

**BARK BEETLE CONDITIONS**

**NORTHERN REGION**

**2006**

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**Northern Region**  
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**REGIONAL SUMMARY**

For the past couple of years, western Montana and northern Idaho have received essentially “normal” amounts of precipitation. Climatologists have suggested that for most of the Region—with the possible exception of southeastern Montana—the long-standing drought is now over. That has been demonstrated in improved growing conditions for most bark beetle hosts over the past couple of years, and resultant reductions in population levels, and associated damage, of several bark beetle species. Still, long-term drought affects are not easily overcome. Some bark beetle species remained at high levels and showed only slight response to improved host conditions in 2006. As a result of at least somewhat-improved conditions, but also unfortunately due to our inability to survey all infested areas, infestation levels recorded for most bark beetle species—with the exception of mountain pine beetle—declined in 2006. Because of a combination of weather, fire, and personnel shortages, only about 70% of the forested portions of the 24 reporting areas were flown in 2006. For most of the Region, where we could obtain it, ground-collected data showed decreasing bark beetle populations. Again, the exception was mountain pine beetle; however, even there, beetle-related damage has declined in some areas due to host depletion.

Mountain pine beetle-infested areas increased in a few locations, and populations expanded into some previously uninfested areas. However, in some stands, intensity of those outbreaks has declined markedly because of the number of trees already killed. Decreases, at least in intensity, were recorded in infested areas on the Bitterroot, Beaverhead, Flathead, Lolo, and Nez Perce National Forests (NF). There was about a 60,000-acre increase on the Deerlodge NF; however, some of that may have been a result of the difficulty in distinguishing year-of-kill from the air. Two Forests in northern Idaho, the Clearwater and Kaniksu, where beetle populations have been high, were not flown in their entirety. In total, fewer infested acres were recorded in 2006 than in 2005, but that was as much a function of how much area was flown as it was how extensive outbreaks remain. A significant amount of the total infested area was once again recorded in whitebark pine stands, but outbreaks in that forest type declined somewhat overall. Because we did not get as much of the total infested areas surveyed this year, in some cases we are relying on 2005 surveys and supplementing that with what ground-collected data we were able to obtain.

Douglas-fir beetle-infested acres decreased in both northern Idaho and western Montana, and are now lower than they have been since 1998. At a few locations in southwestern and central Montana, populations remained at higher-than-normal levels; however, even in those few locations, they have declined substantially. Overall, infested acres decreased in 2006 to about one-third the area recorded in 2005. A small sampling of ground surveys indicated beetle activity is nearly endemic in most areas.

Grand fir mortality attributable to fir engraver decreased significantly once again—down to less than one-sixth the area recorded last year. Western balsam bark beetle-killed subalpine fir was mapped on considerably fewer acres than in 2005; but fewer infested areas were surveyed. Still, notable beetle-caused mortality was found in some areas. Pine engraver and western pine beetle populations were both recorded at virtually endemic levels.

As we anticipate the field season of 2007, we are hopeful of continuing the recovery from the nearly 7-year drought, the effects of which have been less pronounced in the past couple of years. With a continuation of near-normal weather, we believe bark beetle populations will continue to decrease in both intensity and extent. That may not be the case with the on-going mountain pine beetle outbreaks, however. Mountain pine beetle populations are more a function of host conditions than weather. In general, mountain pine beetles are much less weather-dependent than most other bark beetle species. A departure from normal amounts of moisture, and particularly an unusually dry spring, could signal a resurgence of bark beetle activity in the coming year.

#### **Mountain Pine Beetle (MPB):**

The infested area mapped in 2006 decreased significantly in most of the Region. Both the Kaniksu and Clearwater NFs showed significant decreases, however, the majority of those Forests were not flown. Most of the rest of northern Idaho exhibited legitimate decreases in infested area—particularly on the Nez Perce NF, where the infested area declined by more than two-thirds. Several of those formerly heavily infested areas have experienced severe amounts of host depletion. In western Montana, with only a few exceptions, most areas also showed a decrease in infested acres. Lolo NF reporting area showed a slight increase as infestations moved into previously uninfested areas. On the Deerlodge NF, beetle-affected areas increased significantly as populations inhabited not-yet-damaged stands. Still, beetle populations declined in some of the most severely impacted areas, and some of the apparent increase could be the result of mapping trees actually killed in 2004. Acres on which beetle-caused mortality was recorded, in all species and on all ownerships, decreased considerably, to slightly more than 881,000 acres—down considerably from the more than one million acres recorded in 2005. Total infested area is still higher than the 675,000 acres that had been recorded in 2004. On those infested acres, more than 2.4 million trees were killed in 2005—recorded as faders in 2006. A bit more than 83% of those were lodgepole pine. Although beetle populations have declined in some host stands, they continued to expand in a few areas. In some infested areas, for which ground-collected data were obtained, as many as 295 trees (lodgepole pines) per acre have been killed within the past 2-3 years.

A substantial decrease in beetle-caused mortality was noted in whitebark pine stands, but is still quite high—especially on the Gallatin, Helena, and Beaverhead NFs and in Yellowstone National Park (NP). In the Park, aerial surveys did not record as much beetle activity as in past years; however, not all of the Park was flown. Ground surveys

in some of those stands showed 96% of the whitebark pine has been killed within the past few years. Infestations in some whitebark pine stands continued to expand.

Many susceptible lodgepole, whitebark, and ponderosa pine stands remain in the Region. Unless weather patterns change to ones more favorable to their host and less conducive to beetle survival and population expansion, or management activities reduce availability of susceptible hosts, MPB populations and resultant tree mortality will continue until few susceptible hosts remain in many stands.

### **Douglas-fir Beetle (DFB):**

DFB populations returned to, or remained at, nearly endemic levels in most parts of northern Idaho. Not all of the potentially infested areas were flown; but we believed most areas in that part of the Region harbored few active beetle populations. While the Coeur d'Alene, Clearwater, and St. Joe NFs showed the most significant reductions in infested area, most of those Forests were not flown. The Nez Perce NF showed less-significant decreases. Few currently infested trees were observed in areas surveyed in northern Idaho, and we believe populations are at near-normal levels in most Douglas-fir and mixed-species stands.

In western Montana, every area surveyed showed a marked decline in infested stands. In a few areas, especially the Bitterroot, Beaverhead, Flathead, Helena, and Lolo NFs, beetle populations and resultant beetle-killed trees remain at higher-than-normal levels. But on every one of those Forests, infested areas declined in 2006. In many areas, beetle-killed trees were still noticeable; but seldom did we find higher numbers of new attacks in 2006. Stands surveyed in and around areas affected by 2000 and 2003 fires, on parts of Bitterroot and Helena NFs, showed populations declining dramatically. Few areas had more new attacks in 2006 than in 2005. Infested area recorded on aerial detection surveys declined on the Helena NF, from 5,550 acres in 2005 to slightly less than 5,300 acres in 2006. On the Bitterroot NF, where beetles have infested stands not affected by fire, infested area decreased from 69,300 acres in 2005 to just over 27,000 acres in 2006. That was still the most heavily impacted reporting area in the Region. Ground surveys and observations on the Forest showed fewer areas with currently infested trees, so we believe the infestation has declined markedly. Surveys conducted elsewhere in the State were similar. We may begin to see more beetle activity in western spruce budworm-affected areas; but that has not been manifest as yet.

Region-wide, the infested area mapped decreased to just less than 62,800 acre acres; down from more than 177,000 acres in 2005. Approximately 121,800 beetle-killed Douglas-fir were recorded on those infested acres. In most areas, we believe populations are or soon will be still declining. In some areas, still-high populations may be more perceived than real. It is often difficult to separate year of kill from the air.

More than 2 million acres of Douglas-fir, older than 100 years, exist in the Region. Weather and stand disturbances—fire, defoliation, or wind throw—increase the

likelihood of DFB outbreaks in susceptible stands. Preventive management is the key to reducing outbreak potential.

**Western Balsam Bark Beetle (WBBB):**

The number of acres on which subalpine fir mortality, attributed to WBBB, were recorded also decreased in 2006; but those recorded acres are influenced by 1) not all infested areas being flown, and 2) large areas in northern Idaho (St. Joe Reporting Area) being recorded as affected by WBBB, when other factors of SAF decline might also have been involved. Several Forests—especially the Beaverhead, Gallatin and Kaniksu, where beetle populations have recently been high—were not flown in their entirety in 2006. In the areas surveyed, in 2005, more than 250,400 infested acres were reported. That figure decreased to 158,500 acres in 2006. An estimated 186,000 subalpine fir were killed. The Beaverhead NF, in southwestern Montana, harbored the most widespread outbreaks where more than 54,000 infested acres were reported. Still, the entire Forest was not flown. That infested area in 2005 had exceeded 81,000 acres. In many areas, populations appeared to be decreasing, and should continue to respond to improved weather conditions.

**Fir Engraver (FE):**

Grand fir stands, in which FE-caused mortality was recorded, increased to an all-time high in 2004 (more than 298,650 acres). Improved weather over the past few years has resulted in significant decreases in infested area in 2005 and again in 2006. Most mixed-species stands in which grand fir was a component, in northern Idaho and western Montana, showed significantly lower levels of infestation this year. Total infested area in 2005, was reduced to 95,900; and dropped considerably again in 2006, to just over 15,180 acres. Nearly 18,000 grand fir were estimated to have been killed in 2005 (recorded as faders in 2006). We believe these dramatic decreases in FE-caused mortality were a result of better precipitation in the several years. Should we continue on this nearly-normal trend, populations should continue their decline in 2007.

**Others:**

**Pine engraver beetle (IPS)** populations, and associated tree mortality decreased substantially once again in ponderosa pine stands in the Region, but at least some of those decreases resulted from beetle-killed trees in the eastern part of Montana being attributed to MPB rather than IPS. Likely, some of those trees were killed by both—either singly or in combination. Whereas 12,800 acres had been recorded in 2005, less than 1,600 acres were mapped in 2006. We believe throughout the Region, populations were static or have declined significantly within the past couple of years. Only about 3,000 ponderosa pines were killed by IPS last year.

**Spruce beetle (ESB)** populations remained at endemic levels throughout both northern Idaho, Montana, and in Yellowstone NP. Only the Lolo NF had as many as 50 acres infested by ESB in 2006. The outbreak recorded east of Yellowstone Lake in Yellowstone NP, mapped at more than 8,700 acres in 2003 was not surveyed in 2006, but we believe that outbreak has declined to endemic levels.

**Western pine beetle (WPB)**-caused mortality declined once again in 2006, having been recorded on slightly less than 1,000 acres. Just over 3,600 acres had been reported in 2005. About one-third of the infested acres (300), were mapped on the Lolo NF this year. Where observed, mortality was very lightly scattered, totaling fewer than 1,350 trees. We anticipate continuing declining trends if precipitation patterns remain at near-normal conditions.

**Table 1. Acres of Host Type Infested by Bark Beetles<sup>1</sup>, 2004-2006  
(x 1,000)**

Host/Beetle	North Idaho <sup>2</sup>			Montana <sup>2</sup>			Region-Wide		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
DF/DFB <sup>3</sup>	8.9	8.9	2.2	92.5	168.4	60.6	101.4	177.5	62.8
ES/ESB	0.2	0.5	0	0.2	1.9	0.1	0.4	2.4	0.1
GF/FE	264.3	57.4	12.7	34.4	38.5	2.4	298.7	95.9	15.2
PP&LPP/IPS	1.0	0.1	0.2	16.1	12.7	1.3	17.1	12.8	1.5
PINE <sup>4</sup> /MPB	221.9	236.7	68.2	453.3	820.4	813.1	675.3	1,057.1	881.2
SAF/WBBB	41.6	41.8	28.1	133.8	208.5	130.4	175.4	250.4	158.5
PP/WPB	9.9	1.9	0.5	0.4	1.7	0.5	10.3	3.6	1.0

<sup>1</sup> Estimates are from annual aerial detection surveys. Bark beetles were assumed to have been the primary mortality-causing agent. Approximately 70% of the forested areas in the Region were surveyed in 2006.

<sup>2</sup> Figures for ID include that part of the IPNF in Washington; figures for MT include Yellowstone NP and South Dakota.

<sup>3</sup> See note below for beetle and host abbreviations used throughout report.

<sup>4</sup> All MPB hosts: LPP, PP, WWP, WBP/LP (In 2006, infested acres by host were: 728,168; 34,216; 28; 118,137; respectively.)

The following abbreviations, for bark beetles and their hosts, are used throughout this report:

Beetles:

DFB: Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins  
MPB: Mountain pine beetle, *D. ponderosae* Hopkins  
ESB: Spruce beetle, *D. rufipennis* (Kirby)  
WPB: Western pine beetle, *D. brevicomis* LeConte  
RTB: Red turpentine beetle, *D. valens* LeConte  
IPS: Pine engraver, *Ips pini* (Say)  
FE: Fir engraver, *Scolytus ventralis* LeConte  
WBBB: Western balsam bark beetle, *Dryocoetes confusus* Swaine

Hosts:

LPP: Lodgepole pine  
PP: Ponderosa pine  
WBP: Whitebark pine  
WWP: Western white pine  
LP: Limber pine  
DF: Douglas-fir  
GF: Grand fir  
SAF: Subalpine fir  
ES: Engelmann spruce

Reporting Area (RA) summaries follow. For each, bark beetle effects on their respective hosts are noted. To the extent possible, we have indicated areas affected, an estimate of impacts, and beetle population trends. Though reporting areas are typically designated by names of National Forests, Indian Reservations, or National Parks; there may be within those reporting areas, lands of various ownerships—federal, state and private.

## BARK BEETLE CONDITIONS IN MONTANA

### Beaverhead Reporting Area

#### **Dillon RD:**

Noticeable amounts of MPB-killed WBP and LPP in were recorded in the southern portion of Snowcrest Range; more in WBP than LPP. Large groups of WBBB-killed SAF were also noted. A few DF, killed by DFB, were noted in that same general area; however significant amounts of DF defoliated by WSBW suggest DFB activity could increase within the next few years. Lesser amounts of each were more generally scattered in the Blacktail Mountains south of Dillon.

The western portion of the District was not flown in 2006, but in 2005 the following report was noted: To the south, in the Tendoy Mountains, widely scattered groups of WBBB and MPB-killed LPP were observed. South and west of Dillon, from Lemhi Pass to Bannock Pass, scattered groups SAF, were infested by WBBB. In a more general pattern, from Jeff Davis Peak, south to Morrison Lake, scattered WBBB-killed SAF and minor amounts of DFB-killed DF were noted. There were, in that same area, a few small groups of MPB-infested LPP and WBP recorded.

District-wide in 2005; 4,000 DFB-killed DF were recorded on about 1,800 acres; MPB-killed 6,100 LPP on almost 3,400 acres and 1,200 WBP on nearly 600 acres; and almost 10,000 SAF were killed by WBBB on 4,700 acres.

#### **Wise River RD:**

The District was not flown in 2006. The following is the report for 2005. Conditions likely have not greatly changed. Small and lightly scattered groups of MPB-killed LPP were recorded in East Pioneer Mountains. Most were located south of Big Hole River. North of Big Hole River, from about Patton Spring to Fleecer Ridge, large groups of DFB-killed DF were also noted. In that same area, DF stands have also been heavily infested by western spruce budworm, *Choristoneura occidentalis*, Freeman (WSBW). Defoliation coupled with abnormally dry weather could result in increased DFB activity.

For the areas surveyed, DFB-caused mortality was observed on almost 6,600 acres, where 7,100 DF were killed; 7,000 SAF were killed by WBBB on nearly 4,700 acres; and 5,300 LPP were killed on 3,900 acres by MPB. Lesser amounts of mortality were recorded on adjacent State and private lands.

#### **Wisdom RD:**

Wisdom RD was also not flown in 2006. In 2005, there was much widely scattered beetle activity recorded throughout the Pioneer Mountains. Small groups of DFB-killed DF were concentrated in the north, with largest groups northwest of Wise River, and

south towards Table Mountain. Significant amounts of WBBB-caused mortality and MPB-infested LPP were scattered throughout the District.

In the Beaverhead Mountains, west of Wisdom, many widely scattered, but generally smaller groups of SAF killed by WBBB and LPP infested by MPB were noted. DFB activity was also occasionally observed there, but that was down from the past several years. In the Anaconda Range to the north, larger groups of WBBB-killed SAF and MPB-killed LPP were mapped. Some of the larger groups of the former were near Mud Lake; the latter in the LaMarche Creek drainage.

Notable concentrations of WBBB activity, within the past few years mapped in the Ruby Creek drainage, west of Wisdom; and in the Beaver Creek and Thompson Creek drainages in the Anaconda Range to the north seems to have declined somewhat.

Area-wide, almost 13,000 DF were killed by DFB on 5,750 acres; 4,700 LPP by MPB on 2,900 acres; and WBBB killed just over 8,000 SAF on 4,800 acres.

#### **Madison RD:**

Widely dispersed small groups, intermixed with a few larger ones, of WBBB-infested SAF were noted in the Madison Range in 2005. That portion of the District was not flown in 2006. In that same area, small and very lightly scattered groups of MPB-killed LPP and WBP were also observed. Small amounts DFB-killed DF were mapped in a few DF stands.

Throughout the Tobacco Root Mountains, large numbers of SAF, killed by WBBB, were found. Some groups were quite large—up to several trees per acre, covering hundreds of acres each—generally in the vicinity of Missouri Mine, northwest to Lava Mountain. Considerable amounts of MPB-killed LPP were observed in the northeastern part of the Tobacco Roots, from Cataract Lake north to Carmichael Creek. MPB has also affected numerous WBP stands, throughout the Tobacco Roots. Noticeable expansion of WSBW activity could result in increases of DFB populations. Those populations increased significantly in 2006.

In the Gravelly Range to the south, still large amounts of WBBB-killed SAF were observed; from about Pacific Mine, south to Landon Ridge. Also throughout the Range, MPB activity in LPP and WBP stands increased significantly. Especially noticeable were groups of beetle-killed LPP from Cave Mountain, south and east towards Wade and Cliff Lakes. WBP mortality, often in conjunction with white pine blister rust (BR), was recorded extensively throughout the Range. Some of those groups covered several thousand acres each.

In the Snowcrest Mountains southwest of Ennis, many large groups of WBBB-killed SAF, and MPB-infested LPP and WBP were mapped. WBP was also being affected by BR. In addition, smaller amounts of MPB-killed WBP and LPP were noted in the Ruby Mountains, east of Dillon.

In the past couple of years, SAF mortality attributed to WBBB had reached extremely high levels throughout the District. Some stands were more heavily impacted than others, but it appeared there were few SAF stands on the District not affected to some extent. Relatively small groups—up to 100 trees each—were reported in the Tobacco Root Mountains to the north. To the south, throughout the Gravelly Range, extremely large groups of faders—covering as much as several thousand acres each, and averaging an estimated 3-5 trees per acre—were mapped within the past couple of years. That activity remained relatively static.

WSBW activity increased markedly in 2006, throughout the District. In future years, DFB populations may build to damaging levels in defoliation- and drought-weakened stands of DF.

In the past few years, the largest concentrations of WBBB-killed trees were mapped south and west of Ennis in the Ruby Range, throughout the Snowcrest Range, and southern end of the Gravelly Range. Total affected area on the District in 2006 was estimated at 10,700 acres on which an estimated 20,200 trees were killed. In 2005, those aerial survey estimates totaled more than 10,700 SAF killed on 9,700 acres. More than 55,300 WBP and another 21,300 LPP were killed by MPB on 29,400 acres and 12,000 acres, respectively. In 2005, comparable figures had been 58,000 acres of WBP and 13,000 acres LPP. DFB killed about two trees per acre on 113 acres.

To the south, in the Centennial Range, on lands administered mostly by BLM, large amounts of SAF, killed by WBBB, were still present, but decreased from 2004 levels. In that same general area, significant amounts of LPP killed by MPB were recorded, with lesser amounts of WBP having been infested by MPB. Larger groups of SAF faders were noted west of Nemesis Mountain, then west of Baldy Mountain. WBBB killed about 20,200 SAF on 10,900 acres (13,800 trees on 8,900 acres in 2005).

Although not all infested areas were flown, total aerial survey estimates for the Beaverhead RA, on lands of all ownerships, were recorded nearly at 9,000 acres (23,500 acres in 2005) infested by DFB; 87,900 acres infested by MPB (all hosts) (92,000 acres in 2005); and just over 54,000 acres infested by WBBB (82,000 acres in 2005). Approximately 261,000 trees were killed by bark beetles throughout the area in 2005, recorded as faders in 2006. In addition, nearly 151,200 acres showed some level of WSBW defoliation. Dependent upon weather over the next few years, many of those damaged trees could be killed by DFB.

## **Bitterroot Reporting Area**

### **Stevensville RD:**

Considerable MPB-caused damage was mapped in LPP stands northeast of Stevensville, near Three-Mile State Wildlife Management Area. The largest continuous damage is just east of Three-Mile Point, but smaller areas were noted both to the north and south. In the same vicinity, but at lower elevations several small areas of DFB-killed DF were observed and even smaller areas of MPB-damaged PP. There were many more—but much smaller and widely scattered spots of MPB in LPP and DFB-impacted stands throughout the Sapphire Mountains.

On the west side of the Bitterroot Valley, observers found many small spots of MPB-killed trees in both LPP and PP stands throughout that portion of the District. None were of significance, although they could be building. Slightly more was recorded in 2006 than in 2005.

District totals, generally down from those mapped in 2005 showed about 1,400 acres of DFB-infested DF (1,800 in 2006); and a marked decrease in MPB-caused mortality—6,300 LPP on approximately 2,100 acres (14,000 LPP on 7,000 acres in 2005); another 2,400 WBP on 2,400 acres (3,000 WBP on 3,700 acres last year). WBBB activity declined dramatically. Where more than 6,300 acres were affected and 11,100 SAF were killed in 2005; comparable figures for 2006 were 1,400 trees on 780 acres.

### **Darby RD:**

Relatively large tracts of MPB-killed WBP, and SAF killed by WBBB were mapped east of Hamilton. Many groups of DFB-affected DF were found in and near Skalkaho Creek drainage, and were more prevalent in that area than in DF type farther north. We found several small groups of WBBB-killed SAF, and LPP killed by MPB, southward towards Darby.

To the west side, only very small fader groups of LPP and PP, killed by MPB, were noted.

District-wide, DFB-infested acres decreased significantly in 2006, to fewer than 3,100 acres, on which 5,300 DF had been killed (compared to 12,700 acres and 28,000 trees last year). MPB activity also decreased: 1,300 LPP were killed on 500 acres (3,200 acres and 4,500 trees in 2005); and 1,600 WBP on 600 acres (3,400 acres, 5,700 WBP in 2005). Slightly more than 1,300 SAF were killed on 1,060 acres (10,200 SAF on 6,800 acres last year). Minor amounts of other bark beetle-related mortality were occasionally observed.

**Sula RD:**

There were several large areas of DFB-killed DF mapped along both sides of the East Fork Bitterroot River, beginning about two miles east of Sula and extending to the border of the Pintler RD on the Deerlodge NF. Approximately four miles southwest of Sula, surveyors observed more and larger groups of DFB-infested DF. In addition, small groups of WBBB-killed SAF were found at the northeastern edge of the District. The DFB outbreak of the past few years has finally been reduced to near-epidemic conditions.

The only noticeable amounts of MPB activity on the District were three small groups of beetle killed LPP, located about three miles east of Sula.

On the western side of the District, from Saddle Mountain, north to West Fork Bitterroot River, numerous large groups of DFB-killed faders were reported. In that part of the District, a few smaller groups of MPB-killed LPP and WBBB-killed SAF were also noted.

Total area infested by DFB decreased to slightly more than 15,500 acres (26,000 acres in 2005). Approximately 32,000 DF were killed on those infested acres, compared to 60,000 last year.

Also on the District several groups of LPP, killed by MPB and totaling 20 acres (700 acres in 2005), were recorded. At higher elevations, SAF stands generally contained a few larger groups of WBBB-killed trees; totaling about 800 trees on 720 acres—figures had been 8,100 trees on 5,400 acres in 2005.

**West Fork RD:**

A few scattered groups (one of approximately 100 acres) of MPB-killed PP were mapped on the north side of East Piquett creek. Farther south and west, few small areas of MPB activity in LPP were noted near the head of Sheephead Creek. Several small groups of WBBB and a few small groups of ESB activity were noted in a widely scattered pattern in Blue Joint Creek drainage.

There were still a few large areas of DFB-caused tree mortality, but it is reduced from past years. Fader groups were noted throughout West Fork Bitterroot River, with much more damage on the east side than the west. A few smaller groups were found on the south side of Straight Creek.

Along the District's southern boundary, still within the West Fork Bitterroot drainage, several small groups of WBBB-killed SAF were mapped. Burned-over areas in that general area of the District—in tributaries of Hughes Creek, Johnson Creek, and Beaver Creek—could harbor increases in bark beetle activity in the future.

District-wide, DFB infested slightly less than 6,900 acres and killed almost 9,600 DF. Those figures can be contrasted to 49,000 DF on 28,000 acres in 2005. MPB accounted

for about 150 trees on 55 acres (all species). In 2005 MPB had killed 2,300 LPP alone on 1,300 acres. WBBB killed approximately 11,000 SAF on 7,500 acres in 2005; and 2,900 trees on 1,600 acres in 2006.

DFB populations, extremely high following the fires of 2000 and again in 2003 have finally begun to return to more normal levels. Surveys conducted in fire-affected and adjacent stands in 2005 and 2006, showed generally declining numbers of new attacks. In some areas, host depletion has been responsible for beetle population reductions.

Bitterroot RA totals for 2006 showed 27,100 acres infested by DFB, on which nearly 49,500 DF were killed. In 2005, 143,000 DF were killed on 69,300 acres. Slightly more than 2,700 acres LPP; 3,000 acres WBP; and about 330 acres PP contained varying amounts of MPB-caused mortality. Comparable figures for 2005 had been: 12,700 acres LPP; 7,200 acres WBP; and 500 acres PP. About 13,000 MPB hosts were killed. Just over 4,100 acres of SAF stands were infested by WBBB (26,000 last year), on which 4,200 SAF were killed (40,400 in 2005). Mortality attributed to other bark beetles was much less significant.

### **Custer Reporting Area**

#### **Beartooth RD:**

Much of the District was not flown in 2006 due to fire activity. Last year, in the Pryor Mountains a few large groups DFB-killed DF were mapped, especially near Mystery Cave and along Commissary Ridge. Small amounts MPB-killed LP, plus significant amounts SAF, infested by WBBB, were lightly scattered throughout the area surveyed. In 2006, there was much more MPB activity recorded in LP stands throughout the Pryor Mountains. WBBB-killed trees were also widely scattered throughout the area. In 2005, west of Red Lodge, and north of Cooke City, several large groups of WBBB-killed SAF were mapped in upper reaches of Castle Creek, Picket Pin Creek, and Iron Creek.

Significant amounts of MPB-caused mortality in LP stands were mapped generally west of Red Pryor Mountain, in 2005. Infested stands were also noted on lands administered by BLM in that area. In 2006, large amounts of MPB-killed WBP were mapped south of Red Lodge, in the Beartooth Mountains, concentrated on and near Lime Creek Plateau. North of there, above Silver Run Creek, several groups of WBBB-killed SAF were observed. Others were noted about West Fishtail Creek, south of Nye.

In 2005, more than 2,100 acres DF; 3,400 acres SAF; 1,100 acres WBP, and 730 acres LPP contained measurable amounts of bark beetle-caused mortality, District-wide. Nearly 12,000 trees were killed. In 2006, for the part of the District surveyed; MPB killed about 50 PP on 10 acres, another 1,550 WBP on about 180 acres, and 770 LP on 80 acres. WBBB was credited with killing approximately one tree per acre on 680 acres.

**Sioux RD:**

In 2005, minor amounts of MPB- and IPS-killed trees were very widely distributed in PP stands in the North and South Cave Hills, east of Camp Crook; and in the Slim Buttes, east of Buffalo, SD. Southeast of Camp Crook, minor amounts of mostly IPS-killed PP were found in the Short Pine Hills. In 2006, groups were still small and widely scattered, but most was recorded as MPB-related mortality instead of IPS. More widely scattered, but still mostly small groups of MPB-killed PP were mapped throughout Chalk Buttes, Ekalaka Hills, and Long Pines. MPB activity increased markedly in 2006 in the Long Pines.

MPB killed an approximate 70 PP and IPS another 1,100 trees on a combined 1,300 acres, District-wide in 2005.

**Ashland RD:**

Very sparsely scattered, small groups of IPS- and MPB-killed PP were noted east of Ashland, in 2005. In 2006, groups were still small and very scattered, but recorded as MPB-caused damage exclusively. No significantly large groups were reported, but some of the larger ones were found north and west of Saylor, in 2005.

Throughout the District, beetles killed about 12,000 PP on a combined 5,300 acres. Only 2,600 infested acres were reported in 2004.

The 2005 report noted that Custer RA-wide, reported bark beetle-caused mortality totaled 3,900 DF killed by DFB on 4,300 acres. MPB was attributed with killing 500 LP on 320 acres; 400 PP on 600 acres, 760 LPP on 740 acres; and 1,340 WBP on 1,100 acres. And an estimated 8,300 WBBB-killed SAF on were reported on 4,300 acres. Most of those were increases over 2004 levels. Those totals, results of an abbreviated survey in 2006 showed: nearly 2,800 trees killed by MPB (most were WBP) and 650 SAF killed on 1,125 acres.

**Deerlodge Reporting Area****Butte RD:**

Throughout the District, large tracts of LPP stands were still heavily infested by MPB. While populations in some stands are finally subsiding due to host depletion, many areas contain high amounts of MPB-killed trees—some dead for a few years, some killed in 2006. Ground surveys in Lime Kiln basin to the south and in American Gulch to the northwest of Butte showed still-active beetle populations.

Southwest of Butte, along the Deerlodge/Beaverhead NF boundary, there were also a few small groups of MPB-killed WBP noted. In that same general area, in high-elevation

SAF stands along the Continental Divide, near South Fork of North Fork Divide Creek, several small groups of WBBB-killed trees were observed. Most DF-dominated stands on the District have significant amounts of WSBW-caused defoliation, and within many of these stands, small groups of DFB-killed trees were noted. While DFB populations at this time are not high, increases in WSBW activity may well result in increased susceptibility to beetles and a significant increase in DFB activity over the next few years.

Ground surveys conducted there in 2005 showed the infestation on the District was still quite active although decreasing in some areas due to host depletion. In the Lime Kiln area, new attacks, for one 10-plot area, averaged 42 per acre in 2004. That had increased to 72 per acre in 2005. Additional data collected in 2006 showed a total for that area of more than 124 trees per acre killed over the past three years. In Basin Creek, ten plots revealed very few new attacks, averaging only 16 per acre; but a total of 130 total dead trees per acre—killed during the past 3-4 years. In the American Gulch area, where outbreaks were fairly recent, an average 72 trees per acre have been killed in 2005. Data obtained in 2006 indicated in one area there were 274 beetle-killed trees per acre; in another 195 trees per acre.

District-wide, an estimated 276,000 LPP were killed on approximately 87,200 acres in 2006. Those estimates represent moderate increases from 2005 when more than 264,000 LPP were killed on about 69,800 acres. Some outbreaks became less intensive as a result of host depletion.

DFB-killed DF was noted in decreasing amounts throughout the DF type on the District. District-wide, DFB-caused mortality totaled 1,100 trees on 450 acres in 2005; whereas only 110 trees on 45 acres were recorded in 2006.

#### **Jefferson RD:**

Like Butte RD, LPP stands on the Jefferson RD were still heavily infested by MPB. Notable, highly impacted stands of LPP were located in higher elevations throughout Whitetail Deer Creek drainage. MPB-caused damage was almost continuous from a few miles south of Boulder to Little Pipestone Creek, more than 10 miles southeast of Butte. Stands to the northwest, towards Delmoe Lake, were still being severely affected.

Throughout the District, WSBW-caused defoliation increased significantly. The highest concentrations were noted around Boulder. In those stands, small groups of DFB-killed trees were mapped and we believe DFB activity could increase substantially within the next few years. DFB populations have decreased in recent years, but that trend could be reversed within the next several.

North of the Boulder River, near the border with the Pintler RD, a few very small groups of MPB-killed trees were found in WBP stands. In the southern part of the District, additional groups of MPB-killed WBP were also noted. Similar conditions were found in WBP stands to the west. In some of those high-elevation stands we also noted small

groups of SAF, killed by WBBB. Similar conditions were found in the area northwest of Boulder, between Jack and Cataract Creeks.

Infestations on the District were the most extensive on the Forest, increasing significantly in 2006. Infested area on the District was recorded as 119,600 acres 75,000 acres in 2006—only 75,000 in 2005. An estimated 216,000 LPP were killed in 2005, but that number increased to almost 371,500 in 2006. WBBB activity declined some, from about 1,900 SAF killed on 950 acres in 2005; to 1,500 trees killed on 500 acres in 2006.

North of Boulder, on lands administered by both BLM and FS, MPB had killed numerous groups of PP and a few groups of LPP. Beetle populations there did not increase significantly.

#### **Deer Lodge RD:**

MPB activity in LPP stands increased east of Deerlodge, especially near Sugarloaf Mountain, Black Mountain, and Orofino Mountain. West of Deerlodge, significant MPB-caused mortality in LPP stands was noted from Cup Lake, south nearly to Anaconda. Minor amounts of DFB-killed DF were noted in that general area as well.

MPB outbreaks on the District totaled about 12,400 acres in 2005, up to 15,000 acres in 2006. Approximately 22,000 LPP were killed last year, 42,400 in 2006. DFB- and WBBB-caused mortality was much less significant—found on about 170 and 40 acres, respectively.

#### **Pintler RD:**

On the east side of the District, in Powell and Deerlodge Counties, several large areas of MPB-infested LPP were mapped within Dempsy Creek, Racetrack Creek, Lost Creek and Tin Cup Joe Creek, drainages and some of their tributaries. Only small amounts of DFB activity were noted, some just north of Anaconda; however, increased WSBW defoliation could easily result in increased DFB activity.

The southern portion of the District had only small spots of DFB and WBBB activity. Most of that was found in East Fork Rock Creek and Rock Creek drainages. To the west, there were once again, many small groups of DFB-killed trees located near Stony Creek. There were a few small areas where WBBB had killed a few SAF along Little Stony Creek and elsewhere in that general vicinity.

East of the Clark Fork River, areas heavily defoliated by WSBW were mapped. Those stands are likely to become more susceptible to DFB in the future. There were a few small groups of DFB-killed DF in that area. Throughout that area there were widely scattered, mostly small groups of LPP killed by MPB.

DFB killed about 32,000 DF on almost 15,000 acres in 2005; however, those figures were reduced dramatically in 2006, to 4,200 DF on 1,180 acres. MPB accounted for

1,500 dead LPP (5,100 in 2005) and another 100 PP (370 last year) on a combined 1,100 acres (3,700 in 2005). WPB activity was noted on about 15 acres.

For Deerlodge RA, MPB-infested LPP stands increased substantially in 2006. Found on slightly more than 182,200 acres in 2005, that figure increased to 246,130 acres in 2006. More than half a million LPP were killed last year, but increased to nearly 720,000 in 2006. Most infested LPP stands were on FS-administered lands. MPB also killed a reported 4,900 WBP on 2,500 acres. DFB infested another 2,100 acres (20,400 acres in 2005) and WBBB was recorded on 700 acres (6,300 in 2005).

### **Flathead Reporting Area**

#### **Swan Lake RD:**

General decreases in MPB-killed LPP were noted throughout the Swan Valley. Still, there were notably large groups mapped both east and west of Swan Lake and south of Swan Lake on Swan River SF. Some of the largest groups were observed near Sixmile Mountain, above Porcupine Creek, and from North Fork Elk Creek south to Lindbergh Lake.

To the east, in the Swan Range, MPB-killed trees were common in LPP and WBP stands from Goat Creek on the north to Pierce Lake on the south. Largest groups were once again mapped south of Lion Creek and just south of Holland Lake.

FE activity in mixed-species stands has declined considerably and is now only found in small and widely scattered groups north and east of Swan Lake. Very few groups were found, especially when compared to the massive outbreaks of but a few years ago. Several small groups were widely distributed south of Swan Lake. DFB-killed trees were more frequently encountered in 2006; however, groups of beetle-killed DF were still small and very much scattered on the west slopes of the Swan Range. Small groups were more numerous south of Lion Creek.

In the "Island Unit," significant increases in MPB-infested LPP were again recorded near Blacktail Mountain. FE activity has declined markedly and beetle-killed GF were only occasionally encountered. Generally, throughout that part of the District, there has been a marked increase in MPB activity, while incidence of DFB-killed DF and WBBB-infested SAF declined considerably and were rarely recorded.

The once widespread FE outbreak of a few years ago has subsided to nearly endemic levels. In 2005, more than 16,000 GF were killed on 7,500 acres. Comparable figures for 2006 showed 1,700 trees killed on less than 1,000 acres. MPB activity in LPP is still noticeable throughout the District, but has decreased from the 31,000 acres on which 63,000 trees were killed in 2005; to 56,200 dead trees on 22,400 acres. Throughout the District, DFB activity also declined, to 5,000 dead DF (7,400 in 2005) on about 2,200

acres (3,400 acres last year). WBBB-caused mortality also declined from more than 7,500 SAF killed on 4,400 acres in 2005 to 3,400 trees on less than 1,100 acres this year.

### **Spotted Bear RD:**

A few large groups MPB-killed LPP remained at some locations, but were much reduced from the past few years, both in extent and intensity. Large groups were mapped near Kah Mountain, above Soldier Creek, near Stony Hill, Crossover Mountain and Big Bull Mountain. Most of those groups averaged only about 2-3 trees per acre killed in 2005 (recorded as faders in 2006). Fewer groups of WBBB-killed SAF were noted in high-elevation stands throughout the District; and the ones noted were small and widely scattered. A few similar groups were also mapped east of the Reservoir, along Elk Ridge. DFB activity was only lightly scattered throughout the reporting area.

A set of 30, variable-radius plots that have been monitored yearly for the past 26 years, in the Cedar Creek area, south of Spotted Bear, showed an average 63 LPP per acre have been killed by MPB—mostly within the past 6-8 years.

District-wide, MPB infested LPP stands totaled 10,250 acres, on which almost nearly 25,000 trees were killed. In 2005, those figures were 11,100 acres and 18,000 trees. DFB-affected stands on the District remained about static, totaling just over 1,100 acres, whereas 1,000 acres had been recorded in 2005. Slightly more than 2,700 DF were killed, compared to 1,700 last year. Other bark beetle-related activity was light.

### **Hungry Horse/Glacier View RD:**

A variety of bark beetle activity—trees killed by MPB, DFB, FE—was noted in a generally lightly scattered pattern west of Hungry Horse Reservoir. None appeared to be of major significance; however, a few of the largest groups were mapped a few miles south of Hungry Horse. A few larger groups of SAF, killed by WBBB, were observed near Baldhead and Slippery Bill Mountains. North and east of the Reservoir, bark beetle activity was more prevalent. DFB remained active on Coram Experimental Forest near Martin City, though at levels reduced from previous years. WBBB-killed trees were very widely scattered throughout the Flathead Range, south to the District boundary.

MPB-infested LPP were found in larger, though lightly infested groups in the southeastern portion of the District (Great Bear Wilderness). Largest of those groups were found northwest of Nimrod and throughout Middle Fork Flathead River drainage and its tributaries, south of John F. Stevens Canyon. Some of the largest groups were mapped along Patrol Ridge. Elsewhere, MPB-killed LPP was found in small groups generally scattered throughout the reporting area.

In 2005, MPB killed a reported 13,100 LPP on 12,200 acres—both figures down from 2004. Infested acres declined again in 2006 to 7,600; however, more trees were killed—almost 19,000. Another 500 WBP were killed on 200 acres. District-wide, on lands of all

ownerships, WBBB infested acres also declined, from almost 5,400 acres last year, to 750 in 2006; and FE-infested acres declined from 2,300 acres to fewer than 30.

A general scattering of WBBB- and DFB-killed trees were mapped on the Stillwater SF in the Whitefish Mountain Range. A few very larger groups were recorded east of Bull Lake, but overall were much reduced from 2005. Almost no MPB activity was recorded in 2006.

On Forest Service-administered lands, in the North Fork Flathead River drainage (Glacier View RD), WBBB and DFB activity was very widely mapped throughout the District. Largest of the DFB groups were noted in upper reaches of Hay Creek and Whale Creek drainages, while most noticeable WBBB-killed groups of trees were noted along Coal Ridge. MPB-affected LPP was lightly scattered in host type throughout the District, with the more notable groups of MPB-killed LPP were mapped near Cleft Rock Mountain.

District-wide, MPB has infested fewer than 650 acres (1,200 acres last year), DFB actually increased to almost 1,600 acres, on which 3,400 DF were killed; and WBBB activity decreased to less than 2,200 infested acres—down from nearly 5,000 acres in 2005.

#### **Tally Lake RD:**

A significant decrease in all bark beetle activity was noted on the District in 2006. Several small and scattered groups of DFB-killed DF were noted throughout the Logan Creek drainage, and near Tally Lake. They were considerably fewer and less intensely infested than in 2005. Minor amounts of WBBB-killed SAF were noted near Sheppard Mountain, Elk Mountain, and above Bowen Creek drainage. MPB activity was observed in a lightly scattered pattern in a few LPP stands.

On District and adjacent lands, 670 acres (compared to 4,600 acres in 2005) showed some level of DFB-caused mortality; about 600 acres (1,600 acres in 2005) had MPB-killed LPP; only about 30 acres (150 acres last year) of FE-related activity; and less than 550 acres (4,000 acres in 2005) of WBBB-infested SAF. All were significant reductions from previous levels.

Throughout the Flathead RA, and on lands of all ownerships, nearly 44,000 acres have been infested by MPB (compared to 62,500 acres in 2005); 1,500 acres by FE (22,400 acres in 2005); 8,000 acres by DFB (13,500 acres last year); and 5,000 acres by WBBB (22,200 acres reported in 2005). Forest-wide, slightly more than 143,000 bark beetle-killed trees were recorded in 2006. Those were substantial decreases from 2005 levels, when 216,000 trees had been killed.

## Gallatin Reporting Area

### **Big Timber RD:**

DFB populations were at mostly low levels in Big Timber Creek drainage in the southern portion of the Crazy Mountains, but one larger group of beetle-killed DF was mapped near Upper Big Timber Falls. However, WSBW populations have continued to increase in that area and DFB populations could likewise become more expansive. Also noted in the Crazies were areas of MPB activity in WBP and WBBB-killed SAF. Much of that was the upper Sweet Grass Creek drainage.

To the south, in the Boulder River drainage, little bark beetle-caused damage was observed. In the West Fork Upper Deer Creek drainage, areas of WSBW defoliation and small groups of DFB activity could coalesce within the not-too-distant future. In the Lower Deer Creek drainage, WBBB activity was observed. A few small groups of PP, killed by MPB, were seen in low-elevation stands along West Bridger Creek. There were also several small groups of MPB-killed WBP and WBBB-infested SAF located in the upper reaches of East Boulder River drainage. Throughout the drainage, MPB activity in LPP, and a few small groups of DFB-killed DF were widely scattered. There was increasing WSBW defoliation as well.

DFB-infested stands declined significantly throughout the District. Where they totaled about 2,450 acres—most in the Boulder River drainage—in 2005; in 2006 only 40 acres were recorded. Where almost 1,900 DF had been killed, last year, a mere 90 were reported in 2006. MPB had killed 4,900 WBP on 1,640 acres in 2005; those figures were reduced to 1,100 trees on 1,200 acres in 2006. In 2005, 4,200 SAF were affected by WBBB on nearly 1,600 acres—declined to 2,300 trees on 1,400 acres in 2006. All of those figures were decreases from 2005 levels. MPB activity, District-wide, increased somewhat in 2006—440 trees were killed on 210 acres.

### **Livingston RD:**

Damage attributed to DFB has decreased throughout the District, but widespread and heavy defoliation caused by WSBW could change that situation within the near future. WSBW-caused defoliation was heavy in the northern portion of the District—especially near Bald Ridge and surrounding Billie Butte. Little DFB activity was recorded in that area in 2006, but that could change within the next few years.

There were several groups of MPB-killed LPP in the vicinity of Bald Ridge and to the east, in high-elevation WBP stands, MPB activity was also noted. Southward from Bald Ridge, a few small groups of WBBB-impacted trees were mapped close to the border shared with Big Timber RD. In that general area, observers also mapped a few small areas in which MPB has killed both LPP and WBP.

West of Livingston, only a portion of the District was flown. In the part that was, a few stands of LPP near Dry Creek harbored MPB activity. To the east, near North Fork Sixmile Creek, small groups of MPB-killed LPP and WBP were noted. Farther east, damage attributed to WBBB in SAF stands and additional groups of WBP killed by MPB were found. MPB activity in LPP stands occurred occasionally throughout Mill Creek drainage, as did a few small spots of DFB-killed trees. Elsewhere throughout the Yellowstone River drainage, WBBB- and MPB-caused mortality was light and widely scattered.

In the Crazy Mountains, much of which was not flown in 2006, scattered small groups of WBBB-, DFB-, and MPB-killed trees were observed in 2005. MPB activity was confined to WBP stands. The largest groups of MPB-affected WBP were noticed near Davey Butte. WSBW population increases in the Crazy Mountains could lead to resurgence of DFB activity.

DFB infestations on the District had increased to almost 2,400 acres in 2005, but declined dramatically in 2006 to just over 40 acres. Approximately 7,000 beetle-killed DF had been recorded last year—but 80 this year. MPB activity in WBP stands increased somewhat—from 1,200 dead trees on 1,350 acres in 2005; to 1,750 trees on 2,900 acres in 2006. And, while little MPB activity in other hosts was recorded on the District in 2005; in 2006, 4,700 LPP were mapped on almost 4,000 acres. WBBB activity in SAF stands also declined; from 11,000 trees on 4,600 acres last year; to 5,300 trees on 4,200 acres in 2006.

#### **Gardiner RD:**

To the northwest, in the Yellowstone River drainage, we mapped several small groups of DFB-killed trees, a few MPB-killed LPP and other areas where MPB had killed groups of WBP. Just north of Gardiner, WSBW activity was high. It will be of interest to see if DFB populations move into those weakened stands. Near the head of both Eagle Creek and Bear Creek were found larger areas in which MPB had killed WBP. At lower elevations in the same vicinity, MPB had infested a few small areas of LPP. Widely scattered through the area were a few small areas of WBBB-killed trees and a few DF stands impacted by DFB. To the east, mostly small but one larger group of WBBB-killed SAF; and a bigger group of WBP killed by MPB, were mapped near Fisher Creek.

Blister rust was reported as the most significantly damaging agent in WBP stands at several locations on the District; however, MPB and secondary bark beetles may also be affecting those trees.

Throughout the District, about 850 acres of DFB-infested stands were noted in 2005 and declined to 35 acres in 2006. Approximately 700 acres SAF were found to contain noticeable amounts of WBBB-caused mortality in 2005, however, those figures increased significantly in 2006, to 2,000 trees on 2,800 acres. MPB-killed WBP decreased as well. Where 3,800 WBP had been killed on 1,600 acres in 2005, only 1,130 trees were killed

on about 2,000 acres in 2006. Blister rust is still known to infect many of the WBP stands in that area. Quite likely, many also contained MPB-caused mortality.

### **Bozeman RD:**

While some bark beetle activity was noted, District-wide, the most significant insect activity on the District remained the heavily defoliated DF stands harboring high populations of WSBW. The most significant of that activity was noted northeast of Bozeman in the Bridger Creek drainage. To the south, there was less WSBW-caused defoliation, but some areas in the Gallatin Canyon have been seriously impacted. DFB-caused mortality, low at present in most of those areas, may increase substantially within the next few years.

North of Bozeman, in the Bridger Mountain Range, small groups of WBBB- and MPB-caused damage was located in their respective hosts. To the south and east, WBBB activity has increased in SAF stands. To the south, closer to the Hebgen Lake RD, around the Buffalo Horn Creek drainage, several groups of MPB-killed LPP were observed. Above some of those MPB infestations in LPP, there were a few areas found where MPB has killed WBP. Larger groups of MPB-killed WBP were found west of Pioneer Mountain—from Lone Mountain on the north, to the Lee-Metcalf Wilderness on the south.

In total, MPB and blister rust in WBP stands increased substantially in 2006. In 2005, 4,100 acres of WBP had been recorded as infested by MPB and another 1,100 acres infected by blister rust. While blister rust was not recorded in 2006, it is certainly a factor in the 3,800 dead WBP recorded on 18,000 acres in 2006. Acres of WBBB-affected SAF stands also increased—from 11,800 acres in 2005 to nearly 27,000 acres in 2006. Beetle-caused mortality on those acres increased slightly—from 24,000 to 27,000 trees. DFB activity was noted on almost 800 acres (3,100 dead trees) in 2005; but declined to 125 trees on 50 acres this year. However, WSBW defoliation was reported on almost 119,000 acres in the Bridger Mountains. Many of those trees could attract DFB within the next few years.

### **Hebgen Lake RD:**

In the northern part of the District, south of Buck Creek, observers mapped a large area of MPB-killed WBP; and a much smaller group of SAF killed by WBBB. To the north, WBBB-infested stands were more prevalent.

To the east, north of Cinnamon Creek, another significant group of WBBB-killed trees was found. In that area, a few small groups of DFB-killed DF, and many larger patches of MPB-killed LPP was located. WSBW is also active in that area and may lead to increased activity by DFB. DFB populations have recently decreased throughout the District, but activity remaining in close proximity to increasing budworm defoliation may well increase as well.

In the central part of the District, between Wapiti and Kirkwood Creeks, many small groups of bark beetle activity was observed. DFB has killed DF in noticeable numbers; MPB was recorded in both WBP and LPP stands; and WBBB-caused mortality was observed in high-elevation SAF stands. WBBB, and MPB in both WBP and LPP were more concentrated to the east; while DFB activity was evidenced more to the west.

Further south, higher concentrations of all insect damage were in the upper elevations in the Madison Range, and south towards the Centennial Mountains. There, DFB activity was more noticeable, as was WSBW defoliation in Trapper and Sheep Creeks drainages. Larger areas of DFB-caused damage were particularly evident along Watkins Creek. Sheep and Watkins Creek drainages also exhibited large areas of WBBB-caused mortality. MPB activity was also widely distributed in both WBP and LPP stands throughout that part of the District. Throughout the Madison Range, WSBW activity was prevalent; and while DFB-caused damage in light at present, that may not be the case in the near future.

District-wide, in addition to an estimated 28,400 WBP killed on approximately 24,500 acres in 2004; and 24,100 trees on 11,600 acres in 2005; another 5,700 trees were killed on 7,200 acres in 2006. Mortality of that magnitude is having a drastic effect on those stands; and those estimates may be conservative. Data collected on ten variable-radius plots near Lightning Lake in 2004 showed, for the area surveyed, more than 160 trees per acre had been killed in the past 2-3 years. MPB beetle-killed LPP also increased in 2006. More than 8,700 trees were reported on 7,500 acres. DFB activity declined to just less than 900 acres (1,800 acres reported in 2005), on which only 620 dead DF were recorded (compared to 4,400 in 2005). WBBB killed an estimated 12,200 SAF on nearly 11,000 acres. Both those figures were increases over 2005 estimates: 11,000 trees on 7,800 acres.

For the entire Gallatin RA about 1,100 acres of DFB-infested DF stands were observed, compared to 9,520 in 2005. Another 18,100 acres of MPB-infested LPP were mapped—up markedly from only 200 recorded in 2005. More than 31,200 acres of MPB-killed WBP—an increase from 21,000 acres last year—was noted (almost 14,000 WBP were killed); and about 46,000 acres on which WBBB-killed SAF was found were mapped. Nearly 26,600 acres of WBBB-caused mortality had been recorded in 2005. WSBW once again increased significantly, to almost 209,000 acres. That level of defoliation could influence DFB activity in the near future.

### **Helena Reporting Area**

#### **Townsend RD:**

DFB populations have nearly returned to endemic conditions following several years of outbreak levels. Small and very widely scattered groups of DFB-killed trees were mapped throughout the Big Belt Mountains, east of Townsend; but no large groups were

recorded. Overall, the previously affected areas have been much reduced. Extensive amounts of defoliation caused by WSBW on nearly 52,000 acres in that same general area could result in increasing DFB populations if weather conditions further weaken affected trees.

MPB populations in both LPP and WBP stands continued to expand significantly throughout their respective hosts in the Big Belts. Groups of beetle-killed trees ranging in size from 5 to several thousand trees each were mapped from the upper reaches of Beaver Creek southward to Mount Edith. WBP stands near Boulder Mountain, Mount Baldy and Mount Edith, have experienced extreme amounts of MPB-caused mortality, and it continued in 2006. Ground-collected data in the vicinity of Mount Edith showed in some areas nearly 70% of the WBP over 5" d.b.h. (more than 200 trees per acre) has been killed in the last three years. Blister rust was also prevalent in those stands.

Numerous small groups of WBBB-killed trees were noted throughout the Big Belts in stands high enough and moist enough to support SAF. West of Townsend, beetle-killed groups are small and very widely scattered in DF, PP, and LPP types.

District-wide, DFB-infested trees were observed on almost 900 acres (down from 2,300 last year); MPB-killed LPP on 10,500 acres (up significantly from 8,700 acres in 2005), and beetle-impacted PP on fewer than 10 acres. MPB-caused mortality in WBP stands was reported as totaling 19,700 trees on 6,200 acres—not substantially different from the 18,300 trees on 7,800 acres recorded in 2005, nor the 16,000 trees on 6,760 acres recorded in 2004. Many of those trees were also infected by blister rust. WBBB-caused mortality was recorded on about 300 acres—virtually the same level recorded in 2005.

#### **Helena RD:**

MPB-caused mortality was mapped in a very widely scattered pattern throughout PP stands north and south of Helena. Most groups were small, from 1 to 20 trees each. Highest concentrations were mapped south of Helena in the western slopes of the Elkhorn Mountains. Some of the larger groups were near Strawberry Butte. In those same areas, at higher elevations, MPB-killed LPP was also noted; however, most of those groups were small as well.

West of Helena, in the Tenmile Creek and Sweeney Creek drainages—and from there up towards McDonald Pass—MPB-infested LPP stands appeared to be increasing, although groups were still relatively small. DFB populations were still found affecting their hosts in small and widely scattered groups throughout DF type. That is another area, however, where extreme amounts of WSBW-caused defoliation could result in increasing DFB populations over the next few years.

Total DFB-infested area was about 1,500 acres—a very slight increase from 1,200 acres last year. However, WSBW outbreaks on 84,000 acres could lead to DFB increased activity. MPB-killed trees were observed on 3,800 acres in LPP stands (1,500 acres last year), 1,800 acres in PP stands (930 acres in 2005), and 200 acres in WBP stands. MPB

killed a total 14,800 trees in 2005 (2006 faders) in all hosts. WBBB killed SAF on another 260 acres, also reduced from 550 acres in 2005.

### **Lincoln RD:**

A very general scattering of small groups of DFB-killed DF, MPB-killed LPP and WBBB-killed SAF were mapped in host stands throughout that part of the District south of Highway 200. Most groups of beetle-killed trees were smaller than 50 trees each. Large areas of DF defoliated by WSBW (totaling 19,000 acres) could lead to increases in DFB populations. Budworm populations were particularly high along the Continental Divide.

North and east of Lincoln, MPB populations continued to build in LPP stands in the Beaver and Copper Creek drainages. DFB-killed trees and a few groups of WBBB-killed SAF were once again mapped in the Arastra Creek drainage and eastward towards Red Mountain, just north of Lewis and Clark Pass. In the Alice Mountains, north of Alice Creek, several groups of MPB-killed WBP were noted. A few, small groups of DFB-killed trees were found in the Wolf Creek drainage east of Rogers Pass. That whole part of the Forest was another where WSBW populations and resulting defoliation were extreme.

District-wide, about 1,400 acres were infested by DFB; 6,000 acres of LPP, 260 acres of PP, and 670 acres of WBP showed some level of MPB-caused mortality; and about 500 acres were mapped with SAF mortality attributed to WBBB.

Throughout the Helena Reporting Area, and especially northwest of Helena, WSBW populations are increasing significantly. Defoliation, coupled with prolonged drought, could result in increased amounts of DFB activity within the next few years. Area-wide survey estimates for bark beetle-caused mortality for areas flown totaled: DFB 5,300 acres—compared to 5,600 acres last year; MPB 34,300 acres (24,800 acres in 2005), of which 22,100 acres were LPP, 5,100 PP, and 7,100 WBP (almost 98,000 trees, of all species were killed); and WBBB about 1,300 acres—down from 3,400 acres last year.

### **Kootenai Reporting Area**

Only the southern portion of the Forest—Cabinet RD and southern part of Libby RD—was flown in 2006. Reports for the other Districts are reproduced from the 2005 conditions report. Bark beetle conditions likely have not changed dramatically in the past year.

### **Rexford RD:**

DFB populations have returned to near-endemic levels throughout the District. Very small and very widely scattered groups were found at a few locations in DF or mixed-

conifer stands. A few larger groups remained in the Pinkham Creek drainage and especially near Virginia Hill, but most are 20- to 30-tree groups, or smaller. WBBB-infested SAF were also found in mostly small groups. A few larger ones were located near McGuire and Ellsworth Mountains to the east and Boulder Mountain to the west. Some small groups FE-killed GF were mapped at a few somewhat isolated locations. A small number of fairly large groups of MPB-killed WBP were observed near Robinson Mountain.

### **Fortine RD:**

DFB activity declined on the District once again in 2005. Beetle-killed groups were few, small, and widely scattered. Some of the larger groups were mapped in Sunday Creek drainage and its tributaries, south of Fortine. North of Fortine, in the Galton Range, DFB populations also declined markedly. Several large groups of WBBB-impacted SAF were mapped near Stahl Peak and Krag Peak. MPB-caused mortality in WBP increased near Kasanka Peak, north of Stahl Peak, and surrounding Mount Wam. Another group was located to the south near Mount Petery.

Totals for the District showed about 1,500 acres of DFB-killed DF (approximately 2 trees per acre); 700 acres of MPB-impacted LPP and another 900 WBP (average one tree per acre, each); and 2,200 SAF were killed by WBBB on 1,800 acres.

### **Three Rivers RD:**

DFB activity declined throughout the District in 2005. Beetle-caused mortality was still noticeable in small and scattered groups in DF type; but at a much reduced level from recent years. FE-killed GF was frequently encountered, although not in extreme amounts. A few of those larger groups were noted near and east of Yaak Mountain.

Most prevalent bark beetle activity on the District was attributed to WBBB. Larger beetle-killed groups of SAF were mapped near Marmot Mountain, Rock Candy Mountain, and Pink Mountain.

MPB-caused mortality in both WWP and WBP was also noted in significant-sized groups throughout the Yaak River drainage. Notable groups in WWP were mapped near Grizzly Point and Garver Mountain. WBP damage was more prevalent near Cross Mountain and Tepee Mountain. Blister rust infections, common in the WWP type, were also associated with MPB activity. South of Troy, only very light and widely scattered bark beetle activity was observed.

District wide, about 900 DF were killed by DFB on 300 acres—down from 4,400 trees on 1,300 acres in 2004; WBBB killed 4,600 SAF on 5,700 acres—up markedly from 2,400 acres and 1,900 trees last year; and 1,200 FE-killed GF on were noted on 700 acres—both slight increases. MPB-killed trees were recorded on 1,200 acres of LPP stands; 1,700 acres of WBP; and another 1,000 acres of WWP. More than 9,100 WBP; 2,800 LPP; and 350 WWP were killed.

### **Libby RD:**

Bark beetle activity of all species, in their respective hosts, was greatly reduced throughout the District in 2005 and again in 2006. In 2006, very small and widely scattered groups of MPB-killed LPP and DF, killed by DFB, were reported south and west of Libby. Nearly endemic amounts of DFB activity were recorded both north and south of Libby (in 2005)—totaling but 1,200 acres. FE activity was a little more common in 2005, but reduced from 2004 levels—4,600 acres compared to 7,800 acres. Those figures were reduced once again 2006, for the part of the District surveyed. Notable concentrations were mapped south of Libby in the Cameron Creek drainage, and to the north in Quartz Creek and Bobtail Creek drainages in 2005. Minor amounts of MPB-killed trees were noted at a few isolated locations in WPB, WWP, and LPP stands.

Beetle-infested stands on the District totaled: DFB, 1,200 acres—3,000 dead DF; FE, 4,600 acres—7,300 beetle-killed GF; MPB (all hosts, but mostly LPP), fewer than 300 acres; and minor amounts of WBBB- and WPB-caused mortality in both 2005 and 2006.

### **Cabinet RD:**

As DFB populations, and associated damage returned to near-normal levels in 2005; MPB-killed LPP was increasing in parts of the District. Small amounts of DFB-killed trees were noted in Stevens Creek and Pilgrim Creek drainages and to the north in Rock Creek drainage and near Government Mountain last year, but those infestations have been reduced to small, scattered groups in 2006. Most DFB activity was recorded to the north and south of Noxon Reservoir, but no groups were larger than about 10 trees. Significant, however, were large groups of MPB-infested LPP mapped in Little Beaver Creek and White Pine Creek drainages south of the Clark Fork River, and throughout the Vermilion River and its tributaries to the north in 2005. Those infested areas had increased markedly just within the past few years. In 2006, MPB activity in LPP stands on the District was recorded as more widely scattered, but in much smaller groups. Notable activity was reported throughout the Vermilion River drainage, and the Silver Butte River drainage to the north (actually on Libby RD); but most groups were small. Few were larger than about 50 trees. South of Noxon Reservoir, small fader groups were also found scattered throughout LPP stands in the Beaver Creek and White Pine Creek drainages.

FE activity was still noted in a few GF or mixed-species stands, with a few of the larger groups mapped in the upper Trout Creek drainage. WSBW activity on the District, not recorded in the past quarter century prior to 2005, has increased and significant amounts of defoliation was recorded in many DF and mixed-species stands. Heavy defoliation, coupled with drier-than-normal conditions, could lead to an increase in DFB activity within the next few years.

District-wide, DFB-killed DF was found on 400 acres (220 acres in 2005); MPB infested 40,500 LPP (30,300 last year) on 13,000 acres (9,400 acres in 2005) and another 200 PP

on 260 acres; FE killed 115 GF on 130 acres (1,300 trees on 2,000 acres in 2005); and WBBB activity was minor—recorded on less than 200 acres.

Total mortality attributed to bark beetles in the Kootenai RA in 2005 was: 12,000 DF killed by DFB on 5,400 acres (21,000 trees on 9,100 acres in 2004); 11,000 GF killed by FE on 7,700 acres (8,500 trees and 9,100 acres in 2004); 34,200 LPP killed by MPB on 11,500 acres (10,400 trees on 1,500 acres last year); 16,500 WBP and 1,700 WWP killed by MPB on a combined 17,200 acres; and 13,000 SAF killed by WBBB on 12,400 acres (5,700 acres in 2004). Minor amounts of mortality attributed to IPS were also recorded in 2005. Forest-wide totals were not obtained in 2006; however, we believe most bark beetle activity declined, except for MPB in LPP.

### **Lewis & Clark Reporting Area**

#### **Rocky Mountain RD:**

District was not flown in 2006 nor has it been for the past several years. We have no current record of bark beetle activity on the District.

#### **Judith RD:**

Bark beetle activity was noted in a widely scattered pattern of mostly small groups throughout the District in 2006, similar to what had been observed in 2005. Most activity was recorded as MPB-killed PP, found in small groups north and east of the Little Belt Mountains; however, in that same general area, widespread beetle-caused mortality was also found in WBP, SAF, and LPP stands. Largest of the MPB-infested PP stands were mapped in the Dry Wolf Creek and North Fork Wolf Creek drainages, and on the east-facing slopes of Ettien Ridge, southeast of Tollgate.

Significant groups of MPB-infested WBP were found in the central portion of the District—especially near Yogo Peak, Tepee Butte, and Big Bald Mountain. WBBB activity was recorded near Big Bald Mountain, Yogo Peak, Tepee Butte, and Grendah Mountain and a few other high-elevation sites.

The Highwood Mountains were not flown, but in 2005, very light and widely scattered groups of DFB-killed DF and MPB-impacted LPP were noted in that area. Numerous groups of MPB-infested PP were recorded in the Big Snowy Mountains, especially noticeable in South Fork Judith River drainage.

BLM-administered land north of Lewistown was not flown. In 2005, we observed very widely scattered MPB-caused mortality in a few PP stands in the Judith and North and South Mocassin Mountains. Most were small groups; a few were as large as 150 trees, but most were less than 100.

District-wide, DFB was found on less than 200 acres (240 acres last year); MPB on slightly more than 5,900 acres—on all hosts, but most was PP (3,100 acres), next most prevalent being WBP 2,700 acres. MPB killed a total 5,600 trees, most were PP. WBBB-killed SAF was mapped on nearly 4,200 acres—1,250 acres in 2005.

#### **Musselshell RD:**

Widely scattered small groups of trees killed by several bark beetle species were recorded in the Little Belt and Castle Mountains. Most were MPB-killed PP and LPP. Several groups of WBBB-killed SAF were also noted at a few high-elevation sites. DFB activity recorded in 2005 has declined significantly.

MPB-caused mortality in PP and LPP stands was common in the Little Belt Mountains from the Musselshell River east to Stevens Butte, where the largest groups were mapped. MPB-killed WBP was prevalent in higher-elevation stands to the west—especially large groups were mapped near Hoover Mountain in the Little Belts, and near Wapiti Peak in the Castle Mountains. MPB-infested LPP stands were also common in some larger groups in the southern Castle Mountains. Significant WSBW activity throughout the area could lead to increases in DFB populations.

In the Crazy Mountains, widely scattered small groups of WBBB-infested SAF and MPB-impacted WBP were observed. Almost no DFB activity was noted. MPB activity in WBP stands was concentrated near Box Canyon and south of Mount Elmo, with the largest group mapped northeast of Bald Ridge. Numerous small groups of WBBB-killed trees were found near Loco Mountain. Small amounts of MPB-killed trees were noted in LPP type.

Throughout the District, about 1,450 PP were killed by MPB (1,600 in 2005) on roughly 2,500 acres (1,400 acres last year). MPB and blister rust affected WBP and LP on more than 3,850 acres (2,600 acres in 2005); and MPB alone on 4,500 acres of LPP—up from the 1,000 acres recorded last year. Total MPB-caused mortality, all hosts, exceeded 12,000 trees. DFB killed 300 trees on 200 acres—reduced from 770 acres and 2,050 trees last year. WBBB killed 1,600 trees on 1,950 acres—about the same as last year's 2,200 trees on 1,200 acres.

#### **Kings Hill RD:**

Widely dispersed and mostly small groups of DFB-infested DF, WBBB-affected SAF, and MPB-killed LPP and PP were noted throughout the reporting area. Notably large groups of MPB-killed WBP were located near Kings Hill, south of Mizpah Peak, and in higher-elevation stands south of Forest Green. Blister rust was also prevalent in those stands. Largest groups of MPB-infested PP were also noted to the north, near Logging Creek, in the Sawmill Gulch and Logging Creek drainages, and near Monarch Mountain.

MPB was also active in PP stands to the west, in Tenderfoot Creek drainage. MPB activity in LPP stands was mapped as small groups to the south, near Miller Gulch,

Charcoal Gulch, and in the northern Castle Mountains. WSBW activity, common in southern Little Belts, could precipitate increased DFB populations.

Totals for the District were about 5,300 SAF killed on more than 5,100 acres (fewer trees, more acres than last year); 2,800 PP and 14,350 LPP killed by MPB on 1,700 acres and 6,900 acres, respectively (approximately the same for PP, considerably more for LPP); MPB and blister rust have affected 8,600 WBP on more than 6,200 acres—up considerably from 3,900 acres in 2005; and DFB killed 350 trees on 560 acres—down from 2,400 DF and 1,400 acres in 2005.

Area-wide mortality attributed to bark beetles in the Lewis & Clark RA totaled almost 1,000 DF on 1,200 acres (considerably reduced from 5,700 trees and 2,600 acres in 2005); and 47,500 MPB-killed trees on 33,400 acres—of all hosts, roughly one-third each of LPP, PP, and WBP. All figures were up from the 41,100 trees and 20,300 acres reported in 2005. Another 12,600 SAF were killed on 11,400 acres (4,500 acres in 2005; however tree mortality at about the same level).

### **Lolo Reporting Area**

#### **Missoula RD:**

DFB-killed DF were still quite prevalent throughout Rock Creek drainage, but groups were much smaller and more widely scattered than in the past few years—only a few groups exceeded 50 trees. Largest groups were recorded in upper Butte Cabin Creek drainage, and above Solomon Creek. Although small fader groups were numerous throughout the Rock Creek drainage, we found fewer currently infested trees in most areas in 2006 than in previous years. Throughout the District, on lands of all ownerships, a reported 20,600 DF were killed on 6,700 acres in 2005. In 2006, those figures had been reduced to 8,000 trees on just under 1,850 acres.

In the northern end of the Sapphire Mountains, especially in the upper Miller Creek and Allen Creek drainages, southeast of Missoula, MPB-killed LPP increased once again. Numerous groups were mapped in that area, many covering several hundred acres and averaging 2-3 beetle-killed trees per acre in each.

North of Missoula, in the Rattlesnake Creek drainage, MPB-infested LPP was also quite prevalent, and increased notably from 2005 levels. Largest groups were observed near Sheep Mountain, Mineral Peak, Stuart Peak, and east of Boulder Lake. To the west of Missoula, in the Grave Creek Range, MPB activity in LPP stands increased once again in 2006. Particularly large groups of faders were noted in the upper O'Brien Creek drainage and from there northward to Telephone Butte. A few groups of faders extended to a few thousand acres each and averaged 2-3 beetle-killed trees per acre.

District totals in 2005 included 15,800 acres of MPB-killed trees (mostly LPP). Those infested acres increased in 2006 to 35,300 (LPP) and 1,300 (PP); on which more than 105,000 trees were killed. Minor amounts of MPB in WBP, IPS and WPB in PP, and WBBB in SAF were reported in 2006.

### **Ninemile RD:**

MPB activity in LPP stands declined significantly from levels mapped in 2005—especially in the Ninemile Creek drainage. A few larger groups of faders were mapped along the Reservation Divide, near Squaw Peak and Blackrock Mountain; and south of Ninemile Creek around Lookout and Stark Mountains. But the once-massive outbreaks recorded in the past 2-3 years in that area have subsided. The outbreak has run its course near Siegel Pass, where only a few small groups of infested trees were noted. In that area, there were also found a few very small groups of DFB-killed DF. Ground-collected data, for a 10-plot area near Siegel Pass, in 2005, showed an average 187 trees per acre had been killed by MPB over the past several years.

Elsewhere throughout the Ninemile Creek drainage, minor amounts of DFB-infested DF, and MPB-caused mortality in both PP and WPB stands were observed. No significant outbreaks of those were noted, however.

South of the Clark Fork River, in Albert Creek, Petty Creek, Fish Creek, Rock Creek, and Trout Creek drainages, significant groups of MPB-killed LPP were recorded. Largest groups were once again mapped in Fish Creek, Rock Creek, and Trout Creek drainages near Petty Mountain, Garden Point, Cedar Peak, Needle Peak, St. Patrick Peak and Sunrise Mountain. Minor amounts of WBBB, DFB, and MPB (in PP stands) activity were reported south of the Clark Fork River.

In 2005, throughout the District, more than 438,000 LPP were killed by MPB on nearly 50,000 acres. MPB killed another 2,600 PP on 2,500 acres. In 2006, those figures were reduced to 32,000 acres of LPP, but PP-infested acres increased to 6,400. A total of more than 84,000 trees were killed by MPB in 2005 (2006 faders). Last year, 1,300 DF were killed by DFB on 420 acres. In 2006, those figures were reduced to 720 trees on less than 300 acres. WBBB-caused damage was minimal.

### **Plains/Thompson Falls RD:**

A comparison of beetle-infested stands on the District, from 2005 to 2006 show MPB-infestation levels are still very high throughout the District and may have increased in some areas. Largest groups in 2006, however, were mapped north of Plains in the Little Thompson River and upper Thompson River drainages, from about Corona Divide north to the Forest boundary.

Beetle populations have been reduced west of Plains, due to rapidly declining amounts of susceptible hosts. West and south of Thompson Falls, stands are still heavily infested in the Prospect Creek drainage and most of its tributaries. Along CC Divide, both east and

west of Knox Pass, current beetle-caused damage has declined markedly. However, hundreds of thousands of beetle-killed LPP remain in many of those stands. Ground-collected data for a 10-plot area near Mount Bushnell, in 2005, showed an average 120 trees per acre killed by MPB during the past 5 years.

Minor amounts of WPB- and MPB-caused damage was found scattered through lower-elevation PP stands throughout the District. A few stands in which small amounts of DFB-killed DF, and WBBB-killed SAF were also mapped. That mortality was very light and scattered.

Totals for the District and adjacent State and private lands in 2005 showed 408,000 MPB-killed trees on more than 64,800 acres—most of which were in LPP stands. Comparable figures for 2006 showed a significant reduction—26,600 acres of LPP infested and another 1,700 acres of PP. In total, about 85,000 trees were killed. DFB activity was also reduced—to 145 acres, down from 750 acres in 2005. WBBB-caused mortality was recorded on but 20 acres (910 acres last year) and about 50 acres were infested by WPB.

#### **Seeley Lake RD:**

MPB-caused mortality was prevalent in LPP stands throughout the District, and has increased significantly in the past few years. Large groups of beetle-killed trees were noted near Black Mountain and Belmont Point, west of Placid Lake; near Hidden Lake and in Slippery John drainage, north of there; west of West Fork Point and east of Summit Lake to the north; near Richmond Peak and Florence Lake to the east of Seeley Lake; and throughout the Monture Creek drainage farther to the east. WBP has been heavily impacted by MPB, especially near Morrell Mountain, East Spread Mountain, and Conger Point. In most of those locations, beetle populations have declined.

To the west, other groups were once again mapped near Mount Henry and West Fork Point. MPB infestations in LPP intensified considerably in 2006. MPB-affected stands totaled about 9,850 of LPP, where MPB was the sole mortality agent, and another 12,600 acres of WBP with mortality attributed to both MPB and blister rust in 2005. In 2006, comparable data showed 25,100 acres LPP infested, almost 700 acres WBP, and another 200 acres of PP. Total MPB hosts killed exceeded 74,000 trees. It is possible some of the increases in LPP-infested acres and associated decreases in WBP were attributable to areas where those species overlap and the difficulty in distinguishing them from the air.

Elsewhere on the District, DFB-killed trees were more widely scattered and in smaller groups than in 2005. Throughout the DF type, DFB-caused mortality increased was about the same as recorded last year—approximately 1,100 acres, on which 2,600 trees were killed. WBBB-caused mortality was observed on nearly 600 acres (620 acres last year) in a few high elevation SAF stands.

## **Superior RD:**

Observable amounts of MPB activity declined somewhat from 2005 to 2006; however, several very large groups of MPB-killed LPP were once again mapped from near Prospect Mountain, southeast of St. Regis, northwestward Lower Stevens Lake, on the Idaho/Montana border. In that general area, south of the Clark Fork and St. Regis Rivers, very large groups of MPB-killed LPP—some totaling hundreds of thousands of trees—were mapped—especially near Sheep Mountain and Wilson Lake on the east; in the McGee Creek drainage, south of Haugan; and near Saltese Mountain and Lookout Pass.

North of the St. Regis River, throughout the Coeur d'Alene Mountains, largest beetle-infested groups were recorded north of DeBorgia, and from there westward to Mullan Pass. The heavy outbreak existing along CC Divide, between St. Regis and Clark Fork drainages, has finally subsided significantly.

District-wide more than 47,200 acres were infested in 2003. We believe most of those outbreaks continued to expand in 2004, but in some of the areas that have been infested for several years, there likely was a decrease in intensity. Ground-collected data for a few sites on the District showed extreme amounts of MPB-caused mortality in LPP stands during the past few years: East Fork Dry Creek, 138 trees per acre; CC Divide, 103 trees per acre; Dry Creek (permanent plots), 143 trees per acre. MPB-caused mortality in LPP stands on the District totaled 453,300 trees on 64,000 acres in 2005; but decreased to about 120,000 trees on 34,500 acres in 2006.

Numerous, small groups of MPB-caused mortality were recorded in PP stands east of Superior, from First Creek northwestward to the Clark Fork River, at a generally heavier level than recorded in 2005. Acres with noticeable amounts of PP mortality increased from about 1,000 acres last year to nearly 2,700 in 2006. At least some of that mortality is thought to be related to lingering drought effects. Ground surveys have shown still-increasing populations in many areas. In some, host depletion has resulted in population declines. In a few areas surveyed in 2004, current-year attacks averaged more than 120 per acre. MPB killed nearly 2,800 PP on the infested acres mapped. Relatively minor amounts of other bark beetle-killed trees were reported.

Throughout the Lolo RA—no longer the most heavily impacted in the State—MPB killed LPP more than 1.4 million LPP on 204,400 acres; 9,600 PP killed on 5,400 acres; and nearly 10,800 WBP on 7,800 acres in 2005. Comparable figures recorded in 2006 were: 612,000 LPP on 210,000 acres; 32,300 PP on 15,100 acres; and 1,600 WBP on 730 acres. DFB activity was much reduced. Only 16,400 DF were killed on 5,100 acres—down from about 31,000 DF on 10,400 acres in 2005. WBP killed 230 PP on 300 acres (compared to 120 PP on 135 acres last year); and WBBB accounted for 3,400 dead SAF on 1,200 acres—also reduced from 3,700 trees on 2,600 acres last year. FE activity has returned to nearly endemic levels. In 2005, 2,600 GF were killed on nearly 2,700 acres. In 2006, only 500 trees were killed by FE on 200 acres. IPS killed an additional 1,700 PP on 750 acres.

### **Garnet Reporting Area (BLM)**

Large amounts of MPB-killed LPP were recorded throughout the reporting area again in 2006, but not as widely spread as in 2005. Largest groups of beetle-killed trees were mapped in the vicinity of Mammoth Mine, Lost Horse Mountain, and Granite Mountain. In the eastern portion of the reporting area, near Hoodoo Mountain, numerous but smaller groups of beetle-killed LPP were noted. In 2005, it appeared most LPP stands were infested to a greater or lesser degree. That widespread pattern was not as apparent in 2006. To a much lesser extent, and in much smaller groups, MPB-killed PP was also mapped in a widely scattered pattern. DFB-infested DF was also found in many mixed-species stands, but fader groups were small and widely scattered. DFB activity seems to have decreased notably throughout the area. Increasing WSBW populations could exacerbate that situation. WBBB-affected SAF stands were occasionally found in small groups at high-elevation sites.

In total, about 7,800 DF were killed on 3,200 acres in 2005. Those were reduced in 2006 to 2,400 trees on 1,200 acres. MPB killed approximately 18,500 LPP and 930 PP on a combined 12,600 acres last year. In total, for 2006, infested acres decreased for both hosts. Nearly 33,000 LPP were killed on 14,000 acres and 1,600 PP were killed on 825 acres. IPS accounted for an additional 400 dead PP (on 200 acres); and a mere 60 dead SAF were reported on 150 acres (down considerably from 440 acres last year), attributed to WBBB.

### **Indian Reservations**

#### **Blackfeet IR:**

Once again, the Reservation was not flown in 2006. In 2004, the western portion was surveyed along with Glacier NP. In 2004, a few small groups of DFB-killed DF and MPB/IPS-killed LPP were mapped near Lower Saint Mary Lake. The most significant bark beetle-caused damage, however, was several large groups of SAF, killed by WBBB, recorded near Cut Bank Ridge and in upper tributaries of North Fork Cut Bank Creek. On the part of the Reservation flown in 2004, an estimated 4,000 SAF were killed on about 2,600 acres.

#### **Crow IR:**

Very small and widely scattered groups IPS-killed PP were observed throughout the Wolf Mountains, east of Lodge Grass. The largest group, of about 400 trees, was mapped north of Shortys Hill in the Corral Creek drainage.

In the Pryor Mountains, to the west, numerous groups of WBBB-killed SAF were mapped in higher-elevation tributaries of Pryor Creek in 2005. Those infested areas

remained at about the same level in 2006. In addition, areas not previously flown in the Big Horn Mountains contained significant amounts of SAF, killed by WBBB. Minor amounts of MPB-killed LPP, LP and PP were found at a few locations. IPS-killed PP and DFB-killed DF were recorded at nearly endemic levels.

Throughout the Reservation, 227 PP were reportedly killed by MPB on 140 acres in 2005. Similar figures for 2006 showed only 25 trees on 12 acres. In 2005, 110 LP were killed by MPB on 100 acres in the Pryor Mountains; 235 dead LP were recorded on 40 acres in 2006. No DFB activity was reported in 2006. About 650 SAF were killed by WBBB on about 4,000 acres. Nearly the same number of beetle-killed trees, but on only 330 acres, was reported in 2005.

### **Flathead IR:**

MPB-caused mortality decreased remarkably throughout LPP stands on the Reservation. In the Mission Range, east of Flathead Lake, the infested area decreased significantly; however, large groups of beetle-killed trees were once again mapped from Yellow Bay Creek on the north, south to the Reservation boundary at the Rattlesnake Wilderness. Very large groups, some exceeding several thousand acres each were recorded throughout the Jocko River drainage and its tributaries in the southeastern portion of the Reservation. Some larger groups averaged 8-10 trees per acre killed in 2005 (recorded as faders during surveys in 2006).

Outbreaks along Reservation Divide have declined to nearly endemic conditions. A few larger groups were still found near Three Lakes Peak, Warden Mountain, and Edith Peak.

To the west, only small groups of MPB-killed LPP and PP were recorded in the vicinity of Rainbow Lake, Hot Spring. Northward from there, some of the largest beetle-killed groups were mapped above Mill Creek and near Bassoo Peak.

Elsewhere, MPB-killed PP was found quite generally throughout PP type, though in very small and widely scattered groups. Highest concentrations found to the south in the Hewolf Creek drainage, northward to Sonyok Mountain, Coppedge Gulch and north through the Salish Mountains to just south of Lake Mary Ronan. In all those areas, beetle-killed groups are much smaller than recorded in 2005. Some MPB-infested PP and FE-killed GF were found lightly scattered in foothills of the Mission Mountains, east of Flathead Lake. Very little IPS or WPB activity was recorded anywhere on the Reservation; however, there may have been more than was recorded, either in conjunction with MPB, or recorded as MPB. Minor amounts of WBBB-killed SAF were mapped in a few high-elevation stands to the southeast.

In 2005, total beetle-infested areas on the Reservation included 410 DF killed on 200 acres; 11,400 PP and 230 WBP killed by MPB on 15,100 and 1,300 acres, respectively; 6,200 SAF were killed on 6,000 acres by WBBB; and FE killed almost 6,200 GF on 5,600 acres. The most significant damage recorded, however, was the 214,800 LPP killed by MPB on nearly 90,600 acres. For 2006, comparable figures showed declines in

most areas: DFB killed 350 DF on 180 acres; MPB killed a combined 248,800 trees on 45,000 acres of infested LPP, 2,200 acres PP and 20 acres WBP. IPS killed 50 PP on 13 acres, WBBB was attributed with the death of 750 SAF on 280 acres, and FE was still noted on 440 acres, on which 900 GF were killed.

### **Fort Belknap IR:**

The Reservation was not surveyed in 2006; however, conditions were likely little changed from those observed in 2004. Very widely scattered and generally small groups of MPB-killed PP and LPP were mapped across the Reservation in 2004. Groups ranged in size from 1-150 trees, with concentrations noted near Thornhill Butte, Eagle Child Mountain, and near Mission Peak. Most of the latter were small groups of LPP. The largest of those contained an estimated 25 trees. About 530 PP were killed on slightly fewer than 160 acres. Another 125 LPP were killed on about 40 acres. Both of those figures represented nearly static conditions.

### **Northern Cheyenne IR:**

Only a portion of the Reservation was flown in 2006, and only a few small groups of MPB-killed PP were mapped—south of Lame Deer, and west of there in the Trail Creek/Sheep Gulch area. In 2005, minor amounts of IPS-killed PP had been recorded in very small groups widely dispersed throughout the Reservation. Largest groups were found east of Hollowood Creek, and north of Busby. Populations appeared, then, to be at about endemic levels. Those populations have apparently subsided.

ADS data for 2005 showed, Reservation-wide, about 4,400 PP on 2,200 acres were recorded as having been killed by IPS. Another 110 PP on 175 acres were killed by MPB. Those are figures represented decreases in MPB-infested areas, but increases in IPS-infested ones. It is conceivable that there is more interaction between MPB and IPS in PP stands on the Reservation than can be detected from the air. The few figures we obtained for 2006 showed about 50 PP killed by MPB on fewer than 20 acres.

### **Rocky Boys IR:**

The Reservation was not flown in 2006; however, several site visits and ground surveys were conducted on parts of the reporting area. MPB is still a significant management concern on parts of the Reservation. The 2005 report follows. It is still fairly representative of conditions found there in 2006.

A few moderately-sized groups of MPB-killed trees, in both LPP and PP stands, were found south of Tribal headquarters, in stands on Black Mountain, Centennial Mountain, and Sawmill Butte. Largest groups were recorded in LPP stands on Black Mountain—especially in the vicinity of Black Canyon. PP groups were generally much smaller. A few small groups DFB-infested DF were mapped near Lost Canyon. Generally fewer beetle infested groups were noted in 2005 in areas being aggressively managed to reduce the number of beetle-infested trees and threatened stands.

Slightly more than 3,100 beetle-killed LPP were mapped on about 930 acres—a marked increase from the 200 acres reported in 2004. Another 320 PP were killed on 330 acres, but there may have been more beetle activity in PP stands than reflected in this year's estimates. DFB killed about 400 trees on 160 acres—a slight increase over data recorded last year.

## **National Parks**

### **Glacier NP:**

Glacier NP was not flown in 2006. The report for 2004, perhaps not changed significantly, is reproduced here.

Within the past 2-3 years, wildfires have affected thousands of acres of forested stands, in the western, central, and southern portions of the Park. Associated with some of those were increasing amounts of DFB-caused mortality—observed in many widely scattered locations, but near many burned stands, particularly near Kintla, Bowman, Quartz, and Logging Lakes. In response to drought-induced damage, FE populations have built in GF stands at several locations in the Park. The largest of those was located in the Pinchot Creek drainage. And MPB-killed LPP was noted in small and very scattered groups throughout LPP type.

Most significant amounts of beetle-caused mortality in the Park were large groups of SAF killed by WBBB. Largest of those was mapped near Logging Mountain; however, several other large groups were observed in high-elevation stands.

Park totals for 2004, included 5,100 DF killed by DFB on 3,300 acres; 4,800 GF killed by FE on 4,050 acres; 720 of various MPB hosts were killed on 850 acres; and WBBB killed 18,300 SAF on just over 8,200 acres. All outbreaks increased over previously recorded figures.

### **Yellowstone NP:**

Only a very small part of the Park was flown in 2006. An area immediately east of Yellowstone Lake, from there to the Park's eastern border was surveyed. Large groups of MPB-killed LPP were mapped south of Avalanche Peak, near Grizzly Peak and Top Notch Peak; and from there south to Mount Langford. That is much of the same area where MPB has killed thousands of WBP within the past 2-3 years. Some MPB activity is increasing in LPP in that area, but it is also difficult to distinguish between WBP and LPP in some areas where they are intermixed. Some of that mortality likely occurred in WBP stands. A few large groups of MPB-infested LPP stands were also recorded south of Yellowstone Lake, along the Two Ocean Plateau. In addition to what was observed,

and in a few ground surveys conducted there, we have reproduced the 2005 summary for this report.

In 2005 we recorded remnants of a large ESB outbreak, southeast of Yellowstone Lake, recorded at more than 8,000 acres in 2003 that was reduced to but a few thousand acres by 2005. That area was not surveyed in 2006, but we believe it has continued to decline.

Minor amounts of MPB-killed LPP, DFB-infested DF, and WBBB-affected SAF stands were mapped in a widely scattered pattern at various locations throughout the Park. In contrast, significant outbreaks of MPB in WBP stands were mapped in the southeast portion of the Park, from Lynx Creek north to Avalanche Peak. Largest groups were noted around Colter Peak, Mount Langford, and Sylvan Pass. Other large groups were recorded near Frederick Peak and Mount Washburn. In the northwest part of the Park, other significant groups of MPB-killed WBP, interspersed with WBBB-killed SAF, were noted near Dome Mountain, Bannock Peak, Little Quadrant Mountain, and Meldrum Mountain. Minor amounts of DFB could be exacerbated by increasing populations of WSBW in the vicinity of Mammoth.

In 2004, ground observations detected a very large MPB outbreak in WBP stands in the vicinity of Avalanche Peak. Ground-collected data obtained in both 2004 and 2006 in that area showed in some stands more than 170 WBP per acre (and up to 96% of the stand) have been killed within the past 2-3 years.

Beetle-killed totals for the Park, in 2005, included 860 DF, attributed to DFB on 350 acres; 2,100 ES on 1,800 acres killed by ESB; 1,650 LPP on 1,300 acres killed by MPB; 365,200 WBP killed by MPB on 29,200 acres; and finally, 24,300 SAF were killed by WBBB on 11,690 acres. The biggest increases since 2003, by far, were noted in MPB-killed WBP. Now, LPP stands have become increasingly infested. On the portion of the Park flown in 2006, we noted nearly 17,000 LPP and 830 WBP were killed by MPB, on 6,900 and 290 acres, respectively. About 700 SAF were killed by WBBB on 450 acres. DFB-killed trees were recorded in very minor amounts.

## **BARK BEETLE-RELATED SPECIAL PROJECTS—MONTANA**

### **Evaluating the Effectiveness of Thinning Treatments on DFB-Caused Tree Mortality**

In 2005, and in cooperation with Jose Negron (RMRS), a long-term thinning study was initiated in DF stands on the Helena, Lewis & Clark, and Bitterroot NFs to evaluate effectiveness of two thinning treatments on DFB populations and associated beetle-caused mortality. Replicated treatments consist of: (1) basal area reductions, and (2) stand density index (SDI) treatments to maintain or approximate uneven-aged stands. Basal area reduction treatments will be included in ongoing projects on all three Forests; SDI treatments will be evaluated on the Helena and Lewis & Clark NFs only.

Evaluations are in varying stages, dependent upon project status on each Forest. Pre-treatment evaluations were conducted in 2006. Post-treatment evaluations will be conducted beginning in 2007 and annually thereafter, if DFB are active in treatment units. If beetle activity is not found, monitoring will be conducted at 5-year intervals.

For additional information, contact Nancy Sturdevant, MFO.

### **Evaluating Effects of Spring versus Fall Burning on DBF-Caused Tree Mortality**

In 2006, a study was initiated on the Beaverhead-Deerlodge (B-D) and Helena NFs to compare the effects of spring versus fall burning on DFB activity. Spring and fall burns were completed in several units on the Philipsburg RD, B-D NF. Early-spring and late-spring burns were completed on the Townsend RD, Helena NF. We were not able to include units from the third study area because slash was piled and burned rather than broadcast underburn.

This year, we conducted post-treatment evaluations on the Philipsburg and Townsend RDs during which we collected information on vegetation and insect activity in the burned and comparable control units. A report detailing results will be written early in 2007. We hope to add additional study sites within the next few years in an effort to increase our understanding of the effects of spring versus fall burning on DFB activity.

For more information, or to suggest new study sites, contact Nancy Sturdevant, MFO.

### **Testing Efficacy of Verbenone and Hexanol Pouches in Reducing MPB-Caused Mortality in LPP and WBP**

A project was established in LPP stands on the Butte RD, Beaverhead-Deerlodge NF, in an attempt to determine the efficacy of a new, experimental, 7.5-gram verbenone pouch

in protecting trees from MPB attack. An additional treatment, the addition of hexanol pouches was also be assessed. In a randomly-assigned-treatment test, we selected 150 trees, 50 of each to receive the following treatments: No treatment (controls); one, 7.5-gram pouche (Synergy Semiochemicals, Inc.) per tree; or one, 7.5-gram verbenone pouch and one, 10-gram hexanol pouche per tree. Pouches were stapled to individual trees about 6 feet high and on the north side of the tree. A standard MPB tree bait was hung on an adjacent non-host tree or stake, approximately 5 feet from the treated tree. Treatments were installed in late June and evaluated in late September.

A similar test, identical in all respects except for number of treated trees, was installed in a WBP stand near Mount Edith, Townsend RD, Helena, NF. In that area, we selected 123 trees—41 of each treatment. Treatments were installed in late May and evaluated in mid-September.

Test results were encouraging; but in the LPP stands, not as good as we had hoped for. In the LPP test, 39 of 50 control trees were mass- or stip-attacked (78%); of the verbenone-treated trees, 18 of the 50 treated trees were mass- or strip-attacked (36%); of the verbenone/hexanol-treated trees, 12 were attacked (24%).

In the WBP area, of 41 controls, 32 were attacked (78%); verbenone-treated trees, 10 of 41 were attacked (24%); and exactly the same results for verbenone/hexanol-treated trees—10 of 41 were attacked (24%).

While treatments had more attacks than we had hoped; treatment results were significantly different from controls, in both areas. Results were promising, and hexanol treatments were especially encouraging. We hope to re-do the test in 2007 and add another treatment: two hexanol pouches per tree.

For additional information, contact Ken Gibson, MFO; or Sandy Kegley, CFO.

## BARK BEETLE CONDITIONS IN IDAHO

### Clearwater Reporting Area

With the exception of a few areas of State and private land, generally within the Clearwater Reporting Area, the area was not flown in 2006. The Clearwater portion of the 2005 report is reproduced here as an indication of what has been most recently observed.

#### **Pierce RD:**

Very widely scattered and mostly small groups of DFB-killed DF were mapped throughout host type on the District. Greatest concentrations of beetle-killed groups were noted near Elk Mountain. Minor amounts of MPB-killed LPP and FE-infested GF were likewise widely reported throughout the reporting area.

Large groups of balsam wooly adelgid, *Adelges piceae* (Ratzeburg), (BWA) were noted at several locations, most notably near Hemlock Butte and Liz Butte. While mortality has been attributed to BWA, it is not inconceivable that one or more species of bark beetles are associated with those outbreaks.

On State and private lands north and east of Kooskia, small and very widely scattered groups DFB-infested DF were noted (still found in 2006); the largest of those were near Eldorado Ridge. Elsewhere, DFB activity was recorded north of Headquarters and on State and private lands just north of the District boundary. Small amounts FE-killed GF and a few larger groups of BWA-infested SAF were noted in that area. Larger groups of SAF and GF, affected by BWA were also observed east of Headquarters.

District totals are combined with North Fork RD (below).

#### **Palouse RD:**

Very generally and sparsely scattered, mostly small groups (5-10 trees each) FE-infested GF, WPB-killed PP, and DFB-affected DF were mapped throughout the reporting area—comprised of Federal, State, and private lands (same condition on State and private in 2006). Concentrated groups of DF, killed by DFB, were found south and west of Elk City. FE and WPB activity, in their respective hosts was observed in a more broadly scattered pattern east of Potlatch. None of those infested groups were particularly large or of great significance. FE activity, very widespread and damaging, as recently as last year, was greatly reduced (reduced even further in 2006).

On lands of all ownerships, FE-caused mortality totaled an estimated 18,000 trees on 19,100 acres in 2004. This year it has been reduced to only 300 trees on about 300 acres. DFB-killed DF, on the other hand, decreased only slightly, to 2,400 trees on 690 acres.

WPB had killed almost 900 PP on about 500 acres. Other recorded beetle-related mortality was minor.

#### **North Fork RD:**

Very widely scattered, and mostly small groups of DF, killed by DFB, were mapped on the District. Noticeable concentrations were noted near Grassy Point. In the northeastern portion of District (old Moose Creek RD) numerous, large groups MPB-killed LPP were observed; the largest were located near Clearwater Mine, south of Hoodoo Pass, and along Goose Ridge. Other significant groups were located in Kelly Creek drainage and its tributaries. Elsewhere, mostly small and very scattered bark beetle (DFB, WBBB, and FE)-caused mortality was found throughout the reporting area.

District-wide (including Pierce RD), bark beetle-caused mortality totaled: 1,200 DF killed by DFB on 790 acres (down from 1,300 acres in 2004); 22,000 LPP, 36 PP, and 115 WWP killed by MPB on a combined 9,900 acres (5,900 acres last year—the most significant increases were in LPP); 1,300 SAF killed by WBBB on 1,500 acres (3,600 acres in 2004); and about 600 GF killed by FE on only 520 acres (16,800 acres had been infested in 2004). BWA was recorded on another 10,100 acres (down from 15,300 acres) and blister rust was reported to have impacted WWP on almost 2,100 acres. Many of those affected trees may also have been infested by bark beetles.

#### **Lochsa RD:**

Numerous, but small and very much scattered groups of DFB-killed DF, and MPB-infested LPP were reported. A significant portion of the MPB-infested groups of LPP were mapped near Huckleberry Butte and Long Lake Point, south of the Lochsa River. A few widely scattered, small groups FE-affected GF were noted; but at a much reduced level than in the past couple of years.

In many high-elevation SAF stands, damage attributable to both BWA and WBBB was significant, and totaled more than 3,000 acres (18,000 acres in 2004) combined. Other District totals (including Powell RD) showed about 4,100 DF killed on 2,600 acres (virtually static levels from last year); 4,900 LPP, PP, WBP and WWP killed by MPB on a combined 2,100 acres (only slightly higher than recorded in 2004); 1,900 SAF killed by WBBB on 790 acres (2,400 acres in 2004); and 230 GF killed by FE on approximately 165 acres (down markedly from 9,200 acres last year). Another 2,200 acres were affected by BWA and 270 by blister rust—the former was a significant reduction from 2004.

#### **Powell RD:**

There were few major concentrations of bark beetle-caused mortality located anywhere on the District. However, numerous small groups of beetle-killed trees were reported throughout. MPB-killed LPP and DFB-infested DF were the most commonly

encountered, but other a few groups of WBBB-affected SAF and FE-impacted GF were noted, as well. None of those infested groups were of major importance.

Bark beetle-caused mortality for portion of the Clearwater RA flown totaled 7,900 DF on 4,100 acres (4,350 acres in 2004); 2,000 GF on 1,030 acres (51,500 acres in 2004); 3,200 SAF on 2,300 acres (6,100 acres last year); and more than 27,200 MPB hosts killed on just over 12,100 combined acres (7,400 acres last year). For the reporting area, most beetle-affected—with the exception of MPB in LPP—areas declined in 2005. We have very little data for 2006. For the areas flown, DFB activity was recorded on 410 acres; FE on 2,700 acres; and WBBB-killed trees on 830 acres. Those figures are hardly comparable to ones for 2005.

### **Idaho Panhandle Reporting Area**

#### **Coeur d'Alene NF (Coeur d'Alene River RD):**

In 2006, only a small portion of the Forest/District was flown. MPB-caused mortality in LPP stands was recorded from Lookout Pass west to Kellogg and north to Bobtail Ridge, but at much reduced levels from the past few years. Biggest fader groups were noted near Upper Glidden Lake, west of Beaver Peak, above Butte Gulch, and near both West Grouse Peak and East Grouse Peak. Minor amounts of MPB-killed LPP, DFB-killed DF, and GF stands affected by FE were lightly scattered throughout that general part of the District. State and private lands north and east of Coeur d'Alene exhibited small groups of FE-killed GF along Folsom Ridge, others west of Cougar Bay. A few small groups of DFB- and FE-killed trees were noted northeast of Hayden Lake. Another group of MPB-killed LPP was mapped a few miles south of Sandpoint. For that area flown this year, we recorded FE activity on 230 acres; DFB and MPB on less than 10 acres each; and WPB on 60 acres.

Because so little of the District was flown, we are including the report from 2005. It follows:

Though declining somewhat in intensity, large groups MPB-killed LPP were still located west of Lookout Pass, and north of there to East Fork Eagle Creek. MPB-infested stands of LPP and WWP were very generally found throughout the eastern portion of the District.

Many smaller and widely scattered groups FE-infested GF were also found in southern and eastern portion of District, but much less than reported in the past two years. FE populations, generally, seemed to be returning to normal levels.

Small amounts of widely scattered DFB-affected DF were found in the south-central part of District, east of Graham Mountain. In the central portion of the District and west of there, especially near Boundary Peak, Stoney Point, Suburban Peak, Hamilton Mountain

and Fraser Peak large infestations of WSBW were mapped in DF-dominated stand. Depending on weather over the next few years, those outbreaks could result in increasing DFB activity and resultant tree mortality.

On State and private lands surrounding Coeur d'Alene, small and widely scattered groups of their respective hosts were impacted by FE, WBP, DFB and MPB (in LPP). Populations of most bark beetles, however, were much reduced from the past few years.

District totals, on lands of all ownerships, showed DFB-infested area remained static in 2005. In 2004, just over 1,400 acres had been infested—1,410 acres were recorded this year. Less than 2,300 DF were killed. An estimated 300 SAF were killed by WBBB on about 250 acres—compared to 1,550 acres last year. Significant decreases in FE-killed GF were noted. In 2004, an estimated 27,100 trees were killed on 28,000 acres; those declined to 5,400 trees on 6,100 acres in 2004. MPB-killed WWP was noted on more acres, but fewer trees were killed. In 2004 an estimated 800 trees were killed on 450 acres; in 2005, 400 trees on 2,600 acres. Blister rust, however, was attributed with damaging WWP on about 11,000 acres. MPB-caused mortality in LPP increased markedly from 16,000 trees on 3,500 acres to more than 24,300 trees on 12,400 acres. WBP accounted for another 150 beetle-killed PP on about 90 acres.

#### **Kaniksu NF (Sandpoint RD):**

Due to circumstances beyond our control, very little useable ADS data for the three Districts of the Kaniksu NF was obtained in 2006. For the Sandpoint RD, we recorded almost no bark beetle activity. As a result, we have included the following from the 2005 report. We believe most conditions have changed but little in the past year.

Small- to moderate-sized groups of FE-killed GF were still noted south and east of Sandpoint; but in much smaller groups and number of groups than in the past couple of years. Fader groups were still generally scattered from Prospect Peak north to Jakes Mountain, east of Lake Pend Oreille. (Similar conditions were noted in 2006.)

North and east of Sandpoint, FE-killed trees were much less frequently encountered, but a few small groups were mapped throughout mixed-conifer stands. Larger groups were mapped near Wylie Knob. Also to the north, along Hellroaring Ridge, a few groups of WBBB-killed SAF were observed.

District-wide, only 160 acres were still infested by DFB, compared to 600 acres in 2004. About 280 DF had been killed. FE killed an estimated 2,850 GF on about 3,100 acres. More than 9,400 acres had been infested last year. MPB killed 140 trees—nearly equal amounts of LPP and, with a lesser amount of WWP—on about 200 acres. WBBB-caused mortality totaled 400 trees on less than 600 acres. About 1,000 acres had been recorded in 2004. Other bark beetle activity was light.

### **Kaniksu NF (Bonners Ferry RD):**

The same conditions applied for the Bonners Ferry RD. Almost no data were obtained. About 5,000 acres of MPB-killed LPP were recorded, and another 4,000 acres of WSBW defoliation. We believe conditions are similar to those reported for 2005. That report follows:

More of the District was flown in 2005 than in 2004, so much more beetle-caused mortality was recorded. That does not necessarily reflect a resurgence in beetle activity—most of which seemed to have generally declined. Small and declining groups of MPB-killed LPP were found near Katka Peak.

North of Highway 200 and east of Highway 95, to the Canada/US border, large groups of FE-killed GF, MPB-infested LPP, and WBBB-affected SAF were observed. Largest groups of FE-impacted stands were noted near Solomon Mountain, along Dawson Ridge, and south of Round Prairie. Larger groups WBBB-killed SAF were found near Bussard and Ruby Mountains. MPB activity in LPP stands was most noticeable near Hall, Bussard and Copper Mountains.

To the west, in the Selkirk Range north and west of Bonners Ferry, very large groups of WBBB-killed SAF, and MPB-caused mortality, in both LPP and WBP stands, was mapped from Bottleneck Peak and Snow Creek, north to the Canada/US border. Largest groups of MPB-caused damage, in both host species, were found in Trout Creek and Parker Creek drainages. Generally, LPP was infested on lower slopes and WBP was killed along ridges. MPB populations and BR infection levels have been very high in those stands for several years. Host depletion, especially in WBP stands has become more common. North of Long Canyon Creek, most MPB activity is confined to LPP stands. WBBB-caused mortality was heaviest in higher-elevation stands near Harrison Peak, Myrtle Peak, Smith Peak, Lake Mountain, Saddle Mountain, and Silver Mountain.

Throughout the District, MPB activity increased again in 2005, in LPP and PP stands, but declined somewhat in WBP and WWP stands. In 2004, more than 32,700 WBP; 28,000 LPP; and 250 WWP were killed in 2004, and mapped as faders in 2005. Those figures were 19,500 WBP; 47,700 LPP; 90 WWP; and 330 PP in 2005. Total acres affected by MPB, in all hosts, were more than 35,600 acres—compared to 36,500 acres last year; however, a portion of the District was not flown in 2004. WBBB killed more than 18,600 SAF on 20,200 acres—about the same amount recorded in 2004.

### **Kaniksu NF (Priest Lake RD):**

Once again, conditions prevented collection of accurate data for 2006. Very little bark beetle activity was noted, however, about 6,000 acres of WSBW activity was recorded. We have included the following from the 2005 report:

West of Priest Lake, from the Canada/US border south to the District boundary, bark beetle-caused mortality was less significant than in the past few years. Widely scattered

and small groups FE-killed GF and DFB-infested DF were found throughout mixed-conifer types. Heavier concentrations of FE activity were found from Outlet Bay north to Watson Mountain. High infection rates of BR in WWP stands near Gleason Mountain and Diamond Peak could also be accompanied by MPB activity.

WSBW activity to the north, from Granite Mountain to Kaniksu Mountain could also precipitate DFB-caused mortality. On that part of the District, WBBB-killed SAF was prevalent near Grassy Top, Mankato and Helmer Mountains.

On lands of mixed ownership, south of Priest River, numerous small groups of FE- and WPB-killed trees were found in stands of appropriate hosts. North of Priest River, a very few small groups FE-killed GF were recorded, as far north as Priest Lake. East of Priest Lake, small numbers of scattered groups trees impacted by FE, MPB (LPP) and DFB were noted. Largest group MPB-killed trees were located near Klotch Mountain (still evident in 2006); the most significant groups DFB-infested DF were found near Joe Peak. Widely scattered WBBB-affected SAF were found in a few high-elevation stands (notably near Kent Peak in 2006).

District totals for 2005 were: FE—1,050 dead GF on 1,670 acres; WBBB killed 1,800 SAF on 2,700 acres; 300 DFB-killed DF were observed on 255 acres; and MPB killed 55 trees on 75 acres—about equally distributed between LPP, PP, and WWP.

Totals for all three Districts in the Kaniksu RA showed 900 DF killed on 470 acres (down from 1,800 acres in 2004); FE killed 6,800 GF on 7,300 acres (only about a tenth the 65,800 acres recorded in 2004); MPB killed 68,400 trees (about one-third of which were WBP, most of the rest LPP) on 36,400 acres (down slightly from 38,000 acres in 2004); and WBBB killed 19,200 SAF on 19,200 acres—down a third from the 27,800 acres reported last year.

#### **St. Joe NF (Avery/St. Maries/Red Ives RD):**

Because of smoke and weather conditions, only a small part of the St. Joe Reporting Area was flown in 2006. That portion between the Idaho/Montana border and the St. Joe River, from Graves Peak northwestward to Avery, then northward to Moon Pass was flown in the latter part of August. For the area flown, we recorded 4,000 acres of MPB-infested LPP, another 3,900 acres of WSBW defoliation, and very little of anything else. The rest of the Forest/District was not surveyed.

In the area surveyed, MPB-caused mortality in LPP stands is still quite prevalent, but at reduced levels from the past few years. Largest groups were located around Cascade Peak, Washout Point, Bernier Point, Nelson Point, Wonderful Mine, and Champion Point. Although a few polygons covered several hundred acres, intensity of beetle-caused mortality was relatively light—generally about a tree per acre. Elsewhere, MPB- and DFB-caused mortality was very light and widely scattered.

Because so little of the reporting area was flown in 2006, we have included the portion of the 2005 report for the St. Joe. It is at least representative of information available last year, and may suggest general conditions still found there. What data we do have indicates beetle activity is likely reduced from that found in 2005.

MPB-killed LPP, though still quite prevalent throughout the reporting area is much reduced from the past few years. Larger groups, of 200-300 trees each, were mapped in southeastern portion of the area, near Neversweat Peak. A larger group, of 1000 trees, was observed near Sherlock Peak. From there, northwestward through the Bitterroot Range, groups were generally fewer and smaller than in the recent past. Fader groups were generally small and scattered throughout LPP type, with a few larger groups interspersed, all the way west to Big Creek. Numerous small groups, and a few larger ones, were found throughout St. Joe River drainage, as well; from Bacon Peak down to about Boulder Divide. On what was formerly the Red Ives RD, more than 13,200 acres of LPP still had significant amounts of MPB-caused mortality. Another 7,800 acres were reported on the old Avery RD. Other bark beetle-killed trees were much less frequently encountered. DFB activity was recorded on fewer than 600 acres.

Elsewhere, very small and widely scattered groups of DFB-killed DF and FE-infested GF were noted, but none were of significance. Notable groups of WBBB-affected SAF, were mapped in a few high-elevation stands, but totaled only about 600 acres. Both BWA and bark beetles may be influencing some of those stands.

On State and private lands, and Forest Service-administered lands north and east of St. Maries, a few large groups of MPB-infested LPP were observed near Kellogg Peak, Wardner Peak, and Mount Wiessner. Elsewhere in that vicinity, MPB in LPP, and FE and DFB were found to have affected their respective hosts in widely scattered and mostly small groups. Concentrations of DFB-killed DF were noted near Little Bald Mountain and Baby Grand Mountain, south of St. Maries; however, most groups were small. MPB was reported on slightly less than 900 acres, and fewer than a tree per acre had been killed.

Throughout the IPNF RA, about 2,800 acres (3,800 acres in 2004) were still infested by DFB. In 2004, 50,600 acres were affected by MPB, in all of its hosts. That had increased somewhat, to 76,300 acres in 2005. Last year, 108,950 acres showed some level of FE-caused mortality; that declined remarkably in 2005, fewer than 15,000 acres. And the 30,500 acres infested by WBBB in 2004 decreased to 22,000 acres in 2005. With the exception of MPB, all bark beetle-related mortality declined in 2005.

## Nez Perce Reporting Area

### **Salmon River RD:**

Only a part of the District was flown in 2006 due to smoky conditions created by numerous wildfires. In the "Island Unit," west of the Salmon River, only a very few small groups of beetle-killed trees were noted. East of the Salmon, and south of Grangeville, more beetle-killed groups of trees were observed, but they were still mostly small and widely scattered. In the upper South Fork Skookumchuck Creek drainage, and throughout much of the Slate Creek drainage, numerous but small groups of DFB-killed DF were mapped. Most were less than 50 trees each, but a 100-tree group was observed west of Patrol Point.

GF, killed by FE, was significantly less often encountered in 2006, but a few small groups were found scattered throughout the southern portion of the District. The still-significant areas recorded in 2005 may have been masked somewhat by smoky conditions. Those populations, however, appear to have declined markedly.

In 2005, we noted trees killed by DFB, WBBB, and MPB (LPP, PP, WBP) were much less significant, and found at not much higher than endemic levels. In 2006, MPB-killed LPP was much more prevalent, and large groups were mapped in the Little Slate Creek drainage, north of Florence Basin. Numerous groups were also noted to the east in Tenmile Creek drainage and its tributaries.

Throughout the District in 2005, on a total of 12,300 acres, FE killed more than 21,000 GF. About 6,100 acres had been infested in 2004. WBBB killed 720 SAF on approximately 400 acres; and MPB-killed hosts totaled 8,300 trees (mostly LPP) on about 5,800 acres. For 2006, comparable figures showed 2,400 DF killed by DFB on 500 acres; and 2,200 LPP killed by MPB. Minor amounts of other beetle-caused mortality (all less than 100 acres each) were reported. With the exception of MPB in LPP, most bark beetle activity was static to slightly declining from levels reported in 2005.

### **Clearwater RD:**

Only small and widely scattered groups of FE-killed GF were mapped in 2006. A few of the largest groups were mapped in and near the Bully Creek drainage, but the infested area is but a small fraction of that recorded in 2005. Mostly small groups of DFB-killed DF were also occasionally encountered. The largest of those groups contained an estimated 100 trees and was located in the upper Fish Creek drainage, south of Grangeville. A very few small groups of MPB-killed LPP and WPB-killed PP were also noted south and east of Grangeville.

In 2005, a few groups of MPB-killed LPP were reported at some locations, one of 500 trees being noted near Hungry Ridge. That activity has either declined or was not seen

due to unfavorable conditions. BWA-impacted SAF, found scattered throughout the area may also be infested by a few bark beetle species. On State and private land, east of Grangeville, a few small and widely scattered groups of WPB- and FE-killed trees were observed in relatively minor amounts. DFB activity was little observed. In 2006, most beetle activity was recorded in low and generally declining patterns. Less than 750 acres of LPP, infested by MPB; 250 acres of DF, killed by DFB; and 200 acres of FE-infested GF were reported.

### **Red River/Elk City RD:**

As with much of the rest of the Forest, poor conditions resulted in only a partial survey of these Districts. Still, it seemed apparent that MPB-affected LPP stands have decreased significantly from levels of the past few years. A few large fader groups were mapped, but were mostly of light intensity—averaging from 1-3 trees per acre. A few polygons, in the southern portion of the District were still mapped at 5- to 10-trees per acre, but those were the exception. One large group was observed northeast of Elk City, near Anderson Butte. Most of the other largest and most intensively infested groups were recorded from about Orogrande, south—with largest ones being near Nipple Mountain, Moose Butte, Burpee Mountain, Jesse Mountain and Mammoth Mountain. Other groups were small and scattered.

Throughout that area, small and widely scattered groups of DFB-killed DF were also noted. There were not significantly infested areas anywhere on the combined Districts. A few MPB-killed PP were recorded in the southern part of the District—in the vicinity of Mammoth Mountain.

Most of the rest of the District was not flown. In 2005, along the South Fork Clearwater River, several small groups of FE-infested GF had been reported. Like MPB, FE populations, throughout the reporting area, have declined—less than 20 acres of FE-affected GF were mapped in 2006. Acres of LPP infested by MPB still totaled nearly 132,000 acres in 2005; but that has declined markedly to about 37,000 acres in 2006. Approximately 700 acres of PP had also been infested by MPB. About 127,000 beetle-killed trees, of both species, were recorded. DFB activity was reported on 350 acres, on which slightly more than 1,200 trees were killed.

### **Moose Creek RD:**

The District was not flown in 2006. The following is what was recorded in 2005:

Very generally scattered, but also very small groups of bark beetle-killed trees were observed throughout the reporting area. That recorded was predominantly MPB activity in LPP stands, but MPB was found affecting some PP stands as well. In DF or mixed-species stands, DFB-caused mortality was scattered at mid-range elevations; FE activity and WBBB-killed trees at lower and higher elevations, respectively.

Notable concentrations of MPB-killed LPP were mapped in North Fork Moose Creek and Wounded Doe Creek drainages, to the north. A larger group of the same was found to the south, near Gardiner Peak. Few of the infested groups of any of the beetle species exceed 15 trees each. MPB activity accounted for about one dead LPP per acre on about 3,700 acres.

On the former Selway portion of the District, small and widely scattered groups of DFB-infested DF and FE-damaged GF were found in their respective forest types. Larger groups of GF, killed by FE, were noted east of Pine Knob; DFB-killed DF in Goddard Creek drainage, and MPB-infested LPP in upper O'Hara Creek drainage. Widespread BWA activity may have affected populations of some bark beetles.

For the entire Nez Perce RA, the most significant beetle-related mortality was attributed to MPB in LPP stands; however, MPB populations have declined dramatically within the past couple of years. More than 143,700 acres were infested and about 364,300 trees were killed in 2005; but that has declined to 135,000 trees on fewer than 40,000 acres. MPB also killed 3,500 PP on 1,520 acres in 2005, but was reduced to less than 1,000 trees on 730 acres in 2006. Other bark beetle-caused mortality of significance: FE killed more than 67,800 GF on 34,000 acres in 2005—significantly reduced to 1,200 trees on 400 acres; WBBB killed 15,000 trees on 16,000 acres last year, but a mere 350 trees on 65 acres in 2006. DFB-caused mortality totaled 2,800 trees on 1,900 acres in 2005. A slight increase in level of mortality was noted in 2006—4,800 trees were mapped on 1,050 acres. Of less importance: WPB killed about 200 PP on 110 acres. Few other bark beetles were reported in significant levels.

### **Indian Reservations**

#### **Coeur d'Alene IR:**

Mostly small and widely scattered groups FE-killed GF and PP, infested by WPB were found throughout forested areas on the Reservation south and east of Plummer. None were larger than 100 trees each. All bark beetle activity and related damage is much reduced from 2004 levels. Similar conditions were noted in 2006 on portion of Reservation flow.

In 2005, small groups of PP, killed by WPB and DF, killed by DFB, were noted at various locations, but were much less insignificant when compared to the amount of FE-caused mortality distributed throughout the area. FE-killed GF totaled only 1,100 trees on less than 500 acres. A few groups of WPB-killed PP were concentrated just south of Lovell Valley. A total of 1,000 PP were killed by WPB on about 600 acres—a slight reduction from the 900 acres reported in 2004. Lesser amounts of DFB- and IPS-caused mortality were observed. For the areas flown in 2006, we noted FE was still active on about 230 acres, where 860 trees were killed, and WPB killed 110 PP on about 60 acres.

## **Nez Perce IR:**

Large groups of MPB-infested LPP and FE-killed GF were once again found southeast of Lewiston in the Waha Mountains. Largest groups MPB-caused mortality were noted east of Black Pine Campground; while larger groups FE-affected stands were located north there and west of Winchester—those groups have increased in size since 2005. East towards Cottonwood, small and widely scattered groups of WPB- and FE-killed trees were observed. Similar conditions were observed in 2006.

Other smaller groups of FE-killed trees were found throughout host type on the Reservation, but very much reduced from 2004 levels. In 2004, more than 26,000 GF were killed on 75,140 acres, on the Reservation. Those figures declined markedly to 3,900 trees on fewer than 6,800 acres in 2005. Interestingly, data indicated an increase in 2006, when about 6,100 beetle-killed GF were recorded on 8,850 acres. Some of that could have been a result of difficulty in separating year of fading from the air.

At various sites in the reporting area, numerous but small groups of PP were killed by WPB—totaling 450 trees on 155 acres. In addition, a large group of MPB-killed LPP was mapped southwest of Soldiers Meadow Reservoir in 2004 declined in 2005, but once again increased somewhat in 2006. About 3,000 LPP were killed on 1,850 acres in 2006. Those were slight increased over 1,400 trees killed on 1,600 acres in 2005. Approximately 3,400 acres had been mapped in 2004. Throughout the Reservation, IPS activity accounted for 100 dead PP on about 20 acres. DFB activity was little noted.

## **BARK BEETLE-RELATED SPECIAL PROJECTS—IDAHO**

### **Using Verbenone to Protect High-Value LPP Leave Strips at Lookout Pass Ski and Recreational Area, Idaho, 2003-2006: An Operational Case Study**

Applications of verbenone, anti-aggregation pheromone for MPB, began on the ski hill in 2003, when 40 acres of leave strips were treated. Treatment area was expanded in 2004 to cover 100 acres; 120 acres in 2005; and in 2006, 130 acres of susceptible forested strips between ski runs in the ski/recreation area were treated.

Based on past experience, we applied 20, 5-gram verbenone pouches per acre, on a 45-foot by 45-foot grid, in the treatment areas in early spring. In 2006, we re-treated all treatment areas, on the same grid, with fresh pouches in July. Except for second application, similar treatments were conducted each year.

Protection in treated areas was satisfactory. Some attacks were noted, particularly along edges of treated and untreated areas; but in general, many more attacks have been found in untreated areas than treated ones. We plan to treat 130 acres of forested (LPP) leave strips in the ski/recreation area again in 2007. A more detailed report is forthcoming.

For additional information, contact Carol Randall, CFO.

### **Aerially Applied Verbenone Flakes for MPB Control in LPP, Red Ives RD:**

A landscape-scale test for verbenone flake efficacy against MPB attack was conducted in LPP stands east of Red Ives RD, IPNF in 2005. Objectives were: 1) test efficacy of the verbenone flake formulation in interrupting the response of MPB to standard lures, 2) test its efficacy in protecting host trees in treated stands from MPB attack, and 3) assess its non-target effects. Disrupt<sup>®</sup> verbenone flakes (Hercon Environmental) were applied at 150g AI/acre by helicopter to five, 50 acre treatment plots. Five, 50 acre untreated plots were established as controls. Baited traps were placed in each of the treated and untreated plots, and efficacy will be assessed by measuring beetles/trap, tree attack rate, and tree mortality by visually evaluating all susceptible hosts within and along 4 transects per 50 acre plots.

Results from the study showed aerially applied verbenone flakes can significantly reduce proportion of trees attacked by MPB. However, while treatments reduced numbers of beetles attracted to baited traps, its effects were not significant.

Aerially applied verbenone flakes appear to have potential for use in area-wide preventive programs. Higher flake application rates are being considered in future studies to determine if beetle damage can be even further reduced.

For additional information, contact Lee Pederson, CFO.