2023

Cooperative Agricultural Pest Survey Report

MONTANA
DEPARTMENT OF
AGRICULTURE
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Cover photo: A Brown Marmorated Stinkbug landing on a lure on a sticky trap in Missoula. Photo by Carson Thomas.

INTRODUCTION TO THE CAPS PROGRAM

The Cooperative Agricultural Pest Survey (CAPS) program conducts science-based national and state surveys targeted at specific exotic plant pests, diseases, and weeds identified as threats to U.S. agriculture and/or the environment. These activities are accomplished primarily under USDA funding that is provided through cooperative agreements with state departments of agriculture, universities, and other entities. Surveys conducted through the CAPS Program represent a second line of defense against the entry of harmful plant pests and weeds. These surveys enable the program to target high-risk hosts and commodities, gather data about pests specific to a commodity, and establish better baseline data about pests that were recently introduced in the United States. The mission of the CAPS program is to provide a survey profile of exotic plant pests in the United States deemed to be of regulatory significance through early detection and surveillance activities.

The Cooperative Agricultural Pest Survey is a nationwide survey effort initiated by the USDA Animal Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ), to detect and/or monitor the spread of invasive plant pests. To achieve this goal, the USDA APHIS PPQ enlists the assistance of state cooperators. In Montana, state cooperators are coordinated through the Montana Department of Agriculture (MDA), and include not only the Department of Agriculture, but also Montana State University, the Montana Department of Natural Resources and Conservation, USDA Forest Service, and others.

CAPS Program Internet Resources

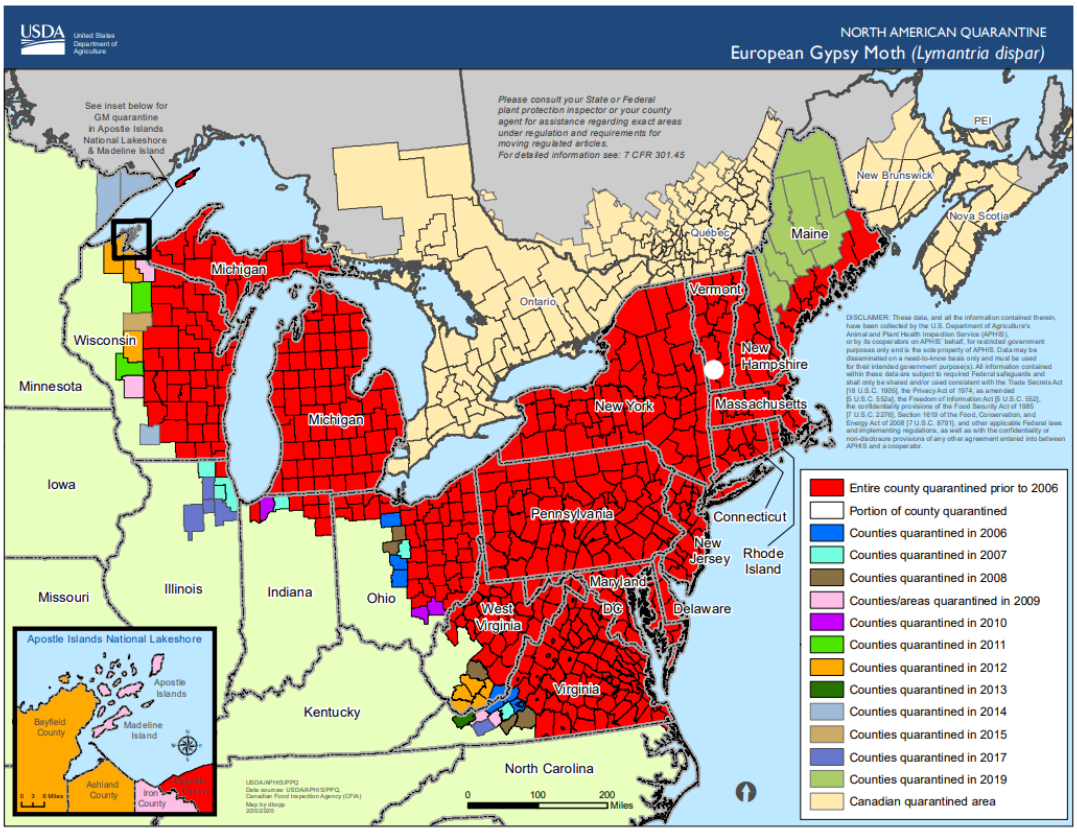
CAPS Website: https://caps.ceris.purdue.edu/home

National Agricultural Pest Information System (NAPIS): http://pest.ceris.purdue.edu/

Hungry Pests: http://www.hungrypests.com/

Montana Wood Boring Insect Project: http://mtent.org/projects/woodboring/index.html

SPONGY MOTH DETECTION SURVEY
Lymantria dispar (L.)



http://www.aphis.usda.gov/plant_health/plant_pest_info/gypsy_moth/downloads/gypmoth.pdf

The European strain of the Spongy Moth (SM) (formerly Gypsy Moth) (*Lymantria dispar* (L.)) was initially introduced into the eastern United States in the mid-1800s. It established rapidly and became a serious defoliating forest pest. Over 500 susceptible host plants have been identified. Most are deciduous trees and shrubs, but older SM larvae will also consume pine and spruce. In Montana, aspen and western larch are of particular importance as potential native tree host of the SM, especially in the western half of the state. Most landscape plants, urban trees and shrubs throughout the state would also be subject to SM defoliation.

Females of the European strain are flightless but crawl actively as they seek out oviposition sites. The egg masses are brownish clumps covered with scales and hairs, and have been found on Christmas trees, boats, RVs, outdoor furniture, firewood, and virtually any other object that might be left outdoors in an infested area. They are thus readily transported to new areas by human activity. The SM is the most destructive forest pest in the eastern United States and large areas of the northeastern and midwestern US are under a federal quarantine to prevent the spread of this pest. There are several other sub-species of closely related SMs from Asia that are not known to occur in North America

but are attracted to the same pheromone lure. Asian SM (ASM) pest pressure has increased in recent years due to increased populations in their native range and changes in international shipping logistics.

Male Spongy Moth. Traps are baited with female sex-pheromone lures and only attract males.

There have been several detections of ASM sub-species adults in the Pacific Northwest. In this sub-species, the female moths can fly, and the caterpillars are more likely to feed on coniferous trees. The new common name was recently adopted and follows the French common name for the moth and reflects the spongy nature of the egg casing.

There have been several positive spongy moth traps in Montana counties in recent years: Cascade (1989, 1990), Fergus (2021), Flathead (2019), Gallatin (1988, 2022), Glacier (2001, 2003, 2007, 2008, 2022), Lewis and Clark (1988), Lincoln (2009), Liberty (1992), Missoula (1996), Park (2001), Yellowstone (1993 and 2011). Given the distance between Montana and the quarantined portions of the US and eastern Canada, it is almost certain these introductions were the result of human activity. Additional support for this is that most, if not all, of these counties are major recreational destinations for the entire U.S. Isolated detections result from the movement of egg masses and pupae on contaminated vehicles and equipment or adult moths “hitchhiking” with vehicles or other conveyances. Positive captures over the past three years highlight the need for monitoring, especially since tourist travel has also increased over the same time period.

In Montana, responsibility for the trapping of spongy moths is a multi-agency cooperative effort between the USDA APHIS PPQ, the Montana Department of Agriculture (MDA), the Montana Department of Natural Resources & Conservation (DNRC), and the USDA Forest Service (USDA FS). All traps were placed by early June and checked throughout the summer.

Spongy Moth caterpillar. Via CT Dept. of Energy and Environmental Protection

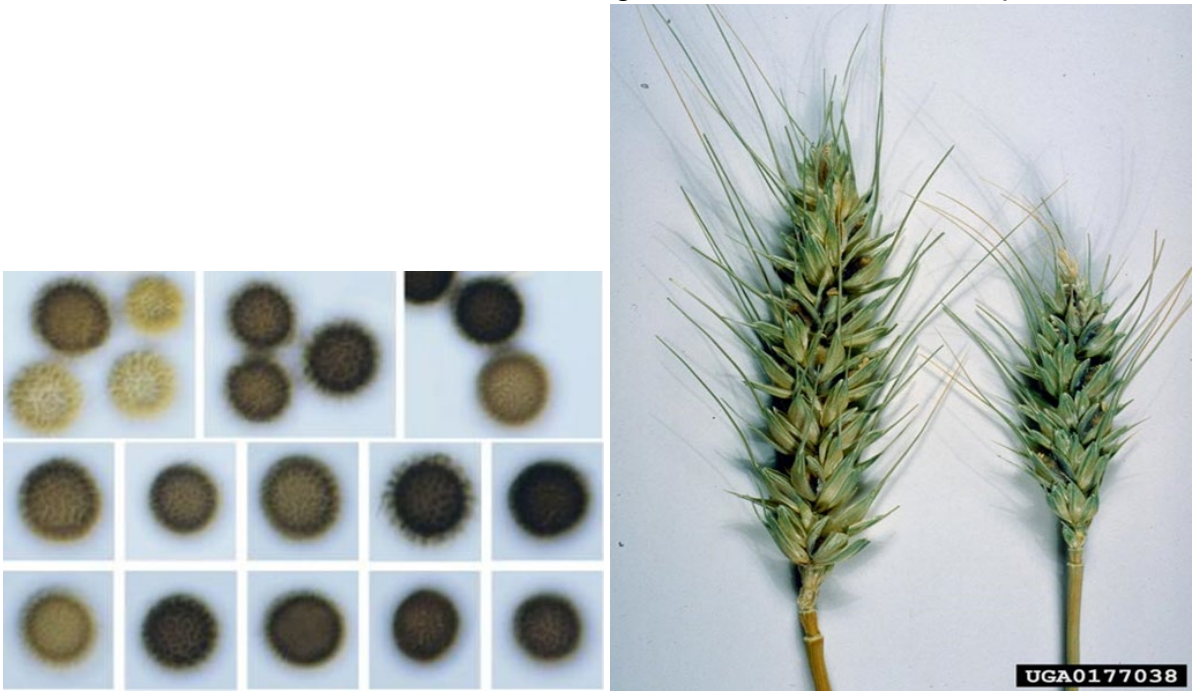
RESULTS: The MDA placed 150 traps in 2023. An additional 805 traps were placed by DNRC, USDA APHIS PPQ, and USFS. Two traps were positive for the presence of SM; one in Gallatin County (USFS) and one east of Missoula (DNRC). Delimitation surveys, conducted by USFS and DNRC, are planned for these locations in 2024. Delimitation surveys of the 2022 Gallatin County and Glacier National Park positive locations yielded no new specimens. No other traps were positive.

KARNAL BUNT DETECTION SURVEY
Tilletia indica Mitra

Karnal bunt (KB) is a fungal disease that affects wheat, durum wheat, and triticale. The disease was discovered near Karnal, India in 1931, hence the name. The first detection of KB in the United States was in Arizona in 1996, in durum wheat seed. Subsequently, the disease was found in portions of Southern California and Texas. The disease has never been detected in Montana field production. KB thrives in cool, moist temperatures as the wheat is starting to head out.

Karnal bunt spores are windborne and can spread through the soil. Spores have the ability to survive within the soil for several years. Grain can also become contaminated through equipment. Therefore, controlling the transportation of contaminated seed is essential in preventing the spread to Montana production areas. In addition, early detection is essential if any type of control or eradication is to be attempted. Montana's participation in the annual Karnal bunt survey is part of the early detection grid set out across the United States.

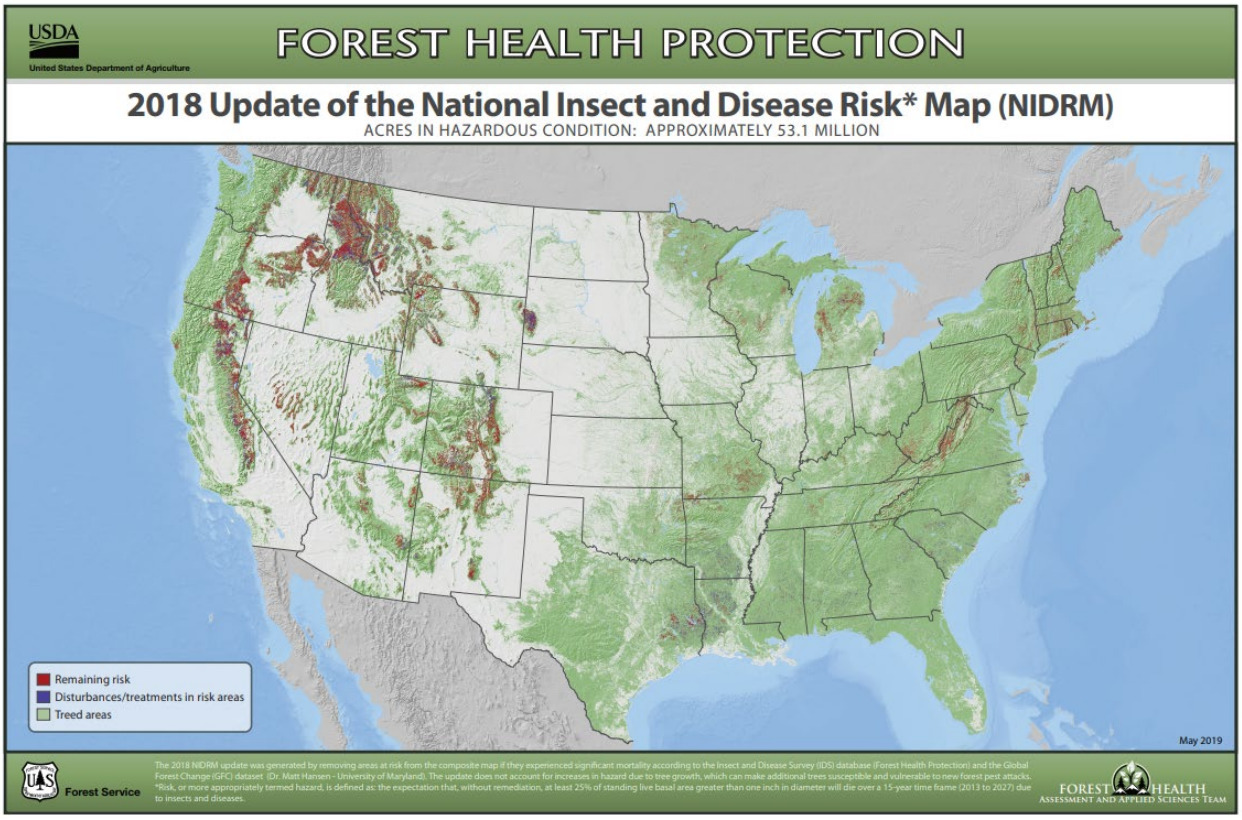
RESULTS: Montana continued to sample for KB during the 2023 harvest. A total of 86 samples were collected from 14 counties across Montana. The APHIS Arizona State Plant Health Director's (SPHD) office Karnal bunt lab conducted the testing. All samples tested negative for the presence of KB. This sampling is critical for wheat growers in Montana. It confirms our wheat is free from KB, ensuring access to international export markets.



(Left) Teliospores of Tilletia indica (Karnal bunt of wheat) showing surface ornamentation patterns. Credit: EPPO. **(Right) Bunted Wheat.** Credit: R. Duran, Washington State University, www.forestryimages.org

FOREST PEST SURVEY
Pest Detection Survey

Forest land occupies an estimated 25.9 million acres in Montana (USDA 2019). Seventy-three percent (18.9 million acres) is publicly owned and under the jurisdiction of federal and state agencies (MT DNRC 2010, USDA 2019). Ecologists recognize 10 different major forest types in Montana. Douglas-fir (*Pseudotsuga menziesi* var. *glauca*), lodgepole pine (*Pinus contorta*), and ponderosa pine (*Pinus ponderosa*) predominate on the forest landscape and are the most commercially important species (MT DNRC 2010). Montana forests provide a wide variety of commercial and recreational benefits that are at risk from both native and invasive forest pests. The Forest Pest Survey is a yearly survey. Exotic beetles of concern to Montana's forests are discussed in the Exotic Woodborer and Bark Beetle Survey section at a latter part of this document.



Pine Sawfly Detection Survey
Diprion pini (L.)

Diprion pini is considered one of the most serious pests of pine in Russia, Ukraine, and Belarus. In Russia, outbreaks usually occur in 3-to-6-year intervals after hot and dry summers (Sharov 1993). Larvae are gregarious feeders and attack the shoots as well as mine the needles from the side. Larvae may also eat the bark of the shoots and may sometimes consume the shoots completely. Sawflies, including *D. pini*, highly prefer pine

stands on infertile and well-drained soils as well as stands that are affected by unfavorable climatic or anthropogenic factors (Augustaitis 2007).

A native sawfly, *Neodiprion* sp. (male), caught in a pine sawfly trap. Photo: I. Foley

RESULTS: 25 pine sawfly traps were placed by MDA in 2023. All traps were negative. However, 17 traps also captured males of native *Neodiprion*, most likely *N. autumnalis*. This sawfly feeds on Poderosa Pine, a common tree where they were captured.

Masson Pine Moth (MPM) Detection Survey

Dendrolimus punctatus Walker, 1855

Masson Pine Moth from Hong Kong, China. © 2019 Young Chan

Dendrolimus punctatus, the Masson pine moth, occurs in China, Japan, Taiwan, and Vietnam. It is one of the most important forest pests in Southeast Asia, and defoliation of pine plantations during larval outbreaks causes signification economic loss. The

primary host is *Pinus massoniana*, but larvae have been recorded feeding on a wide variety of other *Pinus* species. Up to five overlapping generations per year are possible, with fewer generations in northern regions (Gilligan and Passoa 2014a). Because of this potential for serious damage to Montana's pines, the USDA monitors for this pest throughout the state every other year.

RESULTS: 58 Masson pine moth traps were placed by USDA PPQ in 2023. All traps were negative.

Pine Beauty Moth (PBM) Detection Survey

Panolis flammea (Denis & Schiffermüller, 1775)

***Panolis flammea* resting, UK.** © 2011 Malcom Storey

Panolis flammea is a colorful, nocturnal moth in the family Noctuidae native to Europe and Asia (Novak 1976). The species is considered a severe defoliator of *Pinus* species throughout many parts of Europe. Outbreaks in pine plantations in the United Kingdom and Continental Europe have caused damage to thousands of acres and resulted in significant mortality (Gilligan and Passoa 2014b). In the UK, adults are active from March through May. For Montana, lodgepole pines are especially at risk, as *P. flammea* has attacked these trees when planted in Scotland (Bradshaw et al. 1983, Sukovata et al. 2003). Monitoring for this species through CAPS pheromone traps and limiting the potential for establishment helps to ensure that Montana's characteristic pines are protected from possibly severe defoliation and any resulting impacts that could follow.

RESULTS: MDA placed 25 traps in western Montana. Additionally, USDA APHIS placed 58 traps across the state. All traps were negative.

Pine Processionary Moth (PPM) Detection Survey

Thaumetopoea pityocampa (Denis & Schiffermüller, 1775)

***Thaumetopoea pityocampa* in typical resting position.** Photo by Entomart.

Thaumetopoea pityocampa, the Pine Processionary Moth, is a moth in the family Notodontidae native to the Mediterranean (Southern Europe, North Africa, and the Middle East). Larvae in the genus are known to form long lines, or processions, on their way to need feeding locations. The larvae are the main defoliators, feeding upon pine needles, and are a major economic pest of coniferous forests in southern Europe (Bonnet et al. 2008). Additionally, the larvae (caterpillars) are covered in long urticating setae (hairs) that contain a toxin, thaumetopoein. These hairs can lead to severe skin dermatitis and allergic reactions in both people and animals upon contact with the larvae, the nests that the larvae build, or wind-blown loose hairs (Gilligan et al. 2014). Adults are active from May to September.

RESULTS: 25 traps were placed by the MDA in 2022. All traps were negative.

Scots Pine Blister Rust (SPBR) Detection Survey

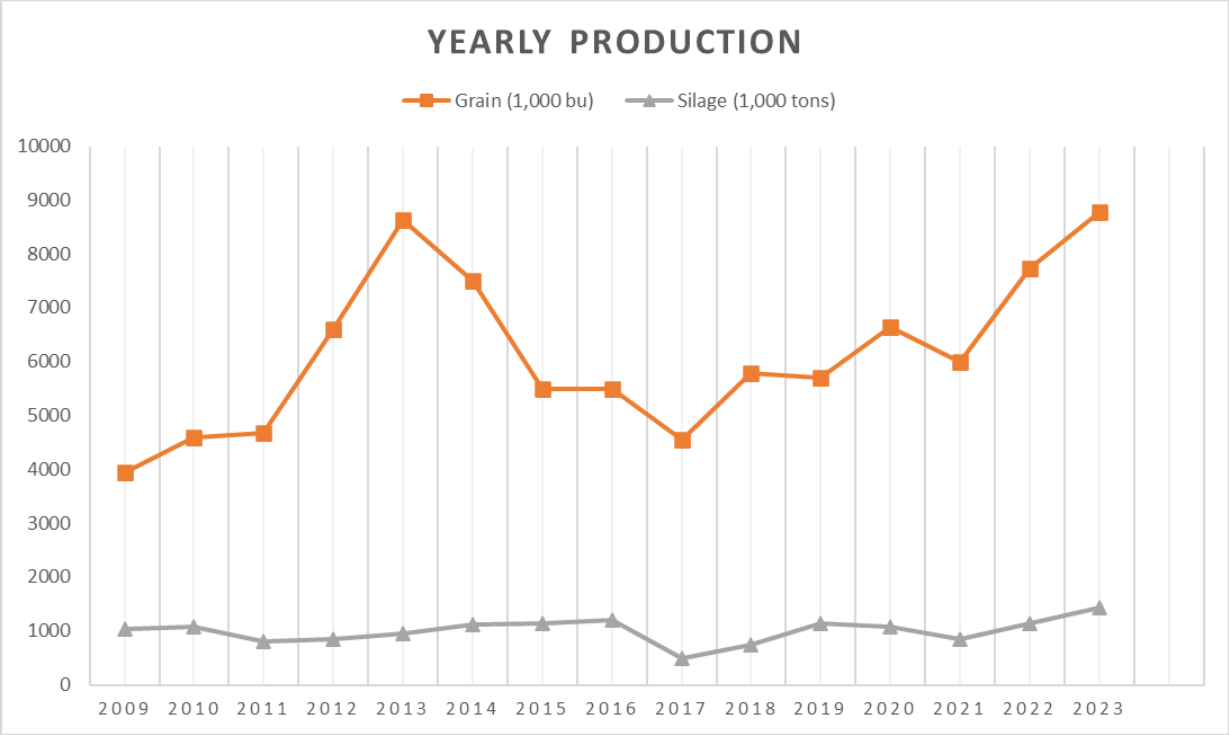
Cronartium flaccidum (Alb. & Schwein.) G. Winter 1880

Scots Pine blister rust (SPBR) is a heteroecious rust fungus native to Europe and Asia. The fungus can cause spotting on needles, and cankers on the stem that produce resin. These cankers can eventually lead to girdling of the stem, resulting in the death of the top or entire tree (Smith et al. 1988). Introduction of this disease to North America could have a major impact on Montana's forests and the health of our ecosystem.

RESULTS: A total of 44 locations were visually surveyed for symptoms of the disease (Pine Detection and EWBB). No symptomatic plants were discovered. All surveys are part of the effort that goes into protecting Montana's forests for the future.

CORN COMMODITY SURVEY
Pest Detection Survey

The United States is the largest producer of corn (*Zea mays*), or maize, in the world. While Montana does not produce as much corn as other states, records of corn production go back to 1879, about 10 years before Montana became a state. Corn is mostly grown in the Yellowstone River Valley, and in Broadwater and Gallatin Counties. Since corn is usually irrigated, the biggest impacts to the amount of corn produced seem to be corn prices. The year 2023 had the highest amount of corn produced for the state since 2009. Due to the importance of Corn for the US Agricultural economy, surveying the state for potential pests serves to protect this important crop.



In 2007, the USDA published guidelines for commodity-based surveys. The idea behind commodity-based surveys is to target export commodities rather than individual pests. Here, multiple survey methods are used to take samples from a single commodity or group of similar commodities over a longer period of time. In the corn survey, MDA used sweep net samples, visual surveys, soil samples for nematodes, and whole plant samples for diseases. This methodology allows the survey to maximize the potential for pest detection and minimize the cost compared to several different surveys for individual pests.

The 2023 Corn Commodity Survey monitored for nine (9) different types of pests and diseases (see table below). This included six (6) insects, two plant diseases, and a nematode. In addition to these nine exotic pests and diseases, other economic nematodes and diseases were monitored for.

RESULTS: During the 2023 Survey, 25 sweep samples were collected. Soil samples for nematode detection analysis were sent to the University of Nebraska Lincoln. No suspect target pests were detected in any of the samples. However, the two moths surveyed for have multiple look-a-likes present in the state, which meant that these had to be dissected to confirm pest absence. These look-a-likes are depicted below.

Whole plant samples were screened for disease by the Schutter Diagnostic lab at Montana State University. No infected plants were detected. Samples that were collected in July were too degraded for analysis, so locations were surveyed again late in the season. Unfortunately, a few locations were already harvested, so a secondary sample was unable to be taken.

Alfalfa Looper Moth, *Autographa californica*. Photo by Frank Etzler.

Celery Looper Moth, *Anagrapha falcifera*. Photo by Frank Etzler.

EXOTIC WOODBORER AND BARK BEETLE (EWBB)
Detection Survey – PPA 7721

Wood boring insects are some of the most dramatically destructive invasive species introduced into the forest and urban landscapes of the United States. These include notorious pests, such as the Asian Longhorned Beetle and the Emerald Ash Borer. Some native wood boring insects, such as the mountain pine beetle, also cause significant damage to Montana's forest resources. However, the threat of exotic wood borers is significant for Montana's agriculture, wood products, tourism, and recreation industries, as these exotic pests are freed from predators and diseases found in their native ranges.

The exotic woodborer and bark beetle (EWBB) survey targets primarily three groups of insects; longhorned beetles (Cerambycidae), bark beetles (Curculionidae: Scolytinae), and wood wasps (Siricidae). Within these groups, six species were specifically targeted in 2023, including Asian Longhorned Beetle and European Spruce Bark Beetle. This survey is conducted by using Lindgren funnels and panel traps baited with various ultra-high release (UHR) ethanols, bark beetle pheromone, and plant volatile lures. Funnel traps also have passive flight intercept capabilities, and the resulting trap catches include many native wood-boring beetles and a range of non-target families. While not specifically targeted, flight intercepts do capture beetles in the family Buprestidae and have the potential to trap exotic buprestids such as the Emerald Ash Borer.

In 2023, Montana State University put out Lidgren funnel traps at 19 locations, two traps at each location. One trap targeted *Ips* bark beetles, while the other one targeted the other species of concern. Additionally, USDA APHIS placed 58 vane traps targeting species in the genus *Tetropium*.

RESULTS: Native species:

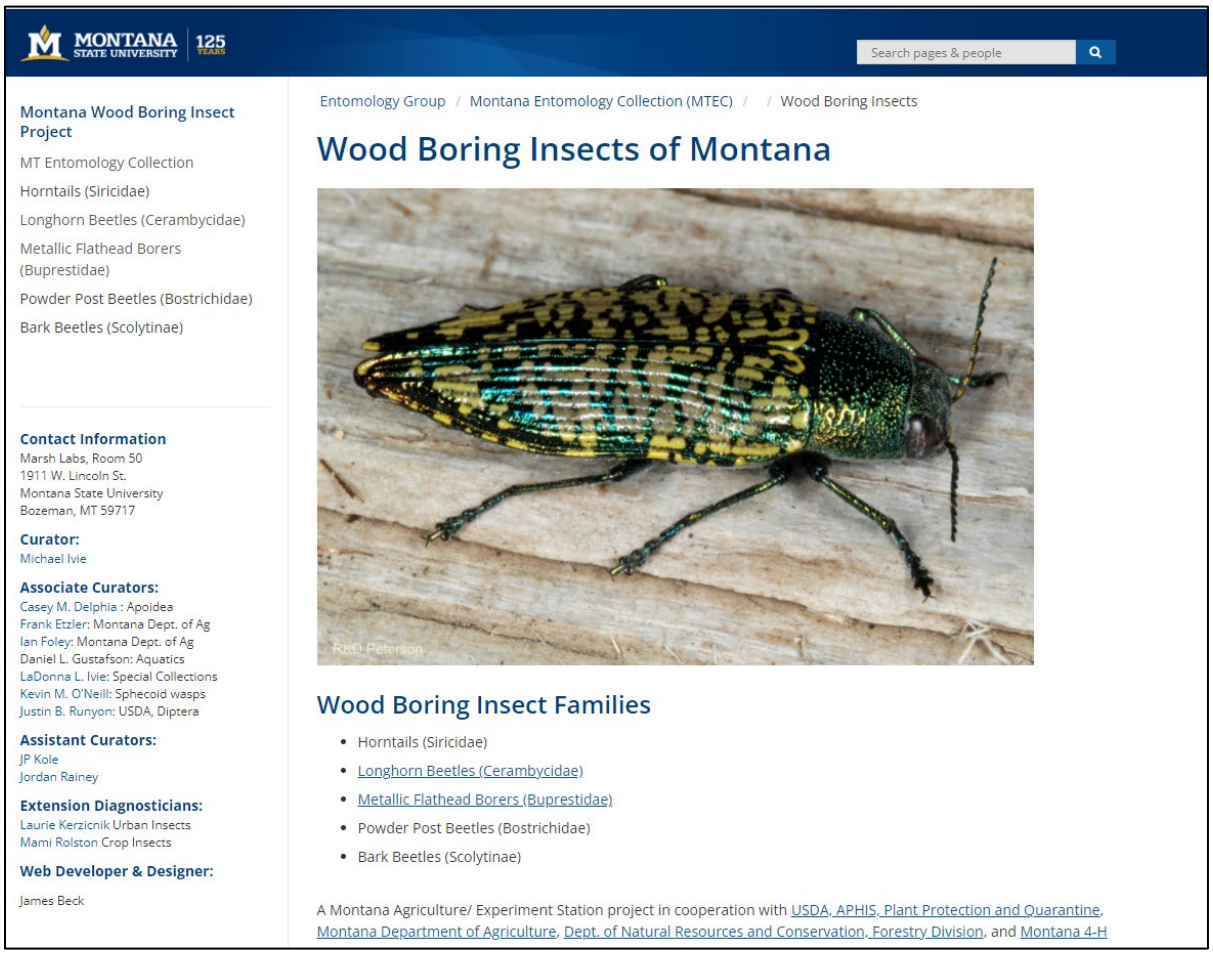
Cerambycidae: There are 152 species of longhorned beetles recorded from Montana (Hart et al. 2013). The most common species in funnel traps include *Acmaeops proteus* (Kirby), *Arhopalus asperatus* (LeConte), *Asemum striatum* (Linnaeus), *Monochamus scutellatus* (Say), *Neandra brunnea* (Fabricius), *Neospondylis upiformis* (Mannerheim), *Rhagium inquisitor* (Linnaeus), *Tetropium velutinum* LeConte, and *Xylotrechus longitarsis* Casey.

Scolytinae: There are approximately 100 species of bark beetles recorded from Montana (Gast et al. 1989, NAPIS 2012).

Montana Wood Boring Insect Project

Montana State University through the Montana Agricultural Experiment Station (MAES) and Montana Entomology Collection (MTEC) has developed an online portal for the "Montana Wood Boring Insect Project". This website contains county level distribution data and images of all of the long-horned and metallic wood boring beetles known to occur

in Montana. Many of the non-target species collected through the CAPS program have been incorporated into this project and are maintained in the MTEC. The project website can be found at: http://mtent.org/projects/woodboring/index.html



Having an understanding of the native fauna of an area is crucial in monitoring for invasive species. This ensures that when something out of the ordinary appears, there is clear data that the species of concern is not known from the area. Having these data on hand also allows timelines to develop, as we'll know when a species was likely first introduced due to a lack of previous records. These can only be done through consistent survey efforts and inventory work.

Target species:

Asian Longhorned Beetle Detection Survey
Anoplophora glabripennis (Motschulsky)

The Asian Longhorned Beetle- (ALB) is native to Eastern China and the Korean Peninsula. It is a woodboring beetle that utilizes many different hardwoods as host trees. In North America, it was first found in Brooklyn, New York in 1996. Since then, it has been found in Illinois, Massachusetts, New Jersey, New York, Ohio, and most

recently in South Carolina. Populations in Illinois and New Jersey have been successfully eradicated. The biggest risk factor of spread is by firewood moved by people. In Montana, species of the genus *Monochamus* are often confused with ALB, but can be distinguished by the rougher elytra while ALB has smooth elytra (see figure below). ALB continues to be absent from Montana.

Native *Monochamus* spp. (Left and Right) compared to Asian Longhorned Beetle (center).
Photo by Frank Etzler.

Black Spruce Beetle and Brown Spruce Longhorned Beetle Detection Survey

Tetropium castaneum (L.) and *Tetropium fuscum* (Fabricius)

The Black Spruce Beetle (BSB) and the Brown Spruce Longhorned Beetle (BSLB) are both longhorned beetles in the genus *Tetropium*. Both beetles are native to Europe and northern Asia, extending as far east as Japan and northern China. They both utilize spruce trees as hosts. Of the two species, only BSLB has become established in North America, with populations found in Nova Scotia and New Brunswick, Canada. Both beetles are surveyed for using the same trap and lure. All traps placed by USDA APHIS were negative.

Black Fir Sawyer and Large Pine Weevil Detection Survey

Monochamus urussovii (Fischer von. Waldheim) and *Hylobius abietis* (L.)

While not closely related to one another, both beetles are surveyed utilizing the same trap and lures. The lures utilized are general for woodboring beetles and are also utilized to monitor ranges of native species in Montana. The Black Fir Sawyer is a longhorned beetle in the family Cerambycidae. It is found across northern Eurasia from the Baltics to Japan. It utilizes firs as a host tree and could potentially cause devastating

losses to North American firs if introduced. The Large Pine Weevil (LPW) is a weevil in the family Curculionidae. It is native to Europe, Turkey, and the Caucasus Mountains. Scattered records of the LPW also exist for Northern Asia. LPW is considered a major pest of commercial pine groves in Europe, and there is strong concern it could cause catastrophic damage to North American pines if introduced. Neither pest was detected in 2023 traps in Montana.

Large Pine Weevil. Credit: Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org

Non-native *Ips* bark beetle Detection Survey

Ips sexdentatus (Boerner & I.C.H.) and *Ips typographus* (L.)

The genus *Ips* are bark beetles in the weevil subfamily Scolytinae. The genus is found across the Northern Hemisphere. These beetles utilize pines and spruces as hosts. Both species of *Ips* surveyed for are native to Europe and Asia Minor. There, they are known to spread fungal diseases and have outbreak years, similar to our native outbreaks of the Mountain Pine Beetle. The concern is that these non-native bark beetles could cause increased stress to our forests and potentially lead to large diebacks of pines and spruces in Montana's forests. While native *Ips* have been detected in these traps, no non-native species were detected.

NURSERY PEST DETECTION SURVEY – PPA 7721

The nursery industry is important as it allows people to cultivate gardens for beauty and to produce food for personal consumption. However, due to the plant trade between states, this could create artificial pathways for the introduction of potential pests. By monitoring these pathways, we can ensure that Montana's green industry is free from any regulated pests and is protected from accidental introductions. In Montana, over 1000 businesses hold nursery licenses, so ensuring that they are protected is crucial to our green industry.

Part of the survey is to also survey the western portion of the state for Northern Giant Hornet (NGH, *Vespa mandarinia* Smith). This species was first discovered in Washington State in 2019. Since then, eradication efforts have been conducted to limit the spread and to attempt to eliminate the species from North America. The MDA's survey work ensures that NGH doesn't spread artificially or naturally into Montana, which could have serious impacts on Montana's Apiaries. Thankfully, no populations of Northern Giant Hornet have been detected in Washington since 2021, so this suggests that this species may be eradicated from the U.S. One more year of surveying without a positive detection will confirm eradication.

Another pest surveyed for is the Tomato Leaf Miner (*Phthorimaea absoluta* Meryrick, which was in the genus *Tuta* from 1994 to 2021). This moth is native to South America and has spread globally in recent years and can oviposit on any plant in Solanaceae. Within Montana, the crop of concern are potatoes, which are grown for seed in Montana. Serious impacts could occur to Montana's Seed potato industry if this species was to become established.

Tomato leafminer, *Phthorimaea absoluta*. Credit: Marja van der Straten, NVWA Plant Protection Service, Bugwood.org.

A third pest of increasing concern that was monitored for was the Box Tree Moth (*Cydalima perspectalis* (Walker)). This moth is native to Asia, and it utilizes species in the genus *Buxus* as hosts. It was first detected in North America in 2018 in Ontario, Canada. In 2021, it was detected in western New York. Since then, it has been detected in Michigan (2022) and Ohio (2023). There is serious concern that this species will spread quickly, similar to how it has spread in Europe, and will damage many ornamental *Buxus* species grown in the U.S.

Other pests, such as the Spotted Lanternfly, African Giant Landsnail, and the Christmasberry webworm, were monitored for as well, but economic impacts of these species are expected to be limited in Montana. While Spotted Lanternfly is a major pest of concern in many other states, Montana lacks populations of the introduced Tree of Heaven (*Ailanthus altissima* (Mill.) Swingle), a tree which is believed to be vital for Spotted Lanternfly to complete its lifecycle. However, due to the high invasion potential as this species spreads in the U.S. and potential risk, we continue to monitor for it in case its host range is broader than currently believed.

RESULTS: 25 nursery locations were sampled and inspected in Montana, in addition to regular nursery inspections. No regulated pests were discovered.

A Box Tree Moth on a *Buxus* plant. Credit: Matteo Maspero and Andrea Tantardini, Centro MiRT - Fondazione Minoprio [IT] via USDA.

BROWN MARMORATED STINKBUG (BMSB) SURVEY
Halyomorpha halys Stål

The Brown Marmorated Stinkbug (BMSB, *Halyomorpha halys* Stål) was first discovered in the US in Pennsylvania in 1998. Since then, the species has spread across North America. In January 2021, BMSB was discovered at a local residence in Billings, Montana. In May 2021, a second specimen was found flying within a personal vehicle in Flathead County. These two localities suggest a much larger distribution than currently known.

BMSB is a pest of concern as it has a large host range, and could affect crops, such as corn, and specialty crops, such as Flathead cherries, and personal gardens. BMSB overwinters in large aggregates and is often considered a nuisance pest of residential homes in areas where it is established.

The MDA, along with Montana State University Extension services and a researcher from the University of Minnesota, surveyed across Montana in 2022 to determine distribution of BMSB within the state. The MDA placed baited sticky traps at five nursery locations around each of the following cities, Bozeman, Billings, Great Falls, Helena, Kalispell, and Missoula. Specimens have been collected at numerous locations in Billings, one location in Flathead Co., and one location in Ravalli Co. No MDA sticky traps detected any BMSB. More specifics have been published in Morey et al. 2022 "First Report of Halyomorpha halys (Hemiptera: Pentatomidae) in Montana, USA [https://doi.org/10.1093/jipm/pmac024].

In 2023, MDA staff again placed baited sticky traps at five nursery locations in each of six Montana communities (30 locations in total). Similar to 2022, no BMSB were captured in sticky traps, although one did land on the pheromone lure in Missoula (pictured on cover). Unfortunately, this individual flew off after the photograph was taken. Specimens of BMSB were also taken at a residence in Billings in late 2023 and early 2024. Taken together, these seem to indicate a larger population of these insects in Montana than suggested by survey data. It also suggests that Montana's nurseries are not a risk pathway for these insects to move across the state. The 2022 and 2023 surveys were partially funded by a Specialty Crop Block Grant.

Some traps and pheromones remain, so more targeted surveying will be done in 2024, mostly targeting the residence in Billings. Other locations will be targeted if the MDA is contacted.

TERRESTRIAL MOLLUSK SURVEY AND EASTERN HEALTH SNAIL (EHS)
PPA 7721

BACKGROUND

Snail samples collected in Cascade County in late July of 2012 were confirmed as Eastern Heath Snail (EHS), *Xerolenta obvia*, one of twelve USDA listed invasive terrestrial snails of national concern. The Montana Department of Agriculture and Montana PPQ conducted survey work in August and September of 2012 to delimit the infested area, determine whether eastern heath snail was present in grain and alfalfa production areas in the state, and to support export of Montana agricultural commodities and products. Survey work confirmed the presence of snails in the Belt area along transportation corridors, residential areas, rangeland, hay fields, and yards. Extensive survey work outside the infested area showed snails were not yet present in grain production areas. Through discussion with individual Belt area landowners and residents, it was determined the snails have been present in the area for at least 25 years, perhaps much longer. Pathways of introduction include rail, mining, travel, and trade/commerce. There is a strong correlation between rights-of-way activities and local distribution of the snail. In 2013, two additional populations of *Xerolenta obvia* were confirmed in Cascade County (in the city of Great Falls and near Monarch).

Eastern Heath Snail, *Xerolenta obvia*. Photo by Ian Foley

MITIGATION EFFORTS

Since 2018, laboratory studies on Eastern Health Snail have been conducted at Montana State University by Jennie Birdsall, Jeff Littlefield, and Annie deMeij. These studies have focused on the development of EHS and determining suitable hosts for feeding. Studies are also being conducted to determine possible biological control of EHS.

In 2023, a team of researchers from Oregon State University (OSU) and USDA-APHIS visited Montana in the spring and fall to investigate aspects of EHS behavior and determine best management practices. There are plans in place to visit again in 2024 to

test the conclusions drawn at the end of the 2023 visits. These data are expected to be published sometime in the future to aid landowners and producers in the affected areas.

SURVEY

Since initial detection, surveys for invasive terrestrial mollusks have occurred every year. Survey sites included high-risk transportation areas, recreational areas, and nurseries. Survey work was focused on presence or absence of snails and no attempt was made to quantify the snail population. Survey work appears to indicate that snails have not spread beyond the infested boundaries identified in 2012. It remains important to conduct survey work in the future to monitor the snail population in the Belt area and determine presence or absence in other areas to support Montana's export markets.

Mollusks have only recently been identified as a threat in Montana. Movement of various materials protected by solid wood packing material into and through Montana increases the risk of introduction of pests – not only through standard commerce, but also through the movement of materials from the seaport inland. Interstate 90, a major route across the U.S., travels the entire width of Montana, from a point just west of Missoula to east of Glendive. The Montana "banana belt," a region of milder climate, runs from the Flathead Valley to the Bitterroot. This area has experienced a rapid influx of people and an increase in the building of higher-value homes, with rates exceptionally high in 2020 and 2021. These properties often include imported materials such as tile, marble, and wood.

(Left) *Cochlicella* sp. on grain. **(Right) Maritime garden snail, *Cernuella virgata*.**

The entire state of Montana is a mecca for recreation including activities of all types. All of these serve as routes of entry into the state for organisms such as the various Veroncellid snails, as well as *Monacha* spp., *Cernuella* spp., and *Cochlicella* spp. These snails could, if established, not only out-compete native species, but also eliminate portions of the food web that are currently supporting the state's famous trout fisheries, become mechanical obstacles to field crop harvest, and directly damage desirable plant species including wheat.

RESULTS: No additional invasive mollusk species were discovered in 2023. Populations of EHS were confirmed to be established in Judith Basin. This highlights the need for continual monitoring and maintaining public awareness and education. Staff with USDA APHIS also survey for EHS populations during grasshopper surveys across the state.

They have surveyed all 56 counties in Montana and looked at an impressive 2051 locations across the state.

Amy Roda, USDA APHIS, testing best management practices in a field in Cascade County, Montana. Photo by Gary Adams.

2023 National Honey Bee Survey

In 2023, Montana had over 244,000 beehives, of which 97% were commercial hives. The remainder belonged to Landowner and Hobbyist beekeepers. These hives are on over 6,900 registered sites, with around 90% of these being commercial sites. Montana has 579 registered beekeepers, which 14% are commercial operators. Most of the Commercial beekeepers provide pollination services outside Montana. Migratory beekeepers typically travel to California in the early spring for almond pollination, then move to fruit crops in Washington and Oregon before moving back to Montana for the summer. Ranked by revenue, beekeeping is the 10th largest agricultural industry in Montana, with honey being the biggest driver in the state. However, throughout the year pollination fees make up the majority of Commercial Beekeeping income.

Montana bee yard. Photo: A. Piccolomini

Pests of honey bees are a serious threat to the agricultural economy of Montana and to the states where Montana-based bees provide pollination. USDA estimates honey bee pollination adds approximately $15 billion to the value of American agriculture. In 2006 beekeepers began reporting unexplained and unexpected losses of 30% or more of their hives. What eventually came to be called “colony collapse disorder” (CCD) was characterized by the rapid disappearance of worker bees from apparently healthy hives. Today, the general consensus among researchers is that Varroa mite infestation and the viruses they vector are the main cause of reduced colony health, and the usage of the term CCD has been largely abandoned.

In 2009 the USDA-APHIS initiated the National Honey Bee Pests and Diseases Survey in all 50 states. The primary objectives of the survey are to confirm the absence of tropical bee mites in the genus *Tropilaelaps*, the absence of the Asian honey bee *Apis ceranae*, and the absence of slow paralysis virus (a honey bee disease associated with

A. ceranae). Secondary objectives include evaluating the overall health of the apiaries sampled to establish a baseline for future research. Samples submitted from the survey will be evaluated for their mite loads (*Varroa,* tracheal mites, and other parasitic mites) and the degree to which viruses and other pathogens are present (particularly *Nosema ceranae*, a more virulent *Nosema* species associated with tropical honey bees). Viruses are identified at the molecular level by the USDA "bee lab" in Beltsville, MD.

Varroa mites on a drone pupa. Photo I. Foley

A subsection of samples taken by the MDA for the National Honey Bee survey are called longitudinal samples. These samples are taken at the same apiary at different times of the year. This allows researchers to determine how different pests and diseases change over time, so that we gain a better understanding of them. This is especially helpful in tracking if Varroa mite populations change over time as well as seeing how viral load and composition changes.

RESULTS: Twenty-two National Honey Bee Survey (NHBS) samples were collected in 2023 and submitted to laboratories at the University of Maryland. Two more samples will be taken in the spring of 2024 as part of the longitudinal surveys. Some results are still pending.

For the visual survey, 3 of 19 apiaries had Sacbrood present, 6 of 19 had Chalkbrood present, 2 of 19 had Parasitic Mite Syndrome, 1 of 19 had Deformed Wing symptoms, and 3 of 19 had black shiny bees. Sacbrood, Deformed Wing syndrome, and black shiny bees are all symptoms of viral infection. Chalkbrood is a fungal pathogen, while Parasitic Mite Syndrome is caused by stress due to a large population of mites and was only found in samples with lots of Varroa mites. Varroa mites were detected in 6 of 19 samples, with one having 182 mites in the sample! Nosema spores were detected in 11 of the 19 samples.

As of February 5th, only five samples have molecular data. All samples with molecular data have Deformed Wing Virus, Israeli Acute Paralysis Virus, Lake Sinai Virus-2, and Varroa Destructor Virus present.

JAPANESE BEETLE (JB) SURVEYS

Popillia japonica Newman

Japanese Beetle, *Popillia japonica* Newman, was first discovered in North America in 1916. Since then, it has spread throughout much of eastern North America. Japanese Beetle (JB) was first discovered in Billings, Montana in 2001. In 2013, nursery stock infested with JB was brought into Montana, affecting 17 nurseries across the state. Due to rapid action by the nurseries and MDA, these localities were negative in 2014. The only area of Montana with a consistent population of JB is Billings, Montana, although the population has moved within city limits since first detection, now more prevalent in the Heights area of the city.

Some pesticide remained from the Specialty Crop Block Grant for community outreach and pesticide distribution for JB in Billings discussed in the 2022 report. However, no data is available on how much of this was distributed in the area.

RESULTS: The MDA put out over 140 traps, focusing on Flathead, Missoula, Ravalli, Sanders, and Yellowstone Counties. The USDA placed traps at 33 airports in Cascade, Flathead, Gallatin, Lewis and Clark, Missoula, and Silver Bow Counties to ensure no accidental introductions to the state via air travel. In Billings (Yellowstone Co.), six trap locations were positive for JB, with a total of 1876 beetles collected from July to October. However, about 97% of these beetles were captured at just two trap locations.

NATIONAL AGRICULTURAL PEST INFORMATION SYSTEM (NAPIS)
2023 Summary Report

Pest Common Name	Pest Scientific Name	Data Source	Number of Counties Sampled	Positives	Negatives	Total
Acute Bee Paralysis (APBV)	*Aparavirus Acute Bee Paralysis*	State Ag. Dept.	8	3	9	12*
American Foulbrood	*Paenibacillus larvae larvae*	State Ag. Dept.	10	0	19	19*
Asian Honeybee	*Apis ceranae*	State Ag. Dept.	10	0	19	19*
Asian Longhorned Beetle	*Anoplophora glabripennis*	University/Extension	8	0	19	19
Black Fir Sawyer	*Monochamus urussovii*	University/Extension	8	0	19	19
Black Maize Beetle	*Heteronychus arator*	State Ag. Dept.	7	0	25	25
Black Spruce Beetle	*Tetropium castaneum*	USDA APHIS	13	0	58	58
Brown Spruce Longhorned Beetle	*Tetropium fuscum*	USDA APHIS	13	0	58	58
Chalkbrood	*Ascosphaera apis*	State Ag. Dept.	10	6	13	19*
Chickpea Cyst Nematode	*Heterodera ciceri*	State Ag. Dept.	7	0	25	25
Christmasberry Webworm	*Cryptoblabes gnidiella*	State Ag. Dept.	9	0	25	25
Chronic Bee Paralysis (CBPV)	Unassigned Paralysis Virus	State Ag. Dept.	8	2	10	12*
Cochlicellid Snail	*Cochlicella* spp.	State Ag. Dept.	10	0	50	50
Curcubit Beetle	*Diabrotica speciosa*	State Ag. Dept.	7	0	25	25
Deformed Wing Virus (DWV)	*Iflavirus Deformed Wing Virus*	State Ag. Dept.	8	11	1	12*
Eastern Heath Snail	*Xerolenta obvia*	State Ag. Dept.	10	11	39	50
Eastern Heath Snail	*Xerolenta obvia*	USDA APHIS	56	0	2051	2051
European Foulbrood	*Melissococcus plutonius*	State Ag. Dept.	10	0	19	19*
European Spruce Bark Beetle	*Ips typographus*	University/Extension	8	0	19	19
False Codling Moth	*Thaumatotibia leucotreta*	State Ag. Dept.	7	0	25	25
Giant African Snail	*Lissachatina fulica*	State Ag. Dept.	9	0	25	25
Hygromiid Snails	*Cernuella* spp.	State Ag. Dept.	10	0	50	50
Hygromiid Snails	*Monacha* spp.	State Ag. Dept.	10	0	50	50
Israeli Acute Bee Paralysis (IAPV)	*Aparavirus Israeli Acute Paralysis*	State Ag. Dept.	8	7	5	12*
Japanese Beetle	*Popillia japonica*	State Ag. Dept.	5	6	137	143
Japanese Beetle	*Popillia japonica*	USDA APHIS	6	0	33	33
Karnel Bunt	*Tilletia indica*	State Ag. Dept.	14	0	86	86
Kashmir Bee Virus (KBV)	*Aparavirus Kashmir Bee Virus*	State Ag. Dept.	8	0	12	12*
Lake Sinai-2	*Sinaivirus Lake Sinai Virus-2*	State Ag. Dept.	8	9	3	12*
Large Pine Weevil	*Hylobius abietis*	University/Extension	8	0	19	19
Late Wilt of Corn	*Magnaporthiopsis maydis*	State Ag. Dept.	7	0	21	21
Maritime Garden Snail	*Cernuella virgata*	State Ag. Dept.	10	0	50	50

Pest Common Name	Pest Scientific Name	Data Source	Number of Counties Sampled	Positives	Negatives	Total
Masson Pine Moth	*Dendrolimus punctatus*	USDA APHIS	13	0	58	58
Moku Virus (MKV)	*Iflavirus Moku virus*	State Ag. Dept.	8	0	12	12*
Northern Giant Hornet	*Vespa mandarinia*	State Ag. Dept.	9	0	25	25
Nosema spores	*Nosema ceranae*	State Ag. Dept.	8	11	1	12*
Old World Bollworm	*Helicoverpa armigera*	State Ag. Dept.	7	0	25	25
Parasitic Mite	*Tropilaelaps* spp.	State Ag. Dept.	10	0	19	19*
Parasitic Mite Syndrome	Parasitic Mite Syndrome	State Ag. Dept.	10	2	17	19*
Pine Beauty Moth	*Panolis flammea*	State Ag. Dept.	6	0	25	25
Pine Beauty Moth	*Panolis flammea*	USDA APHIS	13	0	58	58
Pine Processionary Moth	*Thaumetopoea pityocampa*	State Ag. Dept.	6	0	25	25
Pine Sawfly	*Diprion pini*	State Ag. Dept.	6	0	25	25
Pine Sawfly	*Diprion pini*	USDA APHIS	13	0	58	58
Philippine Downy Mildew	*Peronosclerospora philippinensis*	State Ag. Dept.	7	0	21	21
Sacbrood	*Morator aetatulas virus*	State Ag. Dept.	10	3	16	19*
Scots Pine Blister Rust	*Cronartium flaccidum*	State Ag. Dept.	6	0	25	25
Scots Pine Blister Rust	*Cronartium flaccidum*	University/Extension	8	0	19	19
Silver Y Moth	*Autographa gamma*	State Ag. Dept.	7	0	25	25
Sixtoothed Bark Beetle	*Ips sexdentatus*	University/Extension	8	0	19	19
Slow Bee Paralysis (SBPV)	*Iflavirus Slow Bee Paralysis*	State Ag. Dept.	8	0	12	12*
Small Brown Planthopper	*Laodelphax striatellus*	State Ag. Dept.	7	0	25	25
Small Hive Beetle	*Aethina tumida*	State Ag. Dept.	10	0	19	19*
Spongy Moth	*Lymantria dispar dispar*	State Ag. Dept.	12	0	150	150
Spongy Moth	*Lymantria dispar dispar*	State DNRC	1	1	49	50
Spongy Moth	*Lymantria dispar dispar*	USDA APHIS	15	0	508	508
Spongy Moth	*Lymantria dispar dispar*	USFS/ USNPS	1	1	0	1
Spotted Lanternfly	*Lycorma delicatula*	State Ag. Dept.	9	0	25	25
Tomato Leaf Miner	*Tuta absoluta*	State Ag. Dept.	9	0	25	25
Varroa Destructor Virus (VDV)	*Iflavirus Varroa Destructor Virus*	State Ag. Dept.	8	12	0	12*
Varroa Mite	*Varroa destructor*	State Ag. Dept.	10	6	13	19*
Totals with * means data incomplete	———	———	———	—	—	—
REPORT TOTAL				**91**	**4313**	**4404**

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