



2022 FOREST HEALTH HIGHLIGHTS

The Montana Department of Natural Resources and Conservation (DNRC)



Introduction

Aerial Detection Survey



Blowdown in Stillwater State Forest

Montana's diverse landscape includes approximately 26 million acres of forested land, most of which is located west of the continental divide. Forests are primarily composed of Douglas-fir, ponderosa pine, and lodgepole pine with smaller components of western larch, true fir species and spruce. Forest health issues commonly ebb and flow as populations of pests outbreak in response to triggering events such as storms, wildfire and drought.

Multiple decades of drought conditions have had a cumulative impact on Montana trees, leaving forests less resilient to common insects and diseases. A heat wave in 2021, coupled with the prolonged drought, triggered notable tree decline into 2022 and prompted a variety of symptoms including stunted growth, wilted tops and increased susceptibility to insects and diseases. Spruce trees in a diversity of planted and forested settings were observed with drooping crowns (top 8 feet) throughout host range in western MT. Although not conclusive, this symptom is presumably associated with lack of moisture or extreme heat events.

Impacts of drought can manifest in what may initially appear to be an insect or disease outbreak, yet the actual stressor is the underlying lack of moisture. This complex is particularly common with bark beetles and wood borers attacking trees that are otherwise stressed. Trees can survive with disease infection as well, but begin to succumb when overall tree vigor is compromised by drought.



Fire in the Pioneers



Spruce affected by drought

The USDA Forest Service conducts an annual Aerial Detection Survey (ADS) which provides information about the location and severity of forest health issues across the country. In 2022, approximately 27 million acres were surveyed in Montana which is nearly double the acreage surveyed in the previous two years, representing a return to pre-COVID survey levels. Of the acres surveyed in 2022, 12 million acres were surveyed in both 2021 and in 2022. Although aerial detection surveys are focused on forested, western regions of the state and on federally-owned land, diseases and insects are present and important in all forested areas. Some agents (such as root disease, dwarf mistletoes and rusts) are difficult to discern from the air and are generally underestimated in the data.

Tree damage is not always contiguous on the landscape and therefore surveyors must account for this patchy distribution. Each surveyor has their own technique; some record damage in smaller patches with high severity damage ratings and others may record a large patch with a lesser severity damage rating. Both methods are correct, but the footprint of total acres damaged may be inflated if the range of severity is not taken into account. To adjust for these potential discrepancies, damaged acres are consolidated and converted into a high severity category labeled "severity-weighted acres" (SWA).

Data for this report was derived from aerial and ground-based observations.

Montana Forest Damage Agents 2022

Damage Agent	Acres Mapped	SWA
Douglas-fir Beetle	41,749	7,794
Mountain Pine Beetle	12,105	2,694
Pine Engraver Beetles (Ips)	2,323	1,088
Western Pine Beetle	42	5
Fir Engraver	6,945	636
Spruce Beetle	67	6
Western Spruce Budworm	34,288	23,611
Douglas-fir Tussock Moth	279	261
Scale Insects	462	427
Larch Looper	126	116
Larch Casebearer	181	90
Unknown Defoliator	1,155	480
Subalpine Fir Decline	18,857	2,572
Larch Needle Disease	17,090	4,262
Balsam Woolly Adelgid	1,611	1,409
White Pine Blister Rust	1,057	108
Lophodermella Needle Cast of Pines	695	371
Marssonina Blight	299	299
Drought	8,867	4,762
Wind	1,324	617
Flooding	4,772	1,583

Cooperative Forest Health Monitoring Interagency Program

Northern Region Aerial Detection Survey Data and Products for the 2022 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

[2022 ADS Data - Geodatabase and Shapefiles](#) | [R1 ADS 2022 FinalDataset.gdb](#)

[2022 ADS Printable Damage Quad Maps](#) | [R1 ADS 2022 Damage QuadMaps](#)

[Historical Analysis Toolbox \(HAT\)](#) | [Historical Analysis Toolbox Download](#)

For Further Information or Support, Please Contact:

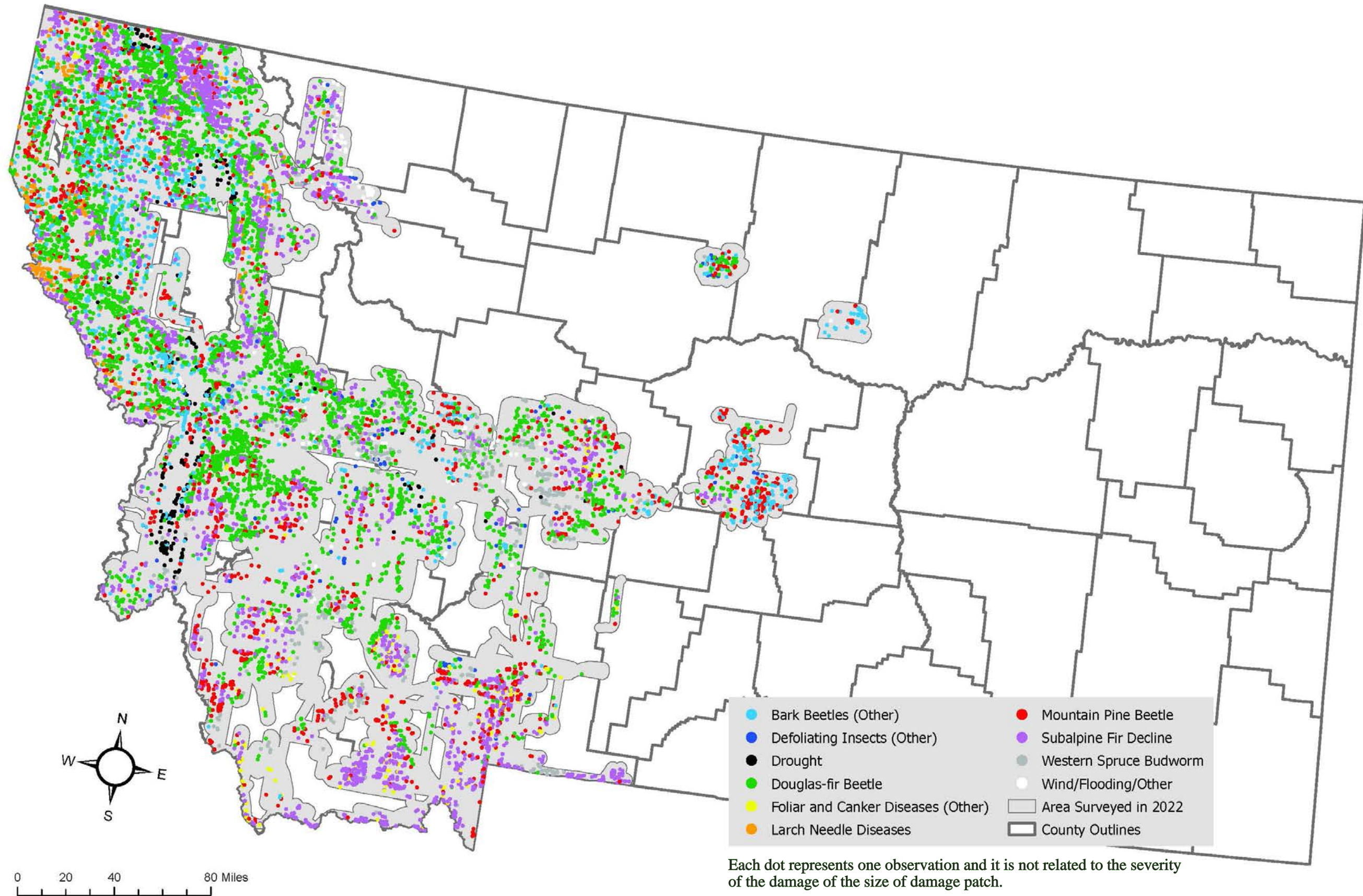
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Aerial Detection Survey's Map



Each dot represents one observation and it is not related to the severity of the damage or the size of damage patch.

Map produced by USDA Forest Service, Forest Health Protection.

Bark Beetles

Damage from Douglas-fir beetle, *Dendroctonus pseudotsugae*, was mapped on more 41,000 acres throughout the host range of Douglas-fir. Compared to 2021, acres with Douglas-fir beetle activity steeply declined in some counties: Cascade (-57%), Granite (-59%) Jefferson (-64%). Douglas-fir beetle activity increased substantially in other counties: Flathead (+406%), Lake (+2265%), Lincoln (+134%), Sanders (+91%). Ground surveys in Seeley Lake, Potomac and Ovando indicated populations of Douglas-fir beetle amplifying in fire-injured trees following the 2017 Rice Ridge Fire and expanding into stands of green trees. Outbreaks near Thompson Falls were also precipitated by colonization in fire-scorched trees with spread into surrounding green forests. Numerous, green-infested trees were identified in western Montana indicating that the moist winter and cool, wet spring did not inhibit the ongoing outbreak.

Aerial detection survey detected western pine beetle, *Dendroctonus brevicomis*, on only 42 acres. However, ground surveys in Plains, Missoula, Frenchtown and Eureka revealed abundant western pine beetle presence in trees comprised by drought and other stressors, particularly in stands infested with black pineleaf scale.

Mountain pine beetle, *Dendroctonus ponderosae*, was detected on approximately 12,000 acres at low severity.

Aerial survey noted pine engraver beetles, *Ips* species, on approximately 2300 acres however, outbreaks can be quite localized and associated with specific management activities. Outbreaks notably increased in some counties (Choteau +151%, Flathead +56%, Lewis and Clark +2225%) whereas activity substantially decreased in others (Lincoln -28%, Missoula -61%, Fergus -88%, Lake Co-98%). Blowdown events in early 2021 near Thompson Falls provided host material for rapid expansion of populations and ultimately resulted in green tree mortality and top-kill of mature ponderosa pine.



Patch of Douglas-fir beetle mortality



Ips gallery in pine



Douglas-fir beetle galleries

Secondary Beetles & Wood Borers

Larch engraver, *Scolytus laricis*, was identified in the tops of pole-sized and mature western larch trees near Eureka, in most observed cases associated with trees attacked by Buprestid wood borers (presumably, but not confirmed to be *Pheanops drummondii*).

Wood borers (Cerambycidae and Buprestidae) were active in Douglas-fir and western larch in northwestern Montana, with notable activity near Missoula, Lincoln, Eureka, Whitefish, Kalispell and along Flathead Lake. Differentiation of Douglas-fir beetle and wood borers are not likely from aerial detection survey and therefore ground surveys provided most reliable, albeit anecdotal, information regarding presence and severity of activity. Ground surveys confirmed extensive wood borer outbreaks in western larch near Glen and Murphy Lakes with associated larch engraver presence in the tops of infested trees.

Other secondary beetles in the region include Douglas-fir pole beetle, *Pseudohylesinus nebulosus*, and engraver beetles including *Scolytus unispinosus* and *S. monticolae*.

Wood borers and secondary beetles with observed in pole-sized and mature Douglas-fir near Helena with abundant woodpecker activity on infested trees.



Wood borers in western larch



Secondary engraver beetles in Douglas-fir



Wood borer larvae in larch

Defoliators



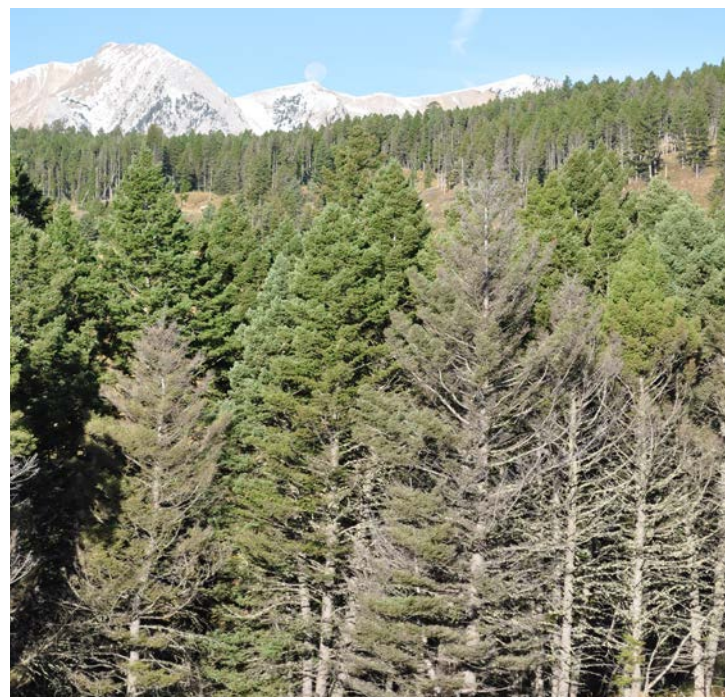
Recovered green ash stand in eastern Montana after years of fall cankerworm defoliation

Green larch looper, *Macaria sexmaculata*, was recorded on 126 acres in Lincoln and Sanders Counties with damage becoming apparent by late August and into September. At the same time, larch needle disease had increased substantially (9-fold from 2021-2022) and likely obscured defoliation from larch looper. Larval sampling indicated low synchrony in larval instars with a later pupation timeframe than currently suggested in the literature. October sampling still included larvae. Larch needle diseases, including *Meria laricis* and *Hypodermella laricis*, were detected on more than 17,000 acres in north-western Montana and were attributed to cool, wet spring conditions.

Moderate to severe intensity outbreaks of larch casebearer, *Coleophora laricella*, were recorded in Lincoln and Sanders Counties. High incidence of larch needle disease in 2022 likely made it difficult to differentiate larch casebearer defoliation.

Douglas-fir tussock moth, *Orgyia pseudotsugata*, declined precipitously throughout the historic outbreak area and no moths of any life stage were detected in 2022. Outbreaks typically last three years and populations declined by 99% from 2020 to 2021.

Western spruce budworm, *Choristoneura freemani*, was mapped on 34,288 acres with concentrated activity near Hebgen Lake, Yellowstone National Park and Custer-Gallatin National Forest. Heavy populations near Stemple Pass (Lewis and Clark County) spilled over into inter-mixed stands of lodgepole pine.



Douglas-fir defoliated by western spruce budworm

Black Pineleaf Scale

High severity black pineleaf scale, *Nuculaspis californica*, caused high severity damage on 192 acres around Phills Lake near Rexford. Black pineleaf scale was also observed from the ground near North Bridge in the area where moderate severity drought was mapped on 160 acres. An outbreak of black pineleaf scale expanded near Woods Gulch Recreation Area near Missoula with western pine beetle further contributing to mortality of infested trees.

In 2015, black pineleaf scale was detected on 104 acres in Houle Creek near Frenchtown. As of 2022, severe mortality has occurred across much of the stand including mature ponderosa pine. Ground plots established by USFS in the infestation yielded high mortality rates associated with western pine beetle, mountain pine beetle and pine engraver beetles. The outbreak is estimated to have originated in 2012 and has had pulses of mortality, especially during the hot, dry summer of 2017.



black pineleaf needle scale



Ponderosa pine stand impacted by black pineleaf scale

Diseases in Ponderosa Pine

Diplodia, *Diplodia pinea*, and western gall rust, *Endocronartium harknessii*, have been chronic in western Montana, leading to branch flagging throughout crowns of ponderosa pine. A localized, severe outbreak of Diplodia was triggered by a hailstorm in July near the northeastern shore of Flathead Lake and spanned across Woods Bay, Bigfork and Echo Lake, with many ponderosa pine suddenly cast in bright orange. Outbreaks are common when hail creates wounds that allow latent Diplodia infections to become symptomatic. Diplodia does not typically kill the entire tree unless stressed by other factors such as drought or bark beetles. Drought also exacerbates western gall rust impacts and may have contributed to the observed decline of heavily infected mature ponderosa pines in the region.

A July hailstorm in Bigfork, MT resulted in a localized but severe outbreak of Diplodia tip and shoot blight in ponderosa pine trees in the area. Diplodia is a fungal pathogen that causes the formation of resinous cankers on pine trees, often causing death of needles and branches. It does not often cause the death of entire trees unless the tree is stressed by other factors such as drought or other insect and disease issues. Outbreaks of Diplodia are common following hail when the wounds caused by the hail stress the tree and allow a latent Diplodia infection to become symptomatic. The hail wounds may also serve as entry points for the fungus into older shoots.



Sporulating western gall rust on pine.jpg



Diplodia outbreak in Bigfork, MT

Root Disease

Root diseases are one of the most important causes of mortality and decline in Montana forests, but because the actual root disease pathogen is primarily underground and the above-ground symptoms can be subtle, the true extent is nearly impossible to detect from aerial detection survey. Therefore, ground observations are most useful in assessing presence and impact on individual stands. The most damaging root diseases in Montana are Armillaria root disease, Schweinitzii root and butt rot of conifers, Heterobasidion root disease (both pine and fir types), Laminated root disease, and Tomentosus root disease.

Bark beetles, particularly Douglas-fir beetle and fir engraver, commonly attack trees that are infected with root disease. Root diseases can interact with drought to make trees more susceptible to bark



Schweinitzii cubicle rot and clubbed root



Laminated root disease in Douglas-fir



Laminated root disease in Douglas-fir

Invasive Species

Ongoing balsam woolly adelgid, *Adelges piceae*, surveys were conducted in the Big Hole Valley near the Idaho border and near Kings Hill with no new populations detected. As of 2022, BWA is only known to be present in the following Montana Counties: Broadwater, Flathead, Gallatin, Granite, Lewis and Clark, Lincoln, Mineral, Missoula, Ravalli and Sanders.

Three adult male spongy moths, *Lymantria dispar*, were collected from pheromone-baited traps. Positive confirmations were from Glacier National Park and the Custer-Gallatin National Forest. Delimitation surveys from a positive moth capture near Lewistown in 2021 yielded no additional moths of any life stage and therefore, spongy moth was not considered as an established pest in Fergus County.

Whitebark pine was listed as “Threatened” by the US Fish and Wildlife Service. White pine blister rust, *Cronartium ribicola*, 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 whitebark pine, limber pine and western white pine.



Subalpine fir



White pine blister rust canker on limber pine



Mature whitebark pine

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