

FOREST HEALTH HIGHLIGHTS 2023

The Montana Department of Natural Resources and Conservation (DNRC)



INTRODUCTION



Western spruce budworm damage on Flesher Pass

Montana's forests, covering roughly 26 million acres, provide a myriad of benefits including wildlife habitat, scenic vistas, clean drinking water, wood products, and recreation. The structure and function of these forests vary over time, often influenced by insects and diseases. While many insects and diseases naturally exist at otherwise undetectable levels in the forest, certain events, such as hailstorms, windthrow, drought, and extreme temperatures can trigger significant pest outbreaks leading to substantial tree mortality. These disturbances can make trees more susceptible to diseases like Diplodia shoot and tip blight or increase their vulnerability to bark beetles and wood borers.

Similarly, the absence of natural disturbances can also lead to outbreaks by creating an ideal habitat for insects and diseases. For example, Armillaria root disease proliferates in stands encroached by shade-tolerant species and mountain

pine beetle outbreaks expand across landscapes of homogenous, even-aged lodgepole pine.

The impacts of heat or drought on tree health may initially resemble an insect or disease outbreak, but often, the underlying stressor is lack of moisture. For instance, a heat wave in 2021, coupled with prolonged drought, triggered notable tree decline across the region that continued into 2023. Impacts were particularly noted amongst Douglas-fir, ponderosa pine, and western larch. Montana forests also include a component of 5-needle pines (limber, whitebark, and western white pine), lodgepole pine, spruce, and true firs (subalpine and grand). Each of these species faces a suite of challenges associated with insects and diseases, underscoring the complexity of forest health management in Montana.

AERIAL DETECTION SURVEY

In 2023, the USDA Forest Service conducted an Aerial Detection Survey (ADS) of forest health conditions on approximately 33 million acres in Montana, an increase of 8 million acres from 2022. Of the acres surveyed in 2023, 24 million had also been surveyed in 2022. Surveyors assessed conditions from fixed wing aircraft and recorded tree damage across various land ownerships. The distribution and severity of damage is not consistent across a landscape; patchy in some places and contiguous in others. To account for this variation, damaged acres are consolidated and converted into "severity-weighted acres" (SWA).

Although survey efforts were focused on the western region, insects and diseases are present and important across the entire state. Some agents (such as root disease, dwarf mistletoes and rusts) are difficult to discern from the air and are generally underestimated in aerial data. Data for this report was derived from aerial and ground-based observations, including excerpts from the USDA Pest Event Recorder for the Northern Region.

MONTANA FOREST DAMAGE AGENTS 2023

Damage Agent	Acres	SWA
Western Spruce Budworm	106,916	67,831
Larch Needle Cast	28,933	22,668
Douglas-fir Beetle	57,645	7,260
Mountain Pine Beetle	23,062	5,337
Subalpine Fir Decline	40,370	3,926
Drought	2,344	2,341
Douglas-fir Tussock Moth	1,473	1,473
Lophodermella Needle Cast of Pines	1,150	1,124
Unknown Defoliator	1,782	1,097
Scale Insects	1,000	943
Balsam Woolly Adelgid	2,466	686
Fir Engraver	5,616	619
Ips Engraver Beetles	3,394	364
White Pine Blister Rust	2,086	346
Spruce Beetle	285	54



Cooperative Forest Health Monitoring Interagency Program Northern Region Aerial Detection Survey Data and Products for the 2023 Survey Season

External (Non USFS) access to data and products: [Box \(Pinyon\) 2022 ADS Data](#)
For access to Box-linked data and products, please contact Jeff Kaiden at Jeffrey.Kaiden@usda.gov.

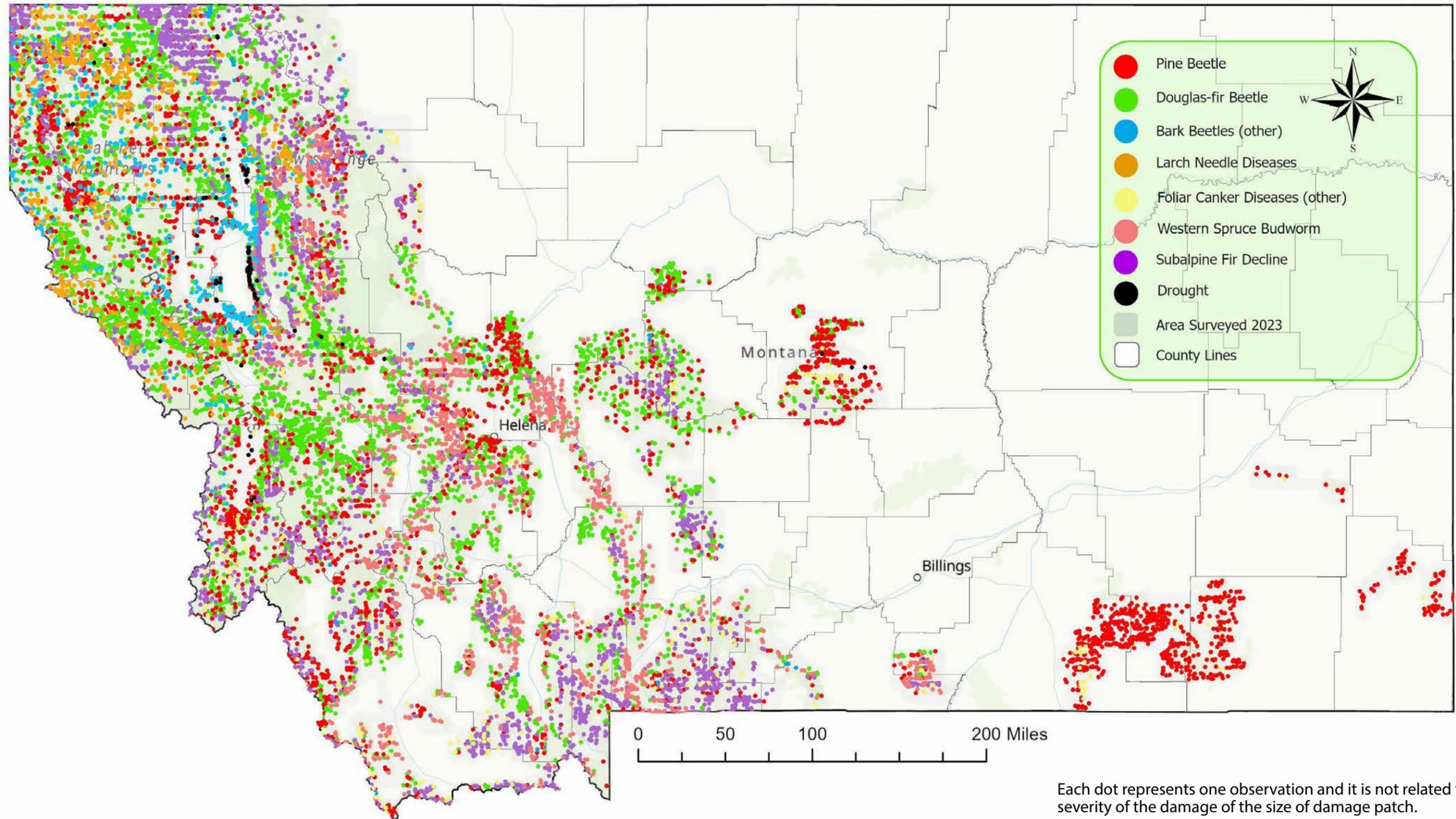
2023 ADS Data - Geodatabase and Shapefiles | [R1 ADS 2023 FinalDataset.gdb](#)
2023 ADS Printable Damage Quad Maps | [R1 ADS 2023 Damage QuadMaps](#)
Historical Analysis Toolbox (HAT) | [Historical Analysis Toolbox Download](#)

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AERIAL DETECTION SURVEY MAP



Each dot represents one observation and it is not related to the severity of the damage or the size of damage patch.
Map data provided by USDA Forest Service, Forest Health Protec-

BARK BEETLES AND WOOD BORERS

Bark beetles attack trees by boring under the bark of apparently healthy or stressed trees. Wood boring beetles similarly bore into trees but more commonly attack trees that have comprised vigor. The crowns of beetle-killed trees oftentimes do not turn red until the following year thus, trees that were mapped in 2023 were actually attacked in 2022.

Damage from Douglas-fir beetle, *Dendroctonus pseudotsugae*, was mapped on more than 57,000 acres throughout the host range of Douglas-fir. Large pockets of mortality were detected on and around Telegraph Mountain west of Cascade (Cascade County), east of Butte in the Delmoe Lake area and in the Elkhorn Mountains southeast of Montana City (Jefferson County). South of Clinton pockets of mortality were scattered throughout the Rock Creek drainage area (Granite County).

Damage to ponderosa pine from western pine beetle, *Dendroctonus brevicornis*, was minimal and widely dispersed in western Montana. Flathead County had the most widespread, low intensity damage totaling ninety-five acres. Activity was generally limited to scattered pockets of 3-5 trees or small patches. Two distinct patches of mortality were mapped to the north of Niarada (Sanders County) and on at least five acres near Flathead Valley Community College in Kalispell (Flathead County).

Mountain pine beetle, *Dendroctonus ponderosae*, was mapped on 23,062 acres, doubling the acreage noted in 2022. Of that new damage almost half was detected in Lincoln, Flathead, and Sanders Counties. Significant pockets of mortality were detected in the Silver Butte Mountains area (Lincoln and Sanders Counties), east of Pinnacle near the Brave Dog and Eagle Ribs Mountains (Flathead County), and in the Beaverhead Range near the Montana-Idaho boarder west of Hwy 324 (Beaverhead County).



Red turpentine beetle in ponderosa pine



Bark beetle



Douglas-fir beetle galleries

Aerial Detection Survey noted a decline in pine engraver beetle, *Ips pini*, damage compared to previous two years of region-wide increases. Mortality was much more common in ponderosa pine than in lodgepole pine. Outbreaks are generally localized and associated with fire, storms, or logging slash.

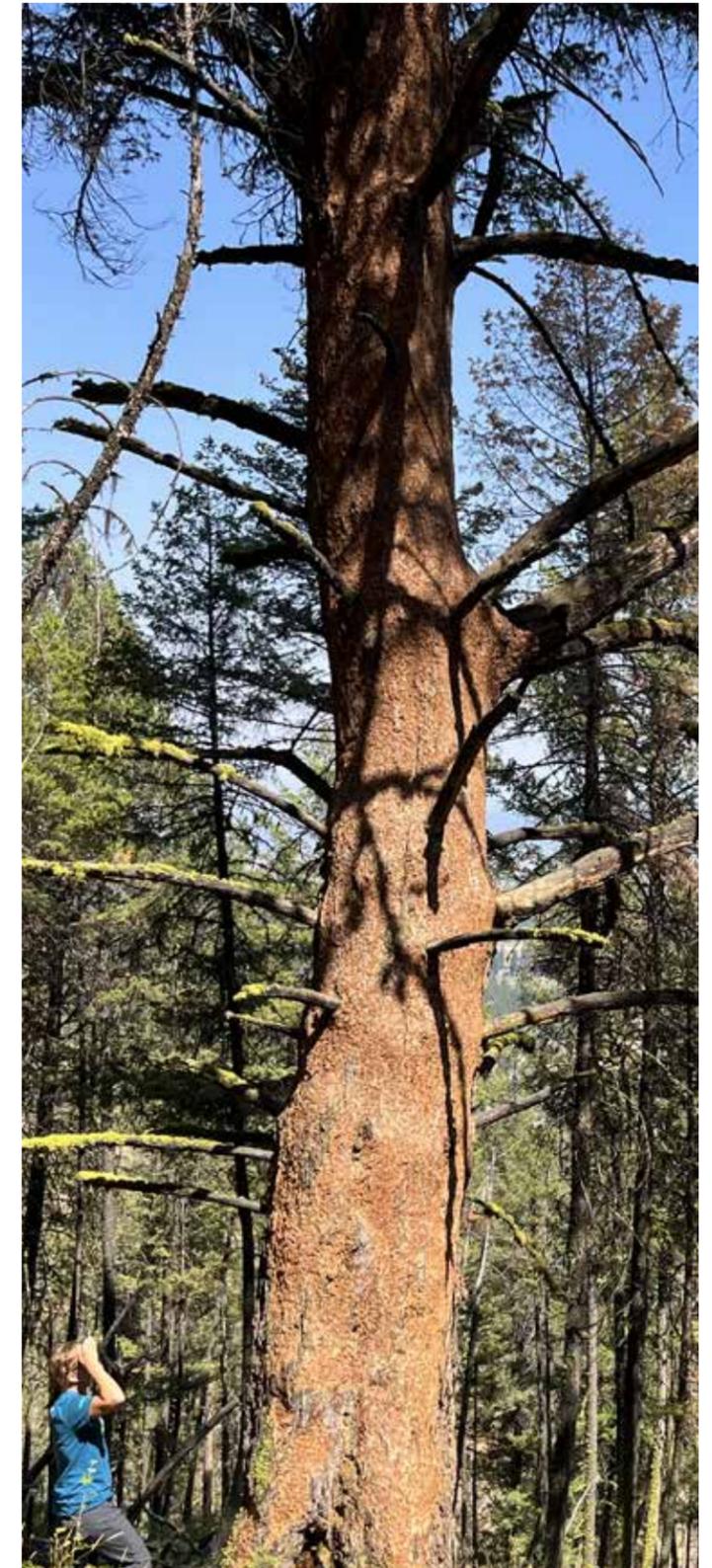
Larch engraver, *Scolytus laricis*, was identified in pole-sized and tops of mature western larch trees near Eureka, commonly associated with metallic wood borers (Buprestidae).

Wood borers were active in Douglas-fir, ponderosa pine, and western larch in northwestern Montana with notable activity near Missoula, Lincoln, Eureka, Whitefish, Kalispell, and along Flathead Lake. Differentiation between Douglas-fir beetle and wood borers was most reliable from ground observations. Surveys in Missoula and Mineral Counties confirmed extensive wood borer outbreaks in Douglas-fir stands.

Douglas-fir pole beetle, *Pseudohylesinus nebulosus*, is considered a secondary insect pest of Douglas-fir, often colonizing smaller, weakened, or suppressed trees. They can colonize alongside other beetles attacking Douglas-fir, such as Douglas-fir beetle, Douglas-fir engraver, *Scolytus monticolae* and *Scolytus unispinosus*, or woodborers, such as flatheaded fir borer, *Phaenops drummondi*. It is likely that some mortality attributed to Douglas-fir beetle included these secondary beetles. Douglas-fir pole beetle was detected in surveys of small diameter trees at sites in Granite, Missoula, and Ravalli Counties.



Secondary beetle impacts in Douglas-fir



Mature Douglas-fir bark flaked off by woodpeckers searching for beetles

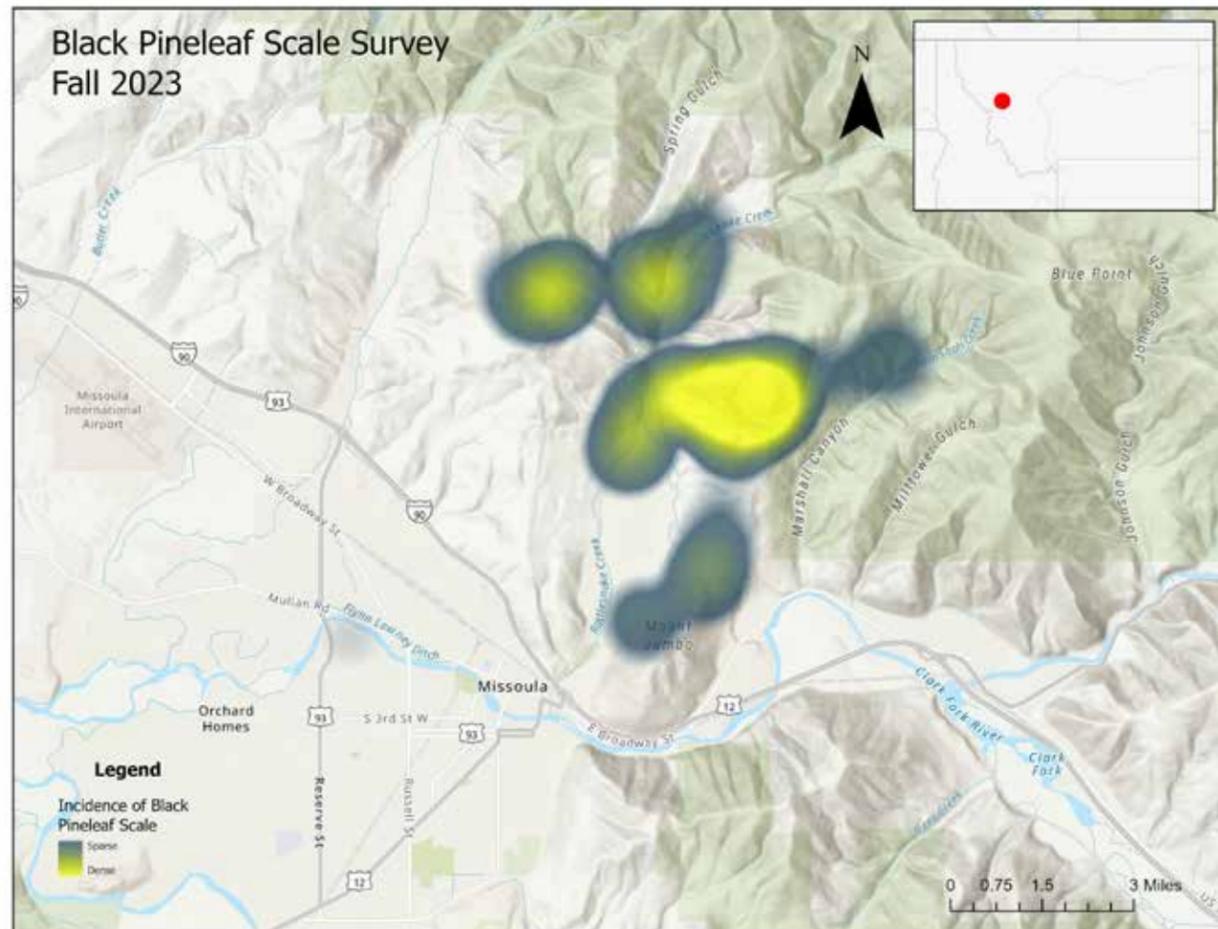
BLACK PINELEAF SCALE

Black pineleaf scale, *Dynaspidiotus californica*, was mapped on nearly 1,000 acres. Active outbreaks were detected in Woods Gulch and Houle Creek (Missoula County); Pinkham Falls, South Jackson Kootenai National Forester, Phill's Lake and the North Bridge spanning the Koocanusa Reservoir (Lincoln County); and Robbins Gulch in the Bitterroot Valley (Ravalli County).

Delimitation surveys were conducted on the perimeter of a black pineleaf scale outbreak in Woods Gulch near the Rattlesnake Recreation Area (Missoula County). Field crews examined needle samples taken from apparently healthy, green ponderosa pine trees in the immediate vicinity of symptomatic, infested trees. Infestations were recorded as abundant, trace (<10% needles), or healthy. Of the 303 trees sampled, 86 apparently healthy trees were abundantly infested with black pineleaf scale. The infestation expanded beyond the apparent patch of red tree crowns.



Black pineleaf scale surveying



Ponderosa pine stand impacted by black pineleaf scale - Chris Foelker, USFS Forest Health Protection

DISEASES IN PONDEROSA PINE

Various diseases infect ponderosa pine and can co-occur in a single tree. Elytroderma, western gall rust, and Diplodia shoot and tip blight have been chronic in western Montana and generally exhibit similar symptoms of spot mortality in an otherwise green crown.

Heat and drought compromise tree vigor and increase ponderosa pine susceptibility to needle diseases associated with branch flagging and defoliation. Aerial Detection Survey detected pockets of ponderosa pine exhibiting drought stress along east of Pablo and Ronan running the length of the Mission Mountain foothills (Lake County).

Elytroderma, *Elytroderma deformans*, has been chronic in the Jette Lake area north of Polson (Lake County) and the Bitterroot Valley (Ravalli County) south of Missoula. More recently, the disease was found causing damage to ponderosa pine on the Bitterroot, Lolo, and Flathead National Forests as well as on tribal land in the Flathead Lake area. Brooms were also found on ponderosa and lodgepole pines in Tree Improvement Areas in northwestern Montana.

Drought continued to exacerbate impacts from western gall rust, *Endocronartium harknessii*, and contributed to the observed decline of heavily infested mature ponderosa pines in the region.

Localized outbreaks of Diplodia, *Diplodia pinea*, were triggered by hail storms near Plains (Sanders County) and Lewistown (Fergus County). Damage was still apparent in ponderosa pine along Echo Lake, Big Fork, and Woods Bay (Flathead County) after a hail storm in 2022 triggered Diplodia.



Diplodia on ponderosa pine cone



Scorched hip canker on ponderosa pine



Sporulating western gall rust on pine

LARCH NEEDLE DISEASES

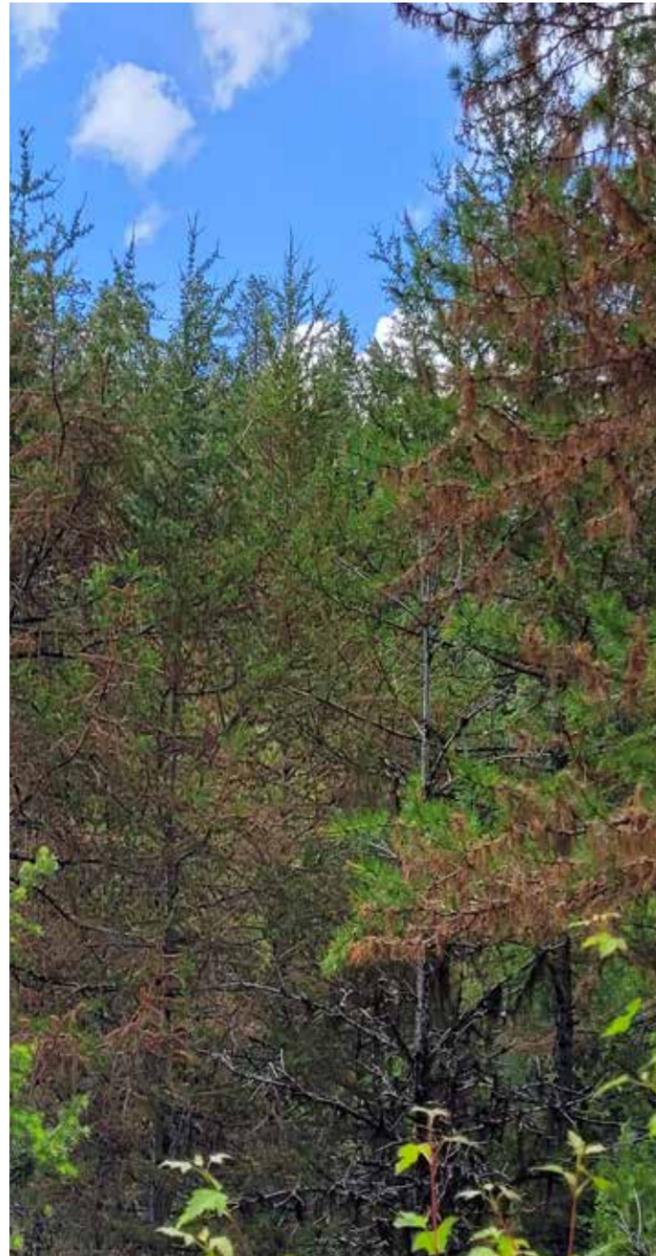
DEFOLIATORS

Aerial Detection Survey reported over 22,000 acres of larch needle diseases in 2023, representing a 4-fold increase from acres detected in 2022. The majority of affected acres were reported in Lincoln and Flathead Counties.

Severe levels of larch needle blight, *Hypodermella laricis*, were observed on the Lolo National Forest (Granite and Missoula Counties). Severe levels were also observed on 2,000 acres of the Stillwater State Forest (Flathead and Lincoln Counties) for three of the past five years. These repeatedly severe infections corresponded to reduced growth. Aerial surveys identified large pockets of defoliation at the southern toe of Stryker Ridge west of Swift Creek (Flathead County), west of Davis Mountain near Rexford (Lincoln County), and west of Hot Springs near Baldy Mountain (Sanders County).



Larch needle blight



Larch stand affected by needle disease - Katie Minnix, USFS Forest Health Protection



Pine tussock moth near Miles City - Andy Miller, DNRC

Defoliating insects feed on needles and leaves, limiting trees' ability to photosynthesize. Although not direct tree killers, repeated years of severe defoliation can lead to mortality.

Western spruce budworm, *Choristoneura freemani*, was mapped on 106,000 acres. Defoliation was recorded in most counties in the western and central part of Montana. Large pockets of defoliation were detected on the Gallatin National Forest (Park County), Browns Gulch west of Butte (Silver Bow County), East of Canyon Ferry Lake in the Big Belt Mountains (Broadwater, Lewis and Clark, and Meagher Counties) as well as south Hungry Horse Reservoir (Flathead County).

Douglas-fir tussock moth, *Orgyia pseudotsugata*, was mapped near Niarada (Sanders County) but wildfire burned the stand before the specific damage agent was confirmed. Douglas-fir tussock moth was not otherwise detected in Montana and presumably the recent outbreak has subsided to endemic levels. Mortality in Douglas-fir stands near Missoula is apparent in stands that were heavily infested with Douglas-fir tussock moth.

Pine tussock moth, *Dasychira griseifacta*, severely defoliated ponderosa pine on approximately 400 acres east of Miles City.

Fall cankerworm, *Alsophila pometaria*, was noted defoliating boxelder and ash trees in eastern Montana in late June.

Light defoliation from the larch looper, *Semiothisa sexmaculata*, was recorded at the Plains Tree Improvement Area (Flathead County) and the Plains Tree Improvement Area (Sanders County) in June 2023.



Western spruce budworm pupal case

INVASIVE SPECIES

Positive trap catches in 2002 were followed up with delimitation surveys near West Yellowstone (Gallatin County) and Glacier National Park (Flathead County). No additional moths were detected in these locations in 2023 therefore, spongy moth, *Lymantria dispar*, is not considered to be established in these locations.

In 2023, two individual spongy moths (male) were collected in pheromone-baited Delta traps.

The USDA confirmed two positive catches from traps in Gallatin (USDA Forest Service lands) and Missoula (Fish, Wildlife and Parks lands) Counties. Visual surveys in trap locations yielded no additional moths of any life stage and therefore, spongy moth was not considered an established pest. DNRC will conduct intensified grid trapping in the vicinity of the positive detection in Missoula County in 2024.

No new detections of balsam woolly adelgid, *Adelges piceae*, were recorded in 2023 and to date, confirmed infestations are in the following counties: Broadwater, Flathead, Gallatin, Granite, Lewis and Clark, Lincoln, Mineral, Missoula, Ravalli, and Sanders.

Long-term impact plots were remeasured in 12 sites across western Montana in 2023. Plots were installed in 2018 to monitor the decline of subalpine fir stands as balsam woolly adelgid infestations progress.

Whitebark pine, *Cronartium ribicola*, was listed by US Fish and Wildlife Service as a threatened species. White pine blister rust and mountain pine beetle have largely contributed to the species' decline throughout its host range. White pine blister rust is a non-native invasive disease that affects all 5-needle pine species in Montana including western white pine and limber pine.



Subalpine fir tagged on balsam woolly adelgid impact survey



Spongy moth captured in Missoula County trap

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