Figure 1. The insects and mites that form galls are often small and very host specific like these *Ribesia sarae*, midges that cause "blisters" only on the leaves of plants in the *Ribes* genus (currants and gooseberries). Leaf galls usually only "steal" a portion of the leaf and healthy, vigorous plants easily withstand the damage as most have a lot more leaves than they actually need. Small songbirds and specialized insect predators can reduce gall-maker populations but never eliminate all galls. Photo by Scott Schell.

What are these critters that have the "gall" to harm my trees?

What are galls?

Common Wyoming landscape trees, such as aspens, fast-growing hybrid poplars, cottonwoods, and bur oaks, may develop noticeable abnormal growths that can cause consternation to their owners. These growths, called galls, are made by insects and mite species.

From the gall-maker's perspective, a gall is very advantageous; they get all of their food from the plant, plus the gall tissue provides protection from bad weather and many predators. Experts estimate that more than 2,000 insect and mite species cause galls on plants.

Galls usually appear on the new, fast-growing parts of plants and vary widely in size, shape, and color depending on the gall-forming species and the plant host.

Are galls killing my tree?

In most cases, galls on leaves (Figure 1) do not cause significant harm to the overall health of deciduous trees. The leaf damage can be unsightly and may cause some stress to the plant, but will not kill an otherwise healthy plant.

Plants weakened from stressors like drought, disease, and other pests can develop severe gall infestations. Galls that form on the end of branches can change the plant's growth form and, in some cases, stunt trees and shrubs.

Do I need to do anything about them?

Control measures for most gall infestations are not necessary. This is fortunate, as some gall-formers

Figure 2. The leaf (left) that is taken over by the poplar vagabond aphid in the early spring remains green and provides food and shelter for the aphids until they abandon it to complete their life cycle. Photo by Whitney Cranshaw, Colorado State University, Bugwood.org, CC-BY. The hard, dry galled leaf (right) remains on the tree and is very visible when the normal leaves drop in the fall. Photo by Steven Katovich, Bugwood.org, CC-BY.

are often difficult, if not impossible, to control economically or easily.

If you're concerned about gall management, first make sure your tree is not water stressed or suffering from treatable maladies like iron chlorosis (yellowing of leaves caused by iron deficiency). Overfertilization, especially with nitrogen-containing products, can sometimes backfire and make the plant attractive, and more susceptible, to aphids and leaf-chewing pests.

To successfully control gall-makers, or any plant pest, it's important to understand their life cycle so you can apply control measures at the optimum times. Note that life cycles vary by species, so make sure to identify which gall-maker you are dealing with before making any management decisions.

Life cycles of common gall-makers

The **poplar vagabond gall aphid** (*Mordwilkoja vagabunda*) has a life cycle involving both sexual and asexual reproduction phases. The aphids overwinter as eggs laid on the bark or in the old galls on poplar trees in the fall. In early spring, these eggs hatch into "stem mothers" at bud break. The stem mother aphids are the first generation of the year and feed on the poplar tree's young leaves, inducing gall formation (Figure 2). The galls provide a protected environment and food source for the stem mothers' many offspring.

Inside the galls, the stem mothers reproduce asexually, giving birth to live nymphs that can develop into winged or wingless adults depending on environmental conditions and population density. Winged adults, called alates, are only $^{3}/_{16}$ of an inch long. They emerge from the drying galls in late spring or early summer. The alates disperse to un-infested poplar trees and other plants, continuing to reproduce asexually. In late summer, a generation of winged male and female aphids emerges. After mating, females lay overwintering eggs on the poplar bark or buds, completing the annual cycle.

Poplars infested with vagabond gall aphids can be treated with a dormant oil solution during the aphid's egg stage. This tactic smothers the exposed eggs; however, the eggs laid inside the old galls will remain unharmed.

Numerous systemic insecticide treatments for aphids on ornamental trees are also available. For

Figure 3. The poplar budgall mite (*Aceria parapopuli*) population in the top of this Laramie street tree is visible in the wintertime (left). In the summer, the galls are hidden amongst the foliage (right). Some fast-growing hybrid poplar tree varieties can be very susceptible to the mites and their growth pattern can be disfigured by the galls. Photos by Scott Schell.

tall, heavily infested trees, this may be the best option, although it can be expensive. Keep in mind that trees that are otherwise healthy and unstressed usually tolerate vagabond aphids without issue other than aesthetic damage.

The **poplar budgall mite** (*Aceria parapopuli*) feeds only on trees in the genus *Populus*, which includes aspens, cottonwoods, and many widely planted poplar tree varieties. These mites cause very distinctive galls (with a texture like cauliflower) to develop from leaf buds as they break dormancy in the spring. Although the mites are wingless, they spread to new trees by hitching rides on bird feet and flying insects.

After surviving the winter in a state of dormancy in galls they formed the previous season, the adult female mites move about and deposit eggs on new buds on their host. Both the adults and newly hatched mites feed and secrete phytohormones, which causes a new gall to start forming on the growing bud tissue. Throughout the growing season, the mites continue to feed on the host plant and reproduce. Upon reaching adulthood, the carrot-shaped mites are only 0.004 to 0.008 inches long.

Management of poplar budgall mite is difficult as the galls provide protection from topically applied pesticides. In addition, the physiology of the mites (classified as arachnids) is different enough from insects that not all insecticides labeled for ornamental trees will kill them. Some miticide products might work well on poplar budgall mites but lack the proper product labeling and would still have difficulty penetrating the galls. Except for some very vulnerable hybrid varieties of poplars, the mites are mainly a cosmetic pest that is only visible in the winter (Figure 3).

The **oak rough bulletgall wasp** (*Disholcaspis quercusmamma*) has a complex life cycle (see page 15) involving two generations per year, each forming different types of galls. In the fall, a generation of all-female wasps emerges from large round galls that form on the branches over the summer. This generation's one goal is to insert their eggs into the dormant buds forming on the branches. The next generation of wasps spends the winter as eggs in these dormant buds.

When the oak buds break dormancy in the spring, the wasp eggs hatch and the larvae start to feed and rapidly develop in these small, barely noticeable galls.

Figure 4. These two bur oaks were planted at the same time but the one on the left was susceptible to the oak rough bulletgall and has been stunted by a heavy infestation. Replacing the tree is probably the best option as no effective insecticides are available for the pest. Photo by Whitney Cranshaw, Colorado State University, Bugwood.org, CC-BY.

Mature male and female bulletgall wasps emerge from the galls by late spring.

After mating, the female wasps insert their eggs into the bark of tender new twigs. After the eggs hatch, the tiny larvae start to secrete a liquid that affects the stem's cambium tissue around them. It is this tissue that will eventually become a marble-sized gall as they grow. The larvae pupate in the gall and don't emerge until fall, at which point the cycle starts over.

Unfortunately, no systemic insecticides currently labeled for ornamental trees have been shown to be effective against the gall wasp larvae. Using a contact insecticide to treat the terminal growth of twigs in the fall may kill some of the wasps before they can insert their eggs into the dormant buds but is not considered highly effective.

Removal of the forming bulletgalls is labor intensive and leaves an open wound on the branch. It is also dangerous: the nectar that oozes from the galls can attract yellowjackets and paper wasps. If a bur oak is so heavily infested by gall wasps that it is stunted, it may be best to replace it (Figure 4).

Prioritize plant health

Galls caused by arthropods are a common occurrence on landscape plants in Wyoming. While they can be unsightly, they rarely kill trees and shrubs. Often, the best course of action is to tolerate galls and focus on maintaining overall plant health. When you need to manage galls, use a combination of cultural, chemical, biological, and mechanical control methods whenever possible.

Still worried about galls? Contact UW Extension entomologist **Scott Schell** at sschell@uwyo.edu or (307) 766-2508 with questions.

Insect allies

Oak rough bulletgalls with no emergence holes in the fall may contain parasitic wasps that developed on and killed the oak rough bulletgall wasps that made the galls. When the parasitic wasps emerge from the galls the following spring, they seek out and attack more of the gall-making wasps.

Life cycle of the oak rough bulletgall wasp

Note: The oak rough bulletgall wasp's life cycle was not completely determined until 2014. For more information, visit https://bit.ly/oak-bullet-gall.

Late summer/early fall

- Self-fertile female wasps make bulletgalls on twigs starting in late summer and insert eggs into forming buds
- Next generation overwinters as eggs

Photo by Whitney Cranshaw, Colorado State University, Bugwood.org

Early spring

- Buds break and eggs hatch
- Larvae develop in small, barely noticeable galls (so small we don't even have a photo of the bud gall)

Late spring

A male and female generation emerge

Photo by Whitney Cranshaw, Colorado State University, Bugwood.org

Females mate and then insert eggs into bark of tender twigs to initiate formation of bulletgall (pictured)

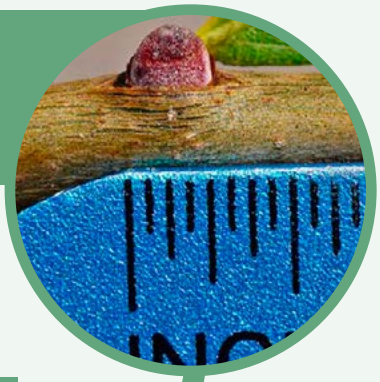

Photo by Joe Boggs, Ohio State University Extension

Eggs hatch and secrete chemicals, which causes the twig to form a marble-sized gall that surrounds a single larva, providing both food and physical protection

Photo by Joe Boggs, Ohio State University Extension

As the blob-shaped larvae grows, their galls get bigger too

Photo by Whitney Cranshaw, Colorado State University, Bugwood.org

After completing development, the larvae pupate but don't emerge as adults until late summer to early fall

Photo by Whitney Cranshaw, Colorado State University, Bugwood.org