

Wisconsin Horticulture Update Summary, April 24, 2015

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WI WEATHER REVIEW

The 60th season of the Wisconsin Pest Bulletin has commenced!

Cool, rainy weather stalled spring fieldwork following a week of unseasonable warmth. After the passage of a low pressure system on April 19, temperatures declined considerably from the 60s and 70s to the mid-30s and 40s (degrees F). Gusty winds and brisk conditions persisted throughout the week, with reports of light snow occurring in northern and central Wisconsin. The widespread early-week precipitation improved soil moisture conditions across much of the state and eased dryness concerns, especially in the west where crop moisture shortages are most pronounced. Although the below-normal temperatures and rain slowed progress made during the brief mid-April warm spell, both spring tillage and planting operations remain well ahead of last year and on pace with the five-year average. Planting of oats, potatoes and corn is expected to resume in full once the weather moderates later next week. (<http://datcpservices.wisconsin.gov/pb/index.jsp>)

Average soil temperatures at 2" as of April 24, 2015: Hancock 45.4, Arlington 42.5.
(http://agwx.soils.wisc.edu/uwex_agwx/awon/awon_seven_day)

Growing degree days (GDD)

Growing degree days is an accumulation of maximum and minimum temperature averages as related directly to plant and insect development. This week, the GDD_{mod50} in Wisconsin ranged from 74 to 192. Following is a list of DD as of April 22, 2015 for the following cities: Appleton-112; Bayfield-89; Beloit-192; Big Flats-154; Cumberland-122; Crandall-80; Crivitz-74; Eau Claire-147; Fond du Lac-115; Green Bay-86; Hancock-154; Hartfield-118; Juneau-133; LaCrosse-183; Lone Rock-180; Madison-170; Medford-99; Milwaukee-99; Port Edwards-143; Racine-100; Sullivan-118; Waukesha-118; Wausau-105. To determine the GDD of any location in Wisconsin, use the degree day calculator at the UW Extension Ag Weather webpage:

http://www.soils.wisc.edu/uwex_agwx/thermal_models/degree_days

To put it in perspective, following is an abbreviated list of plant and insect phenological stages in relation to GDD accumulations at which the events occur (Ohio State BYGL): Silver maple, first bloom, 34; Cornelian cherry dogwood, first bloom, 40; silver maple, full bloom, 42; red maple, first bloom, 44; speckled alder, first bloom, 52; northern lights forsythia, first bloom, 58; Japanese pieris, first bloom, 60; red maple, full bloom, 75; star magnolia, first bloom, 83; border forsythia, first bloom, 86; **eastern tent caterpillar, egg hatch, 92**; Manchu cherry, first bloom, 93; northern lights forsythia, full bloom, 94; Norway maple, first bloom, 116; border forsythia, full bloom, 116; chanticleer callery pear, first bloom, 123; sargent cherry, first bloom, 127; **larch casebearer, egg hatch, 128**; Japanese pieris, full bloom, 129; saucer magnolia, first bloom, 133; common flowering quince, first bloom, 137; Bradford callery pear, first bloom, 142; **European pine sawfly, egg hatch, 144**; weeping Higan cherry, first bloom, 145; P.J.M. rhododendron, first bloom, 147; chanticleer callery pear, full bloom, 149; Norway maple, full bloom, 149; **inkberry leafminer, adult emergence, 150**; sargent cherry, full bloom, 151; star magnolia, full bloom, 151; Allegheny serviceberry, first bloom, 153; Manchu cherry, full bloom, 155; spring snow crabapple, first bloom, 155; apple serviceberry, first bloom, 159; **spruce spider mite, egg hatch, 162**; Bradford callery pear, full bloom, 164; Allegheny serviceberry, full bloom, 169; saucer magnolia, full bloom, 174; P.J.M. rhododendron, full bloom, 178; **boxwood psyllid, egg hatch, 179**; weeping Higan cherry, full bloom, 179; Koreanspice viburnum, first bloom, 185;

regent serviceberry, first bloom, 186; Japanese flowering crabapple, first bloom, 189; eastern redbud, first bloom, 191; **gypsy moth, egg hatch, 192.**

WI CROP PROGRESS AND CONDITION

Copy and paste the following link into your browser to find weather review and reports from around the state.

http://www.nass.usda.gov/Statistics_by_State/Wisconsin/Publications/Crop_Progress_&_Condition/2015/WI_04_26_15.pdf

INTRODUCTION

The host for today's WHU was Erin LaFaive from Eau Claire County. PDDC Director Brian Hudelson and PJ Leisch, Manager of UW Extension Insect Diagnostic Lab were the specialist participants. PJ Leisch, Manager of UW Extension Insect Diagnostic Lab was the special guest speaking about pollinators and neonicotinoids. Participants in today's discussions were representatives from the following counties: Brown (Vijai Pandian), Columbia (George Koepp), Eau Claire (Erin LaFaive), Milwaukee (Sharon Morissey), Racine (Patti Nagai) Walworth (Chrissy Wen), Winnebago (Kim Miller) and Wood (Peter Manley).

HORTS' SHORTS

Agents report the following issues to be of interest this week:

Brown County: It has been a fairly cold week with soil temperatures in the 40's. Daffodils are blooming and star magnolias are starting to bloom. Crabapples are starting to leaf out. We are getting questions about lawns such as what to do about dead patches in the lawn.

Columbia County: Lawns are greening up although I haven't observed anyone out mowing yet. We haven't yet had mosquitos. I did see an apricot tree in bloom last week and that is a concern because of the frost we just had.

Eau Claire: It has been cool and rainy here. Bloodroot is starting to flower. Tulips and daffodils are popping out here and there, and lilacs buds are just starting to swell. No pest problems yet, but some springtails were reported.

Kenosha: We are about the same as Milwaukee, except I haven't heard of any mosquito issues. There have been some reports of ticks.

Milwaukee: I'm marveling at the mosquitos since it has been cold here. Many plants and bulbs are starting to flower. Star and saucer magnolias are in bloom. Trees have a green or red haze depending on species. I haven't heard of or seen any pest problems.

Winnebago: Things are about the same as last week due to the cold weather. Tree leaves are about 0.5" long. We did have a little rain. Not a whole lot going on.

Wood: Not much change from last week; it is still a mix of green and brown. The cold temps last week put us in a holding pattern. We had some rain, but really need more.

Waukesha: We are enjoying tent caterpillars, mosquitos and dandelions.

SPECIALIST REPORT: Insect Diagnostic Lab Update

Presented by P. J. Liesch, Assistant Faculty Associate, UW-Madison Department of Entomology, and Manager of the UW-Extension Insect Diagnostic Lab pliesch@wisc.edu

We have also had a busy week and things are picking up.

Mosquitos

Some mosquitos overwinter as adults and are able to quickly get active when there is some warmer temperatures. I got a first mosquito bite over a month ago.

Ticks

It is also the season for ticks.

Eastern Tent Caterpillar

This species hatches out at about 50 Growing Degree Days so it is active now. Control is easier when the tents are small. <http://learningstore.uwex.edu/Eastern-Tent-Caterpillar-P428.aspx>

Lily Leaf Beetle

This is a new invasive species in the state we only know currently from the Wausau area in Marathon County. The beetle is bright red, 0.25 inch beetle and feeds on true lilies. They spend the winter as adults and I just got a report a week ago that these insects are now active. Keep an eye out for this insect.

<http://umaine.edu/publications/2450e/>

EAB Treatments

We are in the treatment window now for soil drenches to control the larvae for larger trees. Smaller trees can be treated through May.

Clover Mites

We recently received samples of this small reddish mite that feeds on grassy plants in lawns. They are typically active in spring and fall. The diagnostic distinction is that their front legs are longer than the other legs. They do not bite people, but they may try to move into your home. If they get into your home, you can wipe them up with damp, soapy towels or vacuum them up. Seal up any exterior wall cracks or you may try a perimeter control if that is not effective.

<http://www.extension.umn.edu/garden/insects/find/clover-mites/>

Carpenter Ants

We are also hearing reports of carpenter ants.

<http://learningstore.uwex.edu/Controlling-Carpenter-Ants-P300.aspx>

Questions

EAB Soil Drench Uptake

Do you worry that the insecticide uptake if the ash tree isn't leafed out?

As long as it is in the soil, the tree will begin taking it up when it starts growing. The treatment window is mid- to late April in the southern part of the state for 12-15" at DBH (Diameter at Breast Height) or larger. You have a little longer to treat in the northern part of the state. It does take a little longer for larger trees to get it up to the canopy.

EAB Insecticide Soil Persistence

How long does the insecticide stay in the soil? Do you need to worry that it will be leached out?

The insecticide persists in non-sandy soils. In sandy soils there may be some leaching, so hold off treatment if you know that a big rain is coming.

SPECIALIST REPORT: Plant Diagnostic Disease Clinic

Presented by Brian Hudelson, Sr. Outreach Specialist, UW-Plant Pathology, and Director of the UW-Extension Plant Disease Diagnostics Clinic (PDDC) bdh@plantpath.wisc.edu

We had a busy week for this time of year. The PDDC update is attached to the end of this summary.

We have had some greenhouse samples come in with virus issues, both impatiens necrotic spot virus (INSV) and potyvirus. We also saw some grey mold. We have had some root rot samples come in, as well as branches affected by dieback and canker.

Impatiens Necrotic Spot Virus in New Guinea Impatiens

This virus is transmitted by thrips. The leaves were showing the classic viral symptoms of a roughly circular necrotic spots in a target pattern. We diagnosed this with a dipstick virus test. The only control for viral diseases is to discard the plant.

Potyvirus in Celosia

Although our dipstick test indicated potyvirus, the test is not genus specific. There is no control, so this disease is managed by discarding the plants.

Grey Mold on Petunia

This pathogenic fungus tends to be opportunistic on weakened plants due to nutritional stress. If withered flowers are not removed promptly they can spread the fungus and cause stem blights and leaf loss. Healthy plants are usually able to fend it off.

Volutella on Boxwood

We continue to receive boxwood samples; this one was diagnosed with commonly seen volutella blight. This pathogen will attack plants with winter injury, drought stress, or with root rots. This organism tends to hang around and get active when the plant is stressed and this particular sample appeared to have some root rot.

Diseases in Needled Species

We received a fir sample with root rot this week and also Spruce Needle drop. For the latter, I will look for black spiny fruiting bodies arising from cracks in the bark.

Questions

Magnolia Dieback

Do you have any ideas about a magnolia which was about one quarter dead last year and appears to be about half dead this year? The sample we have is pretty dead.

It could be winter injury or possibly verticillium wilt. If it is verticillium that restricts what can be replanted in that spot. We can recover verticillium pretty well as long as the tissue hasn't been dead a really long time. Watch the tree as it leafs out and if they see dieback, then get a sample. Collect the sample as low on the tree as possible since verticillium is transmitted from the soil to the roots.

SPECIAL TOPIC: Pollinators and Neonicotinoids

Presented by PJ Leisch, Manager of UW Insect Diagnostic Lab, UW-Madison Entomology Department

Brian has a copy of my slide presentation to put up on the WHU site. All the slides are numbered and I will try to mention the slide number as we go along.

This topic is of great current interest. There is new information coming out all the time and several new papers have been published in the last day or two that are included in the talk.

Introduction

Slide 2-Besides the well-known honey bee, there are approximately 400-500 species of native bumblebees and solitary bees. Most of our bees are solitary and nest in hollow tubes, in the ground or in old insect holes in trees. Other insects such as moths, butterflies, and beetles may also be pollinators. Insect pollinators as a whole are in decline and there are even some vertebrate pollinators such as bats, hummingbirds and rodents.

Food crops from Alfalfa to zucchini and everything in between are dependent on pollinators. The benefit is estimated at \$8-15 billion dollars/year with most of that concentrated on 5 crops: almonds, blueberries, cherries, apples and oranges. If we lost all of our pollinators our grocery shelves would be empty.

What's Up With Pollinators

Slide 5-Not only bees are in decline. There are a number of complicated factors which are all interacting to lead to decline such as habitat loss and fragmentation, urbanization and removing flowers, intense agriculture with monocrops, diseases, fungi, bacteria, viruses, mites and parasites. Some agricultural practices such as plowing up prairies and using Round-up Ready Crops which decrease the number of flowering weedy plants, and pesticides.

Effects on Honeybees

Viruses, Fungi, and Mites

Slide 6-See the facebook page of Apies mellifera!

Slide 7- Two dozen viruses which cause wing deformities and prevent flight or cause paralysis. Bacteria or fungi such as foul brood or chalk brood or Nosema, and mites such as tracheal or varroa mites. Varroa mites are like ticks and suck the hemolymph (insect parallel to blood) and may also transmit viruses. Slide 8 depicts some of these mites with the upper left hand corner showing some tracheal mites inside a bee. All of the other mites are Varroa mites. The lower left hand picture shows a wing deformity caused by a virus that is mite-transmitted.

An excellent reference is "The Field Guide to Honeybee Maladies" put out by Penn State and available as a PDF. It can answer questions people may put to you in your own offices.

Other Factors

Nutrition-Some keepers use high fructose corn syrup to supplement nutritional needs.

Beekeeping practices such as moving bees-About 60% of beekeepers move these poor bees are moved around to pollinate crops, notably almond trees. Moving colonies en masse can lead to transmitting diseases or pathogens since the bees are concentrated in one are.

Poor genetic diversity- this has led to a decline in the number of queens

Geomagnetic fields-changing location can interfere with the bee navigation due to the change in the geomagnetic fields they use

Pesticides-There is a lot of work being done now, especially regarding neonicotinoid use

Decline Over Time

Slide 11 shows a graph depicting the decline of honeybee populations over time. Particularly noteworthy is when Varroa mites showed up in the 1980's, when neonicotinoid use began in the 1990's and when Colony Collapse Disorder (CCD) was reported in 2006. Varroa mites have had a big impact on CCD since they can also transmit diseases.

Pesticides and Honeybees

The additive impact of all types of pesticides including insecticides, fungicides and herbicides on honeybees is not fully known, especially when all other possible stressors are factored in. Studies on the effects have used small populations of bees or single bees and we don't really know what the impact would be on whole colonies. For instance, besides lethal doses which kill the bees, sub-lethal doses may affect their ability to navigate or their behavior in the hive. We don't really know how suboptimal performance affects the hive.

Neonicotinoids

This class of insecticide is coming under fire for its role in bee decline. Neonicotinoids are neurotoxins that mimic the activity of nicotine and took the place of more toxic compounds such as organophosphates. They do have low mammalian toxicity and can be used in lower application rates. Imidacloprid, the most commonly used neonicotinoid, and nicotine share some chemical structure similarities (Slide 13). Neonicotinoids use systemic uptake and that is seen as advantageous because seeds can be treated or a soil drench can be used.

Neonicotinoid Application and Package Labels

It is definitively known that imidacloprid is very toxic to bees. The package label will include some sort of statement indicating this and what application precautions should be taken to prevent impact (Slide 14). The issue came to the forefront when a tremendous bee die off was attributed to the misapplication of dinotefuran for aphids when linden trees were in bloom and attracting foraging bees. This prompted a new bee box icon (a red diamond with a cartoon bee) shown in slide 16.

Interaction of Effects

On Slide 17, there is a reference to a very good review article which details how many factors play a role in CCD. Neonicotinoids may play a big part in the problem. One of the problems with assessing the actual impact is figuring out how the experimental insecticide exposure impact translates to field application rates, especially for sublethal doses. More research is needed.

Up to 100 different pesticides have been found on pollen with a large number of these fungicides. Slide 19 shows a report on the detection of 35 different pesticides in crop pollen and the increase in susceptibility of bees exposed to fungicides to the gut pathogen *Nosema*.

Slide 20 indicates that careful consideration must be given to the experimental parameters of any study and that realistic rates must be used. For the Harvard study cited on slide 22, this did not appear to be the case as the bees were exposed to up to a 100-fold increase over what would be normal field exposure rates.

Slide 23 references a study that did use exposures congruent with normal field rates on food sources colonies and came to a different conclusion in that there were no effects seen on colony health or foraging behavior. There were a couple of different doses in the experiments, some at higher than normal rates. There could have been delayed effects with higher rates.

Honeybees Versus Native (Solitary) Bees

Honeybees may be more robust than other bees for a variety of reasons, one of which is that they may be able to detoxify the neonicotinoids when they are used at field application rates. Native bees appear to lack this ability.

On Slide 24, a very recent paper from Sweden reporting the effects of rape seed treatment with clothianidin looked at the impact on honeybees and native bees. These researchers looked at the effects on wild bees such as bumblebees and solitary bees as well as honeybees. They saw reduced native bee densities, reduced nesting of solitary wild bees, reduced colony growth and reproduction. For honeybees they did not notice significant impact on colonies. However, sublethal effects were not completely addressed.

Slide 25 and 26 highlight some important differences in honeybees versus wild bees. Honeybees may be a superorganism because the specialization of tasks in maintaining colony exposes fewer individuals to pesticides, foraging sources are not specialized as with some native bees so pesticide exposure is reduced or diluted if foraging on untreated crops, loss of a few bees in the colony is not devastating as it is for solitary bees, and ability to detoxify the insecticide.

Slide 27 references another recent review paper describing the impact of chronic exposure to multiple stressors. Neonicotinoids do play a role.

What Can We Do?

1. Use insecticides appropriately, only if needed, and follow the label guidelines. Avoid off target impacts.

2. Make your yard attractive to native pollinators. Plant a diverse array of flowers that bloom throughout the season from March to October to attract a diverse array of pollinator species.
3. Provide nesting habitat.
4. Educate ourselves. Get involved in habitat restoration or put out bee hotels.

Educational Resources

Slide 29 shows both the X and A-series of educational publications that the Extension publishes.

http://labs.russell.wisc.edu/pddc/files/Fact_Sheets/FC_PDF/Pollinators.pdf

<http://learningstore.uwex.edu/Supporting-Native-Bees-Our-Essential-Pollinators-P1629.aspx>

Slide 31 references the website Pollinator.org. This is a great resource that allows you to put in your zip code and it will give a list of shrubs, flowers, and trees that will grow well in your area.

Slides 32-35 illustrate all the creative ways you can provide nesting habitat for pollinators. You can drill different size holes in blocks, use cardstock tubes. Slide 33 shows that these tubes or stem bundles are actually used by pollinators and how they provision them for their young with pollen.

Society and Pesticides

It is not likely that pesticides can be completely eliminated, but we can use them more responsibly. Slide 37 shows some of the changes we can make in applying pesticides to protect our pollinators. We can change the time of day for application to avoid times when pollinators are active, use less toxic products, use products per label, minimize drift and use insecticides only when needed.

Over 50 species of foraging insects have been documented on dandelions and white clover in lawns. One study looked at the effects of using a less toxic alternative and mowing prior to application. For the former for white grub control, the use of clothianidin resulted in a 75% loss of foraging bees with no new queen production while the use of Acelepryn (chloroantriliniliprole) resulted in no difference from control plots. Mowing the lawn to remove flowers from dandelions and clover prior to application of even a neonicotinoid resulted in no adverse effects to bees. Another option in application behavior is to apply a granular product that is watered in rather than a liquid formula. Both mowing and irrigation are good choices for reducing impact.

Imidacloprid and Bedding Plants

Slides 41 through 43 describe a study to determine how long of a waiting period after neonicotinoid application in a greenhouse is necessary to prevent pollinator exposure. The study tested the concentration of Imidacloprid and breakdown product on different greenhouse flowers at 1, 2, and 4 weeks post application. The results show that after 4 weeks there were no detectable residues on the flowers, but there were residues at both 1 and 2 weeks post application. Application timing can be good way to reduce effects on pollinators.

Slide 44 references two other good publications and PJ would be happy to send them to you if you contact him.

Questions/Comments

Neonicotinoids and home gardening

Will the pesticide used on annuals and perennials breakdown before planting in yards?

It depends on the type of application. For the greenhouse study cited where a spray application was used and no pollinators were present, the insecticide did break down in a couple of weeks. If someone uses a neonicotinoid soil drench, the product can persist longer. Another question people have is how much of the pesticide gets into the pollen and nectar and what is the effect on bees. A lot of research is being done because it depends on the plant. For hardwood trees, such as maple, most of the insecticide bypasses the pollen because it is difficult for it to

migrate to those tissues. Most of the insecticide goes to the foliage. Some field crops such as corn and soybeans show the same result. For some ornamentals, more of the insecticide may get transported into the pollen and nectar. We just don't know yet because everything hasn't been tested. It may be a concern.

So the insecticide may only be present while the plant has the flowers it did when purchased, it may be a small amount anyway and it may not be present in successive blooms?

Yes, but every plant is different because of blooming schedule and whether they bloom once or successively. For some plants such as cucumber, it seems like the neonicotinoids are shunted into the flowers. A lot more work is needed on this topic.

Comment on Russ Groves' recommendation for neonicotinoid use

I just wanted to comment that Russ Groves has been steering people away from neonicotinoid use on zucchini and cucumbers because it does move so well into the flowers.

Yes, every plant is different.

FINAL NOTES and ANNOUNCEMENTS

Next week, the host will be Sharon Morissey from Milwaukee County instead of Ann Wied and the special topic will be given by Erin Silva on organic pesticides. It is also the day of our hort team meeting.

Brian Hudleston: There will be two sessions on answering horticultural questions in May. These sessions are for anyone who answers questions at county offices such as agents, plant health advisors, or master gardeners. P.J. Leisch will give a presentation on insects, Mark Renz will give an update on weeds and invasives, and either Paul Koch or Bruce Schweiger will give information on turf and I will give an update on diseases. If you would like to attend either session, let me know and I will get you on the list. There is a posting on the Wisconsin Horticulture Update for those sessions.

May 14 in Walworth County at the Geneva National Resort in Lake Geneva 8:45 am to 4:45 pm

May 27 in Marathon County Extension in Wausau 8:45 am to 4:45 pm

The full audio podcast of today's and archived WHU conferences can be found at <http://fyi.uwex.edu/wihortupdate/>

UW LINKS

Wisconsin Horticulture webpage <http://hort.uwex.edu>

UW Plant Disease Diagnostics webpage <http://labs.russell.wisc.edu/pddc/>

UW Insect Diagnostic Lab <http://www.entomology.wisc.edu/diaglab/>

UW Turfgrass Diagnostic Lab <http://labs.russell.wisc.edu/tdl/>

UW Vegetable Pathology Webpage <http://www.plantpath.wisc.edu/wivegdis/>

UW Vegetable Entomology Webpage <http://www.entomology.wisc.edu/vegento/people/groves.html#>

UW-Extension Weed Science <https://fyi.uwex.edu/weedsci/>

UW-Extension Learning Store <http://learningstore.uwex.edu>

UW Garden Facts <http://labs.russell.wisc.edu/pddc/fact-sheet-listing/>

WHU "OFF THE AIR"

During this past week specialists have commented on these issues off the air: None

Vegetable Crop Update

Vegetable Crop Update Newsletter #5 is available at <http://www.plantpath.wisc.edu/wivegdis/>

Topics covered in the issue include:

- Late blight reminders and updates
- Linuron herbicide update
- Small acreage vegetable
- Sustainability assessment
- Hops updates

PDDC UPDATE

UW-Madison/Extension Plant Disease Diagnostic Clinic (PDDC) Update

Brian Hudelson, Sean Toporek, Ann Joyce and Joyce Wu

The PDDC receives samples of many plant and soil samples from around the state. The following diseases/disorders have been identified at the PDDC from April 18, 2015 through April 24, 2015.

PLANT/SAMPLE TYPE	DISEASE/DISORDER	PATHOGEN	COUNTY
BROAD-LEAVED WOODY ORNAMENTALS			
<i>Boxwood</i>	<i>Root Rot</i> <i>Sphaeropsis Canker</i> <i>Volutella Blight</i>	<i>Rhizoctonia sp.</i> <i>Sphaeropsis sp.</i> <i>Volutella sp.</i>	<i>Milwaukee</i> <i>Milwaukee</i> <i>La Crosse, Waukesha</i>
FRUIT CROPS			
<i>Apple</i>	<i>Sapwood Rot</i>	<i>Schizophyllum commune</i>	<i>Jefferson</i>
<i>Blueberry</i>	<i>Gloeosporium Canker</i> <i>Phomopsis Canker</i>	<i>Gloeosporium sp.</i> <i>Phomopsis sp.</i>	<i>Pierce</i> <i>Pierce</i>
HERBACEOUS ORNAMENTALS			
<i>Celosia</i>	<i>Unspecified Potyvirus Disease</i>	<i>Unspecified potyvirus</i>	<i>Monroe</i>
<i>Impatiens (New Guinea)</i>	<i>Impatiens Necrotic Spot</i>	<i>Impatiens necrotic spot virus</i>	<i>Sheboygan</i>
<i>Petunia</i>	<i>Gray Mold (Botrytis Blight)</i>	<i>Botrytis cinerea</i>	<i>Monroe</i>
NEEDED WOODY ORNAMENTALS			
<i>Fir (Unspecified)</i>	<i>Root Rot</i>	<i>Phytophthora sp.</i>	<i>Crawford</i>
<i>Spruce (Norway)</i>	<i>Phomopsis Canker</i>	<i>Phomopsis sp.</i>	<i>Dane</i>
<i>Spruce (Unspecified)</i>	<i>Spruce Needle Drop</i>	<i>Setomelanomma holmii</i>	<i>Dane</i>

For additional information on plant diseases and their control, visit the PDDC website at pddc.wisc.edu.