



# Plants of the Shrub-steppe

Botany Background Information for

*Wenatchee Naturalist*

Photos by Julie Sanderson,  
Susan & Paul Ballinger. Used  
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# Meet the co-presenter



- This presentation was co-developed by Julie Sanderson & Susan Ballinger
- Julie has been studying and enjoying the plants of the sagebrush steppe since moving to Wenatchee in 1993.
- She has taught biology and plant taxonomy classes at Wenatchee Valley College and worked as a botanist for the BLM.
- She is currently working as a botanist Chelan County Weed Board



CHELAN COUNTY  
Noxious Weed

# Explore the Shrub-steppe – our sagebrush grasslands



Three points to get out of  
this presentation

- 1. There are many interesting plants to study in the shrub-steppe in the Wenatchee foothills.
- 2. Each species has adaptations that help it survive and reproduce in this environment.
- 3. Studying plants is interesting and worthwhile.

# How many kinds of plants can we find in the shrub-steppe?



Most people might reply that there are four kinds of plants: sagebrush, grass, balsamroot & lupines.

There are actually at least 83 species representing 20 different plant families on the CDLT Jacobson Preserve, and over 215 species in the Wenatchee foothills.



# There's something blooming!



March 13, 2013  
Lily Family



April 9, 2012  
Buttercup Family



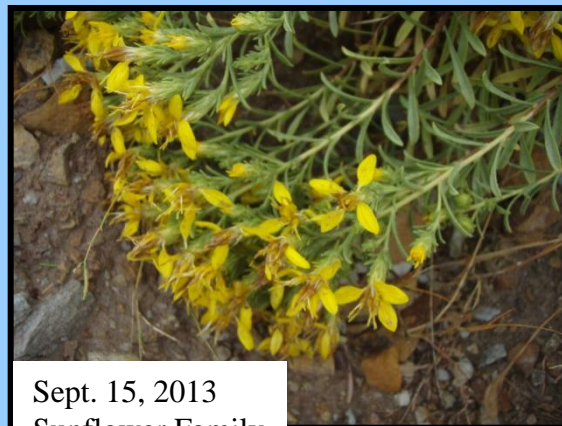
April 2, 2013  
Saxifrage Family

- You can find something blooming 8 to 9 months of the year.

Most years, by early March there may already be plants from 7 different families blooming.



Sept. 2, 2013  
Buckwheat Family



Sept. 15, 2013  
Sunflower Family

Oct. 23, 2012, 6 weeks post-wildfire  
Borage Family



# What's in a name?

- While the scientific names or Latin binomials of these early bloomers may not be familiar to you, the families that these plants belong to contain plants that you know:
- *Draba verna* – Mustard family **Brassicaceae** older-Cruciferae
- *Lomatium geyeri* – Carrot family **Apiaceae** older Umbelliferae
- *Microsteris gracilis* – Phlox family **Polemoniaceae**
- *Lithophragma bulbifera* – Saxifrage family **Saxifragaceae**
- *Mimulus alsinoides* – Snapdragon family **Scrophulariaceae**
- *Ranunculus glaberimus* –Buttercup family **Ranunculaceae**
- *Plectritis macrocera* – Valerian family **Valerianaceae**

# NATIVE PLANTS



- Many of the plants in the sagebrush steppe are **NATIVE PLANTS**.
- These are plants that have been here prior to the 1800's, before European settlement.
- These plants have evolved in this habitat and have adaptations that help them survive and reproduce here.



# INTRODUCED OR EXOTIC PLANTS



- Some of the plants in the sagebrush steppe are **INTRODUCED** or **EXOTIC**.
- These are plants that were brought here intentionally or accidentally from someplace else, diffuse knapweed, for example





# What about WEEDS?

- “WEEDY-ness” is a kind of “personality”, or set of adaptations that allows some plants to be very successful in disturbed habitats.
- Some of the adaptations that allow plants to be WEEDY or INVASIVE are:
  - Abundant seed production (eg. Diffuse knapweed)
  - Effective seed dispersal (eg. Cheat grass)
  - Rapid vegetative reproduction (eg. Dalmatian toadflax)

# Our Own Weedy Plants



- Introduced or exotic plants are not the only plants that have weedy adaptations.
- Remember that introduced plants were native plants somewhere in the world before they were brought here.
- Some of our own native plants, such as barestem desert parsley, have weedy adaptations and can take advantage of disturbed sites as well.



barestem desert parsley *Lomatium nudicaule*



# LIFE CYCLES

- Some plants in the shrub steppe are ANNUALS and some are PERENNIALS.
- These two terms refer to two different kinds of LIFE CYCLES.



annual



perennial

# ANNUALS

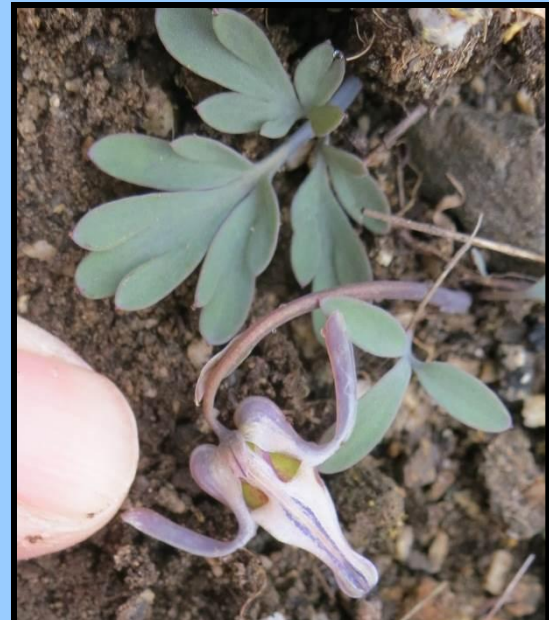
- This is the familiar life cycle of many of our garden plants.
- A seed germinates in the fall or spring
- A plant grows, with roots and shoots developing rapidly.
- The plant produces flowers, gets pollinated, sets new seeds, and dies at the end of the growing season.
- The new seeds are dispersed and in the fall or next spring, when conditions are right, the seeds germinate, starting the cycle over again.

# PERENNIALS

- Most people think of trees and shrubs as perennials, but many non-woody forbs and grasses are also perennials.
- A seed germinates in the fall or spring.
- A plant grows, with roots growing quickly, but shoots growing relatively slowly.
- The plant may or may not produce flowers the first year. It may take many years to produce the first flowers, set new seeds, and disperse the seeds.
- The individual plant lives for many years.



*Lewisia rediviva* bitterroot; leaves have withered away by flowering time



*Dicentra uniflora* steer's head  
blooming in March

# Herbaceous perennials

- Plants may have stems that die each year at the end of the growing season while the roots survive underground. In this case the plant is called an

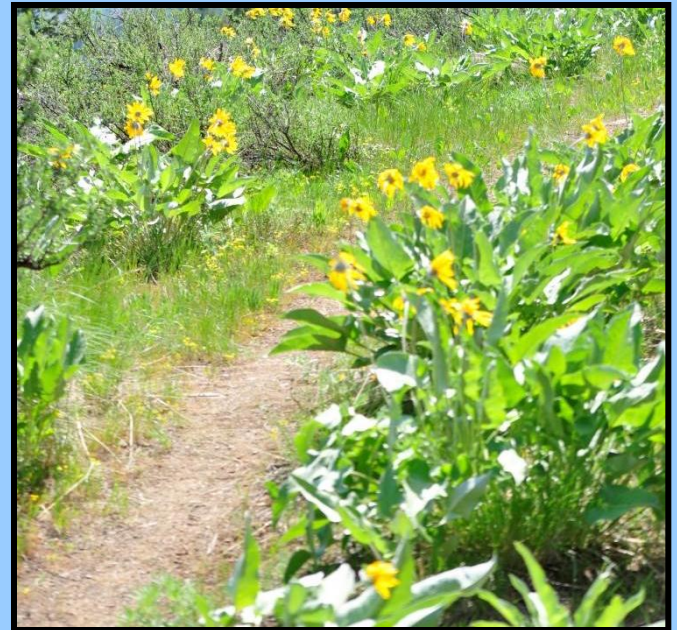
## HERBACEOUS PERENNIAL

- Some examples:

bluebunch wheatgrass    lupine



balsamroot





# Take a closer look

- The following slides will present some of the dominant species in the shrub-steppe and discuss some of the adaptations and life cycle strategies that allow them to survive and reproduce.





# Big Sagebrush – *Artemisia tridentata*

- Big sagebrush is the dominant shrub in much of the shrub-steppe in our area.
- It belongs to the sunflower family, the Asteraceae.



# A woody perennial



- Big sagebrush is a slow growing woody perennial.
- Individuals with large trunks may be 50 to 100 years old.
- The trunks and stems are flammable and the entire plant can be killed by fire.



# Evergreen leaves



Big sagebrush has evergreen leaves that remain on the shrub for more than one growing season.

The leaves are gray green because of the presence of many minute hairs that protect the leaves from water loss and intense sun.

# Root adaptation for a dry climate



- Big sagebrush has two kinds of roots.
- It has shallow roots that spread out in all directions to capture water near the soil surface.
- It also has long thick roots that reach down and use subsurface water sources.

# Big sagebrush flowers and seeds



- Flowers bloom late in the summer from July through September.
- They produce abundant amounts of pollen and are visited by many kinds of insects that feed on pollen.
- The seeds are wind dispersed in late fall and throughout the winter, and germinate in early spring after the snow melts.

# Plant and insect interaction



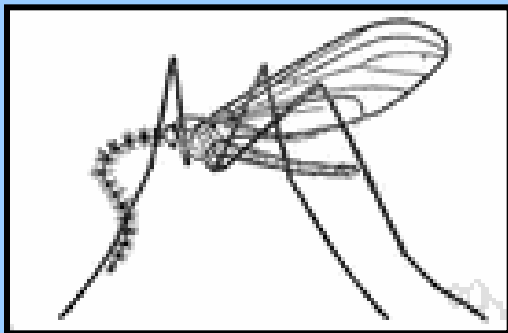
- You are sure to notice the galls that form on big sagebrush triggered by over 28 different species of insect



**Gall-forming insects** have complex relationships with their host plant, & with the parasitoids & predators who either eat them, or lay their eggs inside the larvae.



- These galls are formed by the plant in response to small insects that deposit their eggs in leaf tissue.
- The galls grow and protect the developing insect larvae inside.
- Adult insects eventually emerge from the gall.



Order: Diptera Family Cecidomyiidae  
Several different species of Gall midges  
in the *Rhopalomyia* genus. Induce leaf galls on big sagebrush


# Bitterbrush – *Purshia tridentata*



- Bitterbrush is a common woody perennial shrub in this area, usually found growing in sandier soils than big sage.
- It has a long taproot to reach deep subsurface water.







A close-up photograph of a bitterbrush branch. The branch is covered with small, green, lobed leaves and clusters of small, yellowish-orange flowers. Some of the flowers are in the process of ripening into seeds.

Ripening seeds

**Bitterbrush**  
blooms in early  
May.  
Seeds are set by  
mid summer.  
Small rodents  
collect and store  
seeds in caches,  
and many  
seedlings can be  
found  
germinating from  
forgotten caches  
in the spring.

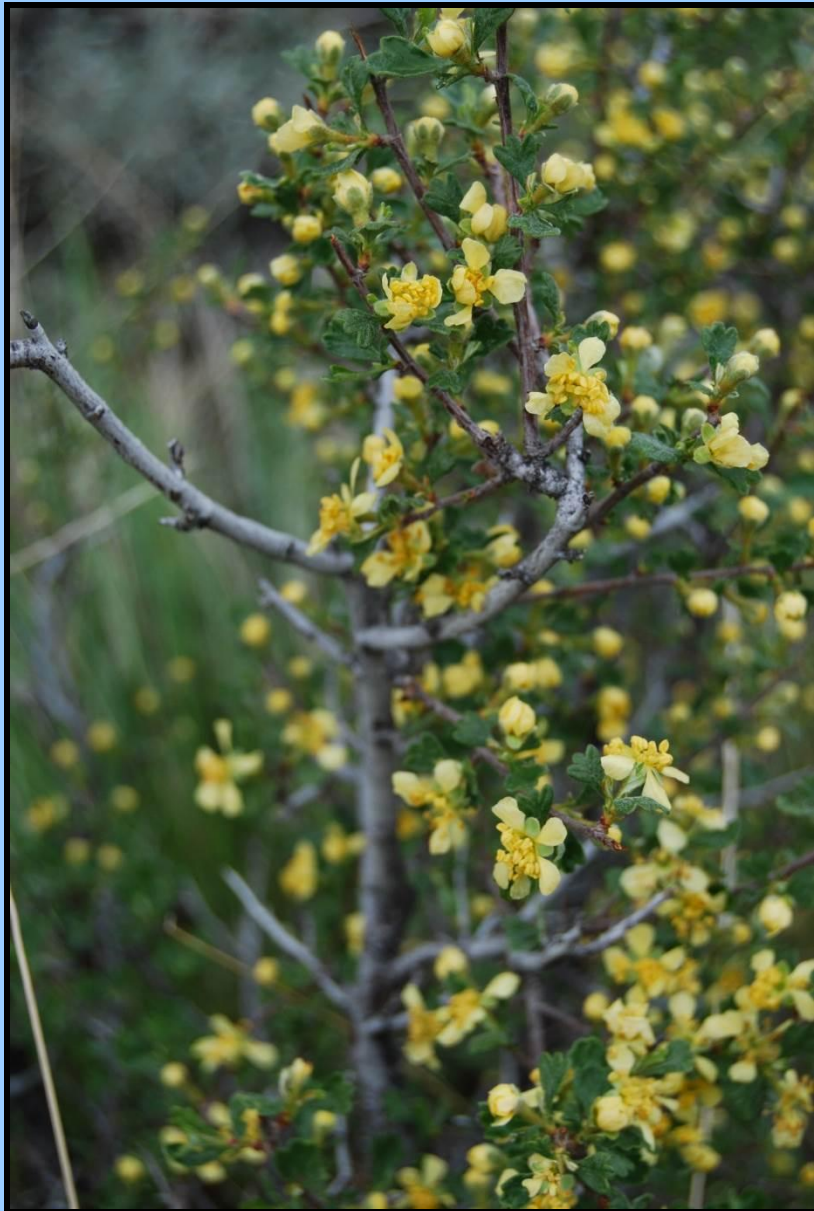
A photograph showing a seed cache sprouting lupine and bitterbrush. The lupine has long, narrow, silvery-green leaves, while the bitterbrush has shorter, rounded, green leaves. Both plants are growing out of a small, dark, soil-filled cavity in the ground.

Seed cache sprouting lupine & bitterbrush

A vertical photograph of a bitterbrush branch. The branch is covered with small, green, lobed leaves and clusters of small, yellowish-orange flowers in various stages of bud development.

flowers in bud

# Flowers adapted for insect pollination



- Bitterbrush belongs to the rose family, Rosaceae.
- A closer look at the flower reveals its resemblance to a small yellow rose.
- The flowers are showy and fragrant, an adaptation that attracts insect pollinators.



# The bunch grasses

- The grass family, Poaceae, is represented by several species of grasses in the shrub steppe, and some of them are bunch grasses.
- Bunch grasses grow in a bunch, which is a group of stems and leaves that all arise from a common growing area, the crown, near the soil surface.



# Bluebunch wheatgrass



- This is the dominant native bunchgrass in much of the sagebrush steppe.
- It survives the hot dry summers by dying back on top after flowering in June.
- The roots and crown stay alive beneath the soil and resume growth in the moister fall and spring weather.

# Root adaptations



- Bluebunch wheatgrass has a very dense mass of roots underground.
- The underground biomass may be equal to or greater than the green leaves and stems that you see above the soil.
- The roots can extend 4 to 6 feet deep into the soil.

# Even spacing of bunchgrasses



- Bunchgrasses are widely spaced where they are competing for limited moisture.
- The large root zones do not overlap underground, giving each grass clump a claim to water falling in its zone.



# Cheatgrass fills in spaces



- Cheatgrass is an annual invasive exotic grass.
- Its shallow roots allow it to fill in the spaces between native grasses and shrubs if the soil is disturbed.

# Open disturbed areas are colonized by cheatgrass



- Cheatgrass germinates and can grow in the fall.
- In this way it gets a head start on the native grasses in colonizing open, disturbed areas.



# Weedy adaptations help



Bromus tectorum

<http://www.mtweed.org/cheatgrass/>



- Cheatgrass produces many seeds early in the season.
- The seeds cling to fur and clothing and are irritating to skin, making them easily dispersed from one area to another by animals and people.

# Balsamroot – *Balsamorhiza sagittata*

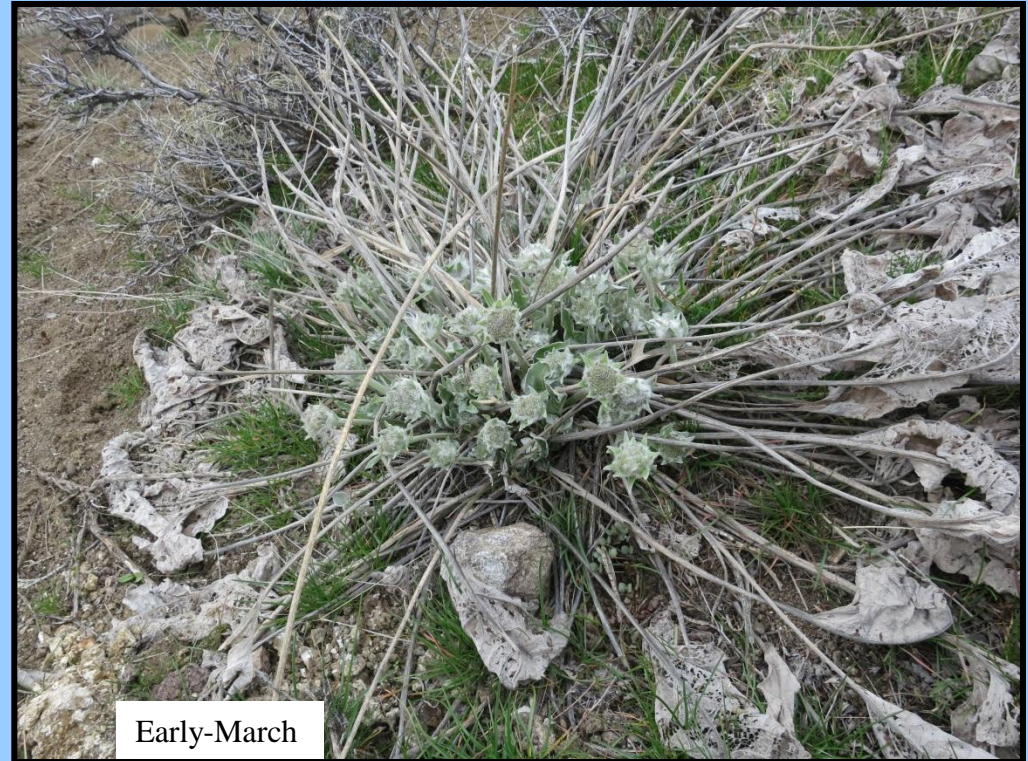


Balsamroot, like big sagebrush, is in the sunflower family, the Asteraceae.

It is an herbaceous perennial forb.



# Last year's growth



- Throughout the fall and winter, balsamroot looks like a dead plant.
- Underground, a long thick taproot is still alive.
- New growth emerges from the crown of the plant in March, as the weather warms and the soil is still moist.

# Blooming!

- By May the balsamroot is in full bloom.
- Warm weather brings many insects to the large showy flower heads which are composed of many small flowers.



# Seed production



- By July the seeds are set and are being dispersed by strong winds or passing animals that shake the seed heads and cause the seeds to be flung a short distance from the plant.
- Soon the leaves will dry up and die, but the plant has stored enough energy in the large taproot to survive until next spring.

# Lupines



- Lupines are native perennial forbs in the pea family, Fabaceae.
- While they are showy and beautiful in the spring, like many other forbs in the shrub steppe, the leaves and stems will dry up and die by mid summer.

# Lupine seed production



- Before the plant dies back in summer, it will have produced its seeds in fruits that look like pea pods.
- The seeds are heavy, but the seed pods open explosively when they are ripe, and fling the seeds away.
- Many of the nutritious seeds are eaten by insects, but enough remain to reproduce.

# Lupines – the nitrogen fixers



- Lupines are important in the shrub-steppe for their ability to capture nitrogen from the air, where it is abundant, and add it to the soil, where it is often a limiting factor for plant growth.



# A weed or not?



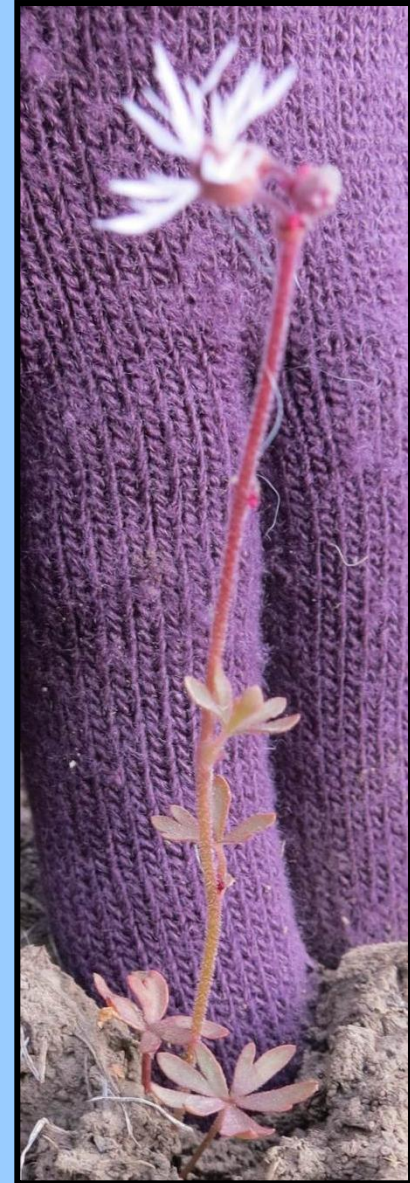
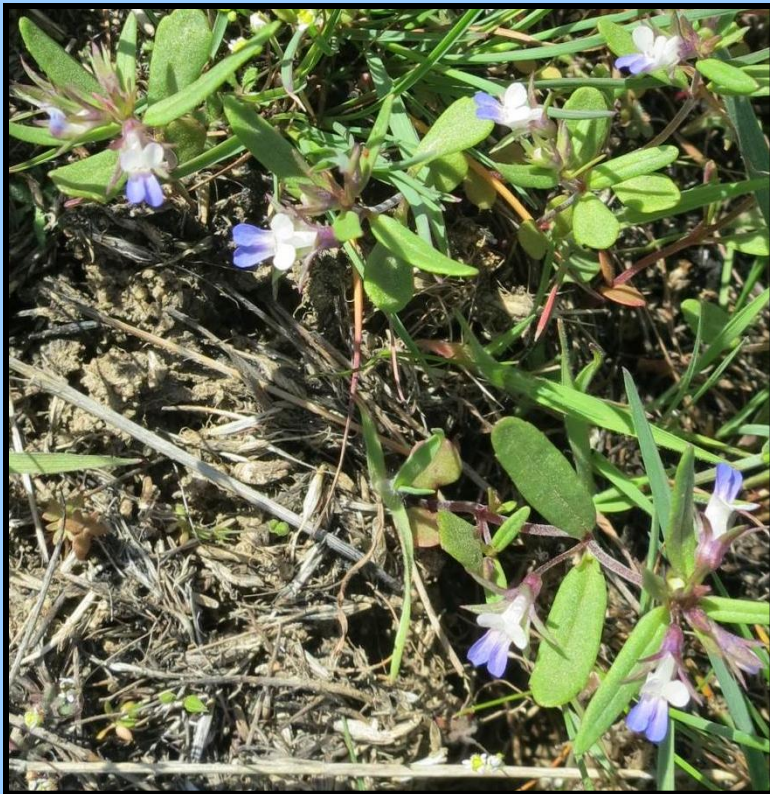
- Lupines are beautiful native plants and are beneficial to the soil, but they can be invasive in disturbed areas.
- Ranchers consider them a weed because they are toxic when eaten by livestock.



So far, the plants we have looked at are all perennials that have adaptations that help them live through the dry season every year. Now we will look at annuals and see a different survival strategy.

# Early spring annuals

- Some of the earliest plants to bloom in the spring are annuals.
- Most are small plants that grow quickly while the soil is still wet.
- Many flower while they are only a few inches tall.



# Phacelia, a spring annual



- By flowering early, annuals can have their seeds set before the heat of summer arrives.



# Life cycle strategy

- By completing their entire life cycle in the short window of mild spring weather, annuals successfully avoid drought.
- The seeds are adapted to survive in a dormant state through summer drought and winter cold, ready to germinate in the spring, when warm moist weather returns.



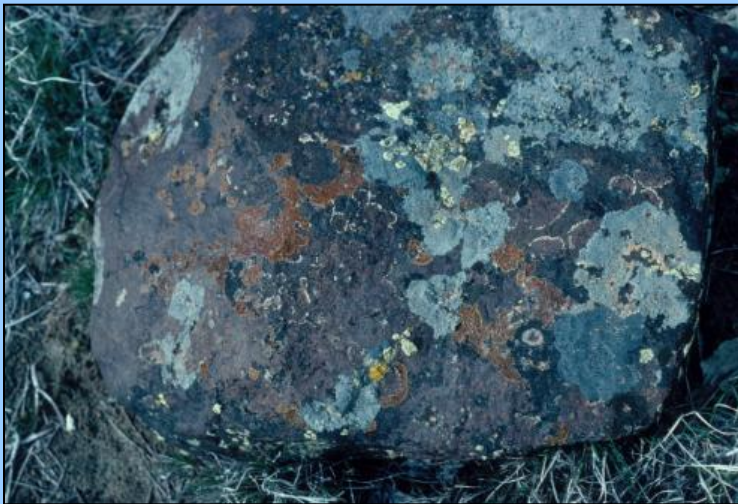
# Successful annuals

- Not all annuals remain small. These fiddlenecks will continue to grow up to 2 feet if the soil remains moist.
- The fiddlenecks are another example of one of our native plants with weedy adaptations that allow them to successfully invade disturbed habitats.



## The cryptogams

- The name cryptogam refers to hidden or ‘cryptic’ gametes. The mosses and lichens do not produce showy reproductive parts like flowers.
- Most people are familiar with mosses and lichens found growing on rocks and bark.



## Less familiar to most is the cryptogamic crust – an important shrub-steppe community component



The **cryptogamic crust** is a layer of mosses, lichens, and algae that grow on the soil surface.

- It serves as a stabilizing layer on the easily erodible soil and helps to retain soil moisture.
- The crust is slow growing and takes a long time to recover from disturbance.



# So many plants, so little time!



- Large or small, showy or cryptic, the many plants of the sagebrush steppe are beautiful and fascinating.
- They have many interesting adaptations and survival strategies for living in a challenging environment.

# The sagebrush steppe is all around you!

- The more we all learn about plants, the more we will appreciate the shrub-steppe, a unique and precious plant community.

