about the same in western Montana in 2009. At a few locations in northwestern and central Montana, populations remained at low-epidemic levels; in other areas they declined considerably. Decreases were noted in most areas, except in the Pryor Mountains on the Custer NF. Declines were especially noted on the Flathead, Helena, and Lolo NFs. Infested acres increased, but only slightly in 2009 from levels recorded in 2008—from 21,500 acres to 22,500 acres. In most areas, DFB populations remain at nearly endemic levels.

GF mortality attributable to FE increased considerably in 2009, but we believe that is attributed to more acres being flown and more low intensity levels recorded. Infested area increased from 360 acres in 2008 to almost 9,200 acres in 2009, but the severity was less than 1 tree per acre on average.

SAF mortality, likely attributed to WBBB, was mapped on more acres in 2009, likely a result of more infested areas being surveyed. Notable beetle-caused mortality was found in some areas as affected SAF acreage increased from 52,700 acres to just over 79,500 acres.

Mortality in PP stands, attributed to IPS and WPB both decreased in 2009. Both were found at relatively low levels, likely due to nearly normal amounts of moisture received the past couple of years.

Fire activity was once again low during the summer of 2009, so few fire/beetle interactions should be encountered in 2010. WSBW populations, however, increased significantly in many areas and we may observe more severely defoliated trees being killed by bark beetles. While drought effects have ameliorated somewhat, cumulative effects of prolonged dry weather in many parts of the state have taken their toll and bark beetle populations are quite adept at taking advantage of any opportunity presented them. Dependent to a large extent on weather for the remainder of the winter and into spring, some bark beetle populations could rebound in 2010. MPB populations, more reflective of host conditions than weather, likely will continue to expand into and within susceptible host stands and decrease in stands already severely affected.

Defoliators

WSBW continues to be the most significant defoliator in the state. In 2009, 2,554,205 acres were mapped as defoliated by WSBW in Montana. Most of this defoliation was in Beaverhead, Flathead, Gallatin, Judith Basin, Lewis and Clark, Lincoln, Meagher, Powell, and Sanders Counties with each reporting over 100,000 acres. Defoliation was widespread in northwestern and central Montana affecting mainly DF. A few areas with multiple years of defoliation are beginning to see tree mortality in association with DFB. Continued defoliation, especially with droughty conditions, could cause an increase in DF mortality.

Defoliation by DFTM and LCB were not reported in Montana in 2009. Areas with defoliation by PTM had been reported in recent years.

Cooperative detection monitoring continued for the gypsy moth, *Lymantria dispar*, in 2009 with USDA Animal and Plant Health Inspection Service (APHIS), Montana Department of Agriculture (MDA), Montana Department of Natural Resources and Conservation (DNRC), and USDA Forest Service. A network of more than 1,000 pheromone-baited traps were placed throughout Montana's forests and urban areas most frequented by travelers.

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 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 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 ES and SAF.

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Foliage Diseases

Over 2,000 acres of Rhabdocline needle cast of DF were identified by ADS in Sanders and Lake Counties on the western edge of the Salish Mountains. About two-thirds of the affected acres were on Tribal lands and one-third was on private lands. ADS also identified WL needle blight on about 60 acres west of Noxon.

Dwarf Mistletoes

Historical assessments of dwarf mistletoe stands in Montana show that about 16% of DF, 33% of LPP, and 30% of WL stands are infested with dwarf mistletoe. More recent assessments using FIA data collected on over 50,000 trees across Montana show that about 1% of DF, 3.2% of LPP, and 3.9% of WL 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

WWP, WBP, and LP are all susceptible to white pine blister rust.

Western white pine

Mature WWP continue to be lost due to a combination of blister rust and MPB. 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. Resistant stock is planted operationally on suitable WWP 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. In order to encourage initiation of pruning programs a two-day workshop was held for federal and state foresters in April of 2009 in Libby, Montana, focusing on the operational aspects of how to carry out pruning in WWP plantations.

Whitebark pine

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

A recent survey by FHP of WBP stands throughout Idaho and Montana found that of the 42 sampled stands, 69% have less WBP regeneration than that of other species such as SAF and ES. White pine blister rust infection varied from 0% to 81% in these stands, and 40% had infection levels greater than 20%. Taking into account the ongoing impacts of white pine blister rust and bark beetles, the report concludes that approximately 75% of these stands will convert to other species without active restoration efforts or the occurrence of wildfire.

Standardized methodology is now being used to establish monitoring plots in

WBP 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 WBP. A database has been developed (http://www.fs.fed.us/r1-r4/spf/fhp/prog/programs2.html) to compile and provide results of surveys in both WBP and LP.

Limber pine

A report describing the current amount, distribution, and condition of LP in Montana will be available in early 2010. Authored by USFS FHP, the Montana DNRC, and the U.S. Geological Survey, it will also provide information on protection and restoration of this ecologically important species.

LP seeds were collected from three Montana sites in 2009 for inclusion in a West-wide collection being carried out for gene conservation, white pine blister rust resistance screening, and various research projects. Seed will be collected from several additional locations in Montana in 2010 if funding is available and cone yields are adequate.

2010 conference in Missoula

In June of 2010 a major conference titled "*The Future of High-Elevation Five-Needle White Pines in Western North America*" will be held in Missoula, Montana. See the following web site for agenda and registration information: http://www.umt.edu/ce/cps/highfive/.

Abiotic Damage

Nearly 800 acres of windthrow and 150 acres of avalanche-caused tree damage were mapped in 2009. Most windthrow occurred in a band that stretches from north-central Montana to southwestern Montana.

ANNUAL AERIAL SURVEY

The annual aerial detection survey in Montana was conducted from June 29 thru September 26, 2009. The survey covered approximately 27.8 million acres of mixed ownership, forested lands, excluding most wilderness areas (Figure 2). Five FHP sketchmappers, using three aircraft, conducted the 2009 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 recent forest disturbance activities are low, other disturbances such as diseases, needle casts, high-water damage and previous fire damage are mapped. The intent of the survey is to cover each area once a year during which time the observer maps as many disturbances 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 FIA (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 in ownerships in some Counties, FIA data may indicate no forestland acres at the County level. This is a result of the intensity of the inventory performed. This discrepency is within their standard of error. Other Federal lands include tribal ownership.

Beaverhead County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	1,073,844	135,995	40,745	17,003	1,267,587
Aspen Decline	0	283	63	0	346
DFB	51	14	4	0	69
ESP	2	4	0	0	6
MPB-LPP	134,180	16,526	4,909	2,710	158,325
MPB-High Elevation	63,854	4,803	828	747	70,232
SAF Mortality	134	6	0	4	144
WSBW	54,263	31,955	15,243	9,243	110,704
Windthrow	25	0	0	0	25

MPB continues to increase in Beaverhead County, particularly in five-needle pines. New activity in LPP is particularly notable in the Big Hole area and the southern portion of the Pioneer Mountains. Large groups were mapped in the Pioneer and Beaverhead Mountains to the NW and SW of Dillon, respectively. FINDITs plot summaries from recently infested areas show 2-41% of LPP currently dead. Based on previous trends some areas can be expected to have up to 90% mortality of trees >5" diameter. On BLM administered lands in the Centennial Mountain Range, MPB-killed LPP and WBP were at reduced levels from just a few years ago. WSBW caused defoliation continues to be present over much of the County with increases most notable on USFS managed lands. DFB remains low, with only a few acres of newly found ESB activity. Also of note is the high level of SAF mortality attributed to WBBB, with significantly more acres noted in 2009. Schweinitzii root and butt rot is common in DF, causing decay in the butt logs but not acting as an aggressive root pathogen. LPP dwarf mistletoe and LP dwarf mistletoe are present in the County. White pine blister rust is common in WBP. A 25-acre patch of windthrow was mapped on Forest Service administered lands about 12 miles north of Lima Reservoir.

Big Horn County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	0	0	285,165	39,586	324,750
Aspen Decline	0	159	66	2	227
DFB	0	125	0	0	125
MPB-LPP	0	4	0	0	4
MPB-PP	0	113	29	0	142
MPB-High Elevation	0	14	0	0	14
SAF Mortality	0	4	0	0	4
WSBW	0	916	75	0	991

In 2009, very little bark beetle activity was noted anywhere, with most detected on the Northern Cheyenne IR. Minor amounts of MPB-killed PP and DFB-killed DF were mapped at endemic levels. The most prevalent insect problem was WSBW with activity noted on both tribal and privately managed lands. LPP dwarf mistletoe and LP dwarf mistletoe are present in the County.

Blaine County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	0	83,825	107,216	0	191,042
MPB-LPP	0	153	0	10	163
MPB-PP	0	82	2	0	84
Windthrow	0	26	0	0	26

Scattered LPP and PP mortality from MPB were recorded in the Little Rocky Mountains on the Fort Belknap IR. Likely some of this mortality in PP has occurred in conjunction with IPS. LPP dwarf mistletoe is present in the County. One 26-acre patch of windthrow was noted on the Fort Belknap Reservation, located in the Little People's drainage.

Broadwater County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	155,612	20,806	101,116	0	277,534
DFB	4	2	4	0	10
MPB-LPP	38,096	79	7,677	10	45,862
MPB-PP	442	744	9,166	800	11,152
MPB-High Elevation	2,738	193	1,853	0	4,784
WSBW	27,694	1,545	17,141	270	46,650

MPB-killed LPP was by far the most significant mortality agent on lands surveyed. Very large groups were mapped in the Big Belt Mountains, near Boulder Mountain, Mount Baldy and southward to Mount Edith. Most stands near Canyon Ferry Lake with host pines show some level of MPB-caused mortality. MPB activity increased significantly in higher elevation WBP forests. MPB activity will probably decrease over the next few years as host is depleted. WSBW increased nearly 4-fold across the County. White pine blister rust has been found in LP. 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 DF. LPP dwarf mistletoe is present in the County.

Carbon County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	130,122	127,055	54,590	10,092	321,860
DFB	2,348	341	138	0	2,827
MPB-LPP	290	0	2	4	296
MPB-PP	0	2	8	2	12
MPB-High Elevation	7,114	771	30	0	7,915
SAF Mortality	182	0	0	0	182
WSBW	643	25	13	0	681
Windthrow	15	0	0	0	15

Almost twice as many acres were flown in 2009 as in 2008 in this County. DFB activity increased significantly in 2009 in the Pryor Mountains and elsewhere in the County. However, some of this increase could be in part a result of the increase in acreage flown. MPB activity in LPP increased slightly in 2009 and remained somewhat static in PP stands. However, there was a significant increase in MPB-killed WBP, especially in Rock Creek drainage. White pine blister rust is common in WBP and LP. LPP dwarf mistletoe and LP dwarf mistletoe are present in the County. A small 15-acre patch of blow down was found on Forest Service administered lands at the northeast head of Inferno Canyon in the Pryor Mountains.

Carter County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	62,418	0	55,333	0	117,751
Aspen Decline	2	0	4	0	6
MPB-PP	57	4	32	4	97

Slightly more USFS managed acres were flown in 2009 than 2008. Within these lands MPB and IPS in PP showed slight declines. A few groups of 1-2 impacted trees were recorded in the Slim Buttes, Cave Hills, and Short Pines. A few small groups of MPB-killed PP were recorded in the Ekalaka Hills and in PP stands just west of Camp Crook, but still in minor amounts. It should be noted that at least some tree mortality attributed to MPB may actually be caused by IPS.

Cascade County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	196,965	10,261	95,225	11,497	313,949
DFB	6	0	95	0	101
MPB-LPP	29,922	5,014	15,659	1,079	51,674
MPB-PP	1,648	3,351	33,669	2,252	40,920
MPB-High Elevation	3,438	0	777	537	4,752
SAF Mortality	387	0	0	0	387
WSBW	40,671	4,565	35,916	4,521	85,673

Number of acres flown almost doubled in 2009 and may thus affect mortality estimates. The 2009 data showed great increases in MPB-caused mortality in LPP, PP and high elevation WBP, although MPB has been active in this area for several years. Many scattered, mostly small groups of MPB-killed PP were mapped throughout the Little Belt Mountains. Groups of MPB-killed WBP were found near Kings Hill as well. DFB activity was low. White pine blister rust is common in LP. Armillaria root disease present in the southeastern portion of the County, and Schweinitzii root and butt rot is quite common, especially causing significant decay in the butt logs of larger, older DF.

Chouteau County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	22,295	0	34,470	2,245	59,010
DFB	0	10	0	0	10
MPB-LPP	0	1,301	457	253	2,011
MBP-PP	0	400	71	29	500
WSBW	0	2,599	3,122	177	5,898

MPB-killed LPP nearly doubled and was located mostly on tribal lands. The largest increase in MPB activity was in PP stands located on Rocky Boys IR, near Salt Coulee and Sawmill Butte. Most of the MPB-killed LPP stands were near Muddy and Timber Creeks. WSBW activity also significantly increased, again, with the largest increase on the IR in stands with high amounts of DF. DFB activity remained at low levels, but may increase in the future because of WSBW repeated defoliation, especially in stands that have had recent fire activity or have large diameter DF. Armillaria root disease is present in the northern portion of the County, on the Rocky Boys IR, but appears to be uncommon. Butt rot and breakage caused by *Ganoderma applanatum* has been observed in quaking aspen on the Rocky Boys IR.

Deer Lodge County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	213,376	9,963	45,203	27,770	296,313
DFB	4	0	5	0	9
MPB-LPP	51,613	2,179	40,670	22,253	116,715
MPB-PP	0	0	10	0	10
MPB-High Elevation	1,861	0	576	1,054	3,491
WSBW	3,102	0	5,530	33	8,665
Windthrow	48	0	5	0	53

MPB continues to be very active with MPB-caused tree mortality decreasing in the northern portions due to host depletion and increasing in areas south of the Continental Divide. In both 2008 and 2009 similar numbers of acres in each ownership group were surveyed. However, acres of LPP affected by MPB increased by almost 25% with estimated number of trees killed increasing nearly 80%. In LPP stands where MPB activity is increasing, FINDITs surveys show 2-30% total mortality, with up to 60 times more mortality than found in 2008. Far fewer acres of MPB in five-needle pines were noted, especially in private ownership, although the estimate of trees killed actually increased. DNRC personnel hung MPB-baited traps in Anaconda at the MT DNRC Office to determine flight period. Peak collections were on 8/27/09 (36). Acres of

WSBW caused defoliation also increased greatly, with many more acres noted under private ownership. White pine blister rust has been found in LP. Schweinitzii root and butt rot is common in DF, causing decay in the butt logs but not acting as an aggressive root pathogen. LPP dwarf mistletoe and LP dwarf mistletoe are present in the County. One 53-acre patch of windthrow was mapped in just west of Champagne Pass (47 acres on Forest Service administered lands and 5 acres on private land), at the northern edge of the County. There was probably one wind event causing windthrow in Deerlodge, Powell, and Jefferson Counties, very near to where these three counties border each other.

Fergus County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	86,611	168,352	298,106	19,491	572,560
Aspen Decline	0	0	49	0	49
DFB	11	2	23	0	36
Flooding - High Water	0	0	13	0	13
MPB-LPP	1,609	446	1,278	72	3,405
MPB-PP	5,646	588	4,216	339	10,789
MPB-High Elevation	6	2	2	0	10
SAF	300	0	0	0	300
Unidentified Disease	43	0	0	0	43
WSBW	14,022	1,963	12,095	827	28,907
Windthrow	0	85	28	24	137

Nearly 40% more acres were surveyed in 2009, all on BLM, State, and privately managed lands. This may explain some of the increased pest activity on these ownerships. However, data from USFS-managed lands (all acres surveyed both years) suggest nearly a 50-fold and 25-fold increase in LPP and PP acres affected by MPB, respectively. WSBW caused defoliation has also increased substantially (4-fold on USFS managed lands) with the possible exception of BLM managed lands. Root disease patches, assumed to be armillaria root disease, were noted in the Big Snowy Mountains. Armillaria root disease was identified in the North Moccasin Mountains, north of Lewistown. LPP dwarf mistletoe is present in this County. A 43-acre polygon of an unidentified disease was mapped on Forest Service administered lands at the top of Browns Gulch, approximately 8 miles east of the community of Garneill. Also noted were a number of patches of windthrow, ranging in size from 3 acres to 75 acres, and dispersed across BLM (85 acres), State (24 acres) and private lands (28 acres). These were mapped northeast of Lewistown, near the top of Ruby Gulch. All were likely due to one wind event. Reports have been received from Montana DNRC foresters of decline and mortality of mature spruce in the Lewistown area. This is apparently affecting primarily urban and (or) landscape trees. Symptoms include branch dieback, thinning crowns, defoliation and (or) dieback of upper crowns, and tree mortality. Examination of

branch and foliage samples revealed the presence of various insect and disease organisms, but all are known to be mainly secondary problems on trees undergoing some sort of abiotic stress. The problem is as yet undiagnosed, but investigations are examining several possibilities, one being that the underlying cause of damage is pesticide-related. One small 13-acre patch of trees damaged from flooding was noted on private land on the North Fork of McDonald Creek, just west of the confluence with Alkali Creek.

Flathead County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	1,647,905	518,720	448,029	151,729	2,766,383
Avalanche	17	19	0	44	80
DFB	3,764	2,874	41	53	6,732
ESB	18	4	0	2	24
FE	271	50	163	92	576
Flooding - High Water	0	2	0	0	2
MPB-LPP	22,492	1,630	2,669	619	27,410
MPB-PP	51	18	176	136	381
MPB-High Elevation	111	0	0	0	111
IPS	0	0	0	2	2
SAF Mortality	10,578	711	82	906	12,277
Unidentified Defoliator	0	0	100	0	100
WPB	2	0	16	0	18
WSBW	199,108	989	51,793	31,041	282,931
WPBR	0	0	17	0	17
Windthrow	106	0	0	0	106

WSBW-caused defoliation is still continuing in Glacier NP. Total number of acres defoliated within the County greatly increased in 2009. Except for MPB-caused pine mortality, bark beetle activity was fairly light. MPB activity increased around Hungry Horse Reservoir, especially on the southern end. Scattered groups of MPB-LPP were also found on the southern edge of Glacier Park. FINDITs summaries for MPB in LPP and PP in mixed conifer stands indicate 0-41% total pine mortality. DFB activity remained about the same in 2009, scattered throughout the County. Numerous groups of DFB-caused mortality were mapped in Glacier NP and on the Coram Experimental Forest. In the park, scattered groups of up to several hundred trees were killed by DFB near Logging, Quartz, Bowman and Kintla Lakes. White pine blister rust is common in both WWP and WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this

County. Eighty acres of avalanche damage was mapped in the County across Glacier NP (19 acres), State (44 acres) and Forest Service (17 acres) lands. Windthrow was noted on 305 acres, largely on BLM managed lands.

Gallatin County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	562,322	87,663	183,846	0	833,831
Aspen Decline	0	0	72	0	72
DFB	979	371	412	80	1,842
MPB-LPP	157,201	11,223	71,553	10,280	250,257
MPB-High Elevation	67,410	2,155	9,143	166	78,874
SAF Mortality	13,500	48	3,984	0	17,532
WSBW	145,533	441	106,530	8,772	261,276

The most dramatic increase in insect activity on federal lands was in the number of acres defoliated by WSBW; which increased nearly 7-fold across the County. This occurred despite slight decreases in surveyed area. High amounts of WSBW-caused defoliation could result in an increase of DFB activity in the future; currently DFB activity is low in the County. MPB-killed LPP increased nearly 4-fold and almost doubled in high elevation pines (mostly WBP) over the last year. Very large groups of MPB-killed LPP were mapped throughout the Bridger Mountains. South of Bozeman, in the Gallatin Canyon and tributaries of the Gallatin River, LPP and WBP killed by MPB were extensive. MPB continues to attack and kill ornamental pines within the city of Bozeman. FINDITs summaries show some areas decreasing in MPB activity, largely due to host depletion. DNRC personnel hung MPB-baited traps at the Montana State University Marsh Lab and Montana State Trust Lands in Bear Canyon to determine flight period. Peak collections were on 9/1/09 (2 traps), and 8/13/09 (154 traps), respectively. SAF mortality also increased in 2009. White pine blister rust is common in WBP and LP. Tomentosus root disease is known to be significant in some campgrounds in this County. Black stain root disease identified from DF, but is considered of minor importance. LPP dwarf mistletoe and LP dwarf mistletoe are present in the County.

Glacier County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	29,112	221,590	157,535	0	408,237
DFB	0	538	110	0	648
ESB	0	2	0	0	2
FE	0	2,382	2	0	2,384
MPB-LPP	123	3,105	136	0	3,364
MPB-PP	0	4	0	0	4
MPB-High Elevation	0	6	0	0	6
SAF Mortality	0	6,905	0	0	6,905
WSBW	0	18,686	395	0	19,081
Windthrow	0	2	0	0	2
Winter Injury	0	27	0	0	27

In 2009, the Rocky Mountain Front of the Lewis and Clark NF was flown for the first time in years. The increase in surveyed acres accounts for the new detection of MPB in LPP on USFS managed lands. Tribal lands and Glacier NP, however, had fewer acres surveyed (e.g. only the western portion of the Blackfeet IR was flown). Nevertheless, activity by FE, WBBB, and WSBW greatly increased on both ownerships. WSBW activity was notably high on Glacier Park's east side—especially along Cut Bank Ridge and near both St. Mary and Sherbourne Lakes. Despite detection of similar acres of DFB and MPB activity (in LPP) in 2008 and 2009, estimated number of trees killed suggests a significant drop in overall tree mortality for both beetles on both the NP and IR. However, increasing DFB activity might be anticipated in these areas of high WSBW activity. White pine blister rust is common in WBP and LP. Armillaria root disease known to be a significant pathogen in DF in the western portion of the County on the Blackfeet IR. LPP dwarf mistletoe and WL dwarf mistletoe are present in this County. One small 2-acre patch of windthrow was noted in Glacier NP east of Waterton Lake and one mile south of the Canadian border. Four neighboring polygons of winter injured LP, totaling 27 acres, was mapped on the Blackfeet IR approximately 3 miles east of the community of Saint Mary, east of Glacier NP.

Golden Valley County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	9,411	0	73,038	0	82,449
MPB-LPP	475	0	6	0	481
MPB-PP	1,305	827	758	117	3,007
MPB-High Elevation	6	0	0	0	6

A similar number of acres were surveyed on USFS and BLM managed lands in 2009 as in 2008, with MPB activity in LPP showing and estimated 7 to 12 -fold increase. MPB activity in PP was also noted, particularly on USFS lands. WSBW activity, however, appears to have lessened, with no acres meeting the threshold of defoliation noted.

Granite County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	597,814	30,748	176,283	38,303	843,147
DFB	875	44	58	6	983
FE	41	0	0	0	41
MPB-LPP	144,858	5,547	21,330	1,712	173,447
MPB-PP	2,163	729	3,612	714	7,218
MPB-High Elevation	5,776	0	414	0	6,190
SAF Mortality	1,982	0	5	0	1,987
WPB	0	2	6	4	12
WSBW	17,638	10,518	24,739	3,751	56,646

Despite slight decreases in the total numbers of acres surveyed in 2008, 2009 surveys noted a 5-fold increase (or greater) in MPB activity in LPP, PP, and five-needle pines. Large groups of MPB-killed LPP were mapped north and east of Georgetown Lake. Virtually all pine stands east of Philipsburg and north of Anaconda, and between Philipsburg and Deerlodge, have been infested at some level by MPB. Defoliation by WSBW was also noted on approximately 10 times the number of acres, over all ownerships. DFB activity showed only a slight increase in acres while SAF mortality was detected at lower levels. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. Schweinitzii root and butt rot is common in DF, causing decay in the butt logs but not acting as an aggressive root pathogen. Elytroderma needle disease is a significant agent in PP in localized areas in this County. LPP dwarf mistletoe and WL dwarf mistletoe are present in this County.

Hill County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	0	0	40,725	0	40,725
DFB	0	2	8	4	14
MPB-LPP	0	2,930	780	17	3,727
MPB-PP	0	37	28	4	69
WPB	0	2	0	0	2
WSBW	0	1,980	2,564	12	4,556

MPB-killed LPP was the most significant mortality agent in the County. Number of acres of MPB-killed LPP, especially on tribal lands, nearly doubled. Very few PP stands were affected by MPB. WSBW activity significantly increased on both tribal and private lands. Armillaria root disease is present in the southern portion of the County, on the Rocky Boys IR, but appears to be uncommon. LPP dwarf mistletoe is present in this County.

Jefferson County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	434,471	56,442	118,934	8,099	617,947
DFB	200	31	218	8	457
MPB-LPP	273,453	4,323	21,240	105	299,121
MPB-PP	18,022	7,968	36,344	1,432	63,766
MPB-High Elevation	7,608	577	675	69	8,929
WSBW	25,790	6,527	21,791	742	54,850
Windthrow	249	0	0	0	249

MPB was still the most significant mortality agent in the County this year. MPB-caused mortality increased in some areas and decreased in many others due to the lack of available host trees. Large groups of MPB-killed trees were recorded in both LPP and PP stands, from about Jefferson City west nearly to Castle Rock, and east to nearly Canyon Ferry Lake. There was a significant increase in MPB activity in PP stands especially near Clancy and Montana City. At highest elevations, MPB-killed WBP remains high. Number of acres defoliated by WSBW significantly increased in 2009. DFB-caused mortality remains about the same but may increase in response to an increase of acres repeatedly defoliated by WSBW. White pine blister rust has been found in LP. A large 250-acre patch of windthrow, adjacent to a 53-acre patch of windthrow in Powell County, was mapped on Forest Service administered lands approximately 10 miles due east of the community of Racetrack.

Judith Basin County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	269,838	0	22,039	0	291,877
DFB	46	0	2	0	48
ESB	10	0	0	0	10
MPB-LPP	30,604	195	1,186	28	32,013
MPB-PP	4,684	167	2,059	315	7,225
MPB-High Elevation	14,449	17	563	30	15,059
SAF-Mortality	1,265	0	16	0	1,281
WSBW	87,462	2,789	17,713	1,354	109,318

MPB continues to be the most important pest. With over three times the number of acres surveyed this year, most of it under USFS management, increases in detected MPB activity would be expected. However, nearly seven times the level of MPB affected acres (all hosts) were actually detected, representative of the increasing MPB activity in this County. Increases were notable to the east of King's Hill. Areas of detected WSBW defoliation also increased more than 4 -fold. The lack of increased detection of both DFB activity and mortality of SAF (complex lead by WBBB) with the increased survey area would suggest that actual mortality may have decreased. White pine blister rust is common in LP. Tomentosus root disease is known to be significant in some campgrounds in this County. LPP dwarf mistletoe is present in this County.

Lake County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	136,743	0	366,299	48,387	551,429
Avalanche	58	0	0	0	58
DFB	130	222	38	30	420
ESB	0	0	4	2	6
FE	59	2	49	11	121
Flooding - High Water	0	0	12	0	12
MPB-LPP	6,511	3,415	1,077	510	11,513
MPB-PP	177	1,295	421	196	2,089
MPB-High Elevation	0	8	0	0	8
IPS	0	2	2	24	28
Rhabdocline pseudotsugae	0	335	171	0	506
SAF Mortality	1,115	1,240	45	59	2,459
Unidentified Defoliator	0	38	13	0	51
WPB	0	12	4	2	18
WSBW	11,950	11,185	7,189	2,959	33,283
Winter Injury	0	13	0	0	13

In 2009, aerial survey was conducted on about twice as many acres on tribal lands versus in 2008. MPB activity increased in both LPP and PP. Number of acres of MPB-killed PP significantly increased in the County, especially on tribal lands. MPB-caused mortality was light and scattered on the Island Unit. SAF mortality and DFB-caused mortality was light and scattered throughout the County. In 2009, the MT DNRC continued to trap *Ips* species in management units of PP on Fish, Wildlife, and Parks' Wild Horse Island. A total of 73 traps were set and more than 400,000 *Ips (*all species combined) were trapped between June 15 and August 31. Peak catches were on July 20 and July 27. Over 500 acres of Rhabdocline needle cast was mapped on the Flathead IR (335 acres) and neighboring private land (171 acres). This large area is located on the western edge of the Salish Mountains, east of the Little Bitterroot River, and is adjacent to over 1500 acres of Rhabdocline needle cast in neighboring Sanders County. White pine blister rust is common in both WWP and WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. Elytroderma needle disease is a significant agent in PP in localized areas in this County. DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this County. A notable problem with crown dieback of PP has occurred for the last several years along the Rocky Point area of Flathead Lake. Work by the Montana DNRC has shown that, for the most part, the damage is apparently due to Diplodia shoot blight, a native disease of PP in the West. A report titled "Ponderosa Pine Crown Dieback along the Rocky Point Area of Flathead Lake, Montana" has been completed that details the damage, diagnosis, biology, and

recommended management for this disease, both for the Rocky Point area and any other locations where similar problems may arise. Contact Amy Gannon (agannon@mt.gov) of the Montana DNRC for a copy of this report. One 58-acre avalanche was mapped on Forest Service administered lands at the headwaters of Lost Creek, just south of Swan Lake. This is very near a 17-acre avalanche in Flathead County. Two small polygons of flood damage were noted on private lands. A 13-acre patch of snow damaged trees was mapped at the head of Sullivan Gulch, near the Flathead and Lake County line, southwest of Big Arm.

Lewis and Clark County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	982,490	30,326	350,445	42,855	1,406,116
Avalanche	11	0	0	0	11
DFB	643	2	1,383	280	2,308
MPB-LPP	234,107	10,237	61,556	11,308	317,208
MPB-PP	52,489	15,417	82,689	11,020	161,615
MPB (High Elevation	3,035	14	5	57	3,111
SAF Mortality	53	0	0	0	53
WSBW	145,970	11,551	77,018	11,396	245,935
Windthrow	16	0	0	0	16

More acres of aerial survey were flown in 2009 on all lands. In 2009, total acres of MPB-killed pines once again increased significantly. In many areas with previous high infestations, intensity began to decline because the majority of the host trees had already been killed by MPB. WSBW and MPB activity is increasing near Rogers Pass. Number of WSBW-defoliated acres greatly increased in the County. Some of the acres defoliated also had increasing levels of DFB activity, such as near Flesher Pass. Many large groups of MPB-killed LPP were once again mapped in nearly every direction from Lincoln. Other bark beetle activity was virtually at endemic levels, except DFB. DNRC personnel hung MPB-baited traps at Mount Helena and the MT DNRC Office to determine flight period. Peak collections were on 8/5/09 (212) and 8/12/09 (216), respectively. White pine blister rust is common in WBP and LP. Armillaria root disease is present in the southeastern portion of the County, and Schweinitzii root and butt rot is quite common, especially causing significant decay in the butt logs of larger, older DF. LPP dwarf mistletoe is present in this County. One 11-acre patch of avalanche damage was noted on Forest Service administered lands just east of the Continental Divide, at the headwaters for Little Prickly Pear Creek, north of Black Mountain. A 16-acre patch of windthrow was mapped on Forest Service administered lands in the headwaters of Deadman Creek, just west of Stemple Pass on the Continental Divide.

Lincoln County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	1,762,707	0	358,595	39,206	2,160,508
Diplodia Canker	39	0	0	0	39
DFB	312	0	49	6	367
ESB	8	0	0	4	12
FE	157	0	150	11	318
Flooding - High Water	2	0	0	0	2
MPB-LPP	4,528	0	979	20	5,527
MPB-PP	633	51	86	14	784
MBP-WP	16	0	2	0	18
MPB-High Elevation	10	0	0	0	10
IPS	2	2	2	0	6
SAF Mortality	6,186	0	0	112	6,298
WPB	74	0	52	2	128
WSBW	149,938	0	27,794	3,120	180,852
WPBR	963	0	57	0	1,020
Windthrow	2	0	0	2	4

Aerial survey was conducted in most of the County in 2009. MPB-killed LPP and PP increased across the County; however, Lincoln County is still one of the least impacted in the State. MPB-killed LPP was light and scattered throughout the Yaak River drainage, and east and south of Libby. Endemic levels of WPB and IPS were found scattered throughout the County. Defoliation from WSBW was recorded at high levels throughout the County, especially west of Highway 2, south of Libby. Two male gypsy moths were caught in Lincoln County. Molecular analysis confirmed both were European. One 39-acre patch of PP infested with Diplodia twig blight was mapped on Forest Service administered lands on the north side of Seventeenmile Creek of the Yaak River. Aerial Detection Survey is not a reliable method for recording the presence of Diplodia twig blight, but the detection from ADS is worth noting in this report. Just over 1,000 acres of white pine blister rust was mapped on Forest Service (963 acres) and private lands (57 acres) in the County. Most polygons were mapped in west and southern portions of the County. Aerial Detection Survey is not a reliable method for recording the presence of white pine blister rust, but the detection from ADS is worth noting in this report. White pine blister rust is common in both WWP and WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. Armillaria root disease was found affecting large PP near Rocky Gorge Campground on Lake Koocanusa. It is possible annosus root disease may have also been involved in the decline of these trees, but was not positively identified (MFO-TR-09-44). DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this County. A small 2-acre patch of flood

damage on Forest Service administered lands was noted. Two small, 2-acre polygons of windthrow were observed on Forest Service and State lands.

Madison County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	602,613	120,988	112,579	0	836,180
Aspen Decline	13	0	26	0	39
DFB	14	6	4	0	24
MPB-LPP	107,474	8,295	23,803	1,210	140,782
MPB-PP	92	0	2	0	94
MPB-High Elevation	55,400	1,978	5,627	308	63,313
SAF Mortality	5,609	6	720	2	6,337
WSBW	44,677	18,253	25,232	2,581	90,743

MPB has been active in Madison County for several years, with activity continuing to show some increases in LPP but, overall, beginning to level off as host is depleted. Mortality of WBP continues throughout high elevations of both the Tobacco Root and Snowcrest Ranges. Past WBP mortality in the Gravelly Range has left few remaining large WBP, many of which are dying is small scattered spots. Mortality of LPP continues along the eastern fronts of the Tobacco and Gravelly Ranges, and in the Snowcrest Range where LPP are found. Both DFB activity and SAF mortality remain similar to 2008 levels, approximating endemic conditions. The few small polygons of DFB-caused DF mortality were noted along the Warm Springs drainage of the Gravelly Range and the headwaters of the Ruby River. Area affected by WSBW defoliation showed modest increases over all ownerships at lower elevations around all three mountain ranges. If defoliation continues at high levels or drought conditions return, increases in DFB activity may be expected. White pine blister rust is common in WBP and LP. Schweinitzii root and butt rot is common in DF, causing decay in the butt logs but not acting as an aggressive root pathogen. LP dwarf mistletoe is present in this County.

Meagher County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	452,100	0	221,586	17,765	691,450
DFB	10	0	20	4	34
MPB-LPP	221,893	413	28,501	1,037	251,844
MPB-PP	7,690	986	20,998	892	30,566
MPB-High Elevation	18,824	39	651	0	19,514
SAF Mortality	54	0	0	0	54
WSBW	165,095	4,282	150,491	5,455	325,323
Windthrow	40	0	0	0	40

In 2009, most of the County was flown, which partly explains significant increase in number of acres reported to be killed by bark beetles. Despite this, number of acres killed by MPB increased substantially throughout the Castle Mountains. MPB activity in LPP increased by nearly 2-fold and by nearly 10-fold in PP. WSBW activity significantly increased throughout the County on private and Forest Service administered lands. Although DFB activity decreased, increases in the future can be anticipated in stands heavily defoliated by WSBW. White pine blister rust has been found in LP. Armillaria root disease is present in this County. Schweinitzii root and butt rot is quite common, especially causing significant decay in the butt logs of larger, older DF. LPP dwarf mistletoe is present in this County. One 40-acre patch of windthrow on Forest Service administered lands was noted in Moonshine Gulch of Antelope Creek.

Mineral County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	632,710	0	85,080	21,305	739,095
DFB	201	0	14	0	215
ESB	2	0	0	0	2
FE	589	0	53	2	644
MPB-LPP	106,969	0	1,916	60	108,945
MPB-PP	3,574	0	180	27	3,781
MPB-WP	4	0	0	0	4
MPB-High Elevation	4	0	0	0	4
SAF Mortality	468	0	6	0	474
WPB	373	0	15	20	408
WPBR	25	0	4	0	29

There was an increase of about 20% in the number of acres flown in the County. MPB-killed LPP was by far the most significant mortality agent on lands surveyed, especially south of I-90 from just above Trout Creek west to Lookout Pass. Fader groups just east of Lookout Pass were large and intensely infested. Most intensely infested stands were near Lookout Pass and in the Dry and Cedar Creek drainages. North of I-90 and the Clark Fork River, beetle activity was much less frequently encountered. There was also a modest increase from 172 to 378 acres of lower-elevation PP killed by MPB in 2009. Minor amounts of WPB-killed PP and SAF mortality were also recorded in the County. White pine blister rust is common in both WWP and WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this County.

Missoula County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	641,553	10,194	600,301	144,223	1,396,272
DFB	1,084	4	111	10	1,209
Drought	0	0	2	0	2
ESB	0	0	2	0	2
FE	7	0	29	0	36
Flooding - High Water	0	2	0	0	2
MPB-LPP	87,299	14,651	23,591	11,475	137,016
MPB-PP	6,335	1,164	18,195	9,259	34,953
MPB-High Elevation	4	149	0	0	153
IPS	0	0	2	0	2
SAF Mortality	149	683	11	66	909
Unidentified Defoliator	0	177	0	0	177
WPB	6	2	17	18	43
WSB	1,235	4,484	6,459	4,966	17,144

MPB activity significantly increased around Missoula, Lolo and the Ninemile Creek drainage. The most significant increase was in the acres of MPB-killed PP followed by MPB-killed LPP. Large groups of MPB-killed LPP were mapped east of the Rattlesnake Wilderness, especially towards Sheep Mountain and Hidden Lake. MPB-killed LPP was also common north and east of Missoula. MPB-killed PP stands were extensively found throughout the Rattlesnake Creek drainage, from Mount Jumbo, north into the Wilderness and northwestward to Grant Creek. Other PP stands were infested to a lesser extent in the Butler Creek drainage. Acres of MPB-killed PP greatly increased on private lands in 2009. DNRC personnel hung MPB-baited traps at Condon, Clearwater Junction, Boy Scout Road, and the MT DNRC Office to determine flight period. Peak

collections were on 9/17/09 (3), 8/14/09 (24), 8/26/09 (266), and 7/15/09 (33), respectively. DFB activity remained about the same in 2009, with 1,848 acres affected across the County. There were minor amounts of SAF mortality recorded in the Fish Creek drainage. WSBW defoliated stands were also detected, especially in the eastern part of the County. WBP and IPS activity slightly increased and was scattered. White pine blister rust is common in both WWP and WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. An unidentified species of black stain root disease was noted in LPP in the Hemlock-Elk Analysis Area on Forest Service administered lands west of Condon (MFO-TR-09-11). Elytroderma needle disease is a significant agent in PP in localized areas in this County. DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this County. One 2-acre polygon of drought damage was mapped on private lands in the Garnet Range, near the headwaters of Ashby Creek.

Musselshell County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	0	28,858	276,685	15,962	321,505
MPB-PP	0	0	4	1	5

Only 5 acres of MPB in PP were detected along the County border, with one acre being on federally managed lands (Fish and Wildlife Service) and four acres on privately managed lands. At least 240 acres of PTM activity were observed by DNRC field staff. Defoliation was severe throughout the PP stand.

Park County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	751,119	81,903	171,212	31,636	1,035,870
Aspen Decline	0	71	0	0	71
DFB	446	32	146	0	624
ESB	0	2	0	0	2
Flooding - High Water	0	180	0	0	180
MPB-LPP	53,801	35,501	48,911	108	138,321
MPB-High Elevation	32,059	36,640	14,219	0	82,918
SAF Mortality	6,004	302	2,432	0	8,738
WSBW	32,850	35,807	47,591	459	116,707

MPB-killed LPP increased almost 4-fold in the County in 2009. Large polygons of MPB-killed LPP were found in the Gallatin, Absaroka and Crazy Mountain ranges. MPB activity in five-needle pine almost doubled. SAF mortality increased significantly from 1,591 to 8,444 acres. WSBW-caused defoliation almost doubled with most of the increase on private lands. White pine blister rust is common in WBP and LP. Tomentosus root disease is known to be significant in some campgrounds in this County. LPP dwarf mistletoe is present in this County.

Petroleum County

Acres of Forestland, Mortality, and Defoliation by Ownership

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

Two acres of MPB-killed PP were detected.

Phillips County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	0	74,920	58,478	0	133,397
DFB	0	6	0	0	6
MPB-LPP	0	73	0	0	73
MPB-PP	0	417	19	2	438
WSBW	0	43	0	0	43

Fewer acres were flown in the County in 2009. Scattered groups of LPP and PP mortality were detected throughout the County, including Fort Belknap IR. Defoliation from WSBW was recorded on 560 acres. LPP dwarf mistletoe is present in this County.

Pondera County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	93,289	0	0	11,661	104,950
DFB	13	0	6	0	19
MPB-LPP	2,304	27	21	242	2,594
MPB-High Elevation	58	0	4	0	62
SAF Mortality	2,030	0	0	0	2,030
WSBW	0	308	1,569	455	2,332
Windthrow	75	0	0	0	75

In 2009 the Rocky Mountain Front of the Lewis & Clark was surveyed for the first time in many years. Increased pest activity is due to this nearly 40 -fold increase in survey area. On Forest Service administered lands, mortality of LPP due to MPB and SAF due to a complex of agents were the most important pest agents. On other ownerships, WSBW was the most prevalent agent. White pine blister rust is common in WBP and LP. A 72-acre patch of windthrow was mapped on Forest Service administered lands at the headwaters of the South Fork of Two Medicine River, southeast of East Glacier Park.

Powder River County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	253,254	71,096	156,632	10,052	491,033
MPB-PP	99	0	8	2	109
WSBW	137	0	167	0	304

Beetle activity was recorded at endemic levels with only a minor amount of MPB-killed PP mapped in forests, mostly to the east and south of Ashland. No IPS activity was noted, although it is likely that MPB and IPS are acting together in current, endemic pockets of PP mortality. The PTM activity (642 acres) noted in 2008 has subsided.

Powell County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	629,866	69,322	242,905	13,704	955,797
DFB	183	27	58	8	276
MPB-LPP	183,149	51,805	45,667	7,642	288,263
MPB-PP	5,808	2,958	24,921	2,936	36,623
MPB-High Elevation	2,346	0	13	0	2,359
IPS	0	0	135	0	135
SAF Mortality	102	0	0	0	102
WPB	0	0	20	6	26
WSBW	55,046	41,451	114,034	13,286	223,817
Windthrow	52	0	0	0	52

WSBW caused defoliation significantly increased across many parts of the County. MPB activity increased in both LPP and PP, on private and federal lands. Around MacDonald pass, mortality has peaked and is declining. On Forest Service administered lands, large polygons of MPB-killed LPP were detected near Ovando Mountain. Endemic levels of DFB, WPB and IPS were lightly scattered across the County.

White pine blister rust is common in WBP and LP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. LPP dwarf mistletoe is present in this County. One 52-acre patch of windthrow was mapped very near a 250-acre patch of windthrow mapped on Forest Service administered lands in Jefferson County. Both patches are likely due to the same wind event, and are located approximately 10 miles east of the community of Racetrack.

Ravalli County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	1,062,377	0	139,434	29,246	1,231,057
DFB	219	0	6	0	225
Dwarf Mistletoe	0	0	2	0	2
Elytroderma	21	0	1	0	22
FE	18	0	0	0	18
MPB-LPP	12,204	0	308	66	12,578
MPB-PP	698	0	355	437	1,490
MPB-High Elevation	2,959	0	0	0	2,959
Pine Engraver Beetle (LPP)	7	0	0	0	7
IPS	0	0	2	2	4
SAF Mortality	5,546	0	43	0	5,589
WSBW	1,329	0	61	444	1,834

In 2008, MPB activity was the most common bark beetle-caused mortality in the County, and that was also the case in 2009. Activity in LPP appears to be leveling off with the 2009 survey detecting more acres affected but fewer trees killed. Large groups of MPB-killed LPP were mapped in the Sapphire Mountains east of Stevensville, areas east of Hamilton, and around Painted Rocks Reservoir. MPB activity (acres and numbers) increased in both PP and five-needle pines. Several patches of PP mortality were noted east of Darby. Other bark beetle-caused mortality was recorded at endemic levels. Modest increases in WSBW-caused defoliation were detected. It should be noted that despite nearly double the acres of SAF mortality mapped in 2009, only around half the number of trees were estimated to have been killed.
Small patches of DF dwarf mistletoe and Elytroderma needle disease were mapped in County. Aerial Detection Survey is not a reliable method for recording the presence of these two diseases. Both diseases are quite common in the forests of Ravalli County. White pine blister rust is common in WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. A yet-to-be-identified root disease was noted in young DF in a 20- to 25-year old plantation on Forest Service administered lands east of Stevensville near Ambrose Saddle. The decay was noted in several trees across the plantation (MFO-TR-09-35). Identification of the responsible agent is forthcoming. Elytroderma needle disease is a significant agent in PP in localized areas in this County. DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this County.

Rosebud County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	76,525	38,671	223,688	32,981	371,865
MPB-PP	20	61	2	0	83
MPB-High Elevation	0	2	0	0	2
WSBW	0	491	0	0	491

Pest activity remains at low levels, with limited WSBW and minimal MPB (likely in combination with IPS) noted on the Northern Cheyenne IR.

Sanders County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	880,116	11,339	477,381	61,432	1,430,268
DFB	207	0	46	0	253
FE	1,891	2	2,894	261	5,048
Larch Needle Blight	60	0	0	0	60
MPB-LPP	98,114	462	4,947	1,547	105,070
MPB-PP	494	314	163	38	1,009
MPB-WP	2	0	2	0	4
IPS	616	2	10	0	628
Rhabdocline pseudotsugae	0	997	557	0	1,554
SAF Mortality	209	20	54	0	283
WPB	102	4	47	8	161
WSBW	158,932	0	15,323	2,173	176,428
WPBR	34	0	3	0	37

Many groups of MPB-killed LPP were mapped surrounding Plains and Thompson Falls. Fader groups increased significantly throughout the Prospect Creek drainage from Thompson Pass to Thompson Falls. South of Plains and south of the Clark Fork River, small groups of MPB-killed LPP, WPB-killed PP, and FE-impacted GF were found widely scattered. Elsewhere in the County, bark beetle activity was light and scattered. WSBW activity significantly increased in some parts of the County and could lead to increases in DFB activity in the future.

One 60-acre polygon of severe WL needle blight was mapped on Forest Service administered lands in Pew Gulch, just west of Noxon. Over 1500 acres of Rhabdocline needle cast was mapped on the Flathead IR (997 acres) and neighboring private land (557 acres). This large area is located on the western edge of the Salish Mountains, east of the Little Bitterroot River. White pine blister rust is common in both WWP and WBP. 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 brown cubical root and butt rot. The tree species most affected are DF and true firs. P-type root disease is known to occur in PP. Severe Armillaria root disease was found affecting large PP in the Pilgrim Creek drainage (MFO-TR-09-21). Tomentosus root disease significantly impacted LP in a campground near Trout Creek (MFO-TR-09-09). Elytroderma needle disease is a significant agent in PP in localized areas in this County. DF dwarf mistletoe, LPP dwarf mistletoe, and WL dwarf mistletoe are present in this County.

Silver Bow County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	178,528	24,440	39,153	4,067	246,189
Aspen Decline	0	0	56	0	56
DFB	13	8	10	6	37
MPB-LPP	102,577	5,712	7,774	4,191	120,254
MPB-High Elevation	11,528	2	36	212	11,778
WSBW	23,687	11,070	17,552	2,666	54,975

Over 80% of the County was surveyed in both 2008 and 2009. MPB continues to kill large numbers of trees over large areas; nearly doubling activity in high elevations (LPP and five-needle pines). However, mortality in LPP (trees per acre and numbers of trees) is down, due largely to depletion of adequate host. WSBW-caused defoliation has increased over two-fold. Although DFB activity remains at low, endemic levels, increased defoliation may cause greater DFB activity in the future. White pine blister rust is common in WBP and LP.

Stillwater County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	122,032	0	114,463	0	236,496
DFB	22	0	2	0	24
MPB-LPP	301	0	4	0	305
MPB-PP	0	0	2	0	2
MPB-High Elevation	18	0	2	0	20
SAF Mortality	12	0	0	0	12
Unidentified Defoliator	11	0	0	0	11
WSBW	6	0	24	0	30

MPB-caused mortality was observed in LPP and WBP stands administered by the Custer NF and in the Beartooth Mountains. Several groups of MPB-killed LPP were

noted near Washbourn Mountains, west of Absarokee. MPB caused mortality in PP slightly declined in the County and SAF mortality also declined. Minor amounts of DFB-caused mortality were also noted. Damage caused by PTM was not mapped by ADS and landowners confirm that populations appear to be in decline. White pine blister rust has been found in WBP and LP.

Sweet Grass County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	243,865	16,803	117,302	0	377,970
DFB	96	0	2	0	98
MPB-LPP	11,712	284	3,292	0	15,288
MPB-High Elevation	11,714	0	470	0	12,184
SAF Mortality	6,095	0	1	0	6,096
WSBW	3,826	138	2,704	53	6,721

DFB activity was low and scattered in 2009. There was a 3-fold increase in MPB-killed LPP and five-needle pines mostly in the Beartooth and eastern Crazy Mountains and in the Boulder Range. Number of acres of WSBW defoliation almost doubled in 2009. White pine blister rust has been found in WBP and LP.

Teton County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	216,012	10,294	20,237	10,294	256,837
DFB	2,260	112	60	43	2,475
ESB		16			16
Flooding - High Water		67			67
MPB-LPP	9,845	13,987	1,812	1,322	26,966
MPB-High Elevation	2,388	2,477	32	5	4,902
SAF Mortality	102	1,971	0	0	2,073
WSBW	191	3,652	3,061	1,198	8,102
Windthrow		71			71

Increased efforts to survey Lewis and Clark NF in 2009 provided some of the first aerial pest survey data for the Rocky Mountain Front, in many years. MPB in LPP was the greatest pest problem noted on all ownerships, although MPB in five-needle pines and DFB in DF was both notable on Forest Service administered lands. DFB was particularly notable near edges of the 2007 fires, due largely to DFB's affinity for scorched DF where populations can build to outbreak numbers. WBBB affected SAF

were also mapped over 70 acres. WSBW caused defoliation was also very active on both private and state lands. Increases in defoliation, coupled with locally high DFB populations may result in continued loss of DF. White pine blister rust is common in WBP and LP.

Valley County

Although no ADS were conducted in Valley County, FHP personnel did visit Fort Peck Corps of Engineer managed lands to evaluated reported tree mortality. Ground surveys found scattered small pockets of PP being attacked and killed by secondary bark beetles, particularly *Ips* species.

Wheatland County

Acres of Forestland, Mortality, and Defoliation by Ownership

	National Forest	Other Federal	Private	State	Total
Forestland	41,083	0	25,677	0	66,760
ESB	2	0	0	0	2
MPB-LPP	12,842	0	591	0	13,433
MPB-PP	1,656	15	4,050	198	5,919
MPB-High Elevation	481	0	321	0	802
WSBW	36,198	64	2,655	125	39,042

A 15 -fold increase in surveyed area, largely on Forest Service administered lands, explains much of the increased pest activity noted in 2009. In pines, MPB remains the most significant pest; killing significant numbers of LPP, PP, and five-needle pines (includes LP). Over 25% of the surveyed lands showed signs of defoliation by WSBW. WSBW defoliates principally DF, but also affecting ES and SAF. White pine blister rust has been found in LP.

Table 1. Mortality, Defoliation and Other Damage detected from the air on National Forests, National Parks and Tribal Lands in Montana, during 2009.

BEAVERHEAD NF		
Dillon RD	**Acres**	**Trees**
Douglas-fir Beetle	14	42
Mountain Pine Beetle (LPP)	68,975	228,697
Subalpine Fir Mortality	30	209
MPB (High Elev 5-needle Pines)	50,794	191,143
Western Spruce Budworm	43,405	0
Madison RD	**Acres**	**Trees**
Douglas-fir Beetle	12	58
Engelmann Spruce Beetle	2	6
Mountain Pine Beetle (LPP)	46,398	175,268
Subalpine Fir Mortality	334	1,144
MPB (High Elev 5-needle Pines)	12,695	38,610
Western Spruce Budworm	18,478	0
Sheridan RD	**Acres**	**Trees**
Douglas-fir Beetle	12	50
Mountain Pine Beetle (LPP)	21,540	72,689
Subalpine Fir Mortality	79	185
MPB (High Elev 5-needle Pines)	27,821	116,308
Western Spruce Budworm	15,673	0
Windthrow	25	0
Aspen Decline	12	0
Wisdom RD	**Acres**	**Trees**
Douglas-fir Beetle	22	194
Mountain Pine Beetle (LPP)	9,576	17,599
Subalpine Fir Mortality	36	252
MPB (High Elev 5-needle Pines)	2,571	4,652
Western Spruce Budworm	1,204	0
Wise River RD	**Acres**	**Trees**
Douglas-fir Beetle	6	33
Mountain Pine Beetle (LPP)	92,961	346,439
MPB (High Elev 5-needle Pines)	16,609	58,187
Western Spruce Budworm	8,406	0

BITTERROOT NF		
Darby RD	**Acres**	**Trees**
Douglas-fir Beetle	65	112
Mountain Pine Beetle (PP)	145	193
Mountain Pine Beetle (LPP)	461	976
Fir Engraver Beetle	4	4
Subalpine Fir Mortality	1,102	903
MPB (High Elev 5-needle Pines)	925	1,545
Stevensville RD	**Acres**	**Trees**
Douglas-fir Beetle	26	70
Mountain Pine Beetle (PP)	835	1,179
Mountain Pine Beetle (LPP)	3,832	16,936
Subalpine Fir Mortality	1,949	1,953
MPB (High Elev 5-needle Pines)	1,831	2,672
Western Spruce Budworm	1,787	0
Sula RD	**Acres**	**Trees**
Douglas-fir Beetle	36	76
Pine Engraver Beetle (PP)	4	10
Mountain Pine Beetle (PP)	69	86
Mountain Pine Beetle (LPP)	631	1,057
Fir Engraver Beetle	8	10
Subalpine Fir Mortality	580	1,022
Pine Engraver Beetle (LPP)	7	16
MPB (High Elev 5-needle Pines)	175	345
Elytroderma	22	0
West Fork RD	**Acres**	**Trees**
Douglas-fir Beetle	96	172
Mountain Pine Beetle (PP)	89	56
Mountain Pine Beetle (LPP)	8,079	13,122
Fir Engraver Beetle	6	10
Subalpine Fir Mortality	1,955	1,952
MPB (High Elev 5-needle Pines)	22	45

CUSTER NF		
Ashland RD	**Acres**	**Trees**
Mountain Pine Beetle (PP)	123	130
Western Spruce Budworm	304	0
Beartooth RD	**Acres**	**Trees**
Douglas-fir Beetle	2,461	6,751
Mountain Pine Beetle (LPP)	823	1,624
Subalpine Fir Mortality	782	1,698
MPB (High Elev 5-needle Pines)	7,906	28,269
Western Spruce Budworm	683	0
Unidentified Defoliator	11	0
Windthrow	15	0
Sioux RD	**Acres**	**Trees**
Mountain Pine Beetle (PP)	77	93
Aspen Decline	2	0

DEERLODGE NF		
Butte RD	**Acres**	**Trees**
Douglas-fir Beetle	14	46
Mountain Pine Beetle (LPP)	108,989	884,224
MPB (High Elev 5-needle Pines)	3,665	22,310
Western Spruce Budworm	27,365	0
Deer Lodge RD	**Acres**	**Trees**
Douglas-fir Beetle	7	37
Mountain Pine Beetle (PP)	474	3,375
Mountain Pine Beetle (LPP)	113,606	1,185,762
MPB (High Elev 5-needle Pines)	4,064	10,697
Western Spruce Budworm	12,239	0
Windthrow	53	0
Jefferson RD	**Acres**	**Trees**
Douglas-fir Beetle	360	942
Mountain Pine Beetle (PP)	1,388	30,109
Mountain Pine Beetle (LPP)	247,548	2,553,861
Subalpine Fir Mortality	972	5,124
MPB (High Elev 5-needle Pines)	8,131	85,989
Western Spruce Budworm	17,830	0
Windthrow	255	0
Philipsburg RD	**Acres**	**Trees**
Douglas-fir Beetle	24	118
Mountain Pine Beetle (PP)	1,177	1,726
Mountain Pine Beetle (LPP)	114,462	454,827
Subalpine Fir Mortality	1,353	1,765
MPB (High Elev 5-needle Pines)	4,361	9,713
Western Spruce Budworm	13,756	0

FLATHEAD NF		
Glacier View RD	**Acres**	**Trees**
Douglas-fir Beetle	140	255
Engelmann Spruce Beetle	4	4
Mountain Pine Beetle (PP)	2	2
Mountain Pine Beetle (LPP)	1,813	4,941
Fir Engraver Beetle	150	254
Subalpine Fir Mortality	7,565	49,660
MPB (High Elev 5-needle Pines)	8	18
Western Spruce Budworm	54,373	0
Windthrow	12	0
Hungry Horse RD	**Acres**	**Trees**
Douglas-fir Beetle	2,149	4,320
Engelmann Spruce Beetle	8	8
Mountain Pine Beetle (PP)	14	14
Mountain Pine Beetle (LPP)	8,997	57,614
Fir Engraver Beetle	36	63
Subalpine Fir Mortality	1,812	3,605
MPB (High Elev 5-needle Pines)	95	82
Western Spruce Budworm	66,102	0
Spotted Bear RD	**Acres**	**Trees**
Douglas-fir Beetle	580	485
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (PP)	26	40
Mountain Pine Beetle (LPP)	6,825	24,999
Fir Engraver Beetle	12	26
Subalpine Fir Mortality	464	1,392
MPB (High Elev 5-needle Pines)	8	16
Western Spruce Budworm	13,421	0
Windthrow	94	0
Avalanche	17	0
Swan Lake RD	**Acres**	**Trees**
Douglas-fir Beetle	1,248	2,575
Engelmann Spruce Beetle	4	6
Mountain Pine Beetle (PP)	719	1,813
Mountain Pine Beetle (LPP)	16,810	74,312
Western Pine Beetle	2	2
Fir Engraver Beetle	118	143
Subalpine Fir Mortality	1,498	5,903
Western Spruce Budworm	36,576	0
Flooding - High Water	10	0
Avalanche	58	0
Tally Lake RD	**Acres**	**Trees**
Douglas-fir Beetle	786	1,075
Engelmann Spruce Beetle	6	7
Mountain Pine Beetle (PP)	4	4
Mountain Pine Beetle (LPP)	225	474
Western Pine Beetle	2	2
Fir Engraver Beetle	10	20
Subalpine Fir Mortality	1,051	2,975
Western Spruce Budworm	74,972	0

GALLATIN NF		
Big Timber RD	**Acres**	**Trees**
Douglas-fir Beetle	6	22
Mountain Pine Beetle (LPP)	19,428	57,083
Subalpine Fir Mortality	6,499	19,512
MPB (High Elev 5-needle Pines)	13,965	47,599
Western Spruce Budworm	5,627	0
Bozeman RD	**Acres**	**Trees**
Douglas-fir Beetle	988	4,388
Mountain Pine Beetle (LPP)	185,614	1,474,345
Subalpine Fir Mortality	14,050	39,410
MPB (High Elev 5-needle Pines)	44,949	179,593
Western Spruce Budworm	201,177	0

Gardiner RD	Acres	Trees
Douglas-fir Beetle	221	455
Mountain Pine Beetle (LPP)	17,944	79,125
Subalpine Fir Mortality	1,675	6,167
MPB (High Elev 5-needle Pines)	13,831	55,543
Western Spruce Budworm	22,707	0
Hebgen Lake RD	**Acres**	**Trees**
Douglas-fir Beetle	4	15
Mountain Pine Beetle (LPP)	72,556	383,529
Subalpine Fir Mortality	3,830	11,032
MPB (High Elev 5-needle Pines)	35,555	106,032
Western Spruce Budworm	38,343	0
Livingston RD	**Acres**	**Trees**
Douglas-fir Beetle	373	1,371
Mountain Pine Beetle (LPP)	67,691	558,102
Subalpine Fir Mortality	10,369	21,500
MPB (High Elev 5-needle Pines)	46,399	218,300
Western Spruce Budworm	22,475	0

HELENA NF		
Helena RD	**Acres**	**Trees**
Douglas-fir Beetle	6	52
Mountain Pine Beetle (PP)	72,839	208,090
Mountain Pine Beetle (LPP)	219,161	2,445,219
MPB (High Elev 5-needle Pines)	4,474	35,238
Western Spruce Budworm	102,597	0
Avalanche	11	0
Lincoln RD	**Acres**	**Trees**
Douglas-fir Beetle	46	88
Mountain Pine Beetle (PP)	11,380	1,742
Mountain Pine Beetle (LPP)	180,918	764,496
Subalpine Fir Mortality	20	67
MPB (High Elev 5-needle Pines)	741	1,494
Western Spruce Budworm	138,642	0
Windthrow	16	0
Townsend RD	**Acres**	**Trees**
Douglas-fir Beetle	55	336
Mountain Pine Beetle (PP)	4,208	45,605
Mountain Pine Beetle (LPP)	81,985	819,187
MPB (High Elev 5-needle Pines)	9,851	56,460
Western Spruce Budworm	89,802	0
Windthrow	40	0

KOOTENAI NF		
Cabinet RD	**Acres**	**Trees**
Douglas-fir Beetle	97	186
Mountain Pine Beetle (WP)	4	4
Mountain Pine Beetle (PP)	297	303
Mountain Pine Beetle (LPP)	41,492	46,035
Fir Engraver Beetle	16	20
Subalpine Fir Mortality	16	28
Western Spruce Budworm	89,634	0
Larch Needle Blight	60	0
Fisher River RD	**Acres**	**Trees**
Douglas-fir Beetle	43	44
Engelmann Spruce Beetle	6	6
Mountain Pine Beetle (WP)	4	4
Mountain Pine Beetle (PP)	197	202
Mountain Pine Beetle (LPP)	2,850	7,467
Western Pine Beetle	72	59
Fir Engraver Beetle	154	96
Subalpine Fir Mortality	12	30
Western Spruce Budworm	52,637	0
White Pine Blister Rust	239	29
Fortine RD	**Acres**	**Trees**
Douglas-fir Beetle	197	284
Engelmann Spruce Beetle	2	4
Mountain Pine Beetle (PP)	4	4
Mountain Pine Beetle (LPP)	1,711	5,138
Western Pine Beetle	2	2
Fir Engraver Beetle	4	11
Subalpine Fir Mortality	3,956	13,597
Western Spruce Budworm	13,773	0
Windthrow	2	0
Libby RD	**Acres**	**Trees**
Douglas-fir Beetle	77	89
Mountain Pine Beetle (WP)	4	4
Mountain Pine Beetle (PP)	143	169
Mountain Pine Beetle (LPP)	134	114
Western Pine Beetle	46	33
Fir Engraver Beetle	119	88
Subalpine Fir Mortality	40	83
Western Spruce Budworm	97,091	0
White Pine Blister Rust	161	44
Rexford RD	**Acres**	**Trees**
Douglas-fir Beetle	6	6
Pine Engraver Beetle (PP)	2	10
Mountain Pine Beetle (WP)	4	4
Mountain Pine Beetle (PP)	129	167
Mountain Pine Beetle (LPP)	325	344
Fir Engraver Beetle	25	16
Subalpine Fir Mortality	259	545
Western Spruce Budworm	460	0
White Pine Blister Rust	19	0

Three Rivers RD	Acres	Trees
Douglas-fir Beetle	28	41
Pine Engraver Beetle (PP)	2	6
Mountain Pine Beetle (WP)	6	6
Mountain Pine Beetle (PP)	226	313
Mountain Pine Beetle (LPP)	528	825
Fir Engraver Beetle	14	14
Subalpine Fir Mortality	1,857	2,561
MPB (High Elev 5-needle Pines)	10	16
Western Spruce Budworm	12,627	0
White Pine Blister Rust	606	0
Diplodia Canker	39	0
Flooding - High Water	2	0

LEWIS and CLARK NF		
Judith RD	**Acres**	**Trees**
Douglas-fir Beetle	55	193
Engelmann Spruce Beetle	10	17
Mountain Pine Beetle (PP)	5,058	29,855
Mountain Pine Beetle (LPP)	29,990	223,203
Subalpine Fir Mortality	1,847	11,659
MPB (High Elev 5-needle Pines)	14,541	112,938
Western Spruce Budworm	99,637	0
Kings Hill RD	**Acres**	**Trees**
Douglas-fir Beetle	19	38
Mountain Pine Beetle (PP)	9,403	62,650
Mountain Pine Beetle (LPP)	167,689	1,474,943
Subalpine Fir Mortality	134	258
MPB (High Elev 5-needle Pines)	10,994	150,595
Western Spruce Budworm	145,238	0
Musselshell RD	**Acres**	**Trees**
Douglas-fir Beetle	6	10
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (PP)	11,780	25,017
Mountain Pine Beetle (LPP)	82,087	693,511
Subalpine Fir Mortality	40	146
MPB (High Elev 5-needle Pines)	7,624	66,447
Western Spruce Budworm	112,944	0
Unidentified Disease	43	0
Rocky Mountain RD	**Acres**	**Trees**
Douglas-fir Beetle	2,907	13,500
Mountain Pine Beetle (LPP)	36,487	270,790
Subalpine Fir Mortality	2,038	10,257
MPB (High Elev 5-needle Pines)	4,261	23,210
Western Spruce Budworm	197	0
Windthrow	75	0

LOLO NF		
Missoula RD	**Acres**	**Trees**
Douglas-fir Beetle	895	788
Mountain Pine Beetle (PP)	12,485	4,750
Mountain Pine Beetle (LPP)	81,615	88,613
Western Pine Beetle	4	4
Fir Engraver Beetle	47	29
Subalpine Fir Mortality	691	234
MPB (High Elev 5-needle Pines)	45	71
Western Spruce Budworm	5,160	0
Ninemile RD	**Acres**	**Trees**
Douglas-fir Beetle	158	252
Mountain Pine Beetle (PP)	3,050	954
Mountain Pine Beetle (LPP)	45,875	180,530
Western Pine Beetle	6	6
Fir Engraver Beetle	2	2
Subalpine Fir Mortality	26	78
MPB (High Elev 5-needle Pines)	4	4
Plains RD	**Acres**	**Trees**
Douglas-fir Beetle	22	80
Mountain Pine Beetle (PP)	177	113
Mountain Pine Beetle (LPP)	18,929	18,038
Western Pine Beetle	54	147
Fir Engraver Beetle	1,523	1,678
Subalpine Fir Mortality	106	296
Western Spruce Budworm	16,312	0
White Pine Blister Rust	34	10
Seeley Lake RD	**Acres**	**Trees**
Douglas-fir Beetle	252	334
Mountain Pine Beetle (PP)	1,931	7,259
Mountain Pine Beetle (LPP)	48,125	253,313
Subalpine Fir Mortality	97	236
MPB (High Elev 5-needle Pines)	4	20
Western Spruce Budworm	1,286	0
Windthrow	47	0
Superior RD	**Acres**	**Trees**
Douglas-fir Beetle	139	403
Engelmann Spruce Beetle	2	2
Mountain Pine Beetle (WP)	4	4
Mountain Pine Beetle (PP)	124	177
Mountain Pine Beetle (LPP)	73,337	65,994
Western Pine Beetle	408	756
Fir Engraver Beetle	648	374
Subalpine Fir Mortality	448	1,299
White Pine Blister Rust	30	88
Thompson Falls RD	**Acres**	**Trees**
Douglas-fir Beetle	106	463

Pine Engraver Beetle (PP)	616	1,500
Mountain Pine Beetle (PP)	158	202
Mountain Pine Beetle (LPP)	45,573	66,508
Western Pine Beetle	50	98
Fir Engraver Beetle	852	927
Subalpine Fir Mortality	151	450
Western Spruce Budworm	68,107	0

BLACKFEET IR	Acres	Trees
Douglas-fir Beetle	582	61
Engelmann Spruce Beetle	2	2
Fir Engraver Beetle	801	370
Mountain Pine Beetle (LPP)	584	731
Mountain Pine Beetle (PP)	4	6
Subalpine Fir Mortality	107	72
Western Spruce Budworm	4,334	0
Winter Injury	27	0

CROW IR	Acres	Trees
Aspen Decline	227	0
Douglas-fir Beetle	125	96
Mountain Pine Beetle (LPP)	4	14
Mountain Pine Beetle (PP)	89	152
MPB (High Elev 5-needle Pines)	14	40
Subalpine Fir Mortality	4	8
Western Spruce Budworm	991	0

FLATHEAD IR	Acres	Trees
Douglas-fir Beetle	259	254
Fir Engraver Beetle	11	19
Flooding - High Water	2	0
Mountain Pine Beetle (LPP)	16,933	95,919
Mountain Pine Beetle (PP)	2,706	2,236
MPB (High Elev 5-needle Pines)	160	467
Pine Engraver Beetle (PP)	40	71
Rhabdocline pseudotsugae	2,060	0
Subalpine Fir Mortality	2,017	4,773
Unidentified Defoliator	228	0
Western Pine Beetle	20	20
Western Spruce Budworm	12,296	0
Winter Injury	13	0

FORT BELKNAP IR	Acres	Trees
Douglas-fir Beetle	6	6
Mountain Pine Beetle (LPP)	236	615
Mountain Pine Beetle (PP)	522	1,620
Western Spruce Budworm	43	0
Windthrow	26	0

NORTHERN CHEYENNE IR	Acres	Trees
Mountain Pine Beetle (PP)	115	126
MPB (High Elev 5-needle Pines)	2	2
Western Spruce Budworm	491	0

ROCKY BOYS IR	Acres	Trees
Douglas-fir Beetle	24	60
Mountain Pine Beetle (LPP)	5,738	74,887
Mountain Pine Beetle (PP)	569	3,145
Western Pine Beetle	2	2
Western Spruce Budworm	10,454	0

GLACIER NP	Acres	Trees
Avalanche	19	0
Douglas-fir Beetle	2,939	3,598
Engelmann Spruce Beetle	4	3
Fir Engraver Beetle	1,632	1,744
Flooding - High Water	2	0
Mountain Pine Beetle (LPP)	4,450	6,503
Mountain Pine Beetle (PP)	2	2
MPB (High Elev 5-needle Pines)	6	10
Subalpine Fir Mortality	7,509	16,164
Western Spruce Budworm	15,716	0
Windthrow	2	0

YELLOWSTONE NP	Acres	Trees
Aspen Decline	71	0
Douglas-fir Beetle	79	240
Engelmann Spruce Beetle	18	20
Flooding - High Water	248	0
Mountain Pine Beetle (LPP)	58,393	166,269
Mountain Pine Beetle (PP)	462	922
MPB (High Elev 5-needle Pines)	41,001	112,264
Subalpine Fir Mortality	2,343	4,270
Western Spruce Budworm	41,660	0
Windthrow	71	0

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
Diplodia shoot blight	*Diplodia pinea (Desmaz.) J. Kickx fil.*	PP
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
Rhabdocline needle cast	*Rhabdocline* spp.	DF
Schweinitzii root and butt rot	*Phaeolus schweinitzii* (Fr. :Fr.) Pat.	DF
Tomentosus root disease	*Inonotus tomentosus* (Fr.) Teng.	ES, DF, LPP
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 pine (Grizzled) tussock moth	*Dasychira pinicola (Dyar)*	PP (DF,ES,SAF,GF,WL, LPP)
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 on all Ownerships in Montana, during 2009

	USFS	Other Fed	State	Private	Total
DFB[1]	14,143	4,773	537	3,075	22,528
ESB[1]	45	28	8	4	85
FE[1]	3,033	2,436	378	3,340	9,187
IPS[1]	618	6	28	153	805
MPB-LPP[1]	2,140,525	199,518	79,888	444,303	2,864,234
MPB-PP[1]	113,809	38,180	31,162	242,282	425,433
MPB-5-NP[1]	315,197	49,848	3,185	36,241	404,471
MPB-WWP[1]	22	0	4	0	26
MPB-All[1]	2,569,553	287,546	114,239	722,826	3,694,164
SAF[1]	62,060	11,898	1,149	7,398	82,505
WPB[1]	557	22	61	176	816
WSBW[1]	1,446,987	228,746	112,613	813,586	2,601,932

[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;
WSBW = Western spruce budworm.

Table 3. Acres of Host Type Infested by Bark Beetles in Montana, From 2007 Through 2009

	2007[2,3]		2008[2,3]		2009[2,3]	
Insect	**Acres**	**Trees**	**Acres**	**Trees**	**Acres**	**Trees**
DFB[1]	22,285	58,773	21,558	39,587	22,528	52,873
ESB[1]	403	572	54	60	75	100
FE[1]	1,657	1,634	359	803	9,187	7,842
IPS[1]	1,187	2,299	10,778	36,669	805	1,751
MPB[1]	807,334	2,559,859	1,819,245	16,903,542	3,694,164	22,259,733
SAF[1]	115,250	286,757	53,194	149,802	82,505	245,595
WPB[1]	401	243	167	182	816	1,302
TOTAL	948,517	2,910,137	1,905,355	17,130,645	3,810,080	22,569,196

[1]DFB = Douglas-fir beetle; ESB = Spruce beetle; FE = Fir engraver beetle; IPS = Pine engraver beetle; MPB = Mountain pine beetle; SAF = Subalpine fir mortality complex; 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 4. Acres with Douglas-fir Beetle-Caused Mortality on All Ownerships in Montana, From 2007 Through 2009

	2007		2008		2009	
Reporting Area	**Acres**	**Trees**	**Acres**	**Trees**	**Acres**	**Trees**
Beaverhead	4,197*	11,138*	376	1,766	87	480
Bitterroot	1,835*	5,430*	674*	1,933*	229	436
Custer	1,086	4,302	85*	163*	2,941	7,552
Deerlodge	107*	386*	411	1,219	539	2,175
Flathead	5,450	9,020	7,899	12,844	4,969	8,797
Gallatin	2,058*	9,803*	722*	3,515*	2,446	10,302
Garnets	47*	154*	283	650	122	236
Helena	419*	1442*	5,166*	3,859*	1,707	1,062
Kootenai	724*	805*	205*	289*	466*	684*
Lewis & Clark	203*	630*	937*	2,075*	3,382	14,418
Lolo	1,261*	3,029*	2,364	6,772	1,626*	2,416*
Blackfeet IR	★	★	55	68	582	61
Crow IR	348	1,371	★	★	125	96
Flathead IR	552	1,102	51*	73*	259	254
Fort Belknap IR	13	57	0	0	6*	6*
No. Cheyenne IR	0	0	★	★	0	0
Rocky Boy's IR	2	25	18	56	24	60
Glacier NP	3,604*	8,814*	2,146	3,950	2,939*	3,598*
Yellowstone NP	379	1,265	166	355	79	240
TOTAL	22,285	58,773	21,718	39,587	22,528	52,873

★ = Not surveyed * = Partially surveyed

Yellowstone NP includes acres in MT, ID and WY

Table 5. Acres with Mountain Pine Beetle-Caused Mortality on State and Private Lands in Montana, From 2007 Through 2009

	2007				2008				2009			
Reporting Area	**LPP[1]**	**PP[1]**	**5-NP[1]**	**WWP[1]**	**LPP[1]**	**PP[1]**	**5-NP[1]**	**WWP[1]**	**LPP[1]**	**PP[1]**	**5-NP[1]**	**WWP[1]**
Beaverhead	6,074*	4*	918*	0*	26,874	0	3,064	0	31,580	0	4,095	0
Bitterroot	6*	45*	0*	0*	36*	61*	0*	0*	424	890	0	0
Custer	217	145	6	0	63*	527*	3*	0*	10	67	32	0
Deerlodge	16,529*	21*	302*	0*	79,935	834	5,435	0	97,179	2,602	2,289	0
Flathead	2,971	1,009	0	0	2,619	795	2	0	4,172	752	0	0
Gallatin	9,641*	56*	7,971*	0*	32,811*	21*	16,467*	0*	152,091	0	27,297	0
Garnets	1,430*	84*	0*	0*	25,712	1,922	105	0	35,560	28,315	0	0
Helena	14,886*	6,312*	0*	0*	55,354*	24,009*	105*	0*	136,546	178,360	2,836	0
Kootenai	4*	4*	0*	0*	951*	148*	0*	0*	1,894*	217*	0*	4*
Lewis & Clark	735*	2,922*	55*	0*	4,191*	1,899*	183*	0*	30,605	50,617	2,877	0
Lolo	5,309*	608*	0*	0*	11,079	531	0	0	31,478*	10,777*	0*	0*
Blackfeet IR	★	★	★	★	44	0	0	0	132	0	0	0
Crow IR	2	36	0	0	★	★	★	★	0	29	0	0
Flathead IR	1,399	109	0	0	431*	203*	0*	0*	987	662	0	0
Fort Belknap IR	0	2	0	0	2	30	0	0	10*	22*	0*	0*
No. Cheyenne IR	0	8	0	0	★	★	★	★	0	2	0	0
Rocky Boy's IR	593	62	0	0	561	258	0	0	1,507	132	0	0
Glacier NP	4*	0*	0*	0*	190	0	0	0	16*	0*	0*	0*
Yellowstone NP	0*	0*	0*	0*	0	0	0	0	0	0	0	0
TOTAL	59,800	11,427	9,252	0	240,853	31,238	25,364	0	524,191	273,444	39,426	4

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

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

Table 6. Acres with Mountain Pine Beetle-Caused Mortality on All Federal Ownerships in Montana, From 2007 Through 2009

	2007				2008				2009			
Reporting Area	**LPP[1]**	**PP[1]**	**5-NP[1]**	**WWP[1]**	**LPP[1]**	**PP[1]**	**5-NP[1]**	**WWP[1]**	**LPP[1]**	**PP[1]**	**5-NP[1]**	**WWP[1]**
Beaverhead	55,673*	6*	43,257*	0*	220,579	0	71,414	0	265,158	0	116,697	0
Bitterroot	2,491*	334*	180*	0*	8,083*	297*	1,384*	0*	12,703	705	2,959	0
Custer	1,151	476	3,334	0	3,277*	476*	1,110*	0*	819	196	8,538	0
Deerlodge	160,671*	78*	2,800*	0*	458,193	745	18,733	0	539,967	2,935	19,120	0
Flathead	40,148	62	16	0	19,058	39	21	0	31,567	398	111	0
Gallatin	20,659*	42*	44,989*	0*	66,374*	5*	67,135*	0*	248,320	0	127,601	0
Garnets	3,830*	21*	0*	0*	44,374	82	0	0	53,578	2,057	0	0
Helena	91,317*	5,235*	526*	0*	263,767*	13,054*	4,088*	0*	459,157	104,332	12,471	0
Kootenai	3,405*	48*	14*	4*	5,956*	116*	0*	0*	45,284*	869*	10*	18*
Lewis & Clark	9,766*	3,331*	2,529*	0*	38,528*	2,248*	9,961*	0*	305,791	24,741	36,305	0
Lolo	123,274*	2,562*	58*	2*	119,425	775	44	0	294,013*	12,134*	50*	4*
Blackfeet IR	★	★	★	★	623	0	0	0	452	4	0	0
Crow IR	286	127	26	0	★	★	★	★	4	60	14	0
Flathead IR	26,413	929	16	0	2,371*	537*	0*	0*	15,946	2,044	160	0
Fort Belknap IR	28	104	0	0	137	598	0	0	226*	500*	0*	0*
No. Cheyenne IR	0	302	0	0	★	★	★	★	0	113	2	0
Rocky Boy's IR	1,281	75	0	0	1,718	190	0	0	4,231	437	0	0
Glacier NP	10,028*	4*	24*	0*	20,786	2	0	0	4,434*	2*	6*	0*
Yellowstone NP	28,085	0	36,838	0	25,535	2	29,950	0	58,393	462	41,001	0
TOTAL	578,506	13,736	134,607	6	1,298,784	19,166	203,840	0	2,340,043	151,989	365,045	22

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

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

Table 7. Acres with Additional Bark Beetle-Caused Mortality on All Ownerships in Montana, From 2007 Through 2009

	Engelmann Spruce			Fir Engraver Beetle			Pine Engraver Beetle			Subalpine fir Mortality			Western Pine Beetle		
Reporting Area	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**
Beaverhead	0*	0	6	0*	0	0	0*	0	0	21862*	464	554	10*	0	0
Bitterroot	0*	4*	0	10*	0*	18	0*	2*	4	9547*	2,838	5,589	0*	24*	0
Custer	0	0*	0	0	0*	0	10	431*	0	5,485	2,449*	771	0	0*	0
Deerlodge	0*	2	0	0*	0	0	0*	0	0	120*	8,400	2,328	0*	2	2
Flathead	12	24	32	1,559	174	494	0	0	2	6,987	16,393	13,038	124	0	20
Gallatin	0*	0*	0	0*	0*	0	5*	4*	0	33350*	14,054*	36,384	0*	0*	0
Garnets	0*	0	0	0*	31	0	33*	0	137	334*	9	0	0*	2	67
Helena	0*	4*	0	0*	0*	0	0*	9,995*	0	6*	16*	20	0*	0*	2
Kootenai	5*	10*	8*	66*	36*	333*	0*	12*	6*	6732*	394*	6,139*	0*	4*	128*
Lewis & Clark	0*	2*	13	0*	0*	0	40*	176*	0	1022*	1,341*	4,173	2*	0*	0
Lolo	8*	0	2*	18*	48	5,898*	470*	45	616*	457*	2,261	1529*	265*	107	575*
Blackfeet IR	★	0	2	★	4	801	★	0	0	★	2	107	★	0	0
Crow IR	0	★	0	0	★	0	0	★	0	4,736	★	4	0	★	0
Flathead IR	0	0*	0	2	2*	11	610	4*	40	1,045	99*	2,017	124	28*	20
Fort Belknap IR	0	0	0*	0	0	0*	19	65	0*	0	0	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	0	0	44	0	0	0	0	0	0	2
Glacier NP	4*	4	4*	2*	64	1,632*	0*	0	0*	1580*	3,624	7,509*	0*	0	0*
Yellowstone NP	374	4	18	0	0	0	0	0	0	21,987	850	2,343	0	0	0
TOTAL	403	54	85	1,657	359	9,187	1,187	10,778	805	115,250	53,194	82,505	401	182	816

★ = Not surveyed * = Partially surveyed

Yellowstone NP includes MT, ID and WY acres

Figure 1. Reporting Areas and County Boundaries in Montana

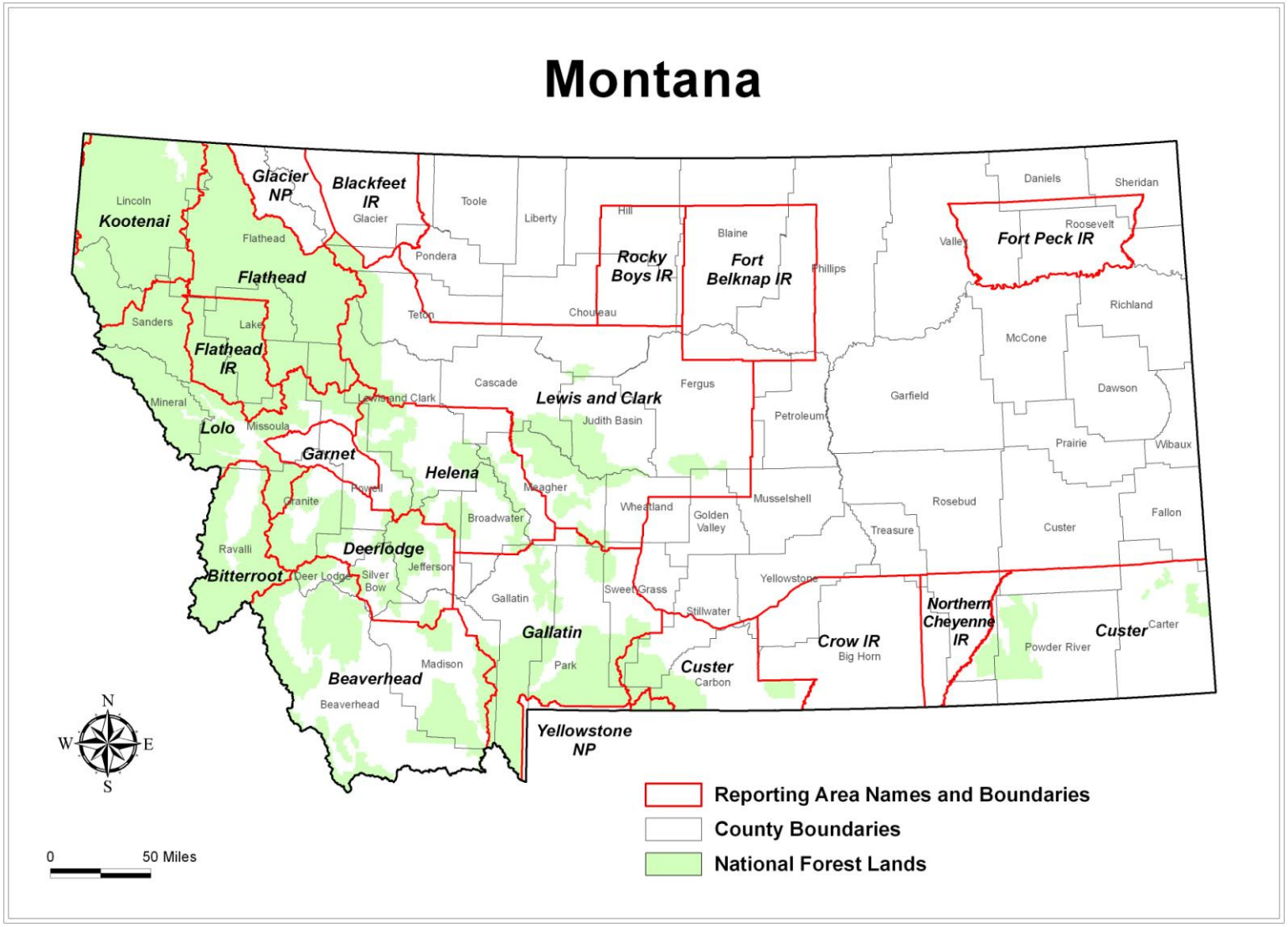

Figure 2. Areas Surveyed During the 2009 Forest Health Protection Aerial Detection Survey in Montana

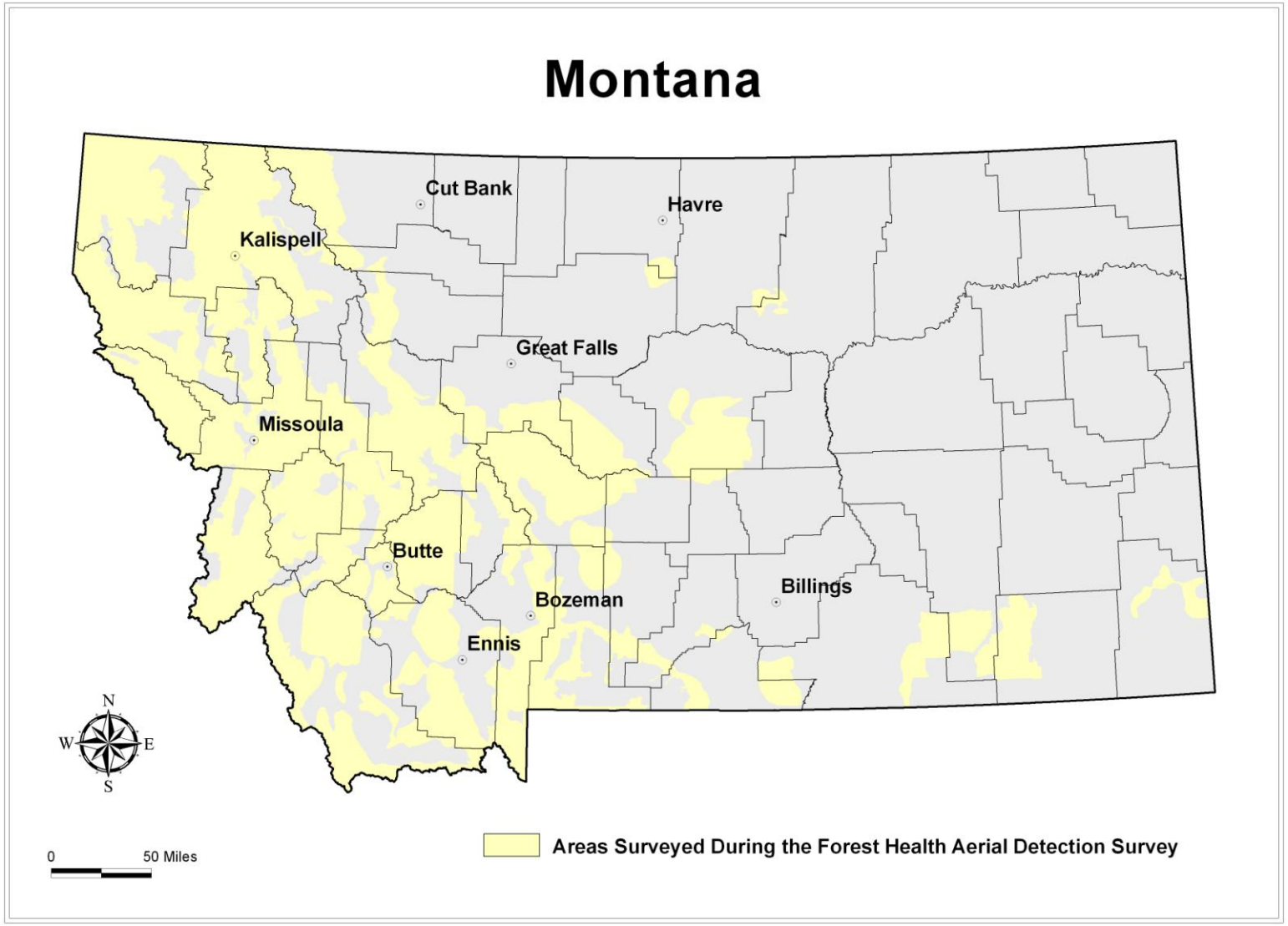

Figure 3. 2009 Mountain Pine Beetle Infestations in Montana

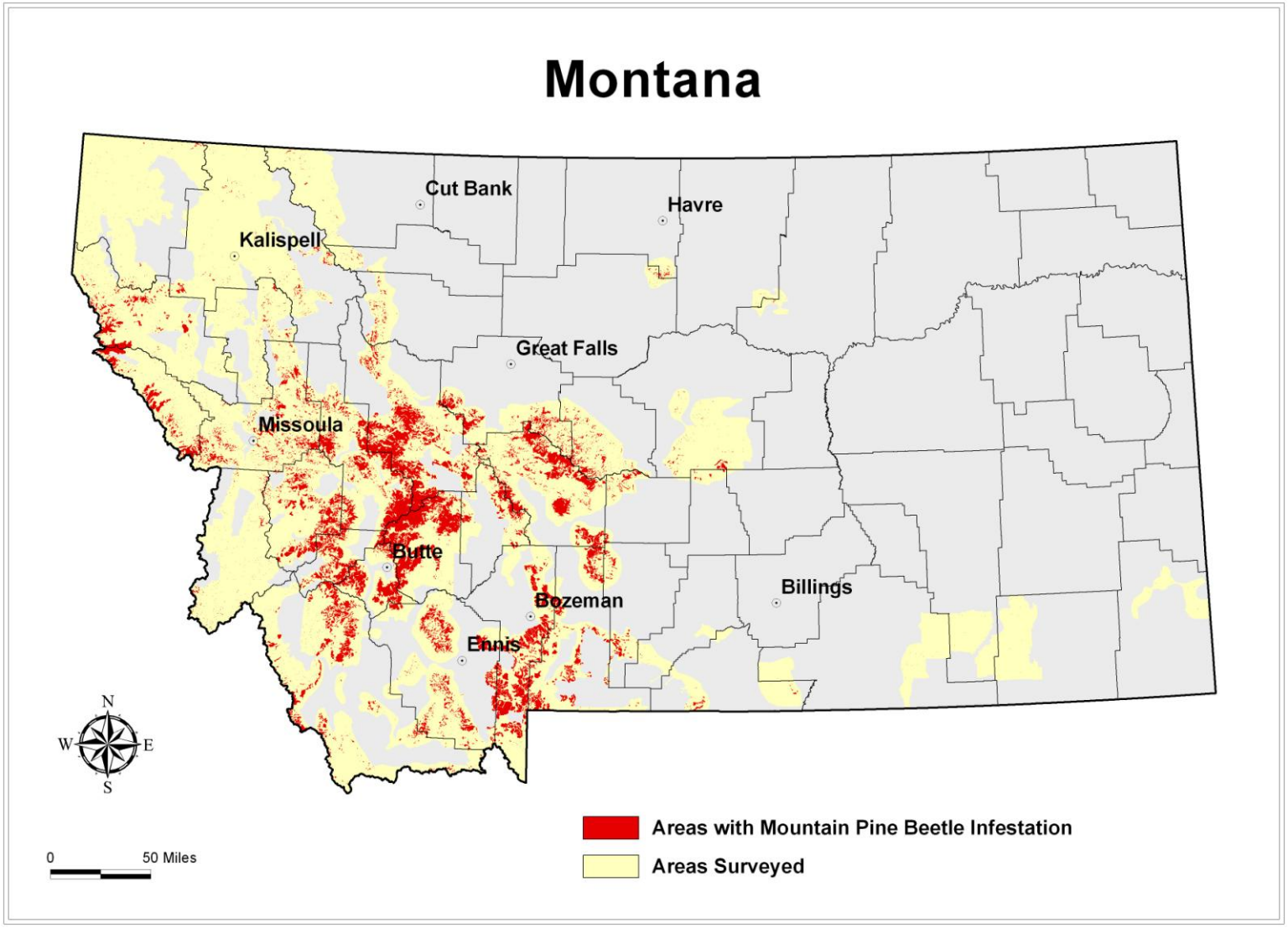

Figure 4. 2009 Douglas-fir Beetle Infestations in Montana

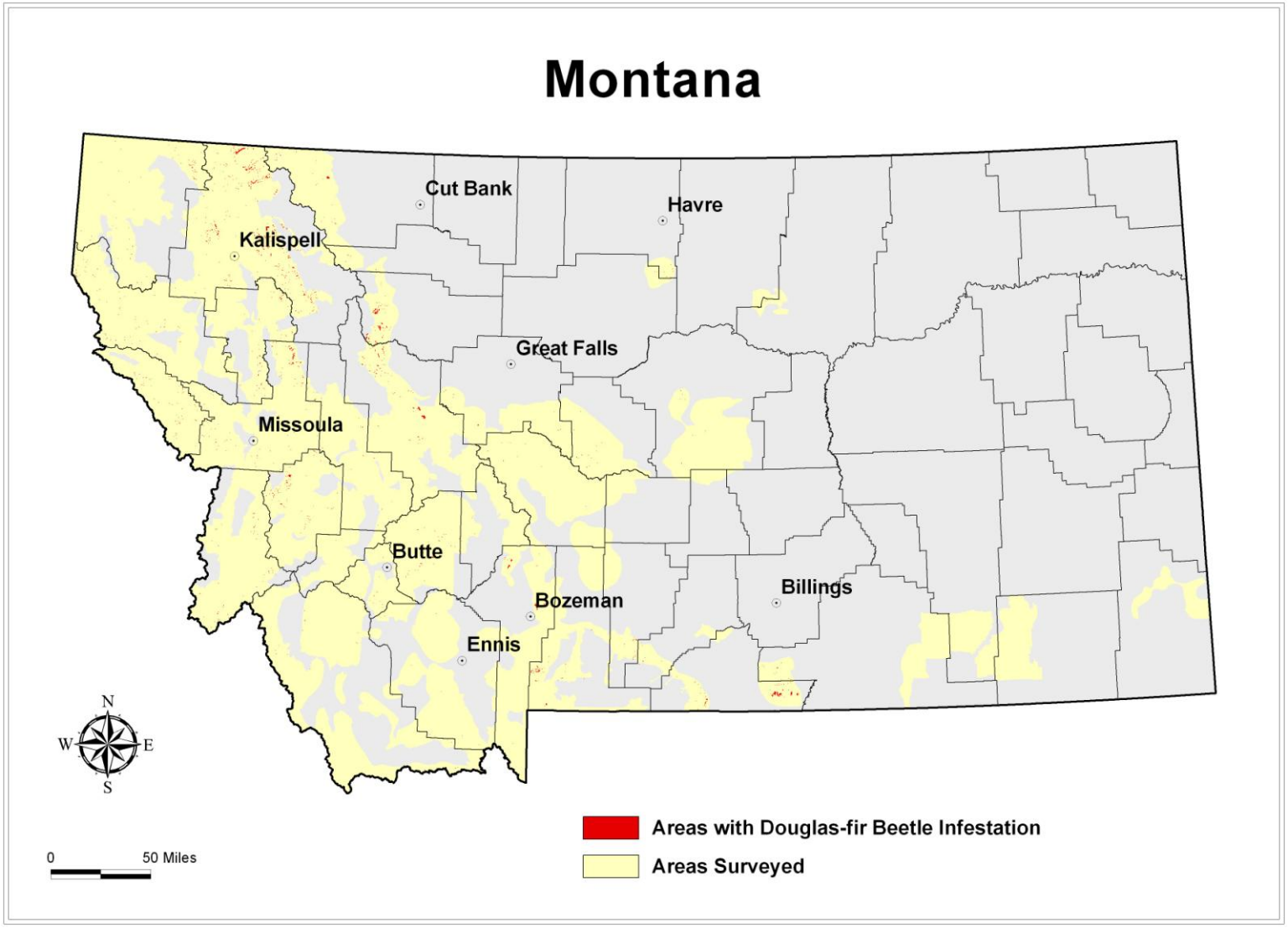

Figure 5. 2009 Fir Engraver Beetle Infestations in Montana

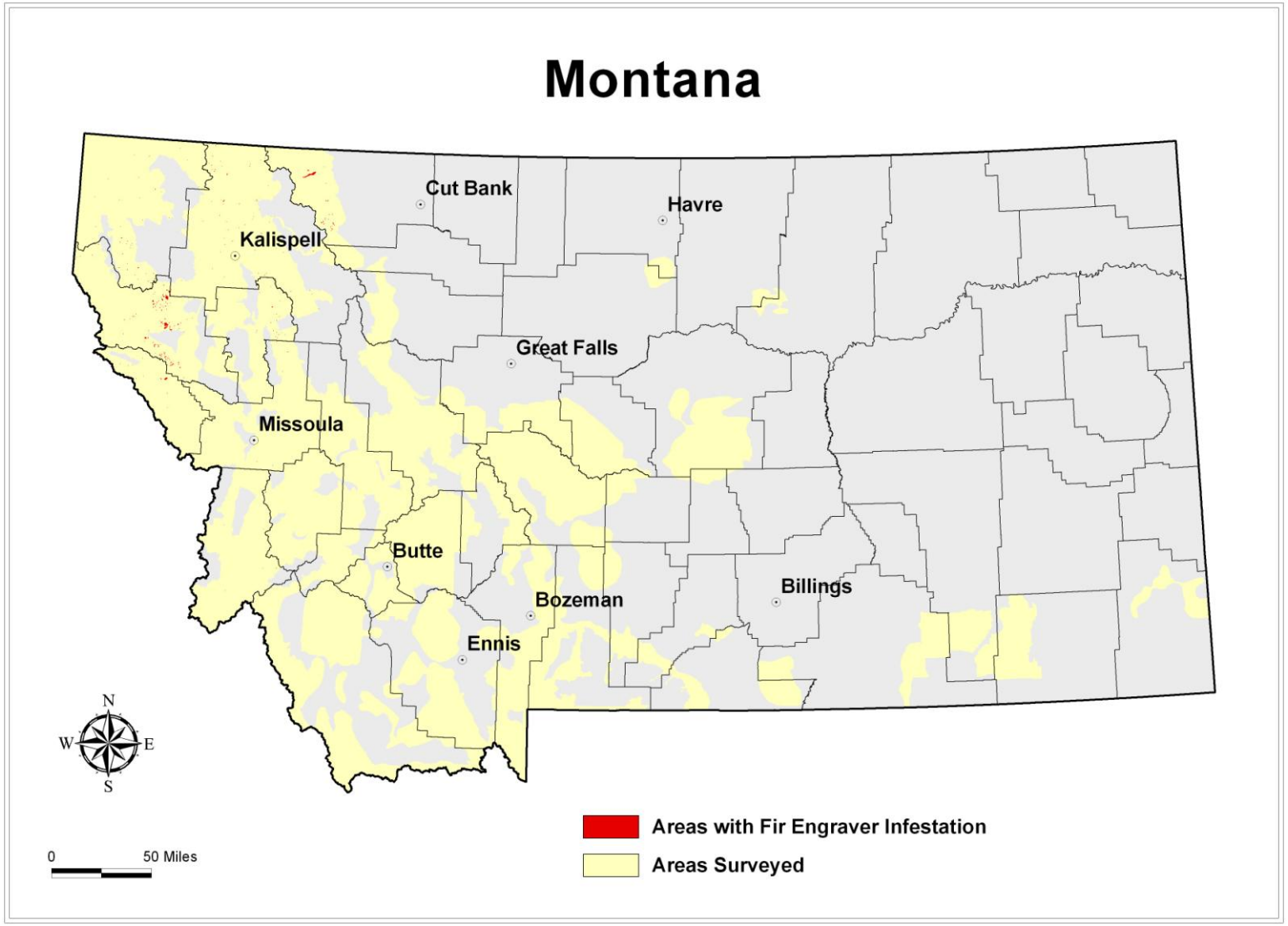

Figure 6. 2009 Subalpine Fir Mortality Complex in Montana

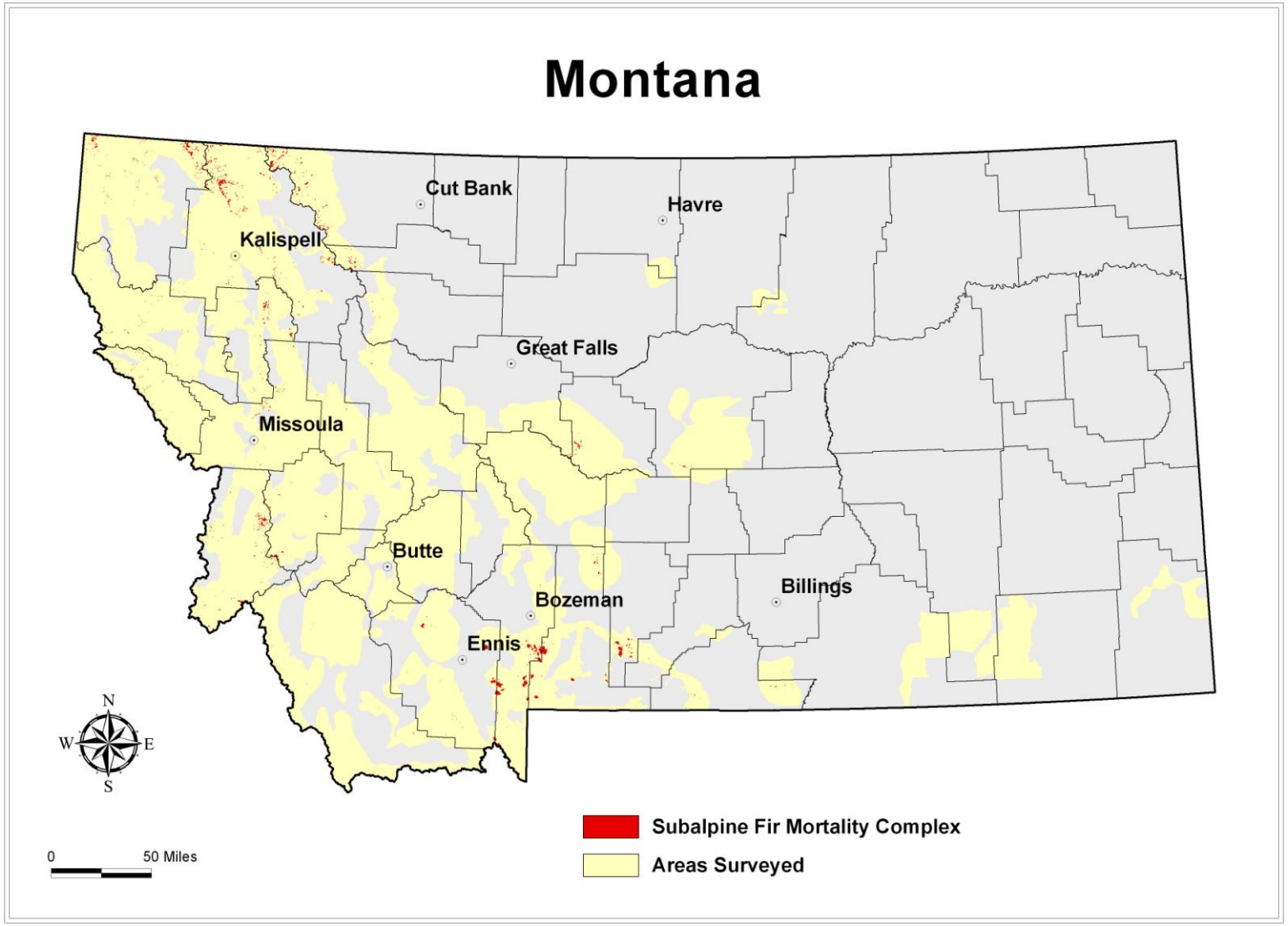
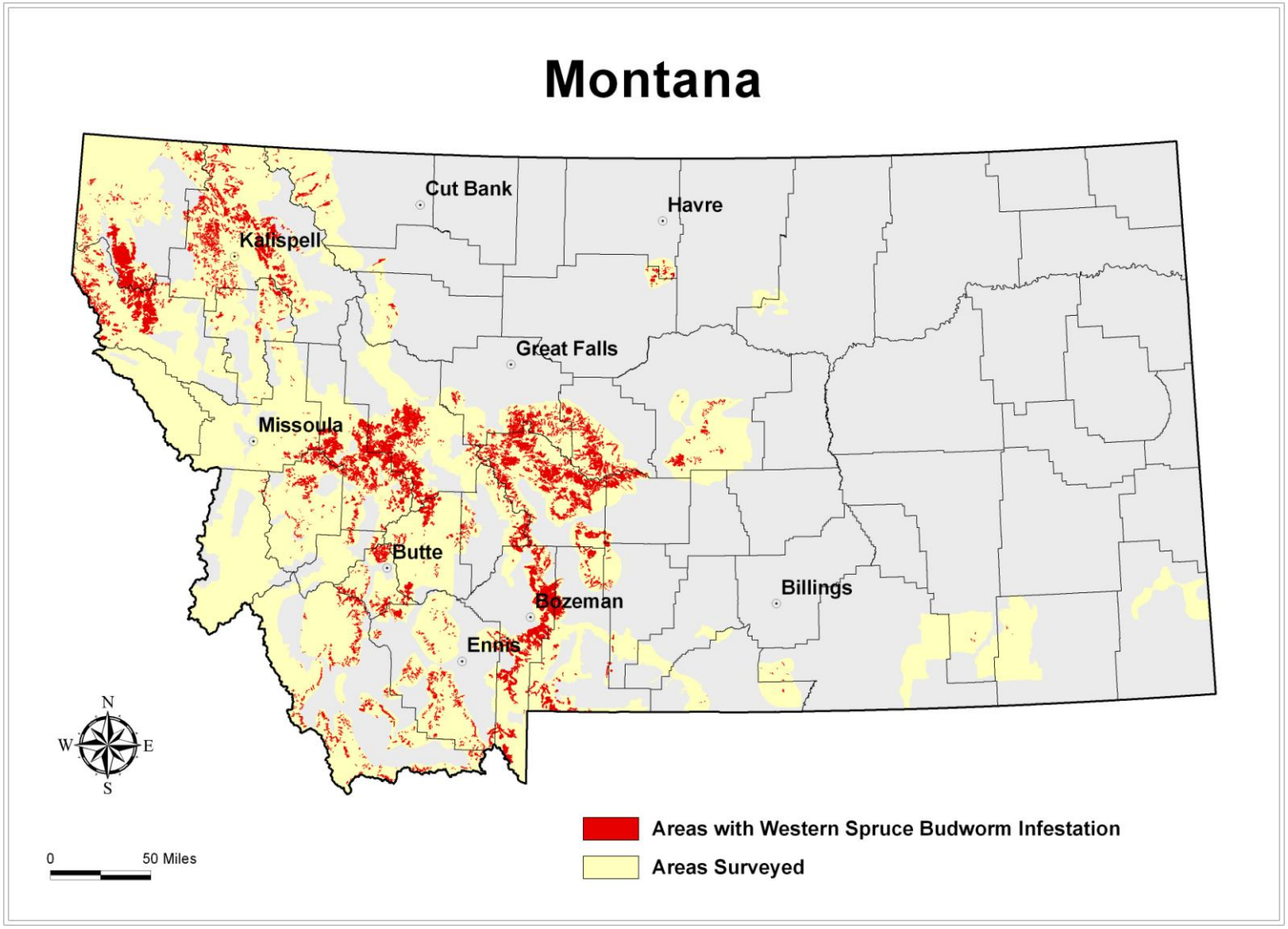
Figure 7. 2009 Western Spruce Budworm Infestations in Montana