UTAH PESTS News

Utah Plant Pest Diagnostic Laboratory and USU Extension Vol. IX, Spring 2015

What's Inside

News Highlights

FUNDING NEWS

The Utah CAPS program at USU has received USDA Farm Bill funding to create a detailed *First Detector* guide. The guide will train citizen scientists such as Master Gardeners and others who are on the front lines to identify potentially invasive new pests in Utah. The new guide will be available in spring 2016.

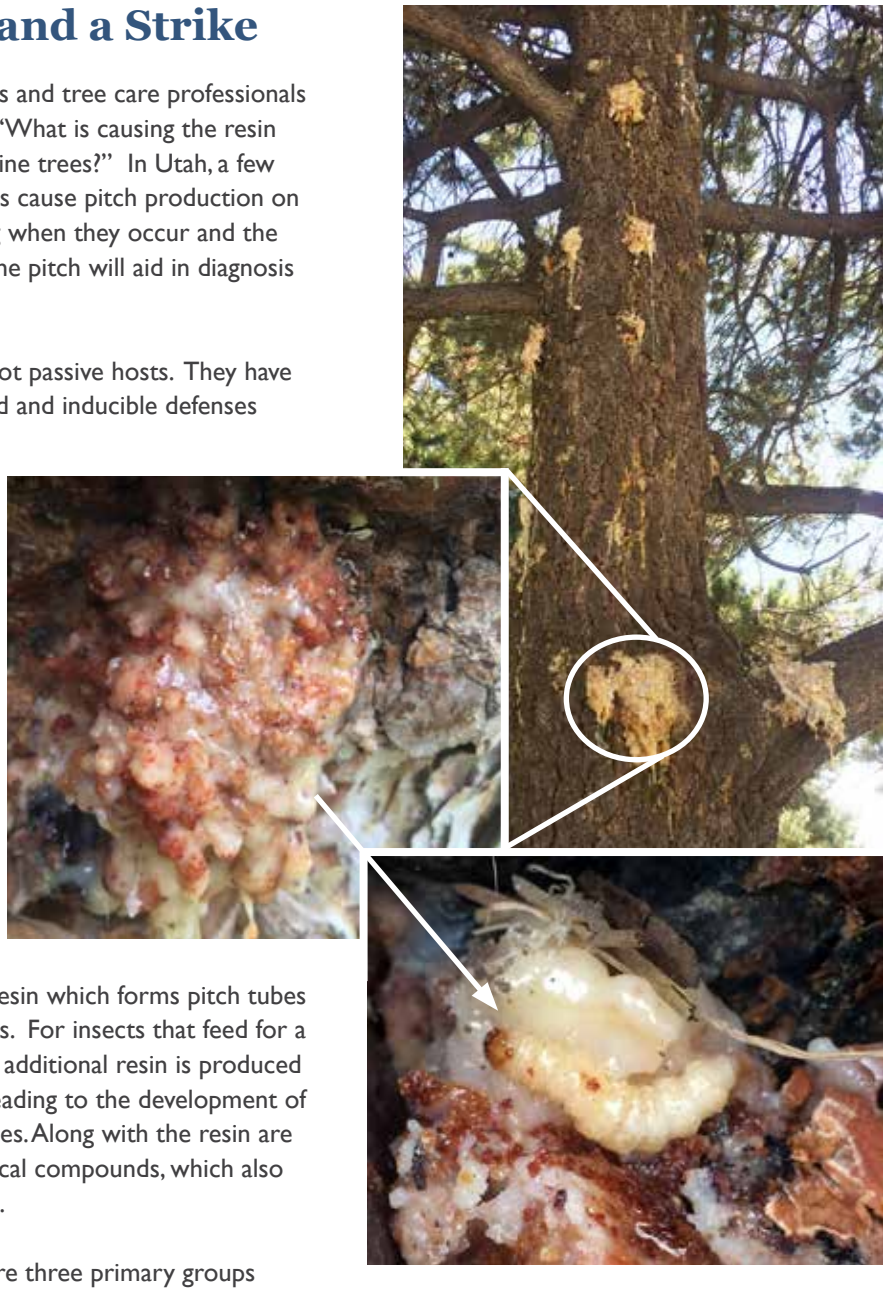
NEW PUBLICATIONS

utahpests.usu.edu

A Pitch and a Strike

Home gardeners and tree care professionals frequently ask: "What is causing the resin masses on my pine trees?" In Utah, a few groups of insects cause pitch production on pines. Learning when they occur and the appearance of the pitch will aid in diagnosis and treatment.

Pine trees are not passive hosts. They have both pre-formed and inducible defenses against invaders. When insect adults or larvae chew through the cambium of pine trees, they encounter the pre-formed, constitutive defenses stored in the sapwood, known as resin. It is the resin which forms pitch tubes and pitch masses. For insects that feed for a prolonged time, additional resin is produced and extruded, leading to the development of large pitch masses. Along with the resin are a suite of chemical compounds, which also provide defense.



Pitch masses on pine caused by clearwing moths are often associated with pruning cuts. The larvae feed on the pitch and the bark underneath.

In Utah, there are three primary groups of insects that cause pitch tubes or pitch masses on pines: bark beetles, pyralid moths (*Dioryctria* spp.), and clearwing moths (*Synanthedon* spp.). Pitch could also be caused by physical/mechanical injury from machinery, pruning, people, birds, animals, or disease.

Pitch tubes and pitch masses are different. Pitch tubes associated with bark beetles (commonly Ips beetles in ornamental pines), are often whitish to yellow in color and are smaller in size, typically the size of a dime or quarter. Pitch tubes form when adult

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Pine Pitch Moths, continued from previous page

bark beetles chew through the bark and into the phloem, releasing stored resin. Healthy trees with ample resin stores can flush beetles out of trees or capture them within the resin, but in some cases, the beetles can still overcome the trees' initial defense attempts. Successful bark beetle attacks will generally leave the pitch tube with a small hole in the middle. When no hole is present in a pitch tube, the beetle may have been successfully killed. Sometimes, you can peel the pitch tube off of the tree and look through the pitch to find a dead adult bark beetle.

Pitch masses may start smaller, utilizing the tree's pre-formed defenses, but the continued feeding action of both the clearwing moth and pyralid moth larvae give the tree time to produce additional resin, which will add to the size of the mass. The pitch masses of both the clearwing moths and the pyralid pitch moths are similar in appearance and can reach several square inches in size.

How do we know which moth is present in the pitch mass? The exact species involved in Utah are not known. Arborists commonly blame Zimmerman pine moth, which causes damage to pines along the Colorado Front Range, however this moth has not been found in Utah. Species that may be part of this pitch insect complex include the clearwing moths, Sequoia pitch moth (*Synanthedon sequoiae*), Douglas-fir pitch moth (*S. novaroensis*), or the pitch mass borer (*S. pini*), and the pyralid moths, Zimmerman pine moth (*Dioryctria zimmermani*) or the pinyon pitch mass borer (*D. ponderosae*).

The UPPDL is interested in determining which species are present in Utah. If you encounter pitch masses on pines and are able to safely remove the mass and the larva, please submit the larva to the UPPDL for identification. If the larva is not present in the pitch mass, it may be located just below the bark behind the mass, or within a few inches of the mass.

Despite its name, the clearwing moth, Sequoia pitch moth (*Synanthedon sequoiae*) feeds on a variety of pines.

The presence of the large pitch masses on pine trees may be alarming, but these moths rarely kill trees. They may cause treetop and branch dieback, as well as unsightly pitch masses. Keep trees healthy and stress free. Do not over-irrigate and thin tree stands to prevent competition. While chemical controls are not recommended for these moths, trunk and branch applications of permethrin or bifenthrin could provide protection.

It is important to determine the species present in Utah provide appropriate treatment recommendations because the pyralid and clearwing moths are active at different times. The pyralid, Zimmerman pine moth, lays eggs on bark from April through May. The clearwing moths may lay eggs from May through August.

-Ryan Davis, Arthropod Diagnostician

Hope for North American Ash Trees?

Dawn Holzer *is the Pest Survey Specialist for the states of Utah and Nevada. The USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine program, provides Pest Survey Specialists for every state. This person gives technical support to the State Survey Coordinators in planning, executing, and reporting annual surveys and coordinating pest detection activities.*

The exotic invasive beetle, Emerald ash borer (EAB), is now known to occur in 25 states including the newest detection in Louisiana. The Winter 2015 *Utah Pests News* contains an article discussing the threat to all North American ash trees, signs and symptoms of EAB, and management options.

This issue will discuss the biological control of EAB. Classical biological control (or biocontrol) is the practice of importing and releasing host-specific enemies from a pest's native range to control populations in the area of introduction. Biocontrol has been used for over 100 years in the U.S. and has successfully controlled invasive insect and weed pests such as gypsy moth, eucalyptus long horned borer, and Klamath weed. At present, the most promising long-term approach for reducing EAB populations and conserving ash in forested areas of North America is biological control.

Two USDA agencies—the Animal and Plant Health Inspection Service (APHIS) and the Forest Service—initiated a biological control effort shortly after EAB was detected in Michigan in 2002. USDA research in the beetle's native range of China identified three potential biological control agents for EAB—*Spathius agrili*, *Tetrastichus planipennisi,* and *Oobius agrili*.

These biocontrol agents are very tiny wasps— the largest one is about the size of a typical mosquito. Female wasps use an organ that looks like a stinger (called an ovipositor) to lay their eggs. Because they must complete a part of their life cycle inside another organism, they are called parasitoid wasps. Two of the species attack EAB larvae, and one targets EAB eggs.

Following host range and specificity testing, USDA prepared an environmental assessment that outlined the risks and benefits of releasing the wasps. With approval from the State of Michigan, USDA began to release the wasps in July 2007. The USDA APHIS PPQ Biological Control Production Facility in Brighton, MI became operational in January 2009. It was designed to produce the EAB parasitoids for field release. Over 720,000 individual wasps have now been released in 19 States: Colorado, Connecticut, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin.

Top: Female *Tetrastichus* wasps have a long ovipositor to drill into trees and lay eggs on emerald ash borer larvae.

Bottom: *Tetrastichus* larvae under tree bark.

Spathius agrili parasitizes up to 90 percent of EAB larvae in ash trees in China. It has a long ovipositor that enables it to attack larvae in ash trees of various sizes. Adult female *Spathius* target EAB larvae by drilling through the bark and laying up to 20 eggs on the surface of the host. The wasp larvae feed and develop on the EAB, resulting in its death. The cycle is repeated 3 to 4 times each summer and fall. *Spathius* overwinter as pupae inside cocoons under the bark of ash trees and emerge as adults in the summer.

Tetrastichus planipennisi also attacks EAB larvae. In China, it can kill up to 50% of the EAB larvae. The life cycle of *Tetrastichus* is similar to that of *Spathius*; however, the female

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Emerald Ash Borer Update, continued from previous page

lays about 100 eggs inside EAB larvae where the wasp larvae grow, eventually killing their host. Because of its shorter ovipositor, *Tetrastichus* targets larvae in ash trees with a diameter of 5 inches or less. *Tetrastichus* completes at least four generations each year. They survive the winter as larvae inside their host or host gallery under the bark of ash trees.

Oobius agrili is the smallest of the biocontrol wasps and targets EAB eggs. When *Oobius* locates an EAB egg in bark crevices, the wasp injects its own egg inside the host egg, where it will hatch, grow, and kill the EAB egg. In China, they can kill up to 60 percent of EAB eggs each season. At least two generations can occur during the EAB egg-laying season. Each *Oobius* adult can parasitize up to 62 EAB eggs during its life time. *Oobius* spends the winter as larvae inside EAB eggs and emerge the following spring as adults.

USDA and State officials, along with national EAB Program management, collectively determine release sites for EAB biocontrol. State cooperators secure permits and agree to follow standardized release and monitoring protocols. Utah has been issued a permit for all three species and will request agents for release when EAB is found here.

These releases will continue while scientists continue to study the establishment, dispersal, and impact these natural enemies have on suppressing EAB populations and the recovery of ash trees. Scientists will also continue to explore the U.S. and Asia for additional EAB natural enemies for possible use in the EAB biological control program.

Although it is premature to talk about the wasps' effect on EAB populations, a recent study reported that parasitoid populations in Michigan are increasing and spreading into adjacent areas. In addition, cooperators in 10 states (Indiana, Illinois, Maryland, Michigan, Minnesota, New York, Ohio, Pennsylvania, Tennessee, and Wisconsin) have successfully recovered the offspring from one or more wasp species. We anticipate more evidence of progress as release sites are continually monitored.

These parasitoid wasps will not eradicate EAB. However, they can be used in an integrated pest management plan to help control the pest and benefit our urban, suburban, and rural landscapes. Continued scientific advances in the fields of forest health, pest management, and entomology offer promise that more effective treatments and tools will eventually be available to fight EAB.

Top: *Spathius agrili* larvae consuming EAB host

Bottom: *Oobius agrili* adult parasitizing EAB egg.

Resources (orange text links to web)

Emerald Ash Borer Biological Control Release and Recovery Guidelines, USDA and US Forest Service.

Questions and Answers: USDA's Emerald Ash Borer Biocontrol Program

View a short film about the emerald ash borer infestation and the Michigan EAB Biocontrol Production Facility

Pre-recorded webinars on emerald ash borer biocontrol

Wintering Raptors for Pest Control on Farmland

Casey Burns
Utah State Biologist, USDA Natural Resources Conservation Service

Neil Paprocki
Conservation Biologist, HawkWatch International

Steve Slater
Conservation Science Director, HawkWatch International

A red-tailed hawk feeding on a vole (***top***) and a Cooper's hawk feeding on a magpie (***bottom***) are two examples of raptors at work, regulating pest wildlife populations on farmland. HawkWatch International monitors raptor populations, and NRCS provides assistance to producers to implement activities that encourage raptors.

Neil Paprocki

Many species of wintering raptors provide pest control benefits for farmers and other rural landowners. Vertebrate crop pests compose a large percentage of the winter diet of raptors. Farmers can provide the appropriate conditions to support wintering raptors, which will increase the pest control benefits on nearby cropland. Raptors congregate in winter when there is no competition for territories around nesting sites. Species of raptors wintering in Utah on cropland include red-tailed hawk, rough-legged hawk, ferruginous hawk, American kestrel, bald eagle, northern harrier, and golden eagle. Rough-legged hawks and kestrels show a preference for cropland habitat over other habitat types in winter. Numerous other species are present in smaller numbers. Owls, which are active at night, are also present on farm land, but are more difficult to survey. Some of these raptor species are present year around, while others are just wintering in Utah.

HawkWatch International and citizen scientists have monitored wintering raptors by conducting roadside surveys in Utah since 2011. The data shows a number of hotspots in Utah where wintering raptors occur in high numbers (see map on next page). During the 2014-15 winter, HawkWatch monitored 10 different areas (9 in Utah and 1 in southern Idaho). Over 40 volunteers participated in the project, counting over 4,000 individual raptors of 17 species, while surveying over 2,600 miles. This ongoing study provides some of the missing information necessary to understand the resource needs, habitat use, and distributions of various species during the often harrowing winter months. The data collected helps guide management decisions, improves our understanding of wintering raptor ecology and land use, and can be used to calculate long-term population trends of various species. NRCS synthesizes this data into management

Neil Paprocki

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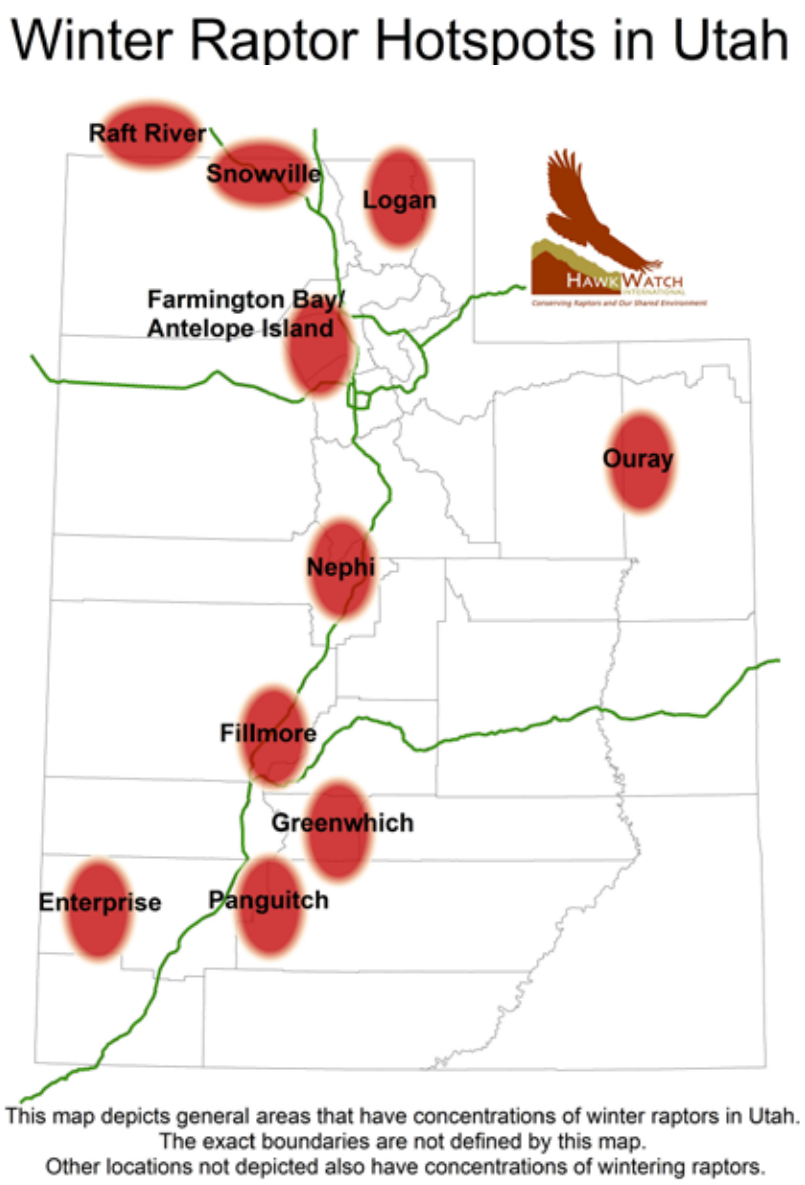
Wintering Raptors, continued from previous page

recommendations to helps farmers plan pest control using integrated pest management (IPM) methods, including using wildlife to control pests.

In general, prey and pest species are denser and/or more accessible on cropland than in surrounding habitat types. Natural and artificial perching sites for raptors are often available within or on surrounding cropland. The combination of abundant prey (pests), and perching sites help concentrate raptors on cropland in winter. The variety of winter raptor species results in a variety of prey species taken. Primary prey types are small mammals and birds, especially voles, mice, starlings, pigeons, doves, rabbits, and carrion. Perching sites include irrigation systems, power poles, fence lines, live and dead trees, wires, and installed artificial perches. Preferences for perch type and height vary by species with some raptors preferring higher perches (red-tailed hawks, bald eagles) while others prefer low perches (ferruginous hawks and kestrels). However, most raptors perch at moderate heights (10-30 feet high). HawkWatch data shows that the majority of perch sites in wintering raptor hotspots are on artificial structures, such as power poles or irrigation equipment.



This map depicts general areas that have concentrations of winter raptors in Utah.
The exact boundaries are not defined by this map.
Other locations not depicted also have concentrations of wintering raptors.

To increase raptor pest control on farmland, provide numerous easily accessible perches of various heights and structures. Artificial perches can be designed and installed easily. Trees can be planted in hedgerows or windbreaks around cropland that will provide perches in the future, as well as a host of other conservation benefits. The aforementioned raptor species have some tolerance for human activity, including routine agricultural activities, but do not do well in highly populated areas or in areas of high disturbance. It is important to minimize disturbance to raptors to the extent practicable. Providing habitat for wintering raptors will help stabilize the downward population trend of many raptor species, and may boost some populations, which could provide year round pest control benefits.

There are numerous other ways to attract raptors and other wildlife species to cropland for pest control during other times of the year. The primary techniques, nest boxes and raptor perches, are described in the publication, Attracting Wildlife for Pest Control on Farmland. NRCS has specifications available for raptor perches, nest boxes, and other wildlife structures.

It is important to note that the recommendations in this document are for cropland and are not applicable to rangeland. While raptors do provide valuable pest control in rangeland, increasing numbers of raptors (and ravens) by adding artificial perches on rangeland is not recommended due to the potential to affect sensitive wildlife species, such as sage grouse.

NRCS is available for conservation planning technical assistance and potential funding assistance. Contact your local NRCS office or Casey Burns for more information.

Organic Matter: "Black Gold" for the Garden

Plants need water, air, nutrients, and sunlight to grow. Proper soil preparation in the vegetable garden will increase plant health by facilitating gas exchange as well as water and nutrient uptake. Conversely, soils with poor structure can have drainage problems, nutrient deficiencies, and ultimately result in decreased plant health or death. A common issue in Utah is the alkalinity of garden soils. Alkaline soils cause certain micronutrients to become less available leading to nutrient deficiencies in garden plants. Iron chlorosis, for example, is a deficiency of iron available for plants and is one of Utah's most troublesome nutrient deficiencies. Poor soil drainage, compaction, lack of nutrients, high soil pH, or reduced plant growth and can be improved by amendment with high quality compost, or "black gold".

Homemade compost from kitchen scraps (left) or leaves (right) is a great amendment option that is usually abundant, weed free, and low in salts.

BENEFITS OF ADDING ORGANIC MATTER:

1. increases soil moisture retention
2. improves soil structure
3. decreases soil compaction
4. improves soil drainage and tilth (workability)
5. certain soil-supplied nutrients more available
6. provides essential nutrients for plants
7. provides food and habitat to many soil macro- and micro-organisms

Organic matter (once-living sources of carbon-containing materials) acts as a binding agent or the "glue" that holds soil particles together and is the key to creating a well-structured soil. Soil structure refers to the combination of primary soil particles such as sand, silt and clay. Soils with organic matter will have improved drainage, higher water holding capacities, increased aeration or gas exchange, and promote root growth.

TYPES OF ORGANIC MATTER

Organic matter can be applied as compost or mulch. Compost is organic material that has decomposed to a state where the original parent material is no longer recognizable. It looks and smells like rich garden soil and is typically incorporated with rotary tillers or other mechanical implements to improve soil quality. It can also be incorporated using the double-digging method which involves digging soil from an area of the garden, mixing it with organic material, and then returning it to the same area. Mulch is material that is applied to the soil surface and is usually not fully decomposed. It is typically used to smother out weeds, protect trees and shrubs, reduce evaporation, or beautify the landscape. Incorporate 2 to 3 inches of organic matter 6 to 8 inches deep into the soil annually to improve garden soil over time. In heavy soils, it may take 2 to 3 years before improvement is seen.

DO Compost	DON'T Compost
Vegetable/fruit scraps	Meats
Leaves	Bones
Wood chips, sawdust, or bark	Large branches
Manure	Dairy products
Grass clippings	Synthetic products
Paper	Plastics
Garden and/or canning waste	Pet wastes

Keep in mind that each type of organic matter varies in the amounts of nutrients (N, P, K, etc.) it provides. Some types may be high in certain nutrients and low in others, so it's important to know which type of organic matter and fertilizers the soil needs. Soil testing before adding organic matter will help ensure that your garden will have all the needed nutrients and be the ideal place for plant growth. Soil samples can be submitted to the USU soil testing laboratory (see www.usual.usu.edu for more information).

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Organic Matter for the Garden, continued from previous page

Organic matter can be the single most important amendment that improves plant growth in Utah soils. Patience is the key to using organic matter to improve your soil; it takes time for garden soil to improve and differences in plant growth and health may not be seen the first year organic matter is incorporated. Keep feeding the soil and the soil will feed your plants.

Resources (orange text links to web)

Preparing and Improving Garden Soil
Backyard Composting in Utah
Using Compost in Utah Gardens
Using Mulches in Utah Landscapes and Gardens
Selecting and Using Organic Fertilizers
Solutions to Soil Problems (link to a series of fact sheets)

-Bonnie Bunn, Vegetable IPM Associate

Mulches, like the straw used above, can reduce moisture loss from soil, moderate surface soil temperatures, control annual weeds and grasses, reduce compaction, and decrease runoff and soil erosion.

Two New Apps Benefit Fruit Growers in Utah and the West

Fruit producers in Utah now have access to a free weather data and pest management mobile app produced by the Utah Climate Center and the Utah State University Extension Integrated Pest Management Program. ***Utah TRAPs*** (Temperature Resource and Alerts for Pests), displays weather information and forecasts pest management recommendations.

Utah TRAPs

Fruit PestFinder

Both apps are free of ads and available for free on Google Play and the App Store.

The Utah TRAPs app is a mobile version of the same tool that is found on the Utah Climate Center TRAPs website. It is available for both Apple iOS and Android operating systems for free, and requires an internet connection to update.

The app will help Utah fruit growers cut costs by providing essential information to make decisions on frost protection, irrigation, and pest management. Utah TRAPs collects weather data from 20 orchard weather stations plus an additional 35 airport and UDOT locations throughout Utah. Temperature-based models provide management predictions for several fruit pests, including codling moth, peach twig borer, San Jose scale, and fire blight. The app also provides real-time temperature, dew point, wind speed/direction and precipitation data.

Fruit PestFinder is a free reference for insects and diseases on fruit crops in the western US. This handy resource helps to identify over 70 insects and diseases of apple, pear, cherry, peach, nectarine, and plum, with more crop hosts to be added.

The app includes each pest's biology, symptoms, and detailed management recommendations, including monitoring techniques, non-chemical controls, and conventional and organic products. It also includes 18 of the most common beneficial insects and mites that target western U.S. fruit pests.

The content will be updated regularly including new pest entries. Users can sync their app to the new content manually, whenever an internet connection is available.

The app can search by pest name, keyword, or attribute, including plant part affected or type of problem. For each pest, there are several images of symptoms and the causal agents. The pest or beneficial can be marked as a favorite for easy access, and users can add notes that can be synced between devices (iPhone to iPad, for example).

What does a Warm, Dry Winter Mean for Insect Populations?

Utah has experienced two mild winters in a row. What are the likely impacts of mild winters on pest insect populations? There is not a precise science to predicting insect populations following a warm winter, but we can make inferences from what is known about mechanisms of insect dormancy, survival, and population growth. Many factors come into play, including effects of repeated thawing and freezing, amount of snow cover, spring frosts, and survival of beneficial insects that will feed on pest insects in spring and summer. In general, it is probable that the long stretches of the warm temperatures in winter 2015 have provided some species the chance to survive in larger numbers.

In temperate regions, such as Utah, many insects enter a form of arrested development to avoid adverse winter conditions, called 'diapause'. Diapause is much like hibernation in vertebrate animals; it is a slow-down in development of a specific life stage. For example, diapause occurs in eggs of grasshoppers and aphids, in last-instar larvae of codling moth and peach twig borer, in pupae of tomato hornworm and corn earworm, and in adults of alfalfa weevil and squash bug. Diapause is primarily triggered by shortening day length in late summer and fall. In preparation for diapause, the insect sequesters fat reserves and moves to a protected site. Upon entering diapause, metabolism is slowed and food and water intake usually ceases. To protect against water loss during

the winter, insect cuticles may accumulate a thicker wax layer or absorb water vapor. Diapausing adults may absorb energy from degenerating flight muscles and cluster together for protection. Insect body fluids and tissues withstand freezing temperatures in a number of ways; the accumulation of antifreeze compounds such as glycerol, sorbitol, or some proteins is a common mechanism.

A mild winter combined with early spring conditions can create a 'double whammy'. Not only will more insects survive the winter, but an early start to the season can translate into greater numbers, especially for insects with a high reproductive rate, short generation time, and multiple generations per year.

INSECTS THAT OVERWINTER AS ADULTS ABOVE GROUND

alfalfa weevil	clover mites	grape leafhoppers	minute pirate bug	stink bugs
asparagus beetles	cucumber beetles	honey bee	onion thrips	two-spotted spider mites
boxelder bug	European paper wasp	lacewings	spider mites	western flower thrips
bumble bee	flea beetles	lady beetles	squash bugs	western predatory mite

Insects that overwinter as adults seek protected sites, such as tunneling into leaf litter, specialized nests, or in cracks and crevices of trees and structures. This group of insects is particularly susceptible to cold winter temperatures and loss of moisture. In general, some individuals are killed by cold or even during average winters, thus regulating the population. But warm winter temperatures will increase survival.

In contrast, fluctuating winter temperatures can take their toll on insects. Warm winter days cause some insects to become active (e.g., boxelder bugs, paper wasps) when they normally would be dormant, and subsequent freezing and thawing temperatures may kill them. In addition, these insects use up stored fats they depend on to survive until the spring. Without access to food, these active insects could starve to death before food becomes available.

Boxelder bugs overwinter as adults. Adults will become active on warm winter days, such as in 2015, but cold nighttime temperatures and desiccation can kill them.

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Insect Survival in a Warm Winter, continued from previous page

INSECTS THAT OVERWINTER AS LARVAE OR PUPAE ABOVEGROUND

bark beetles	cabbage worms	peach twig borer
borers	codling moth	raspberry horntail

Insects in this group seek protected shelter, such as bark crevices or plant debris, or create shelters such as silken chambers in or on plant structures. These protected sites help them avoid severe and fluctuating winter conditions. In general, overwinter survival of this group following a mild winter will be high, and early spring conditions will stimulate earlier than normal activity.

Codling moth overwinters as late-instar larvae, and then pupate in the spring. These shown at right were located under tree wrap on the trunk of an apple tree.

INSECTS THAT OVERWINTER AS ADULTS, LARVAE, OR PUPAE BELOW GROUND

ants	cutworms	flea beetles	syrphid fly	western cherry fruit fly
apple maggot	earwig	sawflies	turf grubs	walnut husk fly

This group of insects is generally less influenced by winter conditions because soil temperatures remain somewhat constant. A detriment to these insects in Utah's winter of 2015, however, is the lack of snow cover, which would normally keep ground temperatures more constant. There could be more survivors than normal if the frost layer of the soil is shallow. Dry soils in the spring may prompt early development and activity; however, insect survival could be harmed by abnormally dry soils.

Apple maggots and western cherry fruit fly spend the winter as pupae a few inches below the soil surface.

INSECTS THAT OVERWINTER AS EGGS ABOVE OR BELOW GROUND

aphids	grasshoppers	honeylocust plant bug	native bees	tent caterpillar
cankerworm	leafhoppers (some)	mosquitoes	spiders	

With a few exceptions, arthropods that overwinter as eggs typically are not affected by abnormal winter conditions. They are well-designed to withstand external extremes. For example, some eggs, such as those of the green peach aphid, can tolerate temperatures as low as -50°F.

Populations are more likely to be affected after the eggs hatch in spring, especially if the emergence is earlier than average due to warm temperatures. Insects that hatch when plant buds open, such as aphids or certain leafhoppers, will be susceptible to spring frosts, and are more likely to succumb to the cold at that time. When spiders hatch, if there is an early availability of food such as flies, beetles, and other insects, there will be a greater chance for the spiderlings to survive, leading to a large population later in the summer.

Aphid eggs, which are laid in near leaf buds, are usually not affected by winter conditions, except they will hatch earlier.

-Marion Murray, IPM Project Leader, and Diane Alston, Entomologist

Lilac Decline – Identifying the Cause of an Old Disease in Utah

For the last 25 years, lilac decline and death has been observed in Utah, especially in Cache Valley. The problem is most evident in older lilacs, where plants die after a few years of decline. Affected plants have a lack of vigor and new growth is usually limited to less than one inch. Leaves are thickened and smaller than normal. They roll downward and are chlorotic or have yellow-green blotchiness and spots. The discolored areas of the leaves will turn brown, resembling scorch. Shoots will die and the dead leaves remain attached. Lilacs in decline have these symptoms throughout the entire plant.

Many attempts have been made to detect the cause of this decline; no fungi, bacteria or virus pathogens have been found. Then in the fall of 2013, we tested plants for the DNA of phytoplasma and found a species related to the phytoplasma that causes X-disease of peach. We are currently investigating whether this is a single phytoplasma that is responsible for the disease.

Phytoplasmas are bacteria that do not have a cell wall and reside in the phloem of plants. They cannot be cultured in media and can only be identified by comparison of the DNA sequences of the 16S/23S spacer regions. They are transmitted by leafhoppers, psyllids, or by vegetative propagation. Other phytoplasma diseases that occur in Utah include X-disease of cherry and peach, alfalfa dwarf, and pear decline.

Management of phytoplasmas is difficult and infected plants will not recover. The most effective method of control is the development of resistant cultivars. Monitoring plants for leafhoppers and controlling leafhoppers with insecticides can prevent transmission. Once a plant is infected it should be removed promptly to avoid the spread to neighboring plants. Plants should be obtained from reputable nurseries and not from old plantings or neighbors.

The symptoms of lilac decline include thickened, twisted leaves with blotchy chlorotic (yellow) areas (***above***). The affected plants will show symptoms on most leaves and shoots (***bottom***).

-Claudia Nischwitz, Plant Pathologist and
Sherman Thomson, USU Extension Plant Pathologist Emeritus

In the National News

NEW BEAN VARIETIES WITHSTAND EXTREME HEAT

Plant breeders at the International Center for Tropical Agriculture (CIAT) have been working to develop a bean–once feared to be a casualty of climate change–that can withstand extreme temperatures. They announced the discovery of 30 new types of "heat-beater" beans. They were developed by crossing common beans—pinto, white, black, and kidney—and the tepary bean. The new heat-tolerant beans may be able to handle an increase in average world-temperatures of 7.2°F.

LEAF ODOR ATTRACTS SPOTTED WING DROSOPHILA

The spotted-wing drosophila (SWD) has become a major pest of fruits in some areas of North America and Europe. It lays its eggs in fresh and ripening fruits, rendering them unsuitable for sale or processing. As reported in the *Journal of Chemical Ecology*, scientists in Germany have identified a leaf odor called beta-cyclocitral that attracts SWD, but no other related drosophilids. They also found that SWD responded more strongly to odors that were emitted by plants during the early stages of fruit ripening and less strongly to plants with fermenting fruits. The authors speculate that SWD may act as an evolutionary bridge between fruit-centered and herbivorous species within the *Drosophila* genus. Their research results may help to develop more efficient traps in order to simplify SWD monitoring.

IMPROVING THE CODLING MOTH VIRUS

Cydia pomonella granulovirus (CpGV) is a natural insect pathogen that is available as a bioinsectide to kill codling moth larvae, the major pest of apples and pears. USDA entomologists found that adding brewer's yeast and brown sugar made the product more attractive to ingestion by the larvae. In 2 years of field trials, the new CpGV mixture killed more larvae (83%) than the virus-only (55%) and water-only controls (17%). CpGV is primarily used in organic production, but its downside is that it breaks down quickly in UV light and there is only a short window for the larvae to ingest it before tunnelling into the fruit.

ORGANIC PRODUCTION INCREASES

Since 2002, the number of U.S. certified organic operations has increased by more than 250%. USDA recently announced that the current number–almost 20,000 operations–is 5% over 2014.

NEW VIRUS REPORTED ON SWITCHGRASS

In recent years, University of Illinois plant pathologists noticed virus-like symptoms in switchgrass, a bioenergy crop. But repeatedly, all affected plants tested negative for known viruses. The scientists then "dove" into deep sequencing, a new molecular technique, and found that the plants were infected with a new virus in the Mastrevirus group, the first of its kind found in North America. The results are reported in *Archives of Virology* where the new virus is named switchgrass mosaic-associated virus 1 (SgMaV-1). Elsewhere in the world, Mastreviruses are responsible for decimating yields in corn, wheat, and sugarcane. Researchers are not sure what vector transmits SgMaV-1 and the impacts of the virus on switchgrass biomass yield, nor do they know what other crops this new virus affects.

NEW CLASS OF INSECTICIDE FOR MOSQUITO CONTROL

Purdue entomologists have identified a new class of chemical insecticide that could provide a safer, more selective means of controlling mosquitoes. Known as dopamine receptor antagonists, the chemical disrupts cell signaling, movement, development, and behaviors, eventually leading to the insect's death. The researchers used the mosquito genome to pinpoint chemicals that will be more selective than current insecticides. Diseases spread by mosquitoes kill thousands worldwide every year.

BOX STORES CONTINUE TO PHASE OUT NEONICOTINOIDS

Lowe's joins BJ's Wholesale Club, Home Depot, and several plant nurseries in phasing out the sale of products containing neonicotinoid pesticides. Lowe's announcement includes a promise to include more organic products, encourage customers to use biocontrol options, and provide more consumer and employee education.

Useful Websites

- University of California created an Urban Ag website that offers information and resources including soil, planting, irrigation, pest management, and harvesting, as well as information on the business of farming, such as how to market urban farm products.
- Herbicide Symptoms is a website from University of California that helps to identify damage from 81 herbicides on crops and ornamental plantings. The site includes nearly a thousand images from more than 14 modes of action.

Featured Picture of the Quarter

In Fall 2014, the Utah Plant Pest Diagnostic Lab diagnosed **gummy stem blight** on spaghetti squash, butternut squash, and acorn squash grown in Utah County. The disease can affect foliage (spots and blight), stems (black spots, cankers, and gumming), fruit (brown to black spots and gumming) and the entire plant (wilting and death). It is caused by the fungus, *Didymella bryoniae*, and is most common in the southern United States and in subtropical and tropical areas of the world. The disease may have been introduced to the Utah site via infected seed. The fungus can survive for up to 2 years on cucurbit debris in the soil, illustrating the importance of crop rotation.

-Image by Claudia Nischwitz, Plant Pathologist

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