

OZONE GARDEN OBSERVATIONS

Did you know that Colorado's Front Range has high concentrations of ozone pollution?

Unlike the ozone layer found high in the atmosphere that protects us from the Sun's harmful rays, ground-level ("bad") ozone is a toxic air pollutant that impacts all living organisms. High concentrations of ground-level ozone cause human health problems like asthma and harm plants in ways that affect us, like reducing yields in agricultural crops and the amount of carbon stored in trees. Sometimes you can even see ozone damage on the leaves of sensitive plants! In this garden, we planted certain varieties of plants that show visible signs of damage from ozone pollution. Help us identify and track ozone damage as it shows up!

How to identify ozone injury on plants

Leaves of plants in this garden will start to show visible damage if ozone concentrations around the plants are relatively high for extended periods of time. Visible ozone injury on broadleaf plants starts as stipple.

Additional symptoms such as leaf yellowing or patches of tissue death can occur as ozone damage accumulates and becomes more severe.

Stipples are dot-like areas of tan, red, brown, purple, or black on the leaf surface. They are typically separate and uniform in size, but may merge and cover much of the leaf surface as ozone exposure continues.

Stipples: Here are examples from our garden in past years



Snap bean



Coneflower



Potato



Milkweed

What's the difference between ozone damage and other leaf damage?

Be careful in your identification of ozone injury! Insects and other diseases can cause symptoms that are often mistaken for ozone injury. To distinguish between ozone damage and other kinds of leaf damage, keep the following points in mind:

- Ozone injury only occurs between the leaf veins, not on the veins themselves.
- Most ozone injury occurs only on the top of the leaf.
- Older leaves of sensitive plants will show the most damage.
- Ozone damage starts as stipple. With extended exposure to ozone, stipple can mix with leaf yellowing and patches of tissue death, making markings less distinct and more difficult to diagnose.

WORKSHEET 1

How many of plants in this garden have been injured by ozone?

1 What is today's date?

2 Where is the garden located?

3 Choose one type of plant in the garden.

This will be the plant for which you collect data. What type of plant is it?



Snap bean



Coneflower



Potato



Milkweed

Plant type:

4 How many of this type of plant are in the garden?

5 How many of this type of plant show stippling or other visible signs of ozone injury?

6 Did you see damage on the leaves that was not caused by ozone?
If so, what do you think might have caused the damage?

OPTIONAL: What percent of the plants are impacted by ozone?

To find out, use the formula below!

Number of injured plants (*question 5*):

_____ x 100 =

Total number of plants (*question 4*):

WORKSHEET 2

What is the severity of the ozone injury on the affected leaves?

1 What is today's date?

2 Where is the garden located?

3 Choose a plant in the garden that has visible ozone injury.
This will be the plant for which you collect data. What type of plant is it?



Snap bean



Coneflower



Potato



Milkweed

Plant type:

4 Randomly choose 10 leaves on this plant.

For each leaf, what is the estimated percent of leaf area that has visible ozone damage?

Use the injury scale and accompanying photos on the next page to categorize the injury to the best of your ability, recording the index value in the table below the leaf photos. The leaf number is only used to identify that there are different leaves, so the order or number does not matter. Be careful to collect data from each leaf only once.

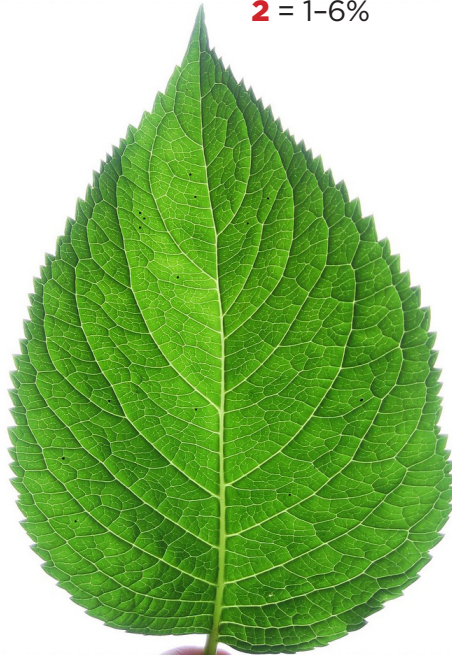
INJURY SCALE

Index Number = Percent Affected

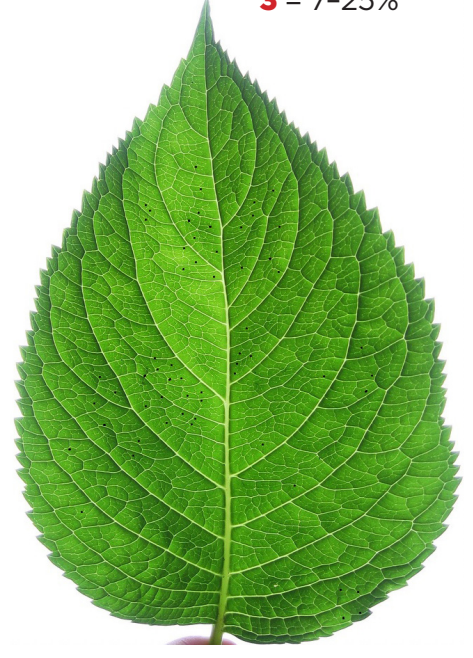
1 = 0%



2 = 1-6%



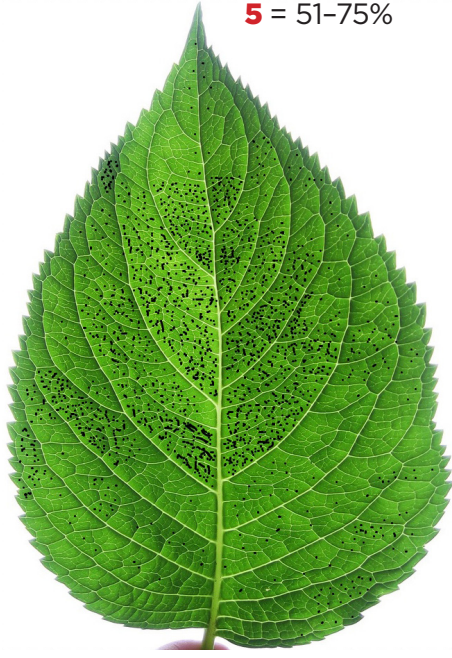
3 = 7-25%



4 = 26-50%



5 = 51-75%



6 = 76-100%



Leaf	Injury Index (1-6)	Leaf	Injury Index (1-6)
1	<hr/>	6	<hr/>
2	<hr/>	7	<hr/>
3	<hr/>	8	<hr/>
4	<hr/>	9	<hr/>
5	<hr/>	10	<hr/>