Nevada Native Plant Society

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Society News

Northern Nevada Events

Our monthly meetings at the UNR Herbarium resume on September 6th.

September 6 – Temitope Israel Borokini, Ph.D. Candidate with the UNR Department of Biology, will discuss his ***Ivesia webberi*** rare plant research.

October 4 – Ann Pinzl, Archives Chair for NNPS and longtime member, will give a program on her **travels to Madagascar**.

November 1 – Jessica Kindred, with the State BLM Office, will discuss the **Seeds of Success program** during our final meeting of the year.

Newsletter submissions – Please submit photos, essays, tales of your botany field trips, plant-related book reviews, or any other material that would be of interest to members to **newsletters@nvnps.org**.

Lupine lepidus along SR 44, Northern California ▲
by M. Hagebusch

Penstemon humilis, Great Basin National Park ▶
by J. Johnson

Southern Nevada Events

No meetings are scheduled for July or August.
Our program coordinator is Lesley DeFalco. Contact her at **defalco@usgs.gov** to receive email updates for Southern Nevada events.

Events subject to change.
Visit nvnps.org for updates.

Two different species of midges triggered gall growth on this big sagebrush.

The Amazing Tale of Sagebrush Galls

Article and photos by Susan Ballinger

If you've stopped trailside to look at a big sagebrush (*Artemesia tridentata*), it's likely you've noticed grape-like growths attached to a leaf or stem.

Some are round, smooth, and reddish, other are covered with a mass of white hairs. Some are dried and shriveled up with a tiny hole visible. Each is gall: a tumor-like growth of plant tissue triggered by an insect. The plant gall grows quickly in response to an invading insect, providing it with all needed water, food, and shelter, usually without causing harm to the host plant. Galls are often specific in shape, color, and size, so an observer can identify the kind of gall-inducing insect just by looking.

Worldwide, there are about 13,000 species of gall-inducing arthropods, including mites, aphids, beetles, moths, fruit flies, wasps, and sawflies, each interdependent upon a specific plant species. The Wenatchee Valley big sagebrush is known to host at least 32 different species of gall midges, a group of tiny (2-3 mm), delicate two-winged flies with long legs and long antennae (family *Cecidomyiidae*).

As flying adults, gall midges live only a few days – long enough to mate. A female lays eggs, either singly or in groups, on top of a sagebrush leaf. The egg hatches quickly, and the larva immediately begins feeding, using its saliva to dissolve plant tissue. The saliva triggers the plant's own hormones to induce rapid atypical growth that encircles the larva, forming a gall. The plant tissue inside the gall provides all needed food and water for the larva. The length of time in the larval stages varies by species from a few weeks to up to two years. Some over-wintering gall midges go into a dormant

stage to slow development and allow the best timing of adult emergence to match the host plant's life cycle. Next, a very brief pupa stage occurs with the formation of sharp antennal horns, used by the pre-adult to mine a passageway to the gall's surface, and dig an exit hole. Then the exoskeleton of the pupa splits open and the adult gall midge flies out of the hole seeking a mate during its final days of life.

Life inside a gall is filled with life-threatening danger for growing gall midges. A variety of types of parasitic wasps seek out a gall, penetrate it, and lay an egg directly inside the body of the resident gall midge larva. Still other hyperparasitic insects repeat this process by laying eggs inside the body of the first invading parasite's larva. Galls attract vegetarian insects that lay eggs inside the gall selected for its abundance of plant tissue. Oddly, sometimes these plant-eaters will attack and kill their roommates inside the gall. Some species trigger gall formation within a gall and as the new gall grows, it can crush and kill adjacent gall midge larva. Finally, some generalist insects will happen upon a gall, tear it apart, and feed on whatever is inside!

When leaves with galls fall off the shrub, ground-feeding birds like the spotted towhee eat these packets of protein. Mice, shrews, and wood rats feed on fallen galls.

▲ A gall midge infestation on big sagebrush.

Common sagebrush (Artemisia tridentata) galls found in Nevada derived from Ron Russo's ***Field Guide to Plant Galls or California and Other Western States,*** pages 309-313.

Scientific name	Common name	Stucture	Size	Color	Location	Surface	Begins rapid development*	Adult insect emerges
Eutreta diana	**Stem gall tephritid (fruit fly)**	Spindle-shaped, single-chamber, firm	10-12mm x 8-10mm	Gray green, purple flush	Terminal stem tissue	Fine, short hairs	Fall	May
Rhopalomyia calvipomum	**Sagebrush "plum" gall midge**	Globular, firm	9-26mm x 8-20mm	Red to violet	Underside of leaves	Smooth	March	June
R. hirtibulla	**Bead gall midge**	Round to conical, single chamber	1.5mm x 1mm	Gray green	Both sides of leaf	Fine, short hairs	May	Spring
R. hirtipomum	**Sagebrush "apple" gall midge**	Round, single chamber	3mm to 12mm	Gray green	Leaf surface	Dense fine, short hairs	Late summer	April
R. medusirrasa	**Woolly bud gall midge**	Globular, multiple chambers	20 to 25mm	Whitish green	Buds	Leaflike with short hairs	October	April/May
R. pomum	**Sponge gall midge** (*most common sagebrush gall*)	Round, irregular, spongy, one to many chambers	Up to 45mm	Brown to purple to green	Mid-leaf to tip	Fine, short hairs	October	May/June
R. tumidibulla	**Sagebrush blister gall midge**	Lenticular, single chamber, easily overlooked	3-4mm x 2mm	Gray green	Inside leaf, one or two per leaf	Slight swelling on leaf	Fall	March/April

*Some galls remain very small over winter and grow rapidly in the spring, others grow large in the fall and either drop to the ground or remain on the plant until the insect emerges.

At least 32 other species form galls on Big Sagebrush (*Artemisia tridentata*) including: *Asphondylia* sp., *Aciurina maculata, Cecidomyia* spp., *Diarthronomyia artemisiae, Diarthronomyia occidentalis, Eutreta oregona, Neotephritis finalis, Orellia undosa, Oxyna palpalis, Oxyna utahensis, Rhopalomyia ampullaria, R. anthoides, R. brevibulla, R. conica, R. cramboides, R. culmata, R. florella, R. gossypina, R. hirticaulis, R. lignea, R. lignitubus, R. mammilla, R. medusa, R. navasi, R. nucula, R. obovata, R. rugosa, R. tridentatae, R. tubulus, R. tumidicaulis, Trupanea nigricornis, Trypetid* sp.

Fly-catching birds like the Say's Phoebe capture winged adult gall midges in mid-air. Once an adult female gall midge lands to lay an egg, it becomes fair game for an insect-gleaning ruby-crowned kinglet or black-capped chickadee. A variety of birds are known to peck on galls to excavate larva as food.

This dramatic story of life and death is happening within most big sagebrush shrubs growing in our region. Next time you are out, take a minute to search for a sagebrush gall and marvel at the complex interdependence between a gall midge and a leaf.

To write this article, Susan utilized a terrific 2006 field guide, **Field Guide to Plant Galls of California and Other Western States**, *California Natural History Guide Series No. 91, by Ron Russo.*
Wenatchee Valley College Entomologist, Dr. Bob Gillespie, provided technical review and assistance with taxonomy.

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▲ A single leaf gall on big sagebrush. Inside is a growing gall midge larva.

A gall midge triggered the growth of galls on this three-tip sagebrush (***Artemesia tripartita***).

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