UTAH PLANT HEALTH

Extension
UtahStateUniversity.

Utah IPM Program and Utah Plant Pest Diagnostic Laboratory

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IN THIS ISSUE

NEW MEDIA

The Plant Health Team is Growing!

Utah State University recently hired two Extension entomologists and Assistant Professors, and we are thrilled that they are now part of the USU Plant Health Team.

Dr. Subodh Adhikari earned his Ph.D. in Agroecology from Montana State University in 2018, where he studied how differently managed farming systems impact weed, insect pests, beneficial insects, and ecosystem services. Prior to joining USU, he worked as a post-doctoral researcher and later as a research assistant professor at the University of Idaho, focusing on dryland cereal-legume cropping systems.

At USU, Subodh is excited to build a research and Extension program that supports Utah growers in managing key agronomic insect pests including alfalfa weevil, blue alfalfa aphid, and cereal leaf beetle. His work emphasizes climate-smart agricultural practices such as cover cropping and crop diversification to enhance biodiversity. He is passionate about working with growers and Extension educators and feels that strong relationships are essential to creating locally-adapted strategies that benefit agriculture and the public.

Dr. Emilie Demard grew up in Saint Etienne, located in eastern-central France. During her Ph.D. program at the University of Florida (UF), she worked on the population dynamics and management of pest mites in Citrus Under Protective Screen (CUPS) using chemical control and predatory mites as biocontrol agents. Before joining USU, Emilie was a post-doctoral researcher at UF where she studied the feeding behavior of several piercing-sucking insects and developed IPM tools for arthropod pests in citrus.

At USU, Emilie will be working primarily on pests of fruits and vegetables, but she is also interested in working in ornamental plants and cut flower crops. She looks forward to meeting farmers and county faculty across the state to help in developing sustainable and cost-effective pest management programs.

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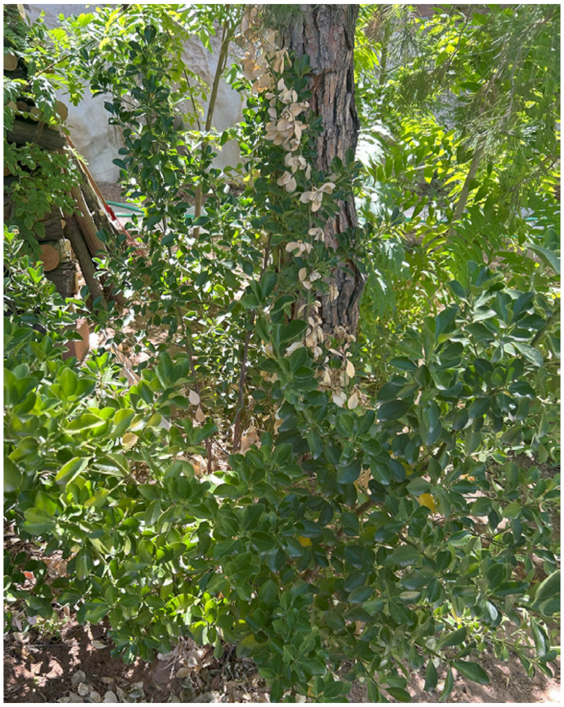
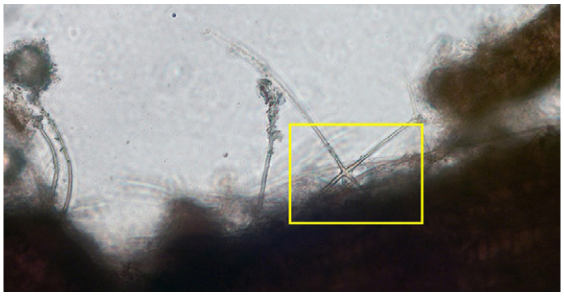
Cotton Root Rot on Ornamental Landscape Trees



Euonymus shrub diagnosed with cotton root rot.

Section of euonymus root that is rotted and covered in mycelial strands (in yellow square) of the pathogen that causes cotton root rot.



Microscopic view of mycelial strand showing cruciform hyphae (in yellow square).

Cotton root rot (also known as Texas root rot and Phymatotrichum root rot), caused by *Phymatotrichopis omnivora* (syn. *Phymatotrichum omnivorum*), was found on euonymus in Washington County, UT this summer. Southern Utah has the optimal conditions for this fungus to survive—hot soils with a high pH. The fungus is assumed to be native to southwestern U.S. and northern Mexico, surviving on—but not killing—native flora. It has over 1,800 hosts ranging from woody ornamentals to vegetables. In Texas and Arizona, cotton root rot causes significant yield losses on cotton and alfalfa and kills other non-native hosts.

Initial symptoms appear in late spring to early fall, two to three years after infection. Branches wilt and die followed by complete plant death, where the brown leaves remain attached. Roots of dead trees are rotten and often have mycelial strands (bundles of hyphae) growing on the root surface. When dirt is carefully rinsed off the roots, the strands may be visible with a hand lens or the

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Trees, shrubs and flowers resistant to cotton root rot that can be grown in Washington County, UT

TREES AND SHRUBS	
Atriplex spp.	Saltbush
Bambusa spp.	Bamboo
Celtis spp.	Hackberry
Chamaerops humilis	Mediterranean fan palm
Chilopsis linearis	Desert willow
Cupressus	Cypress/Juniper
Lycium spp.	Wolfberry
Parkinsonia microphylla	Palo verde
Phyllostachys aurea	Golden bamboo
Prosopis spp.	Mesquite
Rosmarinus officinalis	Rosemary
Trachycarpus fortune	Windmill palm
Washingtonia filifrea	California palm
Yucca spp.	Yucca

FLOWERS	
Antirrhinum majus	Snapdragon
Crocus spp.	Crocus
Fragaria chiloensis	Strawberry
Gypsophila paniculate	Baby's breath
Helichrysum braacteatum	Strawflower
Hyacinthus orientalis	Hyacinth
Iris spp.	Iris
Mentha spicata	Spearmint
Pelagonium spp.	Geranium
Petunia hybrida	Petunia
Tropaeolum majus	Nasturtium
Tulip gesneriana	Tulip
Verbena hybrida	Verbena
Viola odorata	English violet
Viola tricolor	Pansy

Cotton root rot mat of mycelium and spores formed during rainy conditions.
Image courtesy of S.D. Lyda, bugwood.org

naked eye. Some hyphae of the mycelial strands are cruciform (only visible under a microscope), a unique characteristic of *Phymatotrichopis*.

Since the pathogen is native, it may be present in most soils, but it can also be introduced into a location on an infected plant. The fungus can infect and kill newly planted hosts such as lilac, euonymus, pines, locust, ash, Texas umbrella tree, Chinese rain tree, and Chinese pistache. Over time, the fungus grows from the roots of an infected tree and spreads to adjacent roots. Eventually, a grove of trees may be killed.

Phymatotrichopis can survive for several years in the soil, either within root debris or via microsclerotia (hard balls of fungal tissue). In locations with frequent irrigation or during periods of heavy rainfall, the fungus may produce a light tan mat of mycelium and spores on the soil surface. The mats have no known function and do not contribute to the spread of the pathogen. They are not very common and resemble slime mold or other fungi.

Management of cotton root rot is very difficult. Infected plants should be removed, including the roots. Re-plant with a non-susceptible host.

If you have a shrub or tree in southern Utah that suddenly dies a few years after planting, please contact Claudia Nischwitz (claudia.nischwitz@usu.edu) or Ben Scow (ben.scow@usu.edu). We can collect root samples and check them for the presence of *Phymatotrichopis*.

— Claudia Nischwitz, Plant Pathologist and Ben Scow, Horticulture Assistant Professor, Washington County

Sclerotinia White Mold on Tomato

This summer, a Utah State University county Extension office visited a farm whose high-tunnel tomatoes had odd symptoms. The Utah Plant Pest Diagnostic Lab identified it as white mold, which is caused by *Sclerotinia sclerotiorum* and is very rare in Utah. The fungus infects many hosts including carrot, cucumber, and lettuce. It is soilborne and produces two types of survival structures – apothecia for reproduction (cup-shaped fruiting bodies with spores) and sclerotia for long-term survival (hard, black balls of fungal tissue that look like raisins or mouse droppings).

The fungus can be introduced to a new site on infected transplants or in compost that contained infected plants, as sclerotia can survive the plant decomposition process. New infections typically occur during cool, moist conditions (59-70°F); however, they can also occur in warmer conditions. It is likely that the high tunnel temperatures were in the low 80s when the tomatoes became diseased.

Symptoms on tomato include wilting, dieback, and tan spots. Typically, symptoms occur near the top of the plant where spores most easily land, but can also occur near the soil level. Tissue dies quickly, leaving behind a bleached appearance. A diagnostic trick is to look for cottony white mycelium inside dead stems, often with the presence of sclerotia. Once a plant is infected, it should be removed, as there is no cure.

With no fungicides available to use, management is difficult. Crop rotation is not likely to be effective due to the pathogen's large host range and persistence in the soil. Soil solarization by tarping with clear plastic for four weeks in summer is most effective, but takes land out of production. An alternative option in infected sites is to add raised beds with new soil on top of the infested soil. Another option is to use black plastic mulch under the plants to prevent the discharged spores from the apothecia in the soil from reaching the plants. However, in a greenhouse setting, this can lead to high soil temperatures in summer and may not be suitable.

— Claudia Nischwitz, Plant Pathologist and Wesley Crump, Horticulture Assistant Professor, Wasatch County

Tomato plant infected by *S. sclerotiorum*. The arrow points to the margin of infected tissue (top of stem) and healthy (bottom of stem).

White mycelium and black sclerotia exposed from within an infected stem. Image courtesy Wes Crump.

Reference

Rudolph et al. (2025). Effects of high tunnel soil solarization on *Sclerotinia sclerotiorum* in the temperate climate of central Kentucky. *Plant Disease, 109*(4), 842-850.

Termites in Northern Utah

Termites are fascinating organisms with a complex social structure involving castes and division of labor. They are ecologically important in many environments worldwide. Unfortunately, they are also among the most economically important pests, causing billions of dollars in structural damage each year. Often associated with warm and humid regions, termites are also found in cooler and drier areas, including northern Utah. It is important for homeowners and land managers to understand the termite species present, their biology, and the most effective management strategies to protect structures from costly infestations.

There are a few types of termites in northern Utah. Some are less common due to cold winters and arid conditions, such as drywood termites, which nest inside dry wood (including structures), and dampwood termites, which nest in moist and decaying wood. For most property owners in northern Utah, the primary concern are subterranean termites in the genus *Reticulitermes*. The Utah Plant Pest Diagnostic Lab (UPPDL) received multiple samples over the last two years that were identified as *R. tibialis*, the desert or arid-land subterranean termites. This species is widespread across the Intermountain West and prefers cellulose-rich materials such as structural wood, fallen logs, and landscaping mulch.

Alate (top), soldier (middle), and worker (bottom) of the arid-land subterranean termite *Reticulitermes tibialis* found in northern Utah.

Biology, Behavior, and Activity of Subterranean Termites

Subterranean termites do not nest inside wood. They live in underground colonies, which can last for decades and have thousands to hundreds of thousands of individuals. Colonies have a highly organized caste system that include workers (which perform foraging, tunnel building, and brood care), soldiers (which defend the colony using their large mandibles), and reproductives, which include the king, queen, and winged swarmers (alates) and are responsible for forming new colonies.

Since they require constant moisture, subterranean termites remain hidden in the soil or within mud tubes. These tunnels are about the diameter of a pencil and connect the nest to above-ground food sources. Termites consume wood and other cellulose materials, hollowing structures from the inside out.

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In Utah, termite swarms are typically seen in spring or early summer, often after rainfall, when alates leave the colony to mate and establish new nests. Freezing winters reduce surface foraging, but colonies survive below the frost line, inside heated structures, or under snow cover. In spring and summer, irrigation of lawns and plants provides the moisture termites need to thrive. Human practices create microhabitats that support termites in what would otherwise be a challenging environment.

Signs of Infestation and Preventive Measures

Discarded wings around windowsills or foundations is often the first visible sign of termites. Because they stay hidden, infestations may persist for years before becoming apparent. Additional warning signs include mud tubes along foundations, crawl spaces, or basement walls, and hollow-sounding or brittle wood that crumbles when probed.

Development of a subterranean termite colony requires years until structural damage is noticeable. This highlights the importance of prevention and monitoring which is more effective and less costly than treating advanced damage. Some recommended preventive strategies for northern Utah include:

1. **Moisture management**: Repair leaky pipes, roof gutters, and irrigation systems. Ensure that water drains away from the foundation.
2. **Soil-to-wood separation**: Keep structural wood at least six inches above ground and avoid burying posts or fence bases directly in soil.
3. **Ventilation**: Maintain airflow in crawl spaces and attics to prevent moisture buildup.
4. **Landscaping practices**: Store firewood away from structures and avoid piling mulch against foundation walls.
5. **Inspections**: Schedule professional termite inspections every 2–3 years, especially for older homes. This is an optimal option for thorough termite inspections and management.

Long-Term Management

Termite management options include:

- Soil-applied liquid termiticides to kill or repel termites as they attempt to enter.
- Baiting systems containing cellulose mixed with slow-acting insecticides. Workers feed on the bait and transfer it throughout the colony, leading to gradual elimination.
- Localized wood treatments such as borate sprays, dusts, or foam injections for smaller infestations or as a preventive application on vulnerable wood.

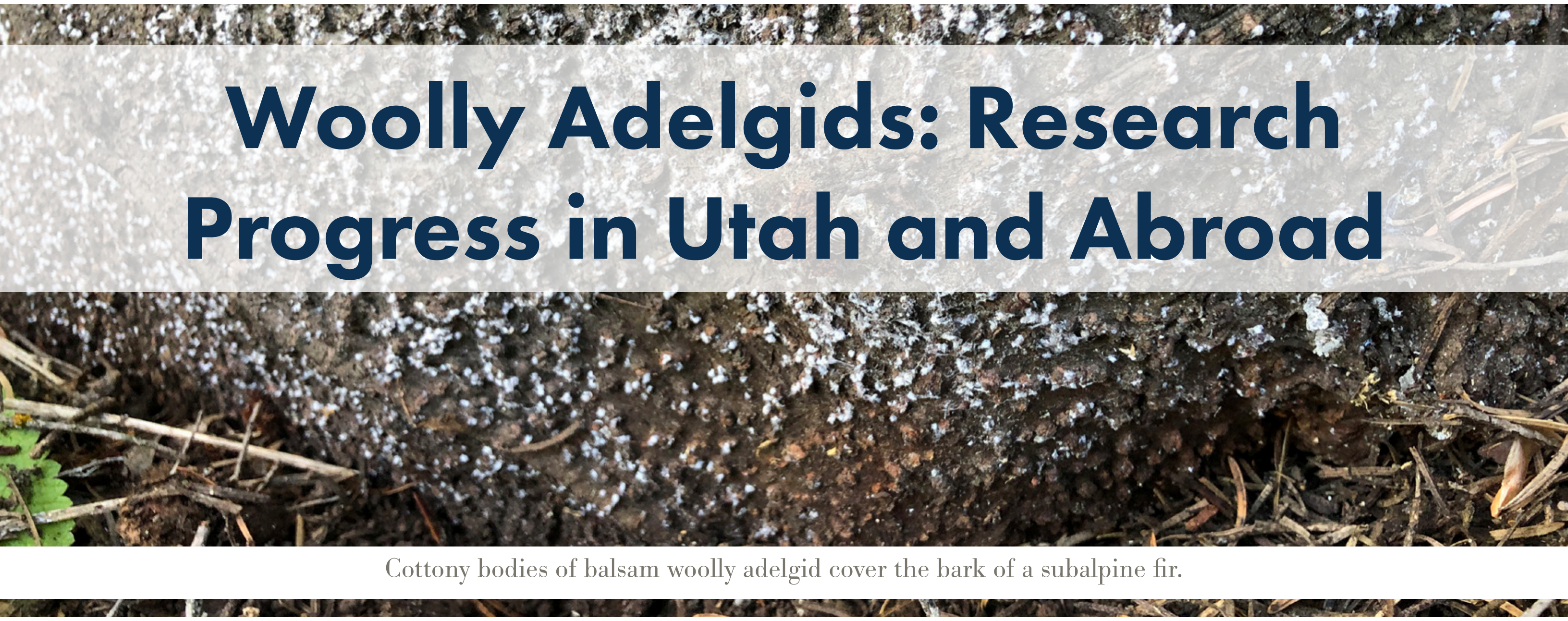
Professional pest management services are strongly recommended as they have the expertise to locate hard-to-detect infestations early and ensure long-term control in the safest way possible. Importantly, termite control is rarely a one-time effort. Since structures are a constant food source, colonies can re-establish, and new colonies may invade from surrounding areas. Some Utah pest control companies offer annual programs to ensure that bait stations remain active, barriers remain intact, and any renewed activity is detected early.

Conclusion

Subterranean termites, particularly *Reticulitermes tibialis*, are the primary termite concern in northern Utah. Although the region's dry climate might seem unfavorable, irrigation, landscaping, and heated buildings provide conditions that allow colonies to thrive. Tactics that combine good construction practices, moisture control, regular monitoring, and professional pest management can significantly help property owners to reduce the risks associated with termite infestations. In case of questions and identification needs for termites and other insects in your property, please contact the UPPDL.

— Ernane Vieira-Neto, Arthropod Diagnostician

Woolly Adelgids: Research Progress in Utah and Abroad



Cottony bodies of balsam woolly adelgid cover the bark of a subalpine fir.

Adelgids are small sap-sucking insects, closely related to aphids, and some species are invasive pests of North American forests. Introduced from Europe, the balsam woolly adelgid (BWA), *Adelges piceae*, is a pest of true firs (*Abies* spp.) and was first reported in Utah in 2017. As of spring 2023, BWA was detected in 10 Utah counties. The hemlock woolly adelgid, *A. tsugae* (HWA) is a pest of eastern and Carolina hemlocks and has not been reported in Utah.

Adelgids produce white cottony egg sacs, which develop into crawlers, the only mobile stage. Once crawlers start feeding, they develop into nymphs and then into adults. Adelgids produce white cottony wax called "wool" which resembles small cotton balls. By feeding on the sap of the trees, adelgids inject their toxic saliva which results in plant symptoms.

Developing a Degree Day Model for Balsam Woolly Adelgid

BWA causes stunting,swelling of terminal branches, called "gouting," and tree decline. USU scientists and collaborators studied a degree-day model for BWA to predict timing of life stages and voltinism (number of generations per year). Between 2020-2022, the team collected bark samples weekly from five infested sites in northern Utah. They observed two generations per year with one adult peak in early summer and a second in late summer and fall. All life stages were found each spring, indicating that BWA successfully overwinters. Based on the degree day model tested, the first generation was completed at 1,104 degree days (base 32°F) after January 1 and the second generation was completed at 2,412 degree days. Using previous temperature records from 1980 to 2020, model predictions suggest that degree day accumulation was suitable for two generations two decades before the first detection of BWA in northern Utah. Models also predict that four annual generations will be possible by the end of the century at elevations of 6,500 to 8,000 feet in northern Utah.

Swelling of fir stems (gouting) caused by balsam woolly adelgid.
Image courtesy of Liz Rideout.

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New Traps for Early Detection of Hemlock Woolly Adelgid

Funnel trap developed by Canadian researchers to detect the hemlock woolly adelgid prior to host symptoms. Image courtesy of Fidgen et al. 2025.

Early detection is key to limiting spread of invasive species and implementing rapid management plans. However, discovering adelgids is challenging due to their nature of hiding in barks and crevices and their clumpy distribution. Recently, a Canadian research team developed and evaluated a novel funnel trap for hemlock woolly adelgid crawlers. While HWA is not present in Utah, the trap and extraction method tested in this new study could be adapted for monitoring BWA in Utah and other U.S. states.

The trap consists of an Allison collar covered by a hardware cloth and connected to a cup filled with a solution to collect and preserve specimens. The traps were hung at about 13 feet off the ground. The study revealed that the funnel trap performs better at collecting HWA when present at low abundance compared to sticky card or canopy branch tip sampling. The researchers estimated that one or two traps per site for two weeks and an intake surface area of 223 square inches per trap led to satisfactory detection of two HWA generations.

Predaceous Flies Associated with Adelgids in Bhutan

While several natural enemies of BWA have been introduced in North America, biological control has not successfully reduced pest populations. Recently, predaceous flies from three families (Cecidomyiidae, Chamaemyiidae, and Syrphidae) were identified in Bhutan, a country located in the eastern Himalayas. The research team successfully generated DNA bar codes for 7 cecidomyiids, 103 chamaemyiids, and 13 syrphids. Although the effectiveness of these flies in controlling adelgid populations is unknown, these results suggest potential management options for adelgids throughout the world.

Implications for Forest Health in Utah

In Utah, surveys, research, and management are led by several organizations, including the U.S. Forest Service, Utah Division of Forestry, Fire, and State Lands, Utah State University Extension, USDA Animal and Plant Health Inspection Service, and local ski resorts. This partnership helps with new BWA detection through aerial surveys, removal of infested trees, and understanding variables that influence the insect spread and survival. Various management strategies are also being investigated to determine the best treatment options.

— Emilie Demard, Extension Entomologist

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Tshering, K., et al. 2025. Diversity, distribution, biology, and predators of adelgids (Hemiptera: Adelgidae) in the conifer forests of Bhutan. *Journal of Insect Science, 25*, Issue 3.

Cover Crops Supplement IPM

Cover crops are plants grown primarily to cover the soil rather than to be harvested as a commodity. They can be planted during the growing season, in the off-season, or between cycles of cash crops, without compromising the main crop, while providing a range of agronomic and ecological benefits. Traditionally, cover crops are used to improve soil health and suppress weeds, important components of integrated pest management (IPM).

A wide variety of species can be used as cover crops depending on the intended goals. Mixtures that combine functional groups often provide broader ecosystem services than monocultures. For example, legumes (hairy vetch, winter pea, crimson clover) are used to fix nitrogen. Grasses (oats, ryegrass, cereal rye) help build organic matter and cover soil. Brassicas (daikon radish, canola, forage turnip) scavenge nutrients, tap deep soil moisture, and act as biofumigants. Other species like sunflowers, flax, buckwheat, and phacelia are also used for their multifunctional benefits, including support for pollinators and natural enemies.

Cover Crops and IPM

Cover crops are increasingly valued for their ability to support beneficial insects and reduce reliance on chemical controls. Beyond weed suppression and soil health, they provide habitat and food for natural enemies such as ground beetles, lady beetles, spiders, and parasitic wasps. These predators and parasitoids help suppress a wide range of pests. For example, ground beetles feed on corn rootworms, slugs, and caterpillars. Lady beetles are effective against aphids. Spiders control armyworms and other soft-bodied pests. Parasitic wasps target various insect hosts.

Cover crop mixes may act as ecological filters, shaping insect communities by favoring beneficial taxa while deterring certain pests. For example, rye cover crops have been shown to reduce corn rootworm damage by supporting predator populations. Some cover crops, such as subterranean clover, host key beneficial insects like big-eyed bugs (*Geocoris* spp.), while others like cereal rye, radish, and sunn hemp can suppress plant-parasitic nematodes. Perennial cover crops also serve as "beetle banks," providing overwintering habitat and sustaining predator populations between cropping seasons. These predator insects require not only floral resources but also a steady supply of insect prey, which cover crops help maintain throughout the season.

By integrating diverse cover crop species, growers can create multifunctional habitats that support both pest control and pollination, offsetting the negative impacts of landscape simplification and agricultural intensification.

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Many natural enemies are supported by cover crops and contribute to regulating pest populations. An aphid parasitoid wasp searches for a pea aphid to attack (Left). An adult seven-spotted lady beetle attacking cabbage aphids (Center). A lady beetle larva feeding on a cereal aphid (Right).

Cover Crop Challenges

While cover crops offer numerous agronomic and ecological benefits, they introduce additional costs and logistical complexities related to seeding, establishment, maintenance, and termination. In dryland or low-precipitation regions like northwest Utah, soil moisture conservation is a major barrier to cover crop adoption. Cover crops can compete with cash crops for limited water resources, making them less viable in water-limited systems. Hence, to avoid competition with subsequent cash crops, cover crops must be terminated before they set seed or deplete soil nutrients and moisture.

Additionally, while cover crops support beneficial insects, they may also harbor or attract new or unintended pests, which could spill over into subsequent crops. This potential for harm underscores the need for more research on how different cover crop species and mixtures influence pest population dynamics. Although pest infestations on cover crops are generally not a major concern, monitoring is essential, especially in systems where insect pests such as disease-carrying vectors or lygus bug are known to persist or migrate between crops.

Cover Crops Suitable for Utah

Cover crop performance in Utah varies widely due to local soil and climate conditions. The USU Crops Extension Team has conducted multi-year trials, primarily to study soil health and weed suppression. While some species have established successfully, others have struggled under Utah's environmental conditions. Given the regional differences in soil and climate, cover crop species and mixtures must be carefully tailored to local environments.

The most common cover crops tested or recommended for Utah (see the details here) are legumes (cowpea, red clover, hairy and common vetch, faba bean, chickpea, lentil, and winter pea), grasses (oats, rye, sorghum-Sudan grass, winter wheat, and barley), brassicas (daikon radish, turnip, and canola), and buckwheat. Additional forb crops tested in neighboring states are sunflowers, flax, and phacelia. Along with soil health and weed suppression, our team will also study benefits for integrated pest and pollinator management with a goal of broader adoption of cover cropping. We will investigate how pests and beneficials are affected by the introduction of new plants on the farm.

— Subodh Adhikari, Extension Entomologist

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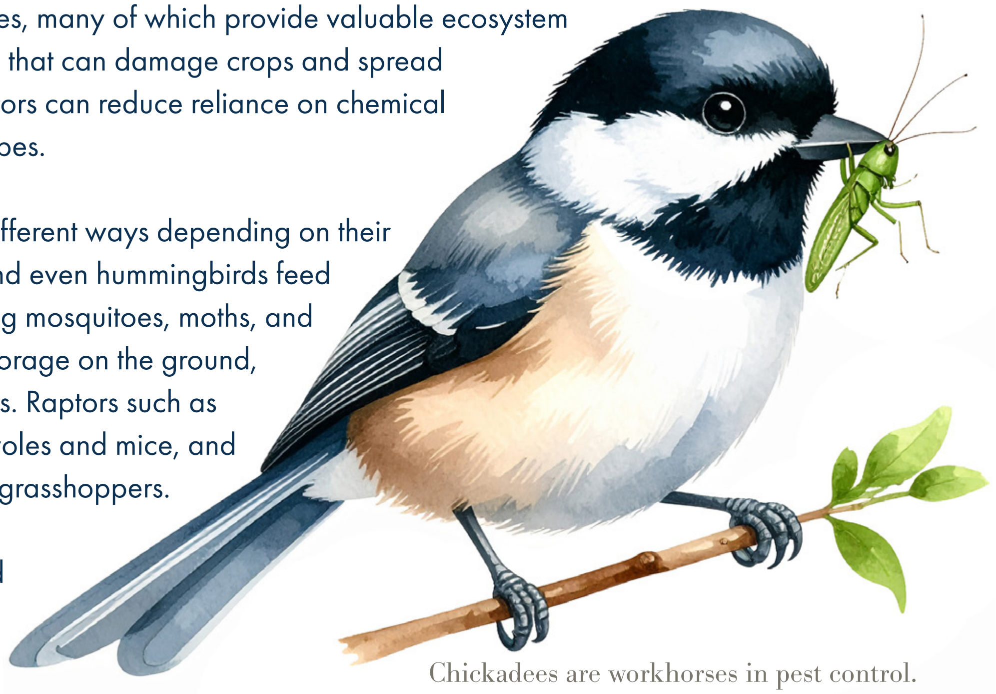
Wild Birds as Pest Control

Utah is home to more than 400 bird species, many of which provide valuable ecosystem services by consuming insects and rodents that can damage crops and spread disease. Encouraging these natural predators can reduce reliance on chemical inputs and promote more resilient landscapes.

Bird species contribute to pest control in different ways depending on their feeding strategy. Swallows, flycatchers, and even hummingbirds feed extensively on small flying insects, including mosquitoes, moths, and beetles. Sparrows and towhees typically forage on the ground, consuming ants, beetles, and grasshoppers. Raptors such as kestrels hunt small mammals, particularly voles and mice, and have also been known to feed heavily on grasshoppers.



Chickadees are workhorses in pest control.
Image generated using Adobe Firefly

Several studies support the ecological and economic value of birds in agricultural landscapes. A review by Díaz-Siefer et al (2021) concluded that when wild birds were promoted on farms using conventional pest control methods, insect pest damage was reduced and crop yield was increased, versus when birds were excluded. In some systems, predatory birds such as kestrels have been shown to reduce rodent populations by 80%, enough to prevent significant crop loss.

Several practices can be implemented to support birds in agricultural landscapes.

1. Preserve habitat diversity through open fields, hedgerows, and native vegetation to not only encourage nesting but also attract a wider range of species and pollinators. A 2018 study showed that apple orchards that included hedgerows, remnant trees within the orchard, or had natural lands on borders, had a greater abundance and richness of bird species.
2. Add fruiting shrubs and trees to provide alternate food sources for omnivorous bird species when pest populations are low.
3. Provide sources of water such as ponds, canals, or small water features as essential hydration for birds during Utah's hot and dry summers.
4. Reduce or avoid broad-spectrum pesticides where possible to preserve insect prey.

— Megan Kast, IPM Associate

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Pesticide Label Changes for ESA

Part 2: Label Changes to Reduce Runoff and Drift

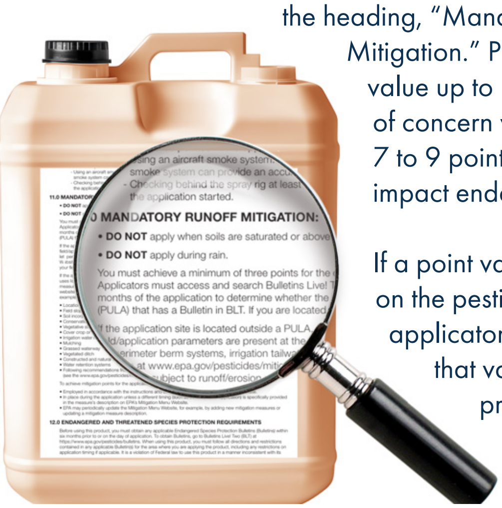
This article is part two in a series discussing upcoming pesticide label changes for Utah agriculture. Part three will address the EPA web tool, Bulletins Live! Two.

The Environmental Protection Agency (EPA) ensures that pesticides comply with the requirements of the Endangered Species Act (ESA). In 2023, EPA developed a workplan that outlines a new approach to ensure that pesticide registrations and label changes are ESA-compliant without overburdening applicators.

Upcoming label changes to comply with ESA only apply to application of conventional pesticides on agricultural lands. It does not apply to application to turf, ornamentals, greenhouses, or nurseries, nor application of organic pesticides.

Mitigating Runoff – Points on the Label

Runoff of pesticides from a farm into ground or surface water is a concern for the health of endangered species. In the coming years, as new conventional pesticides are registered and old products are renewed, their labels will include a number value from 1 to 9 "points" under the heading, "Mandatory Runoff Mitigation." Products with a point value up to 3 are not likely to be of concern while products with 7 to 9 points have potential to impact endangered species.



If a point value is provided on the pesticide label, the applicator or farm must match that value via mitigation practices in order to qualify for applying that pesticide.

Thankfully, the points system should not overly burden Utah farmers, as all applicable applicators in our state are "credited" with at least 2 points. The reason involves slopes and climate.

In the western U.S., the climate is arid and most farmland is flat, while in the East, rainfall can be high and farmland can be hilly. Therefore, the risk of pesticides running off the land varies depending on geographic location. To account for this variability, the EPA assigned every county in the U.S. with runoff vulnerability levels from Very Low to High.

Most counties in Utah are assigned Low and Very Low runoff risk levels, which provides point "credits" to farms. Farms in southern Utah are credited with 6 points, farms in central and northern Utah have 3 points, while Davis and Weber counties have 2 points.

There may be instances where the farm's credit points are lower than the points listed on the label. EPA's Runoff and Erosion Mitigation Menu and Runoff Calculator lists additional options to gain points. For example, tracking and recording farm practices and working with a technical expert each provide 1 point, while vegetative borders and drip irrigation each provide up to 3 points.

Mitigating Spray Drift

Standard spray drift mitigation requirements will be included on all pesticide labels as they have in the past, and these apply to all applications.

In addition, some labels (depending on their toxicity) will include application buffer requirements under the heading, "Mandatory Spray Drift Management" to protect non-target areas from spray drift. If the downwind side of a field is adjacent to a non-target area (typically described on the label), then the applicator must follow the buffer-width requirement. If the downwind side of the field is adjacent to managed areas (roads, hedgerows, mowed grass, ditches, canals, pasture, or rangeland), the applicator does not need to worry about the buffer.

Buffer widths will be clearly specified on the pesticide label and may range from 0 to 160 feet for ground applications. There are mitigations that farmers can implement (or may already have) that will reduce the width requirement of the buffer.

— Marion Murray, IPM Specialist

IPM In The News

Resistance to Biopesticides

Recent advancements in pesticides has focused on biopesticides, but development of a single product can take up to a decade. Researchers from the University of Stirling published a review of existing biopesticide research in *Trends in Ecology & Evolution*, and found that insect pests are evolving resistance to some of these biopesticides faster than previously thought. The team recommends focusing on novel resistance management strategies rather than developing new products. These include increasing crop diversity and careful rotations between multiple biopesticides.

Major Discovery in Plant Disease Resistance

Some pathogens that cause plant disease feed on plants by killing cells first (necrotrophs) while others feed only on living cells (biotrophs). Researchers at Rutgers and Brookhaven National Laboratory have spent a decade to combat these feeding types by exploiting a natural process where plant cells die on purpose. The team determined how a key plant protein, called metacaspase-9, works like a switch to turn on a plant's natural "self-destruct" system. They created two variants of metacaspase 9: a super-variant kills cells to prevent feeding by biotrophs, and a reduced-function variant keeps cells alive to prevent feeding by necrotrophs. These findings, published in *Nature Communications*, allow for development of new treatments based on metacaspase 9 to boost plants' natural defenses against diseases.

Beneficial Virus inside Parasitoid Wasps

Researchers from Israel's Agricultural Research Organization and the University of Haifa discovered a virus named AnvRV inside the ovaries of females of the parasitoid wasp, *Anagyrus vladimiri*. This wasp is used worldwide to manage mealybugs in greenhouses. The study, published in *Annals of the Entomological Society of America*, found that the virus increases the likelihood that the wasp's eggs will successfully hatch inside the mealybug hosts, apparently by suppressing host immune defenses such as egg encapsulation. Although no overall increase in wasp offspring was observed under laboratory conditions, the egg survival benefit suggests that parasitism efficiency can be improved, especially under challenging conditions. The virus may be a promising tool for enhancing biological control.

Boosting Biodiversity on a Conventional Farm

A 10-year project was conducted by the UK Centre for Ecology and Hydrology on a large conventional farm with no surrounding natural habitats. The study, which began in 2005, added a variety of wildlife habitat types including seed-bearing plants, wildflowers, and grass borders and compared biodiversity levels over time. Their study, published in *Journal of Applied Ecology*, found that levels of some butterfly species doubled, and insectivorous bird counts increased, such as the great tit, up 88%, and blue tit, up 73%. Most importantly, overall crop yields were maintained, and in some cases improved. These results show that nature-friendly farming can support wildlife while still maintaining strong agricultural productivity.

UV Light to Reduce Lettuce Powdery Mildew

A team of scientists led by Rodale Institute sought to improve organic control of powdery mildew on greenhouse-grown lettuce. They tested combined or individual treatments of pre-plant exposure to UV-B or UV-C light and post-plant application of the organic fungicide, Milstop (potassium bicarbonate). The best combination

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Featured Picture of the Quarter

Praying mantids are indiscriminate predators and will consume pollinators, other beneficials, and each other. This image was taken just before the male mantid's head was severed (ick!). These two had just mated, and females only consume males if she is in poor condition.

In Utah, the majority of mantids we see are non-native, and include the European mantid, whose color varies from green to brown (at left) and the Chinese mantid, which can reach 4 inches in length.

— Image by Marion Murray, IPM Specialist

IPM in the News, continued

was UV-B light and MilStop, which significantly reduced powdery mildew infestation and significantly increased the total amino acid concentrations. These findings, published in *Horticulturae*, highlight the potential of integrating UV light treatments and fungicide applications for managing powdery mildew and maintaining nutritional quality.

Insect Wasp Biocontrol Without Males

A parasitoid wasp of aphids called *Lysiphlebus fabarum* was recently discovered to reproduce both sexually and asexually (without mating). This reproductive flexibility combines the benefits of rapid population growth from asexual reproduction with the genetic diversity that sexual reproduction brings. The findings, which come from a team of researchers from the University of Stirling and published in *Royal Society Open Science*, could make it possible to rear more resilient biocontrol agents that adapt better to different environments, and improve sustainable pest management strategies.

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NPDN National Plant Diagnostic Network

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USDA United States Department of Agriculture National Institute of Food and Agriculture

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