ANNUAL REPORT 2021

Plant Industry Bureau

Wisconsin Department of Agriculture,
Trade and Consumer Protection
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About the Plant Industry Bureau

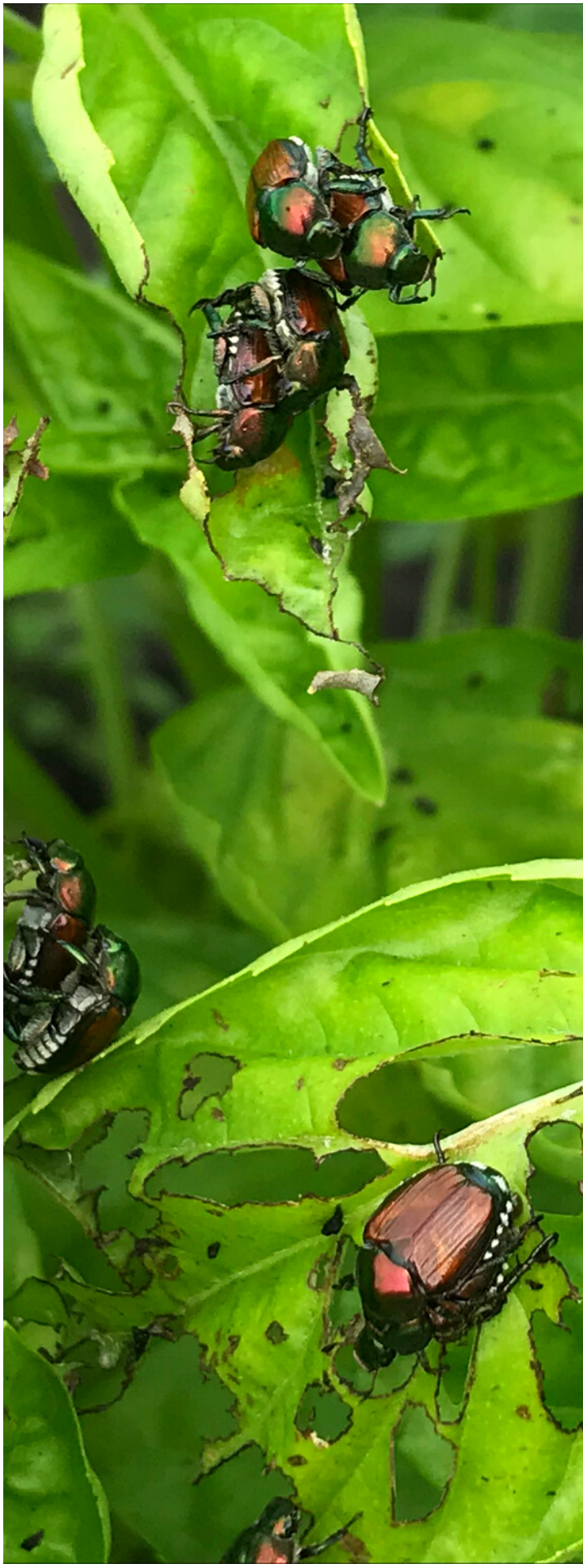
The Plant Industry Bureau protects Wisconsin's agricultural and horticultural industries and native plants by overseeing and ensuring compliance with laws and regulations involving plant pests, honeybees, nursery plants, Christmas trees, firewood and seed. The Bureau implements programs designed to prevent the introduction and spread of harmful plant pests and diseases, especially regulated introduced, invasive species.

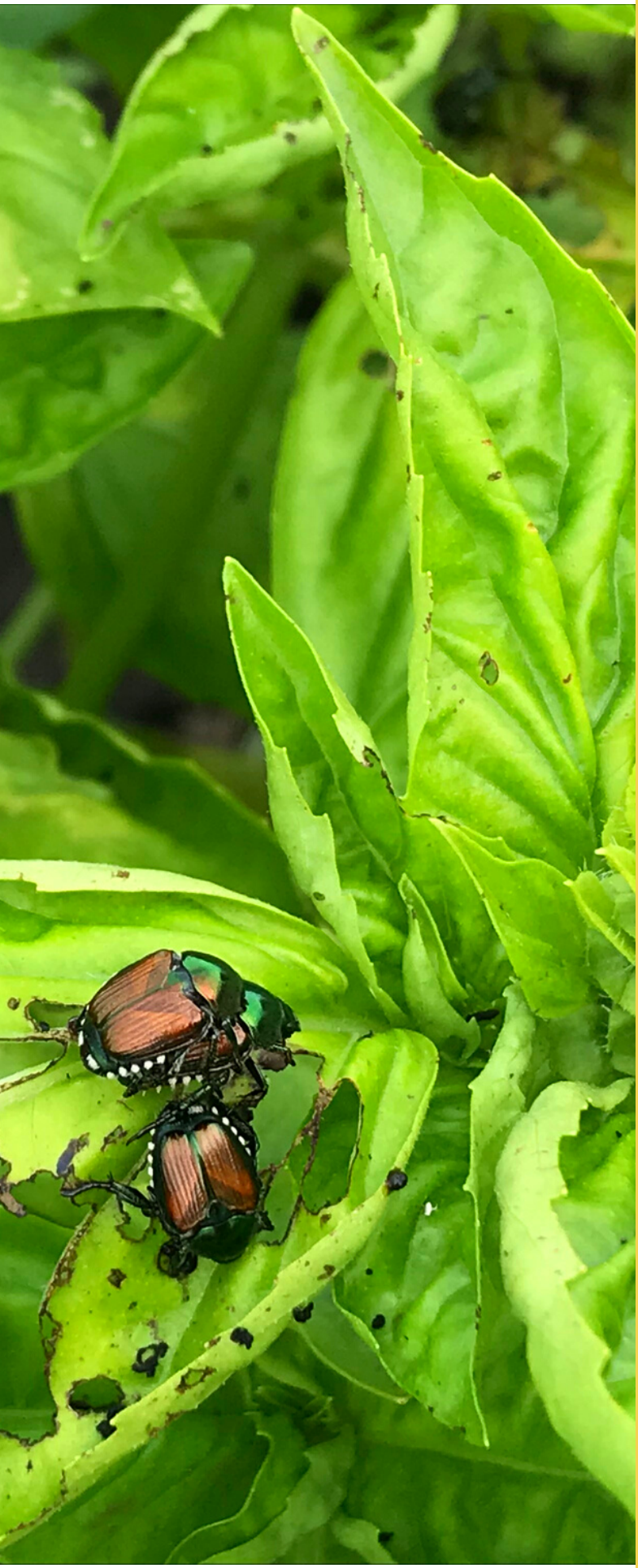
Our Programs

Plant Industry Bureau programs include inspection, export certification, quarantine and survey activities. The Bureau also facilitates interstate and international commerce of Wisconsin agricultural products and commodities by certifying plant health and the pest-free status of plants and plant products.

Our Partners

To carry out its mission, the Bureau maintains partnerships with the United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS), the USDA Forest Service (USDA FS), the Wisconsin Department of Natural Resources (DNR), the University of Wisconsin (UW), tribes and other state and federal agencies.





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Plant Protection Section

As the regulatory section of the Bureau of Plant Industry, the Plant Protection Section works to detect, intercept and prevent the spread of harmful plant pests that threaten Wisconsin's native and commercially grown plants and agricultural resources. Licensing, inspection and certification are the major emphases of the Section.

The Section enforces Wisconsin statutes and departmental rules pertaining to the movement of plants, plant products and honey bees.

Plant Protection Programs

Apiary

Nursery and Christmas Tree

Export Certification

Seed Labeling and Compliance

Firewood Certification

Forest Pest Regulatory

Potato Rot Nematode

Apiary Program

The Apiary Program monitors honey bee hives to reduce the spread of established pests and diseases such as Varroa mite, and to prevent new pest introductions by participating in the annual nationwide USDA bee survey. The program also promotes the adoption of best management practices in Wisconsin's Pollinator Protection Plan. Inspections are offered to all beekeepers, emphasizing compliance with import requirements for bees entering Wisconsin in spring, and certifying migratory bee colonies leaving the state in autumn to pollinate crops in the southern and western U.S.

Apiary inspectors visited 287 beekeepers and opened 2,266 hives in 2021. Annual inspections found decreases in six of the seven honey bee pests and diseases monitored. Varroa mite incidence decreased from 65% in 2020 to 41% in 2021, deformed wing virus incidence decreased from 9.3% in 2020 to 4.2% of hives in 2021, and the small hive beetle incidence rate of 1.1% was the lowest in five years. In contrast, colony winter mortality increased from 20% in 2020 to 42% in 2021 and exceeded the 32% national average. Inspectors issued 87 apiary inspection certificates for 42,957 migratory hives, primarily destined for California, Florida and Texas to be used for pollination services.

Annual apiary inspection results 2017-2021

	2017	2018	2019	2020	2021
Total hives opened	4,214	3,342	3,398	2,396	2,266
Varroa mite	64%	58%	51%	65%	41%
Small hive beetle	10.2%	1.7%	6.3%	2.1%	1.1%
American foulbrood	0.1%	0.1%	0.7%	0.6%	0.1%
European foulbrood	0.2%	0.3%	6.4%	1.2%	1.4%
Chalkbrood	4.2%	1.1%	5.9%	8.3%	5.2%
Sacbrood	5.8%	1.4%	4.8%	9.7%	8.4%
Deformed wing virus	19.8%	1.2%	11.8%	9.3%	4.2%

For the 11th consecutive year, Wisconsin participated in the USDA National Honey Bee Health Survey. Fifty-eight samples were sent to the USDA Bee Research Lab for testing: 24 live bee and brood comb wash samples for parasite analysis; 24 samples of bees in alcohol for virus analysis; and 10 pollen samples for pesticide analysis. To date, no samples have been positive for *Apis mellifera capensis*, *Nosema apis*, Slow Bee Paralysis Virus or *Tropilaelaps*.

INSPECTORS VISITED **287** BEEKEEPERS THIS YEAR AND OPENED **2,266** HIVES

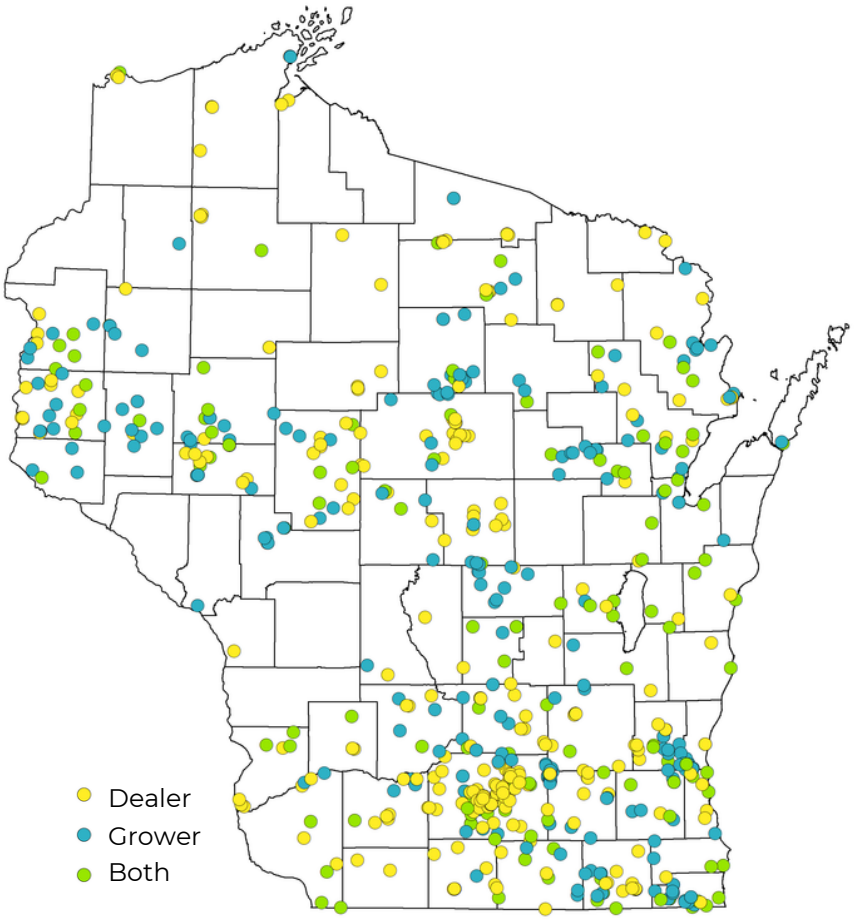
ANNUAL INSPECTIONS FOUND DECREASES IN SIX OF THE SEVEN HONEY BEE PESTS AND DISEASES MONITORED

Nursery Program

The Nursery Program licenses and certifies nursery stock growers and dealers and provides inspections emphasizing regulatory pests. Nursery inspections ensure the production and sale of healthy plants and facilitate interstate commerce through the issuance of over 100 nursery plant health certificates (PHC) annually. The program also inspects nursery stock imported into Wisconsin to prevent the introduction and spread of pests. Nursery inspectors work with the DNR to ensure restricted or prohibited invasive plants are not sold at nurseries.

DATCP licensed 611 nursery stock growers and 1,232 nursery dealers in 2021. Annual inspections included 317 growing fields and 422 dealers statewide, with priority given to companies shipping stock out-of-state. The program issued 115 plant health certificates for the interstate movement of Wisconsin nursery stock. **The top 10 insects and diseases found during inspections were: Japanese beetle, spider mites, leaf spots, viruses, powdery mildew, aphids, flea beetles, leafminers, apple scab and rusts**. New detections in 2021 included Japanese apple rust on crabapple, white rust on coneflower, and two powdery mildew species, one on aspen and the other on viburnum.

Nursery inspectors continued to enforce the DNR Invasive Species Rule NR 40. Routine inspections documented 37 incidents of restricted or prohibited invasive plants for sale at 29 nursery locations, down from 64 incidents at 46 locations in 2020. In addition, 14 rejection notices were sent to nine states for unwanted invasive plants, viruses and scale insects, as a measure to increase awareness of Wisconsin's plant pest regulations.



Map 1. Nursery Inspections Conducted in 2021

As part of the Systems Approach to Nursery Certification (SANC) program, nursery staff conducted a full systems audit and a surveillance audit of Agrecol's seedling and transplant program in 2021. No corrective actions were uncovered during these audits.

Also of note, the Plant Protection Section began publishing a new e-newsletter, ***What's Growing On?*** The newsletter is emailed monthly and offers updates on insects and diseases of concern to the nursery industry, events, and significant finds from current nursery and Christmas tree inspections.

Nursery field inspection | DATCP

Nursery Program

Viburnum Leaf Beetle

The distribution of viburnum leaf beetle (VLB) expanded into northern Wisconsin in 2021, with new reports from nurseries in Marathon and Vilas counties. Populations of VLB have been verified by DATCP and UW-Extension from 14 counties since 2009: Brown, Dane, Iron, Kenosha, Marathon, Milwaukee, Ozaukee, Racine, Sheboygan, Vilas, Walworth, Washington, Waukesha and Winnebago. Inspections in 2021 documented VLB life stages at 18 nursery locations, primarily in southeastern Wisconsin.

Cryptomeria Scale

This non-native armored scale insect known as the "fried egg" or Cryptomeria scale (*Aspidiotus cryptomeriae*) was intercepted on hemlock nursery stock shipped from Ohio to Wisconsin in September. The infested stock was removed from sale and destroyed to prevent the potentially invasive conifer pest from becoming established in the state.

Hemlock Woolly Adelgid

DATCP continued to work with nurseries importing hemlock nursery stock from infested areas to sign compliance agreements ensuring the stock has been inspected or treated to prevent hemlock woolly adelgid (HWA) establishment. Twenty-eight nurseries and landscape companies entered into HWA compliance agreements in 2021. To date, HWA has not been found in Wisconsin.

Lily Leaf Beetle

Detected for the first time in Wisconsin in 2014, the distinctive glossy red lily leaf beetle (LLB) has now spread to 21 counties. While several reports of LLB damage were received in 2021 from areas of the state with known populations, no new counties were added to the LLB distribution map.

Nursery Program

Rusts on Ornamentals

Five different rust species were found on nursery and Christmas tree samples in 2021. The rusts include fir-fern needle rust on balsam fir, *Puccinia* sp. on anemone, *Puccinia silphii* on rosinweed, *Pustula* sp. (white rust) on coneflower and *Gymnosporangium yamadae* (Japanese apple rust) on crabapple. The white rust and Japanese apple rust are first detections for Wisconsin.

Powdery Mildews on Ornamentals

Powdery mildew was detected by inspectors on apple, aspen, aster, Bradbury's monarda, Kentucky bluegrass, serviceberry, viburnum, and wild geranium. Two of the species were new to Wisconsin: *Erysiphe viburniphila* on two viburnums and *Erysiphe adunca* on one aspen. The other powdery mildew species detected were *Erysiphe cichoracearum*, *E. graminis*, *Podosphaera leucotricha* and *P. oxycanthae*.

Boxwood Blight and Box Tree Moth

The Plant Industry Bureau Laboratory analyzed 47 symptomatic boxwood samples from 23 nurseries and retailers this season. All tested negative for blight. One case of the disease was diagnosed by the UW Plant Disease Diagnostics Clinic in December on boxwood from a Milwaukee County residence, marking the state's only confirmed find in 2021.

Box tree moth is an invasive pest from Asia that feeds on boxwood. In 2021, APHIS issued a federal order prohibiting the importation of boxwood, holly and euonymous from Canada after infested stock was sent to at least six states, including Wisconsin. All 10 boxwoods that had been comingled with infested stock at a South Carolina nursery were removed by DATCP staff from residences in Coloma, Neenah, Kenosha and Waukesha in June. No evidence of box tree moth was found on those boxwoods or on surrounding hosts, and all plant material was destroyed by APHIS.

Japanese apple rust on crabapple
Mary Ann Hansen @plantpathva

Japanese apple rust on crabapple
Mary Ann Hansen @plantpathva

Ramorum Blight

Ramorum blight, the pathogen linked to sudden oak death (SOD), can infect over 100 plant species, including many popular nursery ornamentals. Twenty-six symptomatic plants collected from 11 nursery locations were negative for Ramorum blight. Plants tested were andromeda (6), azalea (8), rhododendron (10), viburnum (1) and wintergreen (1). To date, SOD has never been detected in the Wisconsin landscape.

Nematodes

Root knot nematodes (*Meloidogyne* sp.) were detected on anemone, astilbe, spiderwort and woodland sage samples from two nurseries in Washington County. Foliar nematodes (*Aphelenchoides* sp.) were detected on 15 hosta samples from four nurseries in Chippewa, Dunn, Juneau and Rock counties.

Viruses of Ornamentals

Nursery inspectors collected 100 ornamental samples for virus testing at the Plant Industry Lab this year. Potygroup viruses were the most common, found in 30 of 64 (47%) plants tested (mainly irises). Tobacco rattle virus (TRV) was second most common, with 14 of 61 testing positive for TRV, followed by ilarvirus infections in 12 of 60 (20%) plants. In fourth place was hosta virus X, diagnosed in 3 of 18 (17%) hosta samples.

Other noteworthy virus finds included arabis mosaic virus in sedum, tomato spotted wilt virus in cardinal flower and speedwell, and clematis chlorotic mottle virus in clematis.

Tobacco rattle virus on hosta I DATCP

Viruses of Ornamentals Diagnosed in 2021

Virus Samples	POTY	TRV	ILAR	HVX	CMV	INSV	LLCV	TMV	TSWV	CICMoV
Number of positives	30	14	12	3	0	0	0	0	2	1
No. of plants tested	64	61	60	18	24	21	0	22	24	1
Percent of positives	47%	23%	20%	17%	0%	0%	0%	0%	8%	100%

Potygroup viruses; Tobacco rattle virus; Illarvirus group; Hosta Virus X; Cucumber mosaic virus; Impatiens necrotic spot virus; Lilac leaf chlorosis virus; Tobacco mosaic virus; Tomato spotted wilt virus; Clematis chlorotic mottle virus.

Sod sampling I DATCP

Sod Inspection

Seven sod growing operations were inspected in 2021 prior to interstate shipping. Since Wisconsin is generally infested with Japanese beetle (JB) and is classified as a Category 3 state under the Japanese Beetle Harmonization Plan, sod growers who ship potential beetle host material from areas infested with JB are responsible for complying with the certification requirements of receiving states. No regulated pests or diseases were found.

Eastern spruce gall adelgid I DATCP

Christmas Tree Program

Last fall, more than 700,000 fir, pine and spruce trees were harvested from Wisconsin's 859 Christmas tree farms. The state ranks fifth in the nation for number of trees cut and acres in production. By licensing, inspecting and certifying Christmas trees as being adequately free from regulated pests, the Christmas Tree Inspection Program offers a valuable service to producers of trees, wreaths and roping who require certification to ship their products to other states or countries.

Annual field inspections begin on September 1 after the spongy moth (formerly known as gypsy moth) egg-laying period has ended. Christmas trees, along with surrounding fence rows and wood lots, are inspected for regulated pests and other insect, disease or abiotic problems.

All Christmas tree species (fir, pine and spruce) originating in the state's 52-county spongy moth quarantine zone in eastern and central Wisconsin are subject to the federal and state spongy moth regulations. Growers shipping trees from the quarantined areas to states or countries where the moth is not established are required to have their trees inspected and certified free of this pest prior to harvest. Choose-and-cut farms and other growers selling solely within the quarantine are not restricted. In order to fulfill requirements for shipping to Montana, pine trees destined for this state are trapped for European pine shoot moth (EPSM) prior to the inspection season.

Christmas tree field I DATCP

In 2021, inspectors visited 274 of the 374 licensed growers and inspected 606 individual grower fields. Forty-three of the fields were infested with spongy moth egg masses. Of the non-regulated pests noted during inspections, balsam twig aphid and balsam gall midge were the most common insects. Frost damage was the most prevalent abiotic disorder observed. The program issued 120 Plant Health Certificates, 41 Phytosanitary Certificates and one State Phytosanitary Certificate this year.

Number of Christmas Tree Fields Inspected and Spongy Moth Finds 2012-2021

Inspection Year	No. of Fields Inspected	No. of Fields with Spongy Moth
2012	702	6
2013	767	10
2014	667	11
2015	679	10
2016	553	15
2017	673	17
2018	511	45
2019	480	41
2020	517	28
2021	606	43

Christmas tree lot inspections are conducted after field inspections are complete, from mid-November until Christmas. The inspections help in identifying unlicensed growers, documenting tree origin and certification paperwork, and ensuring trees are free from regulated pests. This season, 74 lots were inspected. Elongate hemlock scale (EHS) was detected at six lots on Christmas tree or wreath material from out-of-state sources. Pest Abatement Orders were issued to two big box stores with multiple locations, requiring the removal and destruction of material infested with EHS.

Christmas tree lot | DATCP

Export Certification Program

The Export Certification Program inspects and certifies plant products for interstate or international shipment. Program specialists check country and commodity-specific plant pest regulations and assist customers in understanding phytosanitary requirements for over 200 countries. The program ensures the export of pest-free Wisconsin plant products.

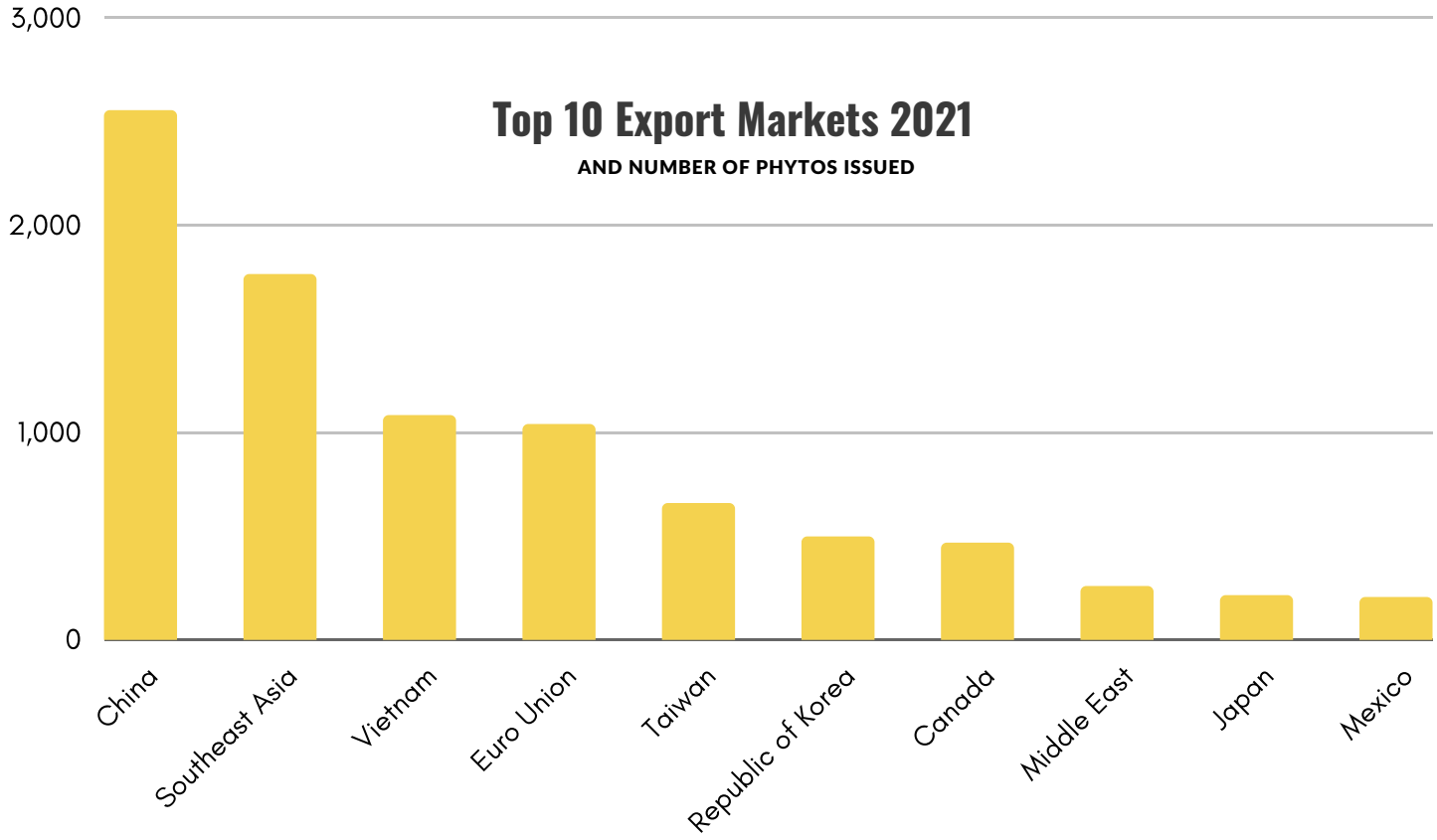
Plant Product exports certified by the Program exceeded $1 billion and were shipped to 84 countries in 2021. The total number of phytosanitary certificates printed was 11,697, up from 9,332 in 2020. China, Southeast Asia (Indonesia, Malaysia, Philippines, Thailand), Vietnam and Taiwan remained the top destination countries for exports, while the European Union rose to fourth place. Grain exports, including soybean and corn, accounted for 50% of the total commodities certified this year, followed by wood products at 36%. No Wisconsin commodities were rejected or destroyed at destination ports in 2021.

2021 STATS

$1 BILLION
IN EXPORTS CERTIFIED IN 2021

84
DESTINATION COUNTRIES

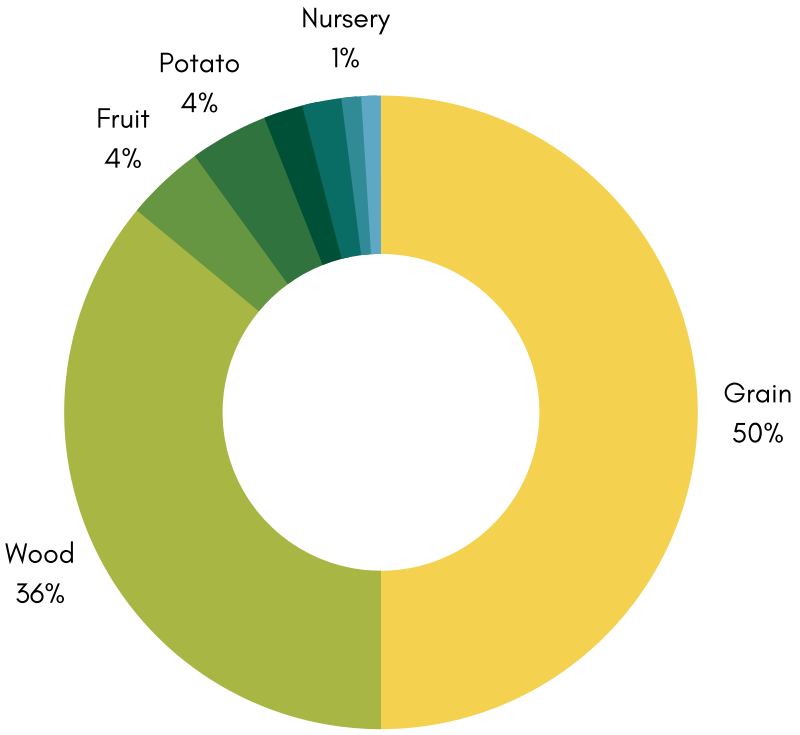
11,697
PHYTOS PRINTED



Federal and State Phytos Issued 2020 & 2021

Program staff printed and issued 11,697 phytosanitary certificates this year, a sharp increase from 9,332 certificates in 2020. The total number of applications processed was 16,874, also markedly higher than 13,135 applications the year before.

Application or Certificate Status	2020 Number of Applications	2021 Number of Applications
Printed	9.332	11,697
Replaced	2,489	3,874
Voided	1,102	1,231
In Progress	145	17
Returned	27	32
Canceled	40	72
Applications Processed	13,135	16,874



Top Exports

Grain exports, including soybeans and corn, accounted for 50% of the total certificates issued in 2021, followed by wood products (logs, lumber and veneer) at 36%. Other major exports this year were dry beans, cranberries, potatoes, wheat, Christmas trees and nursery plants.

Export Certification Program

Wood & Seed Field Inspections

Inspections conducted to support certification in 2021 included logs, kiln dried lumber and seed production fields. Two hundred and sixty-eight log inspections were conducted and 38 kiln dried lumber compliance agreements were signed. Compliance agreements specify actions or best management practices exporting companies must follow in order to meet the requirements of receiving counties. Companies entering into agreements with USDA APHIS and DATCP benefit from reduced inspection times and expedited certification of overseas lumber shipments.

In addition, seed fields totaling 1,047 acres were inspected for 18 seed producers (lab results are provided in the Plant Industry Lab section). Most of the acres were corn and soybean, though onions, oats and garden beans were also included. Seed was exported from Wisconsin to 22 destination countries: Argentina, Australia, Brazil, Canada, Chile, China, European Union, Israel, Japan, Kazakhstan, Malaysia, Mexico, Moldova, New Zealand, Peru, Republic of Korea, Russia, South Africa, Thailand, Turkey, Ukraine and United Kingdom.

Potato Program

The Potato Program includes potato rot nematode surveys, late blight response, and coordination of Wisconsin's seed potato certification program with the University of Wisconsin-Madison.

Potato rot nematode (PRN), *Ditylenchus destructor*, is a pest of quarantine significance which occurs in localized areas of Asia, Europe and North America. Wisconsin is one of 10 states where PRN is found. DATCP established the PRN inspection and quarantine program in 1953 to prevent the spread of PRN. For the last 68 years, the program has helped ensure the continued certification and export of Wisconsin potatoes.

Sixteen fields totaling 568.7 acres were inspected for PRN in 2021. Fifteen of the fields were new to seed potato production and showed no evidence of PRN. One field with a prior history of PRN was positive during harvest inspection. Fields with a history of PRN infestation can only be released from quarantine after fumigation and two successive potato crops show no evidence of the nematode.

Potato rot nematode has never been reported or intercepted in-state or out-of-state in seed potatoes or in commercially grown potatoes from Wisconsin. Today, there are a total of 3,049 acres with a history of infestation. Of these acres, 94% are located in Langlade County, the largest seed potato production area in the state.

In February 2021, DATCP conducted an audit of the UW Seed Potato Certification Program focused on the Lelah Starks Elite Foundation Seed Potato Farm. Results were shared with partners and no significant non-conformities were found during the course of the audit. In addition, no late blight was detected in potato fields requiring pest abatement in 2021.

History of Potato Rot Nematode Infestations in Wisconsin 1953-2021

County	Current Status	Sum of Acres	Count of Fields
Forest	Released not used for potato	15	01
Kenosha	Release not used for potato	01	01
Langlade	Infested	442.3	19
Langlade	Release not used for potato	122.5	08
Langlade	Released/certified seed	1697.4	50
Langlade	Released/table stock	613.3	24
Lincoln	Released/certified seed	37	01
Manitowoc	Released/certified seed	9.3	01
Marathon	Infested	8.4	01
Marathon	Released/certified seed	64.5	02
Portage	Released/table stock	38.2	01

Forest Pest Regulatory Program

Firewood Certification

The movement of firewood in Wisconsin is regulated by quarantines and DNR firewood rules. The spongy moth quarantine prohibits the movement of firewood east to west from the state's 52 infested counties to non-quarantined counties. State EAB quarantines prohibit movement of firewood from Wisconsin to states with regulations for this pest. Only firewood bearing a DATCP label certifying proper heat-treatment or aging methods have been used to kill invasive insects or diseases is allowed into state parks and other state-owned lands.

Under the voluntary Firewood Dealer Certification Program, anyone may apply for certification by completing an application form, obtaining a facilities and processes inspection, and by using an approved firewood treatment method such as heat treatment (heating firewood to 140°F for at least 60 minutes) or seasoning (storing firewood on-premises for at least 24 months before sale or distribution). Firewood which has been inspected and certified receives the DATCP-certified label. Since the program's inception in 2007, a total of 98 firewood dealers have been certified to sell firewood in Wisconsin, including 35 in 2021.

Forest Pest Compliance and Outreach

The Forest Pest Regulatory Program works with the nursery and forest product industries to increase awareness and gain compliance with state and federal quarantines regulating movement of certain trees, shrubs and forest products that may harbor spongy moth or hemlock woolly adelgid (HWA). In 2021, inspectors facilitated 48 compliance agreements, 27 for intrastate movement of spongy moth and 21 for HWA. Program staff also conducted outreach and trained 56 industry personnel on spongy moth identification. An online spongy moth training was developed and posted to the program's webpage. *Don't Move Firewood* brochures were also distributed to WisDOT Welcome Centers and 60 state park and forest campgrounds.

Spongy moth females laying eggs I DATCP

Seed Labeling Program

The Seed Program monitors agricultural, lawn, and vegetable seed to ensure labeler and dealer compliance with standards prescribed by the Wisconsin Seed Law. Seed that does not meet label guarantees or conform to purity, germination rate and noxious weed seed restriction standards may be removed from the marketplace and labelers may be subject to penalties. Seed program inspectors perform a range of duties, such as evaluating labels for compliance, issuing stop sale orders and collecting samples for analysis.

In 2021, DATCP licensed 797 seed labelers. Of the licensed labelers, 175 (22%) were inspected and 93 (12%) were sampled, with a total of 368 samples collected. The seed samples included 129 grasses, 55 vegetables, 48 large grains (corn, soybean, pea) and 42 cereals. The remaining 48 samples were alfalfa (22), clover (20) and native seed (4). Eighty-seven seed labelers from 2020 claimed "out of business" or canceled their licenses this year and 63 new licenses were processed.

DATCP inspects all licensed seed labelers in Wisconsin on a three-year rotation and targets labelers with a history of exceeding the state average violation rate. During the past decade, an average of 29% of licensed labelers have been inspected annually. For 2021, companies with poor compliance records and those which had not been sampled in the past two years were targeted for priority sampling. Grasses, mixtures and legumes were also targeted for sampling this season.

Seed industry violations fell to the lowest level in program history. Fifteen violations were found in the 368 samples, for a 4.1% violation rate. Five of the violations were categorized as minor and 10 were considered serious. The 2021 violation rate is also well below the 10-year average of 6.1% and indicates improvement in labeling compliance.

Ten-Year Seed Inspection Results 2012-2021

Year	No. Labelers	No. of Samples	No. of Violations	% Violation	% Labelers Inspected	% Labelers Sampled
2012	729	335	38	11.3%	30%	12%
2013	725	375	30	8.0%	26%	14%
2014	730	341	18	5.3%	29%	12%
2015	725	343	16	4.7%	33%	14%
2016	728	374	18	4.8%	28%	16%
2017	742	410	22	5.4%	24%	16%
2018	743	371	17	5.1%	26%	15%
2019	789	392	26	6.6%	37%	16%
2020	821	*84	*	*	*	*
2021	797	368	15	4.1%	22%	12%

Pest Survey and Control Section

The Pest Survey and Control Section conducts surveys for the early detection of exotic plant pests and diseases of economic and regulatory significance and responds to new pest introductions by initiating strategic control or eradication measures. Surveys supply information to the Bureau's regulatory programs and may be used to determine pest presence or absence, substantiate pest-free status, or to establish or revise a quarantine regulation. The Section includes the Plant Industry Laboratory in Madison, which provides plant pest and disease diagnostic services to the Bureau's regulatory and survey programs.

Pest Survey Programs

Plant Industry Bureau Lab

Forest Pest Survey

Spongy Moth Program

Commodity Crop Survey

Specialty Crop Survey

Hemp

Plant Industry Bureau Laboratory

The Plant Industry Bureau Laboratory provides plant disease diagnosis and insect pest identification for the Bureau's Christmas tree, Nursery and Pest Survey Programs. The lab also performs testing for phytosanitary certification necessary for domestic and international export of plants and plant products. This year, the lab processed 557 plant samples for diseases and 157 samples for insect and mite pest concerns. In addition, 1,030 field-collected insect trap samples were screened for regulated and non-native pest species.

New detections in 2021 included two rusts, Japanese apple rust (*Gymnosporangium yamadae*) on crabapple and white rust (*Pustula* sp.) on coneflower, as well as two powdery mildew species, *Erysiphe aduca* on aspen and *E. viburniphila* on viburnum. All four finds were from Wisconsin nurseries.

Advances in the lab this year were the addition of six new polymerase chain reaction (PCR) diagnostic tests for general fungi, nematode and oomycete identification, plus PCR tests for *Fusarium sambucinum*, potato mop top virus (PMTV) and *Spongospora subterranea* f. sp. *subterranea*. The PMTV and *S. subterranea* testing is part of the lab's survey of Wisconsin potato growing areas for these two pathogens.

The lab also collaborated with national and international partners, supplying *Phytophthora* spp. cultures from past Christmas tree surveys to the Canadian Forest Service for current research, and participating in a National Plant Diagnostic Network (NPDN) inter-laboratory comparison of a real-time PCR assay to detect *Fusarium sambucinum*, the causal agent of dry rot in potatoes.

Tobacco rattle virus on peony | DATCP

PMTVfoliar symptoms I Neil Gudmestad NDSU

PMTV spraing | AHDB/Sutton Bridge CSR

False root-knot nematode I R. M. Harveson

Plant Industry Bureau Laboratory

Potato Mop Top Virus Survey

Potato mop top virus (PMTV) was detected for the first time in Wisconsin-grown potato tubers in 2020. In response, the Bureau began a two-year statewide survey for PMTV and its vector, *Spongospora subterranea* f. sp. *subterranea* (the fungus-like organism that causes powdery scab). The survey is funded by the USDA Specialty Crop Block Grant Program. Although PMTV is not a regulated organism, it contributes to viral load in seed potatoes and renders infected tubers unmarketable due to internal necrosis. The powdery scab pathogen was included in the survey because it vectors PMTV and allows PMTV to persist in the soil for years, potentially infecting future potato crops.

During the first year of the survey, the Plant Industry Lab received 103 potato tuber samples from various seed and commercial growers throughout Wisconsin. The tubers were tested for PMTV and the powdery scab pathogen using the gene-based diagnostic test PCR. All tuber samples were negative for PMTV in 2021. Powdery scab, first documented in Wisconsin in 2002, was detected at low levels on nine of the 103 samples.

Cereal Cyst Nematode Survey

The Plant Industry Lab surveyed for a number of regulated exotic cyst nematodes this year. Included were the exotic cereal cyst (*Heterodera filipjevi*), the cereal cyst (*H. avenae*), the false root-knot nematode (*Naccobus aberrans*) and the Mediterranean cyst (*H. latipons*). Lab specialists also recorded any non-target cyst nematodes found. No exotic cyst nematodes were detected in samples from 66 fields. Nineteen fields had other cyst nematodes, including 13 fields with soybean cyst nematode (*H. glycines*).

Plant Industry Bureau Laboratory

Lab Testing for Export Certification

Agricultural crops grown for seed export are inspected during the growing season for regulated insects, diseases and nematodes. Field inspection and lab testing of the standing crop before harvest is a service provided to seed companies and growers to meet the phytosanitary requirements of domestic and foreign customers. For the 2021 growing season, inspections were requested by 20 seed producers. Most of the inspected acres were corn and soybean, though blueberries, onions, oats, garden bean fields and philodendron were also included. A total of 98 samples were tested at the Plant Industry Lab for 97 different diseases (bacterial, fungal and viral) and nematodes.

Goss's wilt was found in 21 of 48 seed corn fields and maize dwarf mosaic virus was detected in one field. Test results were negative for bacterial leaf streak, High Plains disease (HPV), maize chlorotic mottle virus (MCMV), Stewart's wilt, wheat streak mosaic virus (WSMV) and exotic downy mildews. Stewart's wilt has not been documented in the state since 2010.

Of the six oats samples tested, all were free from bacterial leaf streak, Cephalosporium stripe, HPV and the nematode *Anguina tritici*. Soybean samples from two fields tested negative for anthracnose of soybean, arabis mosaic virus, bean pod mottle virus, tobacco ringspot virus, tomato ringspot virus, peanut stunt virus, southern bean mosaic virus and bacterial wilt of dry beans. Forty-four blueberry samples were negative for the viruses blueberry shock, blueberry scorch and sheep pen hill. Three samples of garden beans, onions and philodendron (one each) submitted for testing were negative for nematodes and pathogens of regulatory concern.

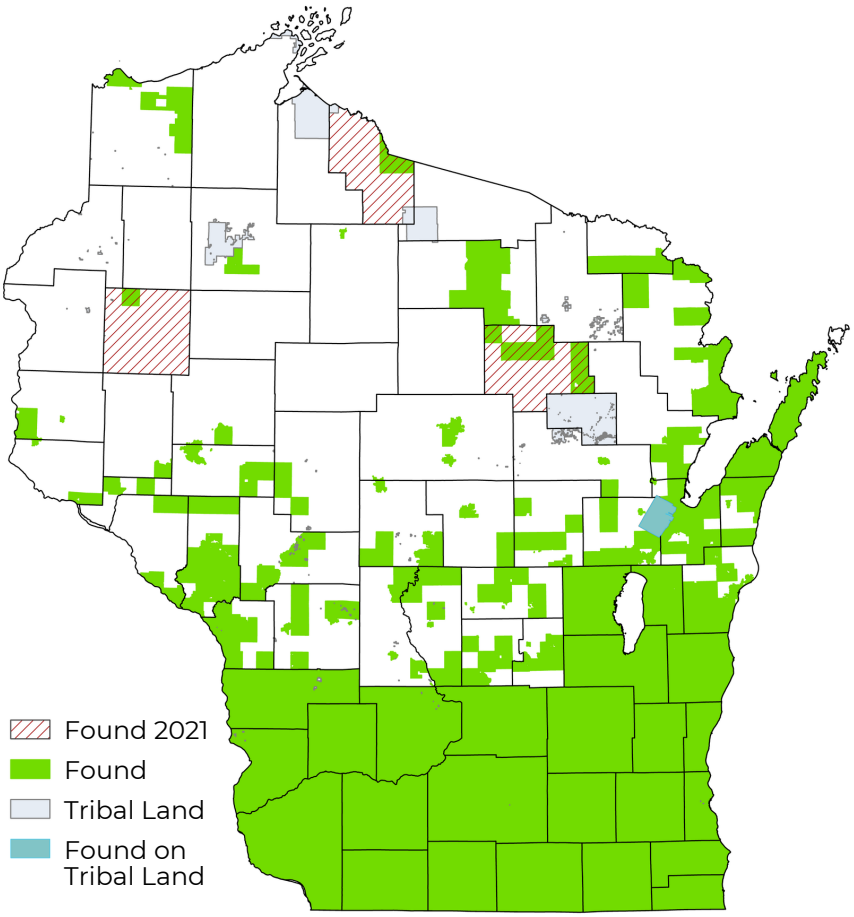
Seed corn field I DATCP

Forest Pest Surveys

Forest entomologists set 178 insect traps across 69 sites in 2021 as part of forest pest detection and monitoring work. Five separate surveys generated 1,030 trap samples, from which over 10,000 insect specimens were identified and screened for 18 regulated or non-native tree pests.

Emerald Ash Borer

In the 13 years since emerald ash borer (EAB) was first found in Wisconsin, this ash tree-killing pest has spread to 61 of the state's 72 counties. Validated reports of dying ash trees made by arborists, citizens and municipal, state, tribal and county forestry staff to the DATCP Pest Hotline led to detections in three new northern Wisconsin counties this year: Barron, Iron and Langlade. Another 90 municipal finds were confirmed within counties known to have EAB infestations. New county and municipal-level detections decreased by more than 50% from 2020 to 2021. This downward trend is expected to continue as EAB spreads into the more sparsely populated northern region of the state.



Map 2. Emerald Ash Borer Detections 2008-2021

Spotted Lanternfly

Preemptive detection work for spotted lanternfly (SLF) continued in 2021. Surveys were concentrated in eight southern Wisconsin counties with known infestations of this pest's preferred host, *Ailanthus altissima* (tree-of-heaven), including Dane, Grant, Jefferson, Kenosha, Milwaukee, Racine, Rock and Walworth.

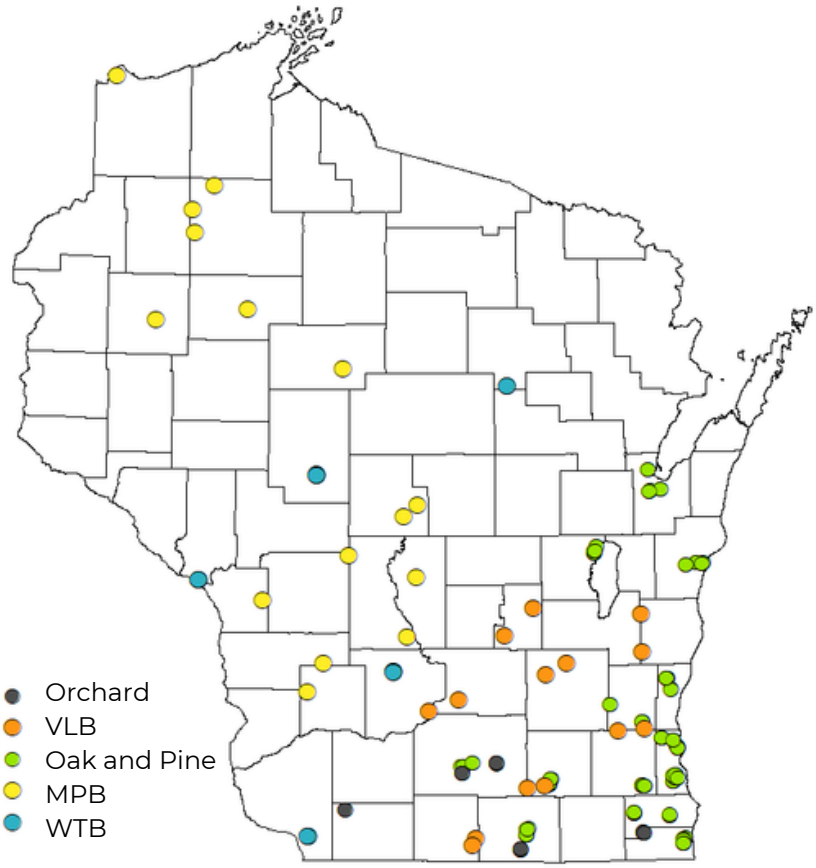
A total of 21 circle-style traps baited with methyl salicylate were set in Ailanthus trees. Visual surveys for SLF were also conducted at the tree-of-heaven sites and in 28 apple orchards statewide. No SLF were detected as part of the visual or trapping surveys.

Although SLF has not officially been found in Wisconsin, unconfirmed reports of dead SLF that "hitchhiked" by aircraft or in commercial and personal vehicles have been submitted to the DATCP SLF reporting portal (slf.wi.gov). In 2021, a dead lanternfly specimen was found in plastic-wrapped pallet goods at a Jefferson County facility. Similar interceptions have been reported from states outside of the generally-infested region of the eastern U.S. Early detection of this pest relies heavily on public reporting of SLF finds.

Velvet Longhorned Beetle

Surveys for velvet longhorned beetle (VLB) have been conducted in Wisconsin since 2017, following the first detection in Milwaukee County. For the 2021 season, trapping was carried out at 18 sites across 10 counties, including four apple orchards and 14 urban locations. The urban traps were based in counties with no prior detections. Orchard traps were reset at sites where VLB was collected for the first time in 2020. The survey resulted in the capture of two VLB specimens in a Columbia County trap, which is a new county record.

In five years, early detection surveys have collected VLB in 10 southeastern Wisconsin counties: Columbia, Dane, Fond du Lac, Kenosha, Milwaukee, Ozaukee, Racine, Rock, Walworth and Waukesha. All collections were made using cross-vane panel traps with pheromone lure.



Map 3. Forest Pest Detection Surveys 2021

The pest potential of this introduced Asian wood borer remains unknown. Velvet longhorned beetle has been found in at least 14 states and is established in Illinois, Wisconsin and Utah. In Wisconsin, it has been intercepted in rustic hickory-style log furniture manufactured in China (2016) and collected in survey traps. Research indicates in may be a secondary agent with a preference for stressed or unhealthy trees. To date, no infested trees have been observed or reported in the Wisconsin landscape, and there have been no environmental or economic impacts attributed to VLB.

Oak and Pine Commodity Survey

Forest entomologists also conducted an oak-pine commodity survey in 2021 funded by the Plant Protection Act 7721. Survey target organisms were 13 National Priority Pests—five moth defoliators and eight wood borers and bark beetles—which pose a threat to the state's natural and urban forests and its forest product industries.

Monitoring of 120 traps was carried out at 30 industrial properties in 12 counties from May through August. Survey traps yielded 796 samples and nearly 6,000 specimens were screened for exotic target pests. Although no targets were detected, several other non-native species of interest were collected as bycatch, including the exotic ambrosia beetles *Ambrosiophilus atratus* (1), *Anisandrus maiche* (46), *Xylosandrus crassiusculus* (1) and *Xylosandrus germanus* (312). DATCP forest entomologists are currently documenting the distribution of these recently introduced ambrosia beetle species and assessing their potential impact to trees in plant nurseries, landscapes and orchards.

Forest Pest Surveys

Mountain Pine Beetle Survey

Mountain pine beetle (MPB) has been described as the most destructive pest of mature pine trees in North America. It has not been found in Wisconsin. An exterior MPB quarantine was established by DATCP in 2017 to restrict imports of untreated or bark-on pine products and firewood from MPB-infested areas that could bring the beetle into the state. In 2021, traps were set in 15 pine stands near forest product industries across 13 central and western counties. Biweekly monitoring from July through August found no MPB in the 65 trap samples collected.

Walnut Twig Beetle Survey

Annual presence-absence surveys for the walnut twig beetle (WTB) have been conducted in Wisconsin for the last decade. The beetle is native to the western U.S., but in recent years has been found east of the Mississippi, though not in Wisconsin. As a vector of the *Geosmithia morbida* fungus, which scientists believe causes thousand cankers disease of walnut, WTB is a regulated pest for walnut exports.

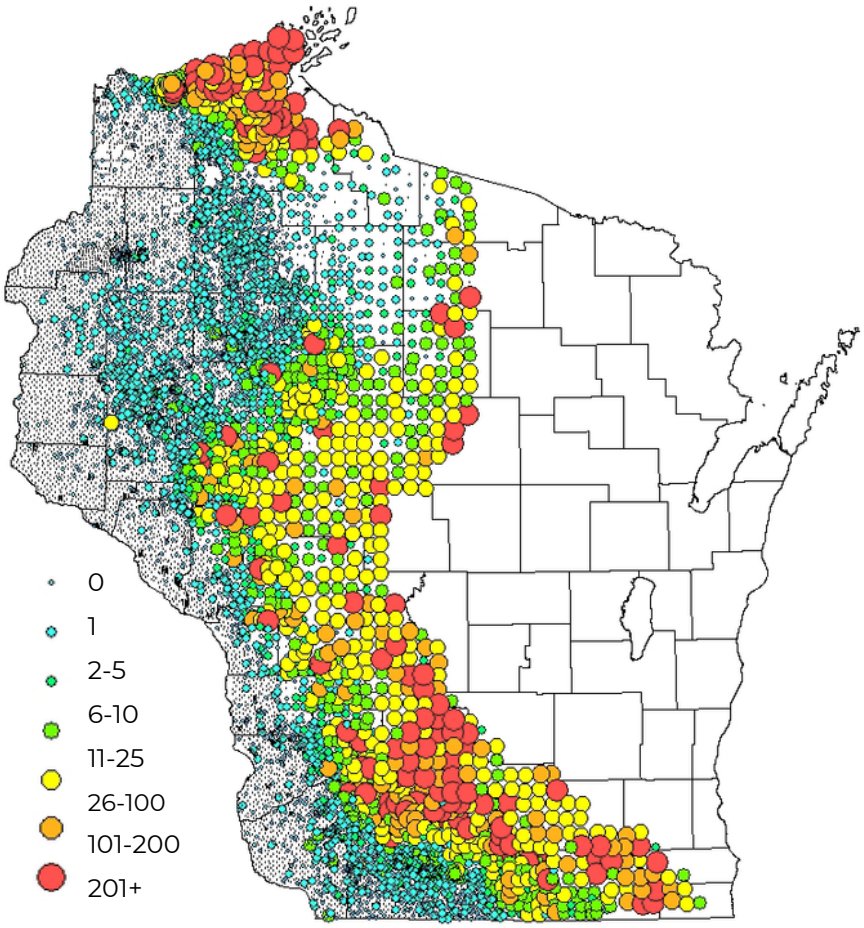
This season, monitoring was conducted at five sawmills where 13 multi-funnel traps were set in log yards holding walnut. Walnut twig beetle was not found in the 120 trap samples processed. Other species of concern detected were: *Ambrosiophilus atratus* (10), *Cyclorhipidion pelliculosum* (2), *Xylosandrus crassiusculus* (1) and *Xylosandrus germanus* (74). These four previously mentioned exotic ambrosia beetles species have been commonly collected as survey bycatch over the last several years across a variety of landscapes, including orchards, forestland, industrial and urban areas.

Walnut twig beetle exit holes I nfs.unl.edu

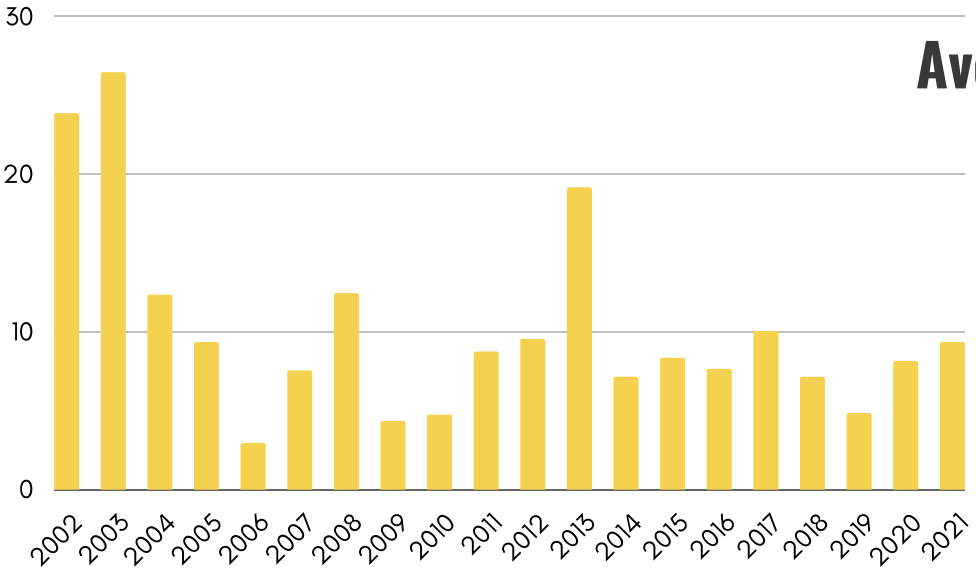
Spongy Moth Program

The Cooperative Spongy Moth (formerly gypsy moth) Program is a collaborative interagency effort between DATCP, USDA-Forest Service, and the Wisconsin Department of Natural Resources. The program's mission is to detect and treat infestations to slow westward range expansion of the spongy moth across the state. Annual trapping surveys are conducted to pinpoint emerging populations and are the basis for determining treatment areas.

In 2021, seasonal trappers set 10,787 traps across western Wisconsin and caught a total of 99,847 male moths (9.3 moths/trap). This 19% increase from the previous year's totals (2020: 83,720 moths, 8.3 moths/trap) marks a second consecutive year of population growth in Wisconsin. Dry spring conditions are suspected to have suppressed naturally occurring larval pathogens, which likely increased moth populations by allowing more caterpillars to reach adulthood.



Map 4. Spongy Moth Trapping Survey Results 2021



Ave No. Moths per Trap 20-Year Trend

Annual average moth counts have ranged from as high as 26 moths per trap in 2003 to less than one per trap, with a 20-year average of 10 per trap

Spongy Moth Program

While the majority of population growth occurred in the historically infested central and eastern parts of the state, above-average rates of spread were observed in previously uninfested areas of northwestern Wisconsin. Future trapping efforts will determine whether the elevated trap catches in this region arose from established local populations versus drifts of transient male moths from heavily infested areas in central Wisconsin.

The Spongy Moth Slow the Spread Program treated 45 sites totaling 88,977 acres in 2021. BTK applications began May 19 and ended June 3. Foray BTK was applied to 11,800 acres at 24 sites in western Wisconsin. Forest Service mating disruption (MD) applications occurred from June 25-July 13. A total of 77,177 acres at 21 sites were treated with MD in western Wisconsin.

Eau Claire and Richland counties were added to the state and federal quarantine zone this year. Persistent populations across large portions of these two counties necessitated the expansion. With these additions, 52 of Wisconsin's 72 counties are now under quarantine for this insect.

Since spongy moth survey and control projects began in Wisconsin in 1971, a total of 1,040,347 traps have been set and over 4,300,718 acres treated. Annual average moth counts have ranged from as high as 26 moths per trap in 2003 to less than one per trap, with a 20-year average of 10 per trap.

Spongy Moth Trapping and Treatment Summary 2012-2021

Year	Number of Traps	Number of Moths	Ave. Moths per Trap	Acres Treated
2012	18,293	173,558	9.5	193,924
2013	18,513	353,134	19.1	145,860
2014	13.105	92,786	7.1	168.113
2015	11,712	97,505	8.3	232,668
2016	11,386	86,462	7.6	201,207
2017	10,940	109,333	10.0	154,947
2018	10,748	76,447	7.1	7,288
2019	10,962	52,396	4.8	113,911
2020	10,308	83,720	8.1	152,978
2021	10,787	99,847	9.3	88,977

51-YEAR PROGRAM STATS

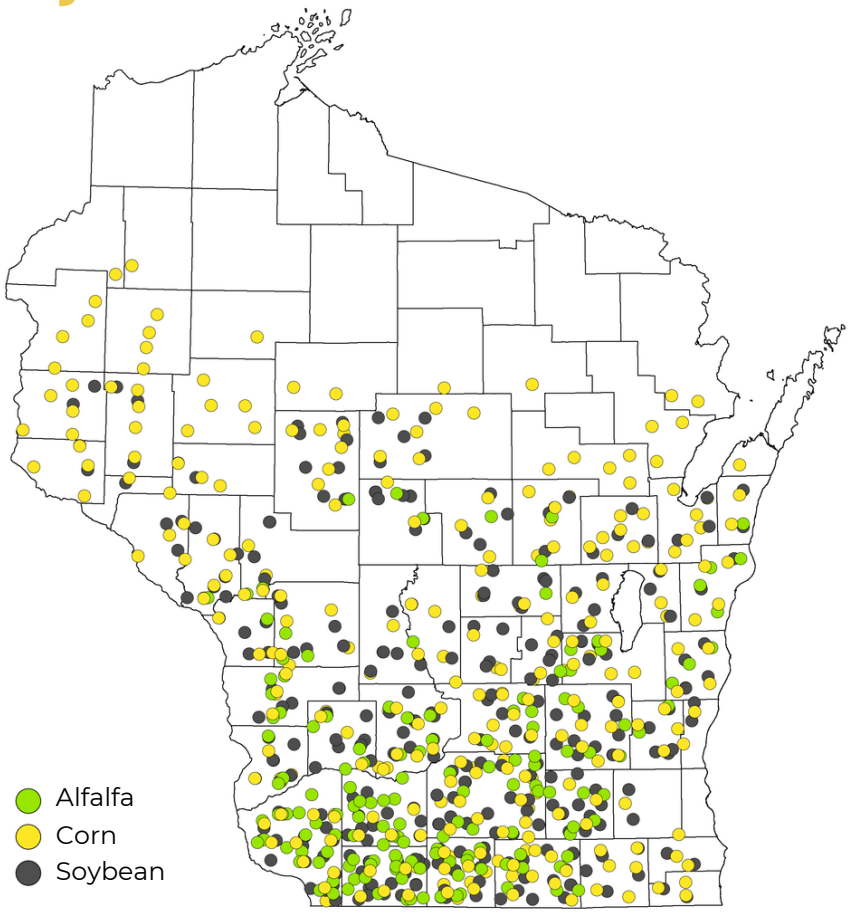
1,040,347
TRAPS SET

5,596,680
MOTHS CAPTURED

4,300,718
ACRES TREATED

Commodity Crop Surveys

Pest survey specialists monitored alfalfa, corn and soybean fields in 2021 for several invasive national priority pests that are currently not known to occur in Wisconsin or have limited distributions in the state. Survey work was funded by the USDA Cooperative Agricultural Pest Survey (CAPS) Program and DATCP, and conducted from May through August. Field crop surveys also collected data on the leading economic pests of concern to Wisconsin crop producers, such as the corn rootworm, Japanese beetle and soybean aphid.



Map 5. Commodity Crop Surveys 2021

Invasive Soybean Pests

USDA CAPS surveys in Wisconsin soybean fields targeted three national priority pests: cucurbit beetle, maritime garden snail and yellow witch-weed. These exotic species have been identified as threats to U.S. agriculture with a high likelihood of introduction into Wisconsin. Visual surveys in 301 soybean fields yielded no new detections.

Soybean Gall Midge

An emerging pest of Midwestern soybeans, the soybean gall midge (SGM) was not found in Wisconsin in 2021. In the last four years, SGM populations have been confirmed in 140 counties in Iowa, Minnesota, Missouri, Nebraska, and South Dakota, including 26 new counties this year. Larvae of the SGM feed internally at the base of soybean stems and cause stem breakage. DATCP is participating in a multi-state effort by the North Central Soybean Research Program to understand the regional distribution and impact of this new soybean threat.

Soybean Aphid

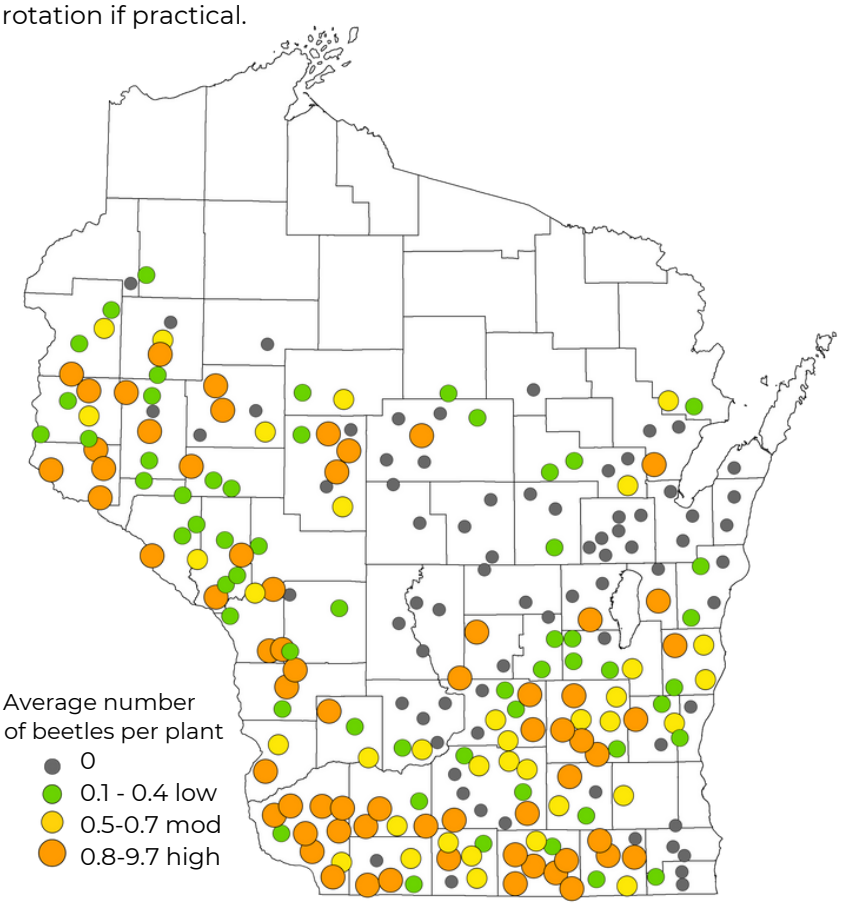
Populations recorded during the annual survey were very low. Ninety-eight percent of the 143 fields sampled from July 13-August 16 had average counts below 50 aphids per plant, and no surveyed field had an economic population above the 250 aphid-per-plant threshold. The 2021 state average count was just six aphids per plant. For comparison, the 2020 survey found an average of 15 aphids per plant and the all-time record-low average of five aphids per plant was recorded in 2019. Results of this season's effort suggest that aphid pressure was low in 2021, and no soybean field sampled met treatment guidelines during the survey timeframe.

Commodity Crop Surveys

Corn Rootworm

Beetle populations rose sharply in southern and western Wisconsin this season. The annual survey in August found a state average of 0.8 beetle per plant, an increase from 0.6 per plant in 2020 and the highest average in more than a decade (since 2008). The heaviest adult rootworm pressure was recorded in the southwest counties, where the district average more than doubled from 0.7 beetle in 2020 to 1.7 beetles per plant in 2021. Counts were also relatively high in the south-central and west-central regions, at 1.2 and 0.7 beetle per plant, respectively. Corn fields with populations above the 0.75 beetle-per-plant threshold comprised 28% of this year's 229 sites.

Based on the higher populations observed in August, southern and western Wisconsin corn producers were advised to closely review their rootworm management plans for 2022 and consider crop rotation if practical.



Map 6. Annual Corn Rootworm Beetle Survey 2021

Corn rootworm beetles I Kevin Arvin flickr

Western Bean Cutworm

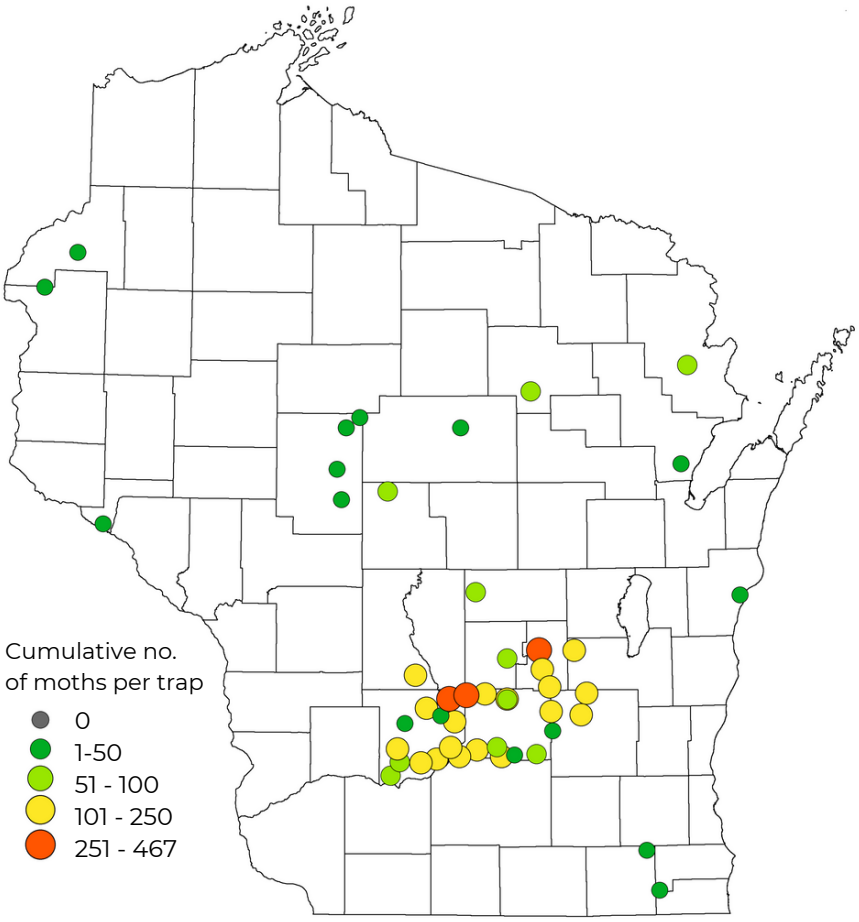
Moth counts in 2021 were the highest recorded in 16 years of surveys. The annual trapping program from June-August registered an average of 117 moths per trap (5,607 moths in 48 traps), surpassing the previous survey record of 79 moths per trap (10,807 moths in 136 traps) set in 2010. The highest individual count for the 10-week monitoring period was 467 moths in Columbia County. This season's relatively large flight produced heavy larval infestations in scattered corn fields in the west-central and central counties by late summer.

Invasive Corn Pests

Corn surveys conducted in Wisconsin as part of the USDA CAPS Program targeted five exotic national priority pests: cucurbit beetle, late wilt, maritime garden snail, Philippine downy mildew and yellow witchweed. Visual surveys in 414 corn fields found no new exotic pests. A map showing the 2021 CAPS commodity survey sites is provided on page 27.

Corn Earworm

Pheromone traps captured a cumulative total of 11,837 moths in 16 traps during the late-season monitoring program, with the largest flights recorded during the first week of September. The highest individual weekly trap count was 1,579 moths at Arlington in Columbia County from August 26-September 1. Compared to 2020 when 4,747 moths were collected in 18 traps, this year's total count was 1.5 times higher. The risk to late sweet corn from migrating corn earworm adults was also elevated in 2021, and the September moth flights produced localized larval damage to apples, corn and tomatoes.



Map 7. Western Bean Cutworm Moth Counts 2021

Black Cutworm

An early planting season in 2021 contributed to a low risk of cutworm damage to emerging corn. The spring trapping survey captured 1,320 moths in 48 traps, with a peak recorded May 6-12. Severe black cutworm injury was not observed this season. In fact, a late, widespread frost on May 28 posed a greater threat to emerging corn than cutworms.

Corn Tar Spot

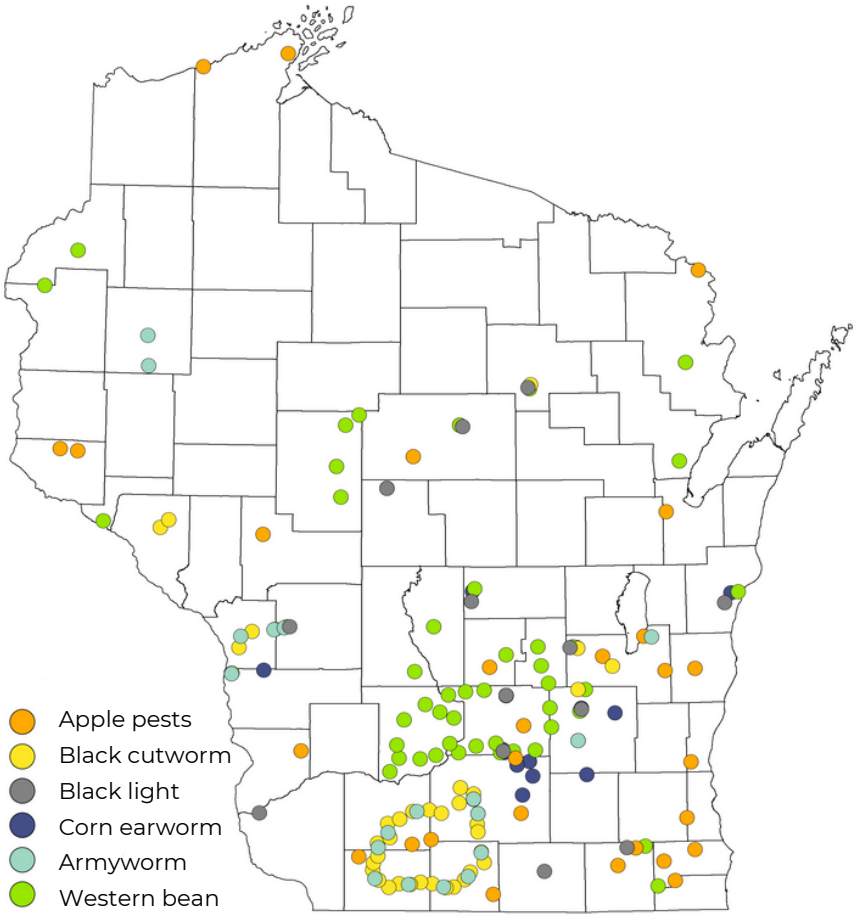
This foliar disease reached epidemic levels in Wisconsin and the Midwest three years ago and was widespread in 2021. Reported for the first time in the state in 2016, corn tar spot (*Phyllachora maydis*) initially appeared late in the season and was mainly a cosmetic problem. By 2018, the disease began developing earlier and infecting corn fields statewide. Corn tar spot was documented by the UW-Madison and DATCP in 58 counties this year, 15 of which were new county records for Wisconsin.

Commodity Crop Surveys

European Corn Borer

Larval populations remained extremely low in 2021. The state average count in 229 corn fields sampled this fall was 0.04 borer per plant, which is only marginally higher than the 2020 survey average and the all-time low average of 0.01 per plant recorded in 2018 and 2019. Five of the state's agricultural districts showed averages less than or equal to last year's levels, while negligible increases were noted in the south-central, southwest, west-central and north-central areas. Larvae were absent from 89% of the fields sampled in September and October.

The near-record low number of corn borers observed again this year reflects the continued prevalence of Bt corn, which accounted for 79% of the state's corn acres in 2021.



Map 8. Insect Monitoring Network Sites 2021

Insect Monitoring Networks

To accomplish its objective of collecting and reporting current data on economic pests affecting Wisconsin crops, the Pest Survey Program maintains several volunteer insect trapping networks. Some of the network traps are managed by DATCP's own field specialists, while many are monitored by cooperators throughout the state. Cooperators represent a variety of agriculture backgrounds, including apple growers, agronomists, farmers, crop consultants, gardeners, and UW-Extension staff. This year, 69 cooperators participated in the program's monitoring networks.

Insect Monitoring Network Trap Numbers 2021

Pest Type	Counties	No. of Traps Set	Trap Type
Apple orchard pests	21	224	Pheromone delta
Black cutworm	16	48	Pheromone milk jug
Black light	11	12	Black light trap
Corn earworm	9	16	Hartstack
Armyworm	11	20	Pheromone milk jug
Western bean cutworm	21	48	Pheromone milk jug

Fruit Pest Surveys

Black Stem Borer

An introduced species native to Asia, the black stem borer (BSB) has become naturalized throughout much of the U.S. since the first detection in New York in 1932. This generalist member of the ambrosia beetle group is capable of infesting a broad range of ornamental and forest species. Until recently, infestations in apple trees were rare. In the last 10 years, Michigan, New York and Ohio have reported an increase in BSB infestations associated with apple tree decline. Two recent cases have been recorded in Wisconsin apple orchards: the first in 2019 in Lafayette County and a second in Dane County in 2021 where apple trees had been predisposed to attack by fire blight infection.

During the 2021 season, a BSB survey was conducted in apple orchards in Dane, Kenosha, Lafayette and Rock counties. Nine ethanol-baited multi-funnel traps collected 2,540 BSB specimens, 75% of which were captured in a single trap along the orchard perimeter near a forested area. Peak flight activity was recorded April 27 through June 9, when 92% of beetles were collected, and BSB activity ended by August 25.

Surveys since 2013 have documented BSB in 34 Wisconsin counties, both as the target pest and as bycatch. The prevalence of BSB in survey traps suggests it is widespread across much of the southern half of the state.

Non-Native Ambrosia Beetles

Fifty-eight specimens of the non-native ambrosia beetle *Anisandrus maiche* were collected from four of five apple orchard survey sites this season. First identified in the state in 2016 as trap bycatch from exotic beetle surveys, *A. maiche* was subsequently found in honey locust saplings in Ozaukee and Washington counties during routine nursery inspections, in 2017 and 2018, respectively. As of December 2021, over 1,000 *A. maiche* beetles have been collected from 16 Wisconsin counties.

Black stem borer entrance holes frass | DATCP

Bark beetle multi-funnel trap in orchard | DATCP

Fruit Pest Surveys

Blueberry Maggot

A new state record was established in 2016 when adult flies were collected for the first time in Adams and Sauk counties. Despite continued survey efforts over the last five years, no additional detections have followed. Counties surveyed in 2021 were Dane, Jackson, Juneau, Monroe, Portage and Wood, where 24 yellow sticky traps were set. No flies were captured. Based on the limited distribution records, it is unclear if this economic pest is more widely established in Wisconsin or if it will eventually pose a threat to the fresh fruit industry.

Brown Marmorated Stink Bug

Pierce County, in northwest Wisconsin, was the only addition to the Wisconsin BMSB distribution map in 2021. Thirty-seven of the state's 72 counties now have confirmed BMSB finds. Reproducing populations of this invasive pest are well established in southern and eastern Wisconsin, and range expansion is advancing into the western and northern areas of the state.

Apple Orchard Pests

Twenty-eight cooperating apple orchards in 21 counties provided data on the appearance and abundance of apple maggot, codling moth, dogwood borer, lesser peach tree borer, obliquebanded leafroller, redbanded leafroller and spotted tentiform leafminer, all insects of concern to the state's apple industry. Cooperators also scouted orchards for the invasive spotted lanternfly, which has not yet been detected in Wisconsin. Insect counts were published weekly at **pestsurvey.wi.gov**. Apple growers who participate in the program report higher confidence in the effectiveness of their pest management programs, along with an overall reduction in seasonal insecticide use.

Brown marmorated stink bug I Erik Agar

Swede midge survey trap I DATCP

Vegetable Pest Surveys

DATCP plant pest specialists visited 10 community gardens and CSA farms on a biweekly basis this season to survey for new and emerging vegetable pests. The two primary targets were the swede midge and leek moth. The former is a newly introduced species, while the latter has not been found in Wisconsin.

Swede midge

Swede midge (SM) was confirmed for the first time in the state in 2019. The flies were captured on survey traps in Dane and Milwaukee counties. This year, traps were set in Columbia, Dane and La Crosse counties as part of an exotic vegetable pest detection survey in urban community gardens. All traps were negative for swede midge. No new SM detections have occurred since 2019.

Leek moth

Early detection surveys for this allium pest native to Europe have been conducted in Wisconsin since 2018. Until recently, leek moth was a National Priority Pest due to the frequency of interceptions at U.S. ports of entry and its capacity to cause severe economic losses to allium crops.

Leek moth was first detected in North America in 1993 in Ottawa, Canada, and gradually spread into New York through natural movement by 2009. Its range expansion is expected to continue.

In the last four years, pheromone traps have been set at 51 garden and small farm locations to detect this pest. Leek moth has never been captured in a survey trap or reported in Wisconsin.

Swede midge damage to broccoli I DATCP

Hemp Program

Beginning January 1, 2022, the state operated hemp program was discontinued and regulatory authority for the production of hemp in Wisconsin was transferred to the USDA. Wisconsin hemp growers are now licensed by USDA and hemp processors no longer require a license.

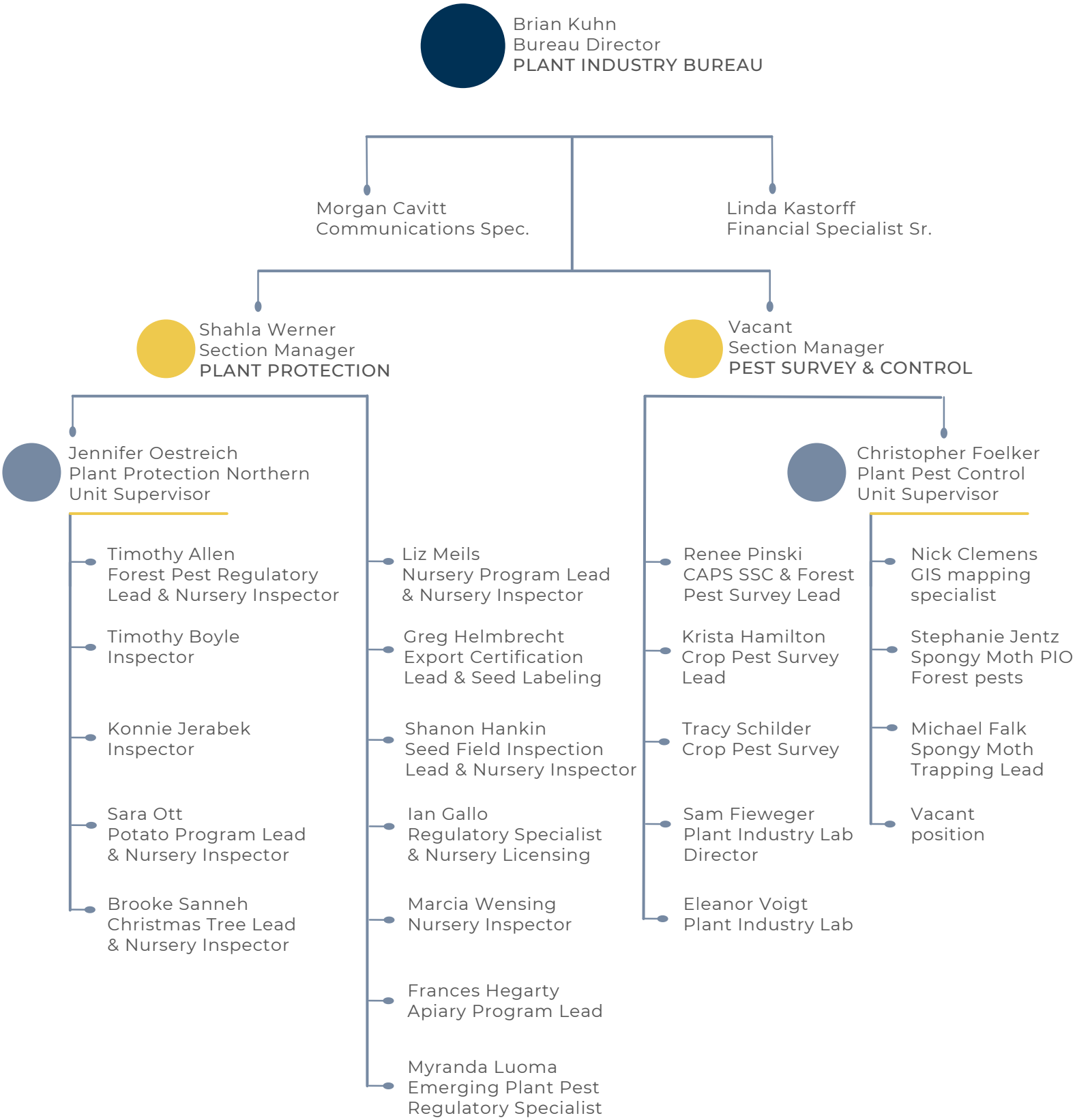
In 2021, the DATCP Hemp Research Program regulated the production of hemp as defined at Wis. Stat. § 94.55(1). The program provided opportunity to grow and process hemp in the state to the greatest extent authorized under federal law.

For the 2021 season, the hemp program licensed 679 growers. Of those, 655 obtained a 2021 grower annual registration and were authorized to grow this year. Although 427 processors were licensed by DATCP, only 417 could process hemp in 2021 because they had a processor annual registration.

Program data showed 1,989 acres of hemp were planted in 66 counties this year. From those acres, 722 regulatory samples were taken. Eighty-nine percent of the samples passed regulatory testing by having a total THC content of 0.3% or lower, while 11% of the samples failed testing.

More information about to the discontinuation of the state-operated hemp program is available at the DATCP Wisconsin Hemp Resources webpage.

Plant Industry Bureau Organization



2021

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Division of Agricultural Resources Management