FOREST HEALTH HIGHLIGHTS

The Montana Department of
Natural Resources
& Conservation

2024

FORESTRY & TRUST LANDS DIVISION
FOREST PEST MANAGEMENT

Introduction

Dead lodgepole with evidence of woodborer activity; Chief Joseph Pass. Photo: Rose Picklo

Over the ages, Montana's expansive forests have been shaped by glaciers, fires, railroads, harvesting, storms, and, not least of all, insects and diseases. Diverse forests cover nearly 25 million acres across the state, varying from gnarly trees surviving harsh alpine climates, to densely shaded timbers carpeting mountains and valleys, to pine savannahs of the plains. All of these forests, in all of their forms, are host to insects and diseases.

Many of the forests we appreciate today developed under wetter growing seasons occurring during the 1950s-1990s. Combined with fire exclusion, these conditions promoted mesic-adapted species like Douglas-fir, grand fir, and cedar, and fostered woody encroachment into prairie and pasture.

The wetter period has recently shifted to drier conditions that are lasting decades. Trees well-suited for past conditions are now contending with rising temperatures and lack of precipitation. Even during years when snowpacks are near-normal, high temperatures lasting into late summer can severely hinder tree vigor. Moisture-stressed trees are less able to defend themselves against insect attacks and diseases, which can be more aggressive and pathogenic.

This phenomenon is apparent in current conditions across Montana, particularly in the western portion of the state. Bark beetles and wood borers that are not typically aggressive have been attacking trees stressed by ongoing drought or scorched during the "Heat Dome" of 2021. Chronic defoliators such as western spruce budworm are severely damaging and, in some cases, killing trees compromised by ongoing defoliation. Grand fir and spruce that established during the wetter years are browning out across their host range.

Invasive species also play a significant, largely irreversible role in forest ecology. White pine blister rust has altered the presence of all five-needle pines in Montana: whitebark pine, limber pine, and western white pine. Interagency efforts are constantly underway to detect novel species that threaten Montana's forested landscapes and shaded communities.

The annual Forest Health Highlights offers a snapshot of forest conditions across Montana in 2024. Data is comprised of aerial detection surveys conducted by the USDA Forest Service Aerial Detection Survey Program along with ground-based observations and surveys conducted by Montana DNRC personnel and partners.

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Aerial Detection Survey

The 2024 Aerial Detection Survey (ADS) conducted by the USDA Forest Service encompassed approximately 70% of Montana's forested lands. Aerial surveys were conducted using fixed-wing aircraft, with observers recording damage across diverse land ownerships. The resulting data revealed a broad spectrum of damage severities across the landscape, characterized by contiguous areas of damage in some regions and patchy distributions in others. To account for variation in damage severity, acres were consolidated into a single polygon of high severity and indicated as "acres damaged."

Survey efforts focused on western Montana, but insects and diseases are present and significant statewide. Certain pathogens such as root disease, mistletoes, and rusts, are challenging to detect via aerial surveys, leading to potential underestimation. This report integrates data from aerial and ground-based observations, supplemented by information from the USDA Pest Event Recorder for the Northern Region.

MONTANA FOREST DAMAGE AGENTS 2024

Damage Agent	Acres Mapped	Acres Damaged
Western Spruce Budworm	54,810	47,211
Douglas-fir Beetle	37,734	5,628
Mountain Pine Beetle	15,849	2,431
Subalpine Fir Decline	14,328	2,084
Fir Engraver	8,500	963
Larch Needle Diseases	8,163	5,850
Windthrow	5,510	2,811
White Pine Blister Rust	2,720	309
Drought	2,522	1,561
Black Pineleaf Scale	2,476	1,088
Ips Engraver Beetles	1,809	390
Scale Insects	1,787	1,043
Lophodermella Needle Cast	1,717	1,584
Unknown Defoliator	602	330
Balsam Woolly Adelgid	480	113
Western Pine Beetle	387	36
Larch Casebearer	386	200
Spruce Beetle	46	6

Cooperative Forest Health Monitoring Interagency Program
Northern Region Aerial Detection Survey Data and Products for the 2024 Survey Season

External (Non USFS) access to data and products: Box (Pinyon) 2024 ADS Data
For access to Box-linked data and products, please contact Jeff Kaiden at Jeffrey.Kaiden@usda.gov.

2024 ADS Data - Geodatabase and Shapefiles R1_ADS_2024
2024 ADS Printable Damage Quad Maps R1_ADS_2024 Damage QuadMaps
Historical Analysis Toolbox (HAT) Historical Analysis Toolbox Download for ArcPro

For further information or support, please contact:

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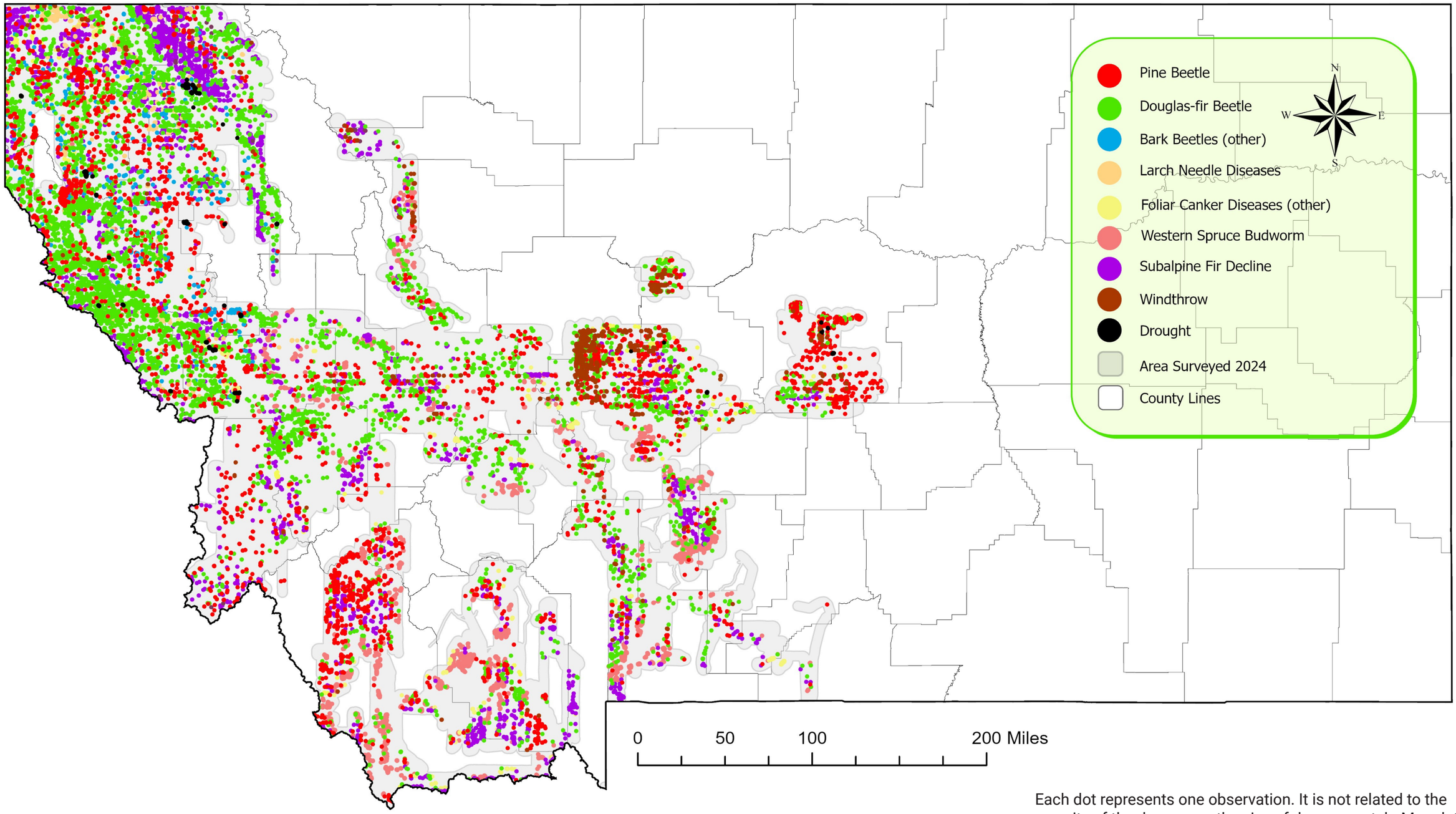
Aerial Detection Survey Map



Each dot represents one observation. 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 Protection.

Bark Beetles

Bark beetles live and reproduce underneath the bark of host trees. While bark beetles attack and kill healthy trees, trees that are stressed due to biotic and/or abiotic factors, such as drought, are less able to successfully defend themselves against bark beetle attacks.

Douglas-fir beetle, *Dendroctonus pseudotsugae*, was identified on over 18,000 acres in 2024. High severity damage was mapped north of Eureka and Kootenai Falls (Lincoln County); on the northwest side of the Hungry Horse Reservoir (Flathead County); in the Lyons Gulch/ Water Hill area (Sanders County); and north of St. Regis (Mineral County). Larger but less severe pockets of mortality were mapped in the Bilk Gulch area (Powell County), around Quigg Peak (Granite County), and just east of the Little Belts (Judith Basin County).

Damage from mountain pine beetle, *Dendroctonus ponderosae*, was mapped on 7,854 acres in 2024. Larger pockets of moderate to severe damage were identified primarily in Lincoln and northern Sanders counties, particularly around Lost Buck Pass and Baree Mountain. Severe damage was also mapped in the Big Belts, south of Diamond City (Broadwater County).

Douglas-fir beetle galleries. Photo: Jacob Chadwell

Western pine beetle, *Dendroctonus brevicomis*, continued to have minimal impact on ponderosa pine in Montana. Damage was mapped on 63 acres in 2024. Mortality was light; the largest area affected was 12 acres, located slightly southwest of Greenough (Missoula County). In 2023, a localized outbreak was reported near Flathead Valley Community College; no subsequent damage was observed during aerial detection in 2024. On-the-ground reports from the Bitterroot Valley identified western pine beetle activity in large areas with declining ponderosa.

Ips galleries. Photo: Rose Picklo

Ips species (also known as pine engraver beetles) are a secondary pest that cause top kill and can cause mortality. In 2024, damage from Ips was mapped on 756 acres. Approximately 20 acres of severe mortality occurred southwest of Smith River State Park (Meagher County) with larger, lighter pockets of damage spotted in near Blacktail Creek (Fergus County). However, the majority of Ips damage reported occurred in Flathead, Lake, Sanders, Mineral, and Missoula Counties.

Fir engraver, *Scolytus ventralis*, is primarily a pest of grand fir in Montana, although it can occasionally attack subalpine fir. Fir engraver damage was mapped on 1,714 acres in 2024. These beetles infest both standing trees as well as freshly downed logs. Unlike other bark beetles, it is possible for the beetle to infest a portion of the bole but not kill their host (known as strip attacks). Fir engraver can also cause top dieback in smaller trees, which was observed in the Swan Valley by DNRC service foresters. Drought-stressed or diseased grand fir are less able to defend themselves against fir engraver beetles; the presence of fir engraver is a solid indicator of stressors, especially drought and/or root disease. Damage was concentrated in the northwestern portion of the state, consistent with the beetle's historic range. Severe damage was mapped near Brush Creek (140 acres; Lincoln County), Canyon Peak (34 acres; Sanders County), and northeast of Weeksville (5 acres; Sanders County). Large pockets of light to moderate damage occurred east of Baree Mountain (Lincoln County), east of Flathead Lake along Birch Creek (Lake County), and west of Schley (Missoula County).

Other secondary bark beetles include Douglas-fir pole beetle, *Pseudohylesinus nebulosus*, and Douglas-fir engravers, *Scolytus unispinosus* and *Scolytus monticolae*. These secondary beetles typically colonize smaller-diameter Douglas-fir and/or Douglas-fir that are weakened or suppressed. Larch engraver, *Scolytus laricis*, activity increased in 2023 in Lolo National Forest at lower elevations; no further observations documented in 2024.

Pine sawyers. Photo: Dan McConnell

Wood Borers

Unlike bark beetles, wood borers typically attack trees that are compromised. Drought combined with other stressors (such as other insects and disease) can increase susceptibility of host trees to wood borers. Damage from wood borers is challenging to assess from the air, as it presents similarly to bark beetle damage in the canopy. However, woodborers have much larger galleries and exit holes, which can be easily distinguished from the ground. Foresters reported high levels of wood borer activity in all host species near Missoula and Kalispell, with high levels of flatheaded wood borer in Douglas-fir near Finley Point (Lake County). In 2024, wood borer activity was documented throughout western Montana.

Defoliators

Although defoliation typically does not cause mortality in a single season, repeated defoliation events interrupt photosynthesis and starve trees of nutrients over time, resulting in death.

Douglas-fir tussock moth damage. Photo: Amy Gannon

Western spruce budworm, *Choristoneura freemani*, feeds on the needles of Engelmann spruce, Douglas-fir, subalpine fir, and grand fir. Defoliation was mapped on 44,916 acres throughout southwestern and central Montana in 2024. Hundreds of acres of severe damage were mapped just south of the Crazy Mountains, near Tobin Creek and in the Custer-Gallatin National Forest, near Mill Creek (Park County); along Smith Creek (Meagher County); south of the Tobacco Roots, scattered through the Ruby Range, and in the northwestern part of the Gravelly Range (Madison County). Spillover into lodgepole pine was reported in western Lewis and Clark County and in the Maxville region of the Beaverhead-Deerlodge National Forests.

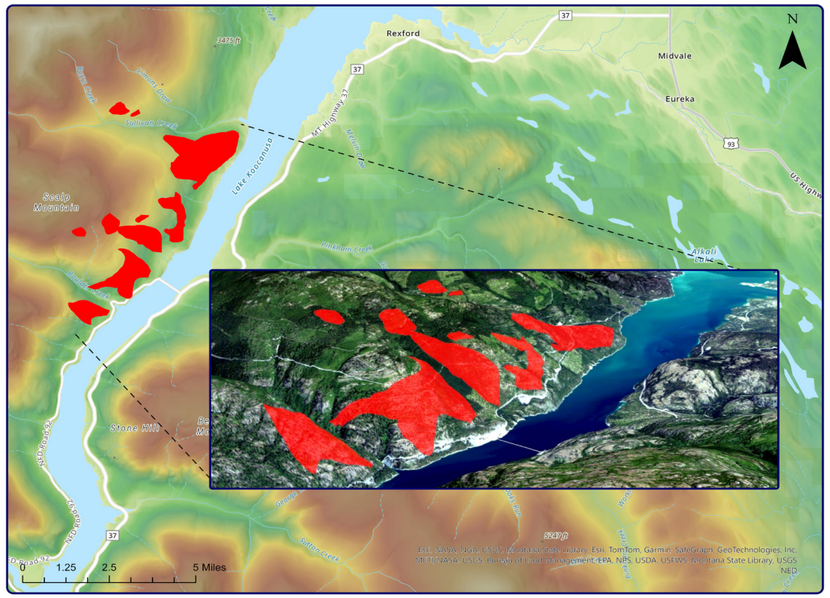
Douglas-fir tussock moth, *Orgyia pseudotsugata*, is a pest of Douglas-fir. Damage from this defoliator greatly decreased in 2024. On-the-ground reports identified larch looper, *Semiothisa sexmaculata*, activity in western larch near Lake Kookanusa. This native moth is a chronic defoliator of seed orchards. No new outbreaks of pine tussock moth, *Dasychira grisefacta*, were reported in 2024, and a recent outbreak near Miles City has reportedly subsided.

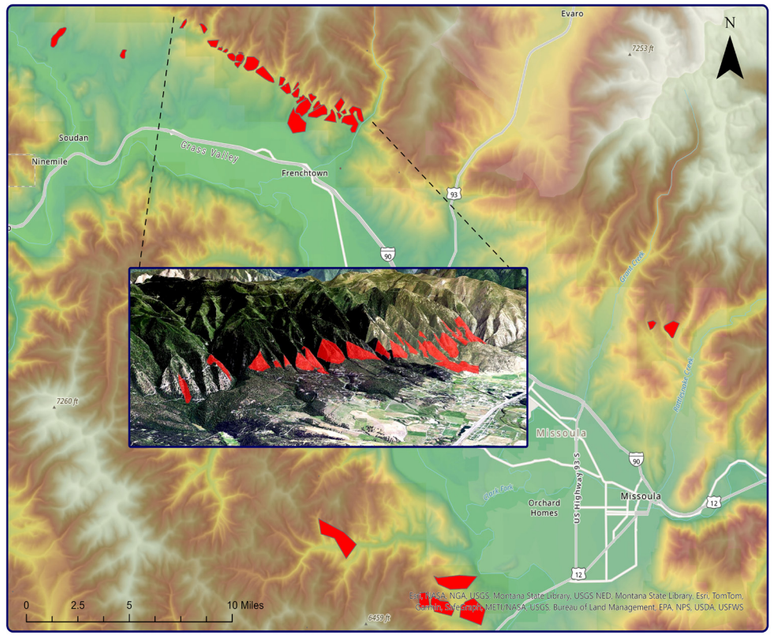
Black Pineleaf Scale

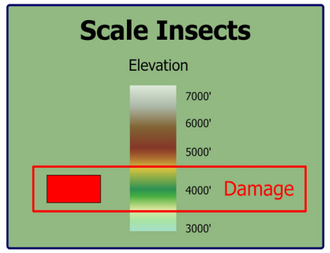
Black pineleaf scale, *Nuculaspis californica*, was identified on 2,476 acres in 2024. Black pineleaf scale infests pine needles, resulting in yellowed, thinned crowns. Over time, heavy infestations can result in mortality. Conditions that negatively impact tree health, such as ongoing drought, are associated with black pineleaf scale outbreaks. However, given the unprecedented nature of the current outbreak, it is unclear how strong a role drought is playing compared to other potential factors. Damage consistently occurred between 3,500-4,500 feet in elevation, i.e., within the inversion zone (see maps). Additional damage may be present in unmapped areas.

Black pineleaf scale. Photo: Alexis Armstrong, DNRC

Near Rexford, approximately 1,400 acres of moderate to high severity damage was mapped on the western side of Lake Koocanusa (Lincoln County).







Damage due to scale was heaviest near Frenchtown, with high severity damage occurring between Six Mile Creek and Mill Creek Road; lighter damage was mapped west of Missoula, near Hayes Creek and O'Brien Creek, as well as in the Sawmill Gulch area (Missoula County).

Ponderosa Pine Diseases

Diplodia in ponderosa. Photo: Shawn Morgan

The fungal pathogens elytroderma, diplodia shoot and tip blight, and western gall rust infect ponderosa pine. These common, chronic diseases can cause shoot and branch dieback, as well as broom-like deformities in the case of elytroderma. This dieback presents as patches of orange, dead needles. It is not uncommon for a ponderosa to be affected by more than one of these diseases at the same time. The effects of chronic diseases like elytroderma, diplodia, and western gall rust can be exacerbated under stress conditions (e.g. drought).

Elytroderma, *Elytroderma deformans*, is present on ponderosa throughout much of western Montana. This needle cast pathogen heavily infects the lower crown, especially in areas with an abundance of moisture and densely-packed ponderosa. Present throughout western Montana, elytroderma was reported in the Bitterroot (Ravalli County) and around Polson (Lake County).

Diplodia shoot and tip blight, *Diplodia pinea*, stunts new shoots and primarily causes branch dieback, although in cases of extreme stress may cause mortality. Infections can remain latent until triggered by environmental stresses, such as drought or hail. Common in western Montana, diplodia was reported in Fergus, Lake, Missoula, Sanders, and Ravalli Counties.

Western gall rust, *Endocronartium harknessii,* can infect lodgepole and ponderosa pines. The pathogen causes galls to form on branches, resulting in death, and forms "hip cankers" when located in the main stem, compromising the structural integrity of the tree. Sporulating galls (pictured) are orange in spring and early summer. Western gall rust is chronic in western Montana and was reported in Powell, Lake, and Missoula Counties and throughout the Bitterroots.

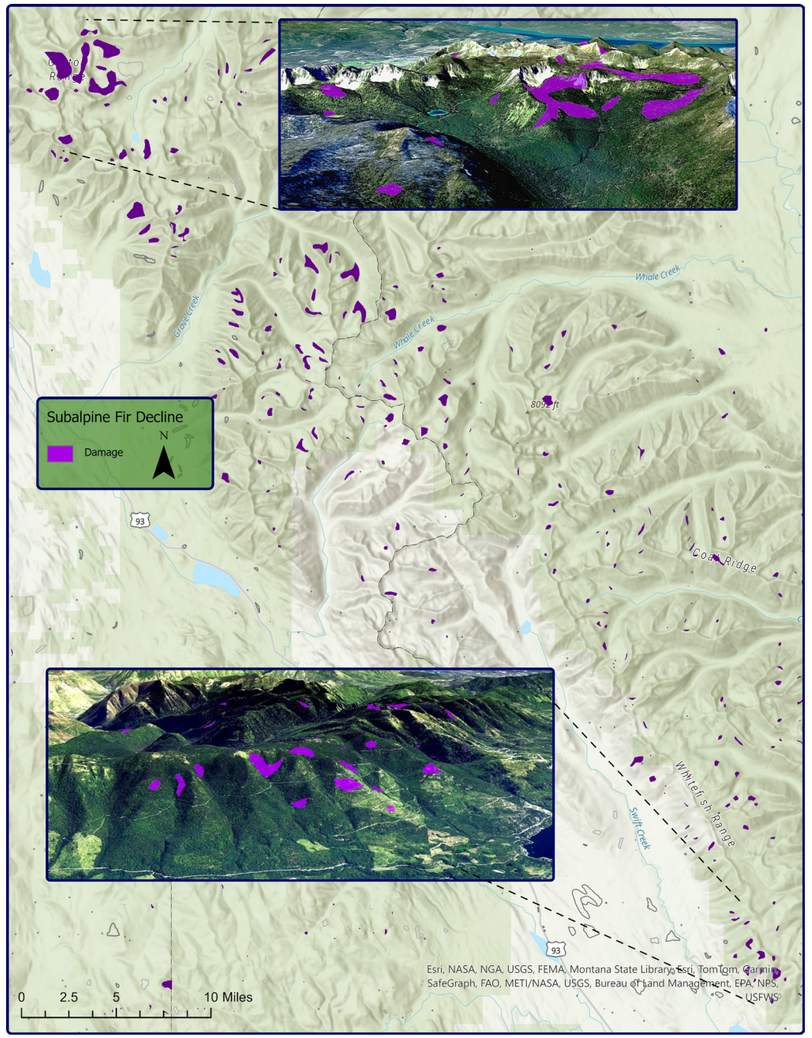
Western Gall Rust. Photo: Emma Merdovic

Larch needle blight. Photo: Jacob Chadwell

Larch Needle Diseases

Larch needle diseases were mapped on slightly more than 8,000 acres in 2024, down considerably from 2023. Damage was concentrated primarily in northwestern Lincoln County, along the Yaak River with approximately 2,700 acres impacted. Activity has declined in Stillwater State Forest compared to years past, with only about 50 acres mapped. Approximately 740 acres of high-severity damage was recorded north and east of Sanders Mountain, along the Hand Creek drainage.

Fir Decline



Subalpine fir

Subalpine fir decline was mapped on 12,500 acres in 2024. Damage was concentrated in the Whitefish and Galton Ranges (Flathead and Lincoln Counties), with large, moderate-severity damage mapped in the Salish Mountains (Lincoln County), Helena-Lewis & Clark National Forest near Nevada Creek (Lewis & Clark County), east of Ennis Lake in the Madison Range (Madison County), and south of Lima Reservoir, east of Monida (Beaverhead County). Smaller pockets (under 15 acres) of high-severity damage were mapped in the Pioneer Mountains (Beaverhead County), the Tobacco Roots (Madison County), and near Bald Butte in Helena-Lewis & Clark National Forest (Lewis and Clark County).

Subalpine fir decline in the Whitefish and Galton ranges. Approximately 884 acres of damage pictured.

Grand fir

Mortality and defoliation in drought-affected grand fir were mapped on 715 acres on the Stillwater State Forest (Flathead County). Lack of available moisture (drought) and hotter temperatures can severely compromise tree vigor, particularly in overcrowded stands where competition for resources is intensified and exacerbating factors such as root disease are present. Under these conditions, grand fir is more susceptible to secondary insect pests, such as the fir engraver, *Scolytus ventralis*. DNRC unit offices in the northwest part of the state (Libby, Plains, and Swan) reported multiple events of declining grand fir.

Declining grand fir near Plains. Photo: Nathan Cole

Root Disease

Root disease is a common and persistent mortality agent in Montana's forests. Aerial detection surveys cannot capture the extent of root disease because the pathogenic fungi that cause root disease are found below ground. Root diseases spread tree to tree through the roots, resulting in pockets of mortality. Common root disease fungi in Montana include *Armillaria*, *Heterobasidion*, *Schweinitzii* root and butt rot, *Tomentosus*, and laminated root disease. Once present in a stand, root diseases cannot be eradicated and the pocket of mortality will slowly expand over time. Prevalence of root disease has increased due to ingrowth of shade-tolerant species. Shifting species composition towards less susceptible species is recommended for stands with root disease. Additionally, trees impacted by root disease have increased susceptibility to bark beetle attack, which is compounded by environmental conditions such as drought. Depending on how advanced the disease is within the tree, structural integrity of the trunk may be compromised.

Armillaria on Douglas-fir. The white, latex-like mycelial fan is typical of this pathogen. Photo: Amy Gannon

Weather Events

Weather events play a significant role in forest health. Downed trees can serve as brood habitat and promote development of bark beetle populations, triggering outbreaks. Shallow-rooted trees, particularly lodgepole and spruce, are especially susceptible to windthrow. In late November 2024, a wet snowstorm in northwest Montana caused bending and snapping of saplings as well as large, old trees. Damage was concentrated from Eureka (Lincoln County) down to Whitefish, Columbia Falls, Polebridge, and West Glacier (Flathead County). In May 2024, a severe blowdown event occurred in the Little Belts, south of Great Falls (Cascade County). In late July 2024, a storm with hurricane-force winds uprooted urban spruce trees and caused significant damage to boulevard trees in Missoula (Missoula County).

Tree breakage in the Flathead. Photo: Holly McKenzie

Breakage from heavy, wet snow can provide brood habitat for bark beetles. Similarly, hail damage can also facilitate fungal infections.

Invasive Species

In 2024, there was a single positive trap catch of spongy moth, *Lymantria dispar*, at the Basin Campground (Carbon County) near Red Lodge. An egg mass survey was conducted and yielded no egg masses, but additional delimitation (grid) surveys will be conducted in 2025. A delimitation survey was conducted in 2024 around the Sha-Ron boat launch in Missoula (Missoula County) following a single positive detection in 2023. No additional moths were detected in Missoula in 2024, indicating that a population has not established.

Spongy moth larva. Photo: Bill McNee, WI DNR

Emerald ash borer. Photo: Laurie Kerzicnik, USFS-FHP

Limber pine survey, Haystack Butte. Photo: Rose Picklo

As of 2024, emerald ash borer, *Agrilus planipennis*, has not been detected in Montana. Although emerald ash borer was recently detected in North Dakota, the greatest threats to Montana forests are insects that are inadvertently transported in firewood.

White pine blister rust, *Cronartium ribicola,* was introduced to North America around 1900. The fungus infects five-needle pines such as limber, whitebark, and western white pine. White pine blister rust has been a major factor along with mountain pine beetle in the decline of the threatened whitebark. An ongoing assessment of limber pine along the Rocky Mountain Front was initiated in 2017-2018. Sites were remeasured in 2024 to determine the pace and extent of damage to limber pine stands, with plans to continue monitoring in 2025.

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