PRO Green EXPO

Colorado Convention Center

Denver, CO | February 5 - 7, 2020

Secret Lives of Gall Makers

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Colorado State University

Gall: **An abnormal plant growth *caused by the action of insects or other organisms***

Crown Gall
(Bacterium)

Black Knot of Cherry
(Fungus)

Some Plant Pathogens Produce Gall-like Growths

Juniper-Hawthorn Rust (Fungus)

Juniper Stages

Fruiting structures of Rust Fungi can have unusual forms

Primary Groups of Gall Making Arthropods in Colorado

- Gall-making aphids
- Psyllids
- Eriophyid mites
- Gall midges
- Gall wasps

Some New Words

- **Cecidology – the study of galls produced by insects, fungi, mites and other organisms**
- **Cecidogen – a substance that can produce a gall**

How do insects and mites produce galls in plants?

- **Selective wounding** of growing tissues produces cellular changes
- **Introduction of chemicals** (cecidogen) that cause cellular changes

Important Note: Gall production results from effects on actively growing (meristematic) tissues

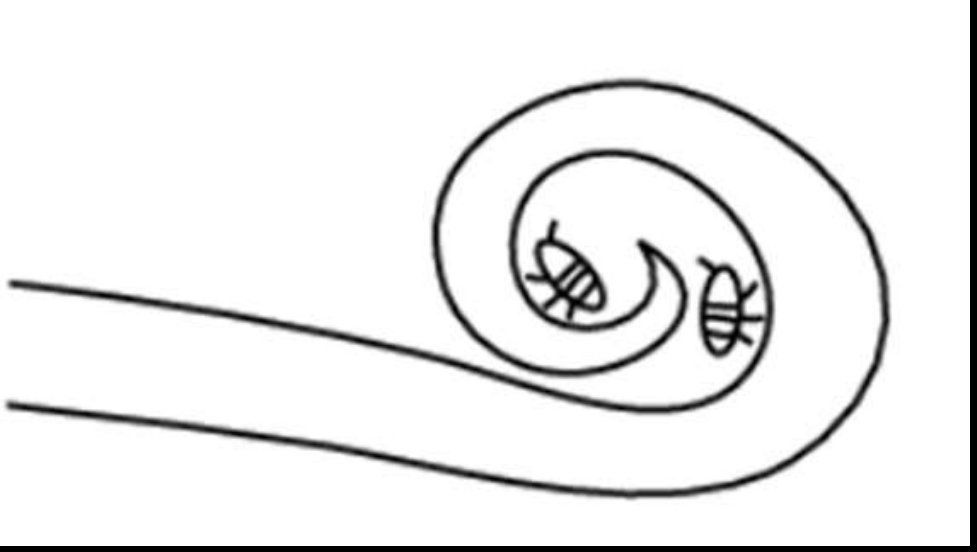

Figure courtesy of Karsten Schonrogge

Would a leaf curl be considered a gall?

Leafcurl Injuries

Default Diagnosis: **Produced by aphid feeding on emergent growth, producing distortion**

Black Cherry Aphid

Myzus cerasi

Hawthorn

Chokecherry

Honeysuckle Witches' Broom Aphid Injury

Green Peach Aphid Damage

Leafcurl Plum Aphid

Brachycaudus helichrysi

Snowball Aphid Injury

Leafcurl Ash Aphid Injury

Figure courtesy of Karsten Schonrogge

Open galls are produced by insects (and mites) with sucking mouthparts.

These form when the plant responds to the feeding of the gallmaker by producing a growth that surrounds the insect.

Aphids

Psyllids

Eriophyid mites

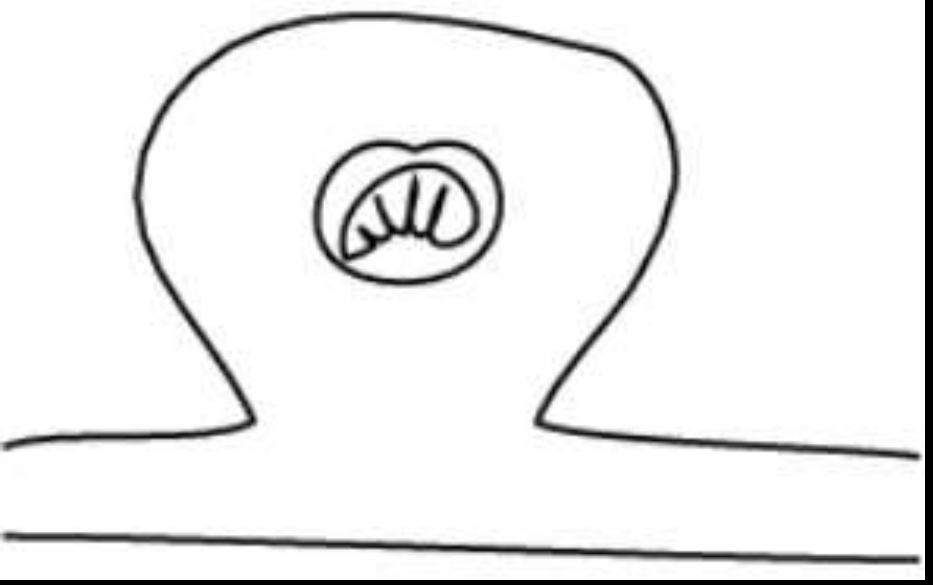

Figure courtesy of Karsten Schonrogge

Closed galls are producing by gall-making insects with chewing mouthparts.

Eggs inserted into tissues and the developing larvae develop within the plant.

Gall-Making Aphids

- Adelgidae (adelgids)
  - Associated with conifers
  - Host alternation common
- Eriosomatinae (“woolly aphids”)
  - Associated with deciduous plants
  - Host alternation common

Adelgids

Hemiptera: Adelgidae

The “woolly aphids” on conifers

Cooley Spruce Gall - Produced by the Cooley Spruce Gall Aphid (Adelgid)


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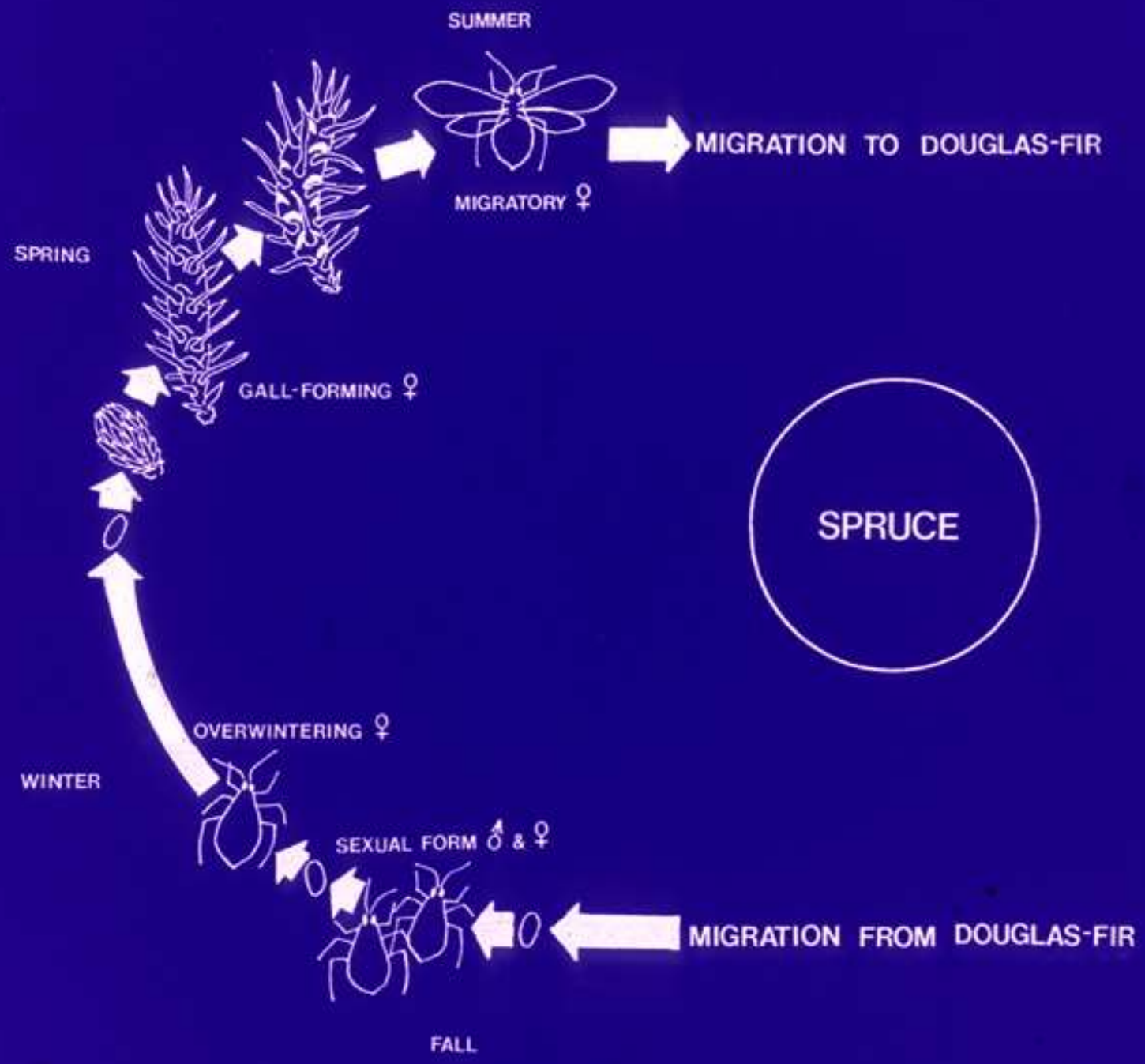
SUMMER
MIGRATION TO DOUGLAS-FIR
MIGRATORY ♀
SPRING
GALL-FORMING ♀
SPRUCE
OVERWINTERING ♀
WINTER
SEXUAL FORM ♂ & ♀
MIGRATION FROM DOUGLAS-FIR
FALL

Cooley spruce gall adelgid – Woolly aphid form associated with Douglas-fir


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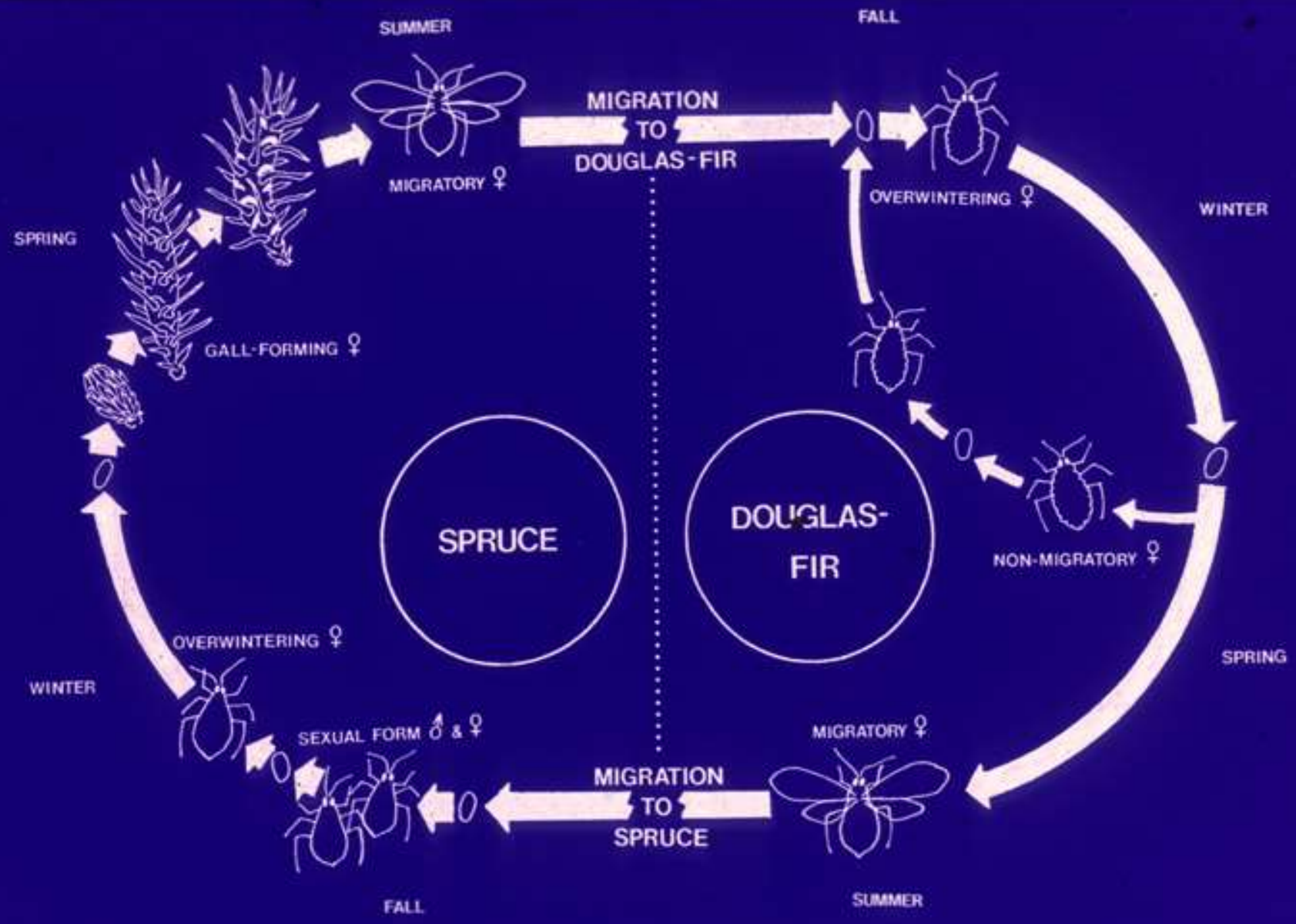


LIFE CYCLE OF THE COOLEY SPRUCE GALL ADELGID


UGA1325029

Aphids

Hemiptera: Aphididae

Pemphigus spp. galls on *Populus*

Pemphigus spp. galls on *Populus*

Poplar Petiolegall Aphid
(*Pemphigus populitransversus*)

Summer hosts of *Pemphigus* spp. are roots of herbaceous plants

Psyllids

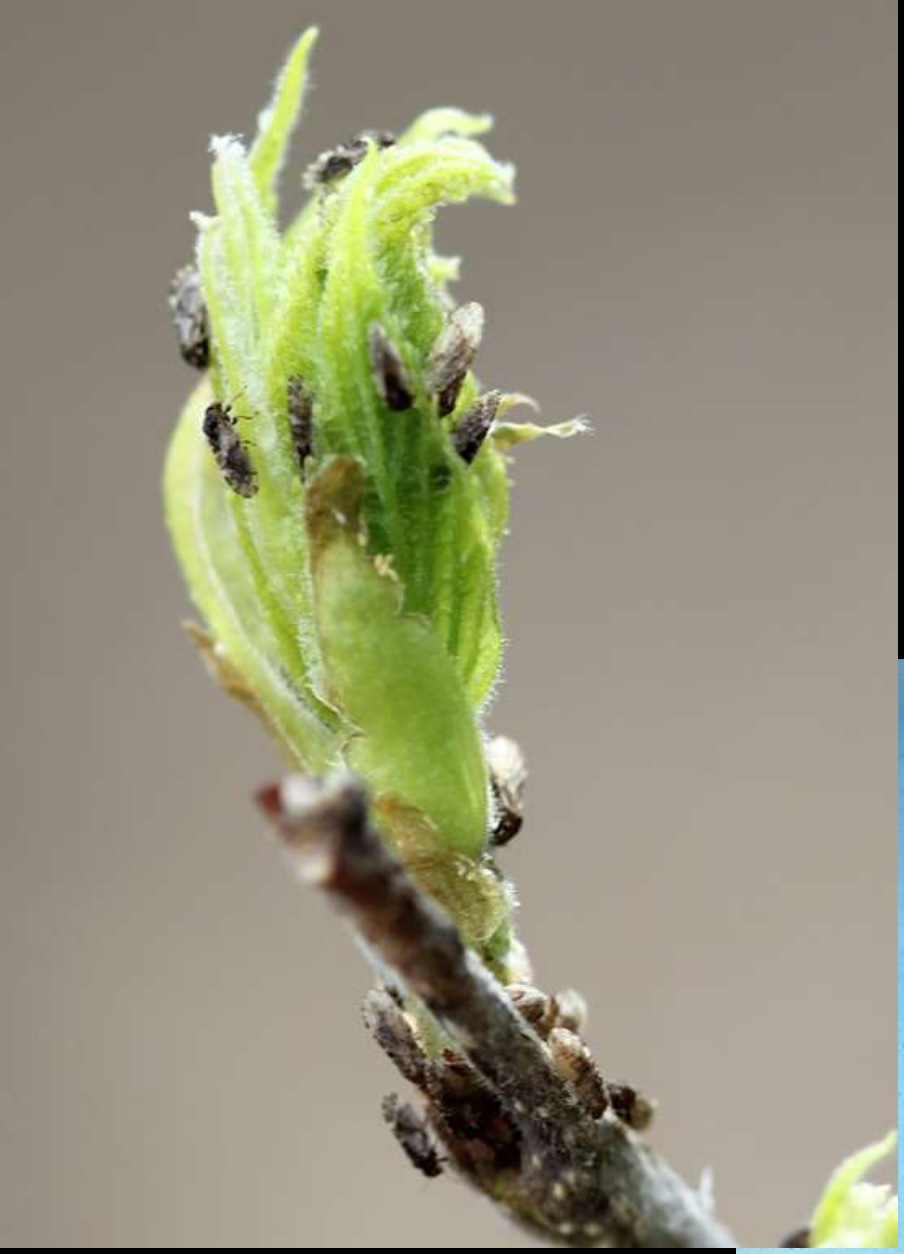
Family Psyllidae

Common symptom: Swelling of leaf at feeding site.

Hackberry nipplegall psyllid

Photograph by Jim Kalisch, University of Nebraska

Hackberry blistergall psyllid



Overwintered adults return to the new growth in spring to lay eggs

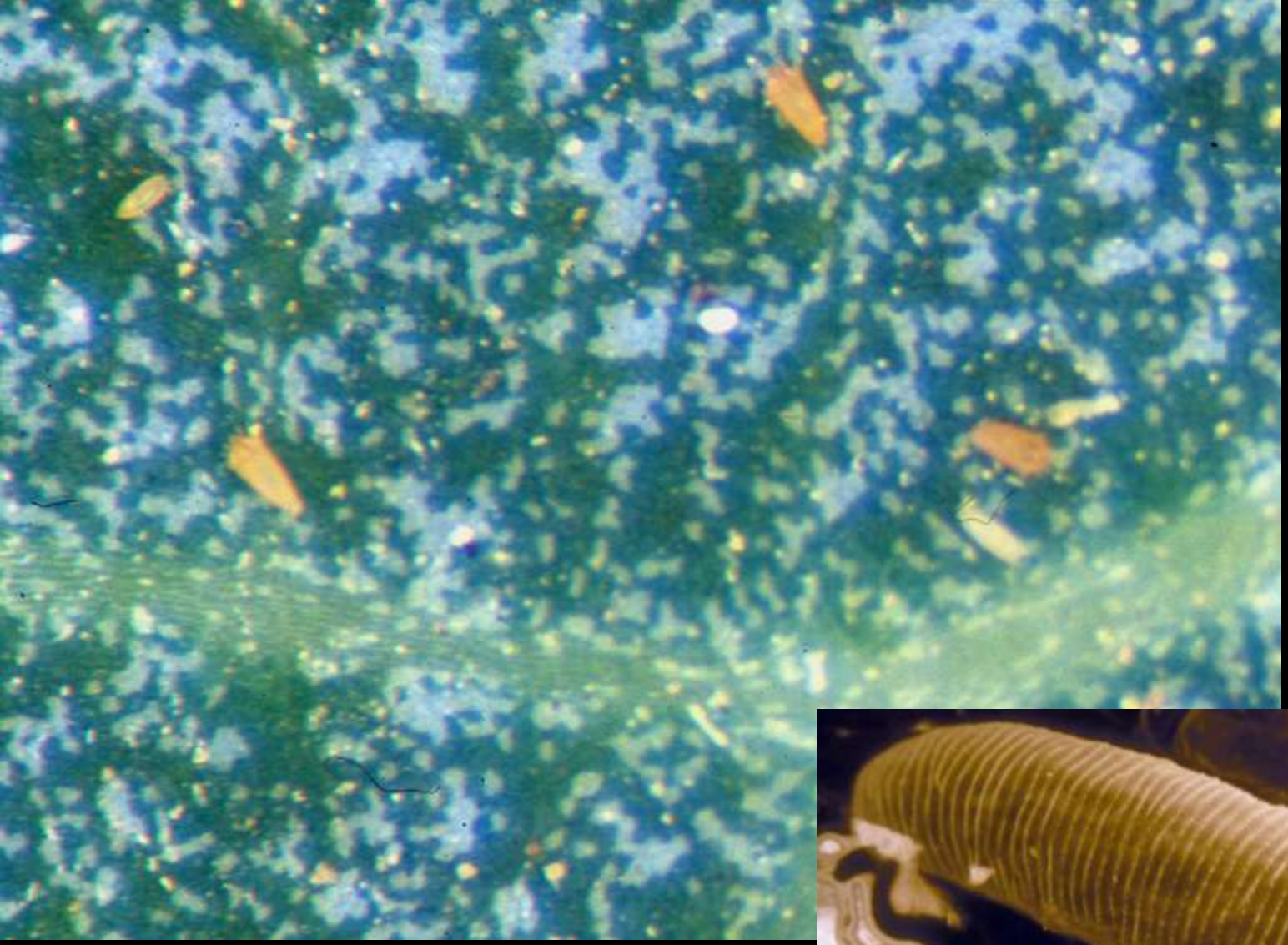
Hackberry nipplegall psyllid

Mixture of blistergalls and nipplegalls

Psyllids make many kinds of galls on hackberry

Eriophyid Mites

Acari: Eriophyoidea



Eriophyid mites

Rust Mite Injuries

Blistergalls (top)

Pouchgalls (bottom)

Erineum (top)

Fingergalls (bottom)

Blistergalls

Pearleaf blister mite

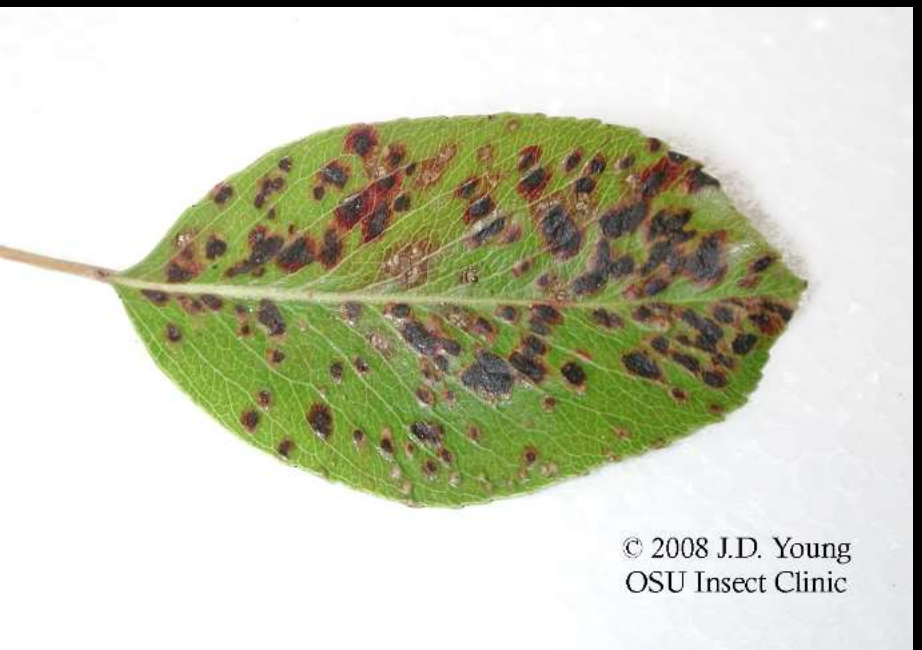


Photo courtesy R.S. Blyther

Walnut leaf blistergall mite

A transition symptom to what might be called a “pouchgall”

Photo courtesy Just Another Weed Patch Farm

Pouchgalls or bladdergalls

Pouchgall on boxelder

Pouchgalls on Oregon ash

Pouchgall on aspen

Pouch-type gall from grape erienum mite

Bladdergalls on willow

Maple bladdergall mite

Maple bladdergall mite

Fingergalls

Fingergalls on maple

Fingergalls on littleleaf linden

Fingergalls on chokecherry

Fingergalls on American plum

Erieneum producing eriophyid mites

Erinea on maples

Cranberrybush viburnum erineum

Erinea associated with pouchgall of boxelder

Erineum associated with pouchgall of aspen

Grape erienum mite

Upper leaf surface

Lower leaf surface

Erineum on aspen leaf

Distortion of flowering structures

Ash flowergall mite

Cottonwood catkingall mite

Generally disorganized growths

Poplar budgall

Various *Trisecatus* species are associated with distortions of conifers

Undescribed species of eriophyid mite

Bindweed Mite:

Biological Control Aid for Field Bindweed

Gall Midges

Diptera: Cecidomyiidae

Common symptoms:
Swelling and/or stunting of leaf growth

Honeylocust Podgall Midge

Adults lay eggs on emerging leaflets.

There are multiple generations produced annually.

A larva and two pupae of the honeylocust podgall midge

Pinyon Spindlegall Midge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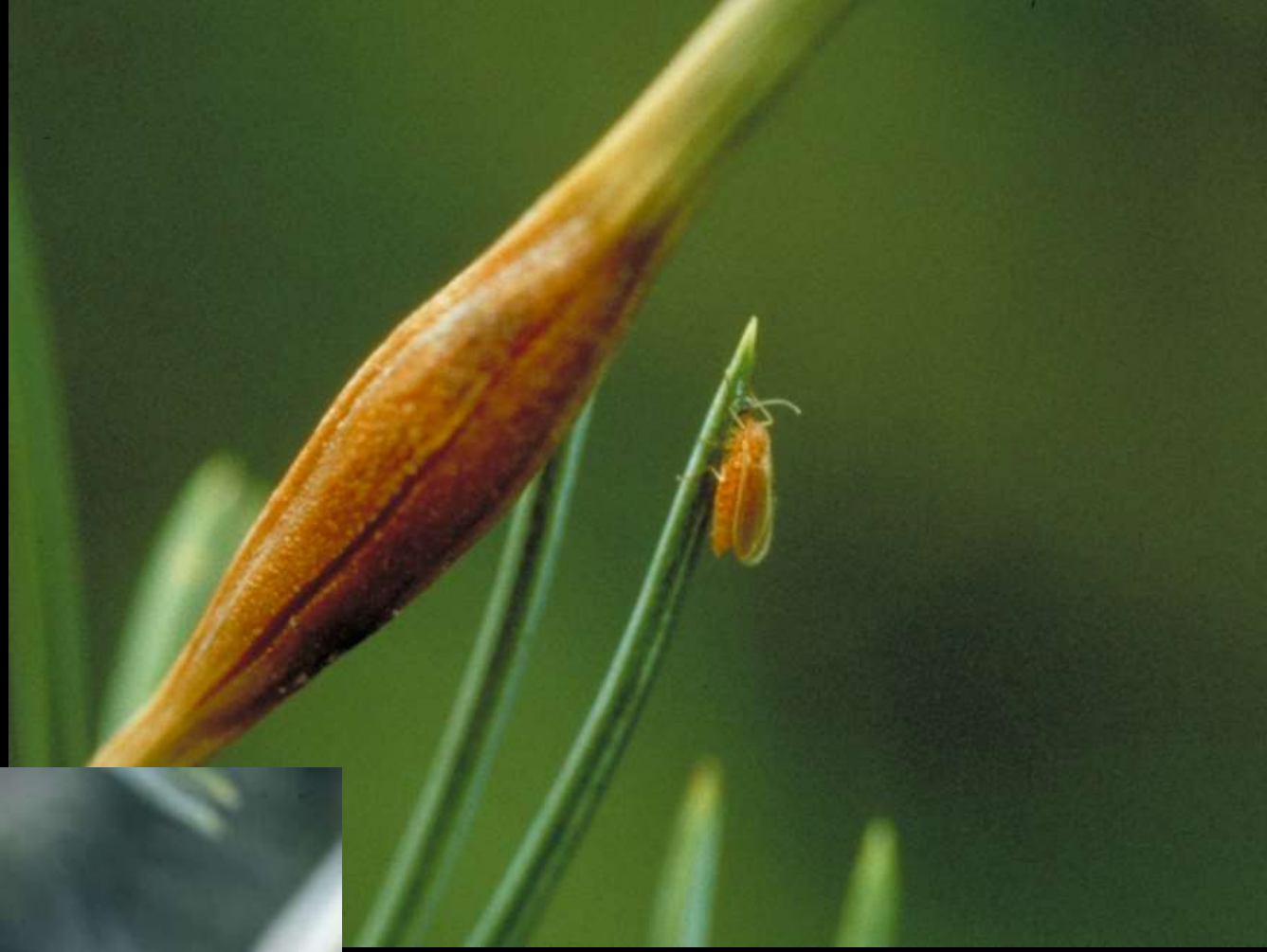


Adults emerge coincident with new growth of the following June

Gouty veingall midge of boxelder


5393474

Larvae of ash midrib gall midge

Juniper tipgall midge

Willow conegall

Wreath made of willow conegalls (David Leatherman)

Chokecherry fruitgall midge

Poplar Twiggall

Produced by the poplar twiggall fly, *Hexomyza schineri*

Poplar Twiggall Fly

Above: Adult

Top right: Adult resting on leaf

Right: Leaf tatters symptom produced by feeding (oviposition punctures)

Top: Ovipositing adult

Upper Right: Oviposition wound in early stage gall

Right: Early stage galls

Cumulative effects of galling (left), new galls (below left) and cross-section of gall (below)

Old poplar twiggall damage in forest near Salida

Gall Wasps

Hymenoptera: Cynipidae

Translucent oak gall

Jumping oak galls

Upper side of leaf – raised bumps

Under side of leaf – fuzzy balls

Mossy rose galls

This photo series courtesy of Ken Gray Collection/Oregon State University

Bulletgalls on oak twigs

Most gall wasps on oak have two generations that produce two different types of galls

Oak rough bulletgall wasp

Stunting produced by oak rough bulletgall wasp

Adults emerge from galls in mid-October to mid-November and lay eggs in buds…….

The eggs from this hatch in spring to produce a generation within a budgall

Spring stage adults are much smaller than those observed in fall

Spring stages consist of both males and females

Spring stage adults lay eggs in the emergent twig growth.

New galls begin to erupt in late spring/early summer. They become full-sized by late summer.


These galls exude **honeydew**
Photograph by Crystal Cooke

The honeydew on the galls attracts many kinds of insects

Oak rough bulletgalls produce a sweet exudate that is are attractive wasps

A Collage Made of Galls from Oak Twigs

Artist: Crystal Cooke

An interesting **gall wasp-woodpecker interaction** on bur oak

The gall wasp *Callirhytis flavipes* develops under the bark of twigs branches, and the trunks of oak

They are small and develop within small chambers. There are dozens of these chambers in the above photo.

Downy woodpeckers work the bark and extract the developing gall wasp larvae in winter and early spring

This can result in extensive debarking of trunks, branches

This can lead to dieback of limbs and the upper trunk

After this gall wasp emerges from the trunks//branches, it moves to new leaves. The summer generation develops within an irregularly shaped gall of the midrib.

Gall Insect Management

- Carefully assess the actual damage
  - Overestimation of effects is typical; Gall production typically looks worse than it is
  - Only developing tissues can be transformed to galls

Only actively growing tissues are "gallable"

Do they overwinter on the plant?

Dormant season sprays can usually be effective

They are in this stage today, and through the next couple of months. Very easy to kill with most anything now (If you want to do that.)

Wait too long and you have 800 eggs or nymphs to kill.

Spruce recovery from Cooley spruce gall injury – insects killed by soil-applied imidacloprid

Do they overwinter off the plant?

Treatments should coincide with egg laying

Hackberry psyllids – eggs laid on emergent foliage

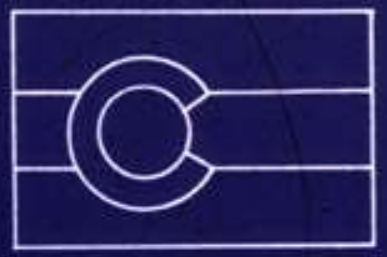
Honeylocust podgall midge – eggs are laid on newly emerging leaflets (multiple generations)

Pinyon spindlegall midge – eggs are laid at base of newly emerging needles in June

One group of gall makers that is never well controlled with insecticides

Gall wasps on woody parts of the plant

COLORADO STATE SYMBOLS



STATE FLAG

STATE BIRD

LARK BUNTING

STATE FLOWER

COLUMBINE

STATE GALL

COOLEY SPRUCE GALL

Ready….

Set….

Go Home!

This presentation will be posted at the Insect Information Website

- Housed at Department of Bioagricultural Sciences and Pest Management
  - Search "BSPM CSU"
- Within "Entomology"
- "Insect Information"
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Thank you!

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For more information on Colorado Insects check out the **CSU Insect Information Website**
For more information on Hemp Insects check out the **CSU Hemp Insect Website**