OZONE GARDEN OBSERVATIONS

Did you know that ozone pollution is harmful to plants and animals?

Unlike the ozone layer found high in the atmosphere that protects us from the Sun's harmful ultraviolet (UV) rays, ground-level 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 lowering 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 show visible damage if ozone concentrations around the plants are relatively high for extended periods of time. Ozone injury on broadleaf plants first appears as stipple. Ozone injury is cumulative, so symptoms are typically worse in the late summer or early fall after leaves have been exposed to high ozone concentrations for longer periods of time.

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.

Examples of stipples on the plants from our garden

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 ozone 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.

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IS THERE OZONE DAMAGE?

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

1. **What is today's date?** _____

2. **Where is the garden located?** _____

3. **Which plant type are you collecting data about today?**
   Circle the picture of the plant type you are observing today.

Snap bean

Coneflower

Potato

Milkweed

Note: If your garden has both sensitive and tolerant types of these plants, be sure to only collect data from the sensitive plants.

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 have been injured by ozone?

To find out, use the formula below!

Number of injured plants *(question 5)*: _____

_____ x 100 = _____

Total number of plants *(question 4)*: _____

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HOW SEVERE IS THE OZONE DAMAGE?

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 type in the garden that has visible ozone injury to collect data from today.** Circle the picture of the plant type you have chosen.

Snap bean

Coneflower

Potato

Milkweed

Note: If your garden has both sensitive and tolerant types of these plants, be sure to only collect data from the sensitive plants.

4. **Choose 10 different leaves of this plant type to sample**.

Tips for leaf selection:

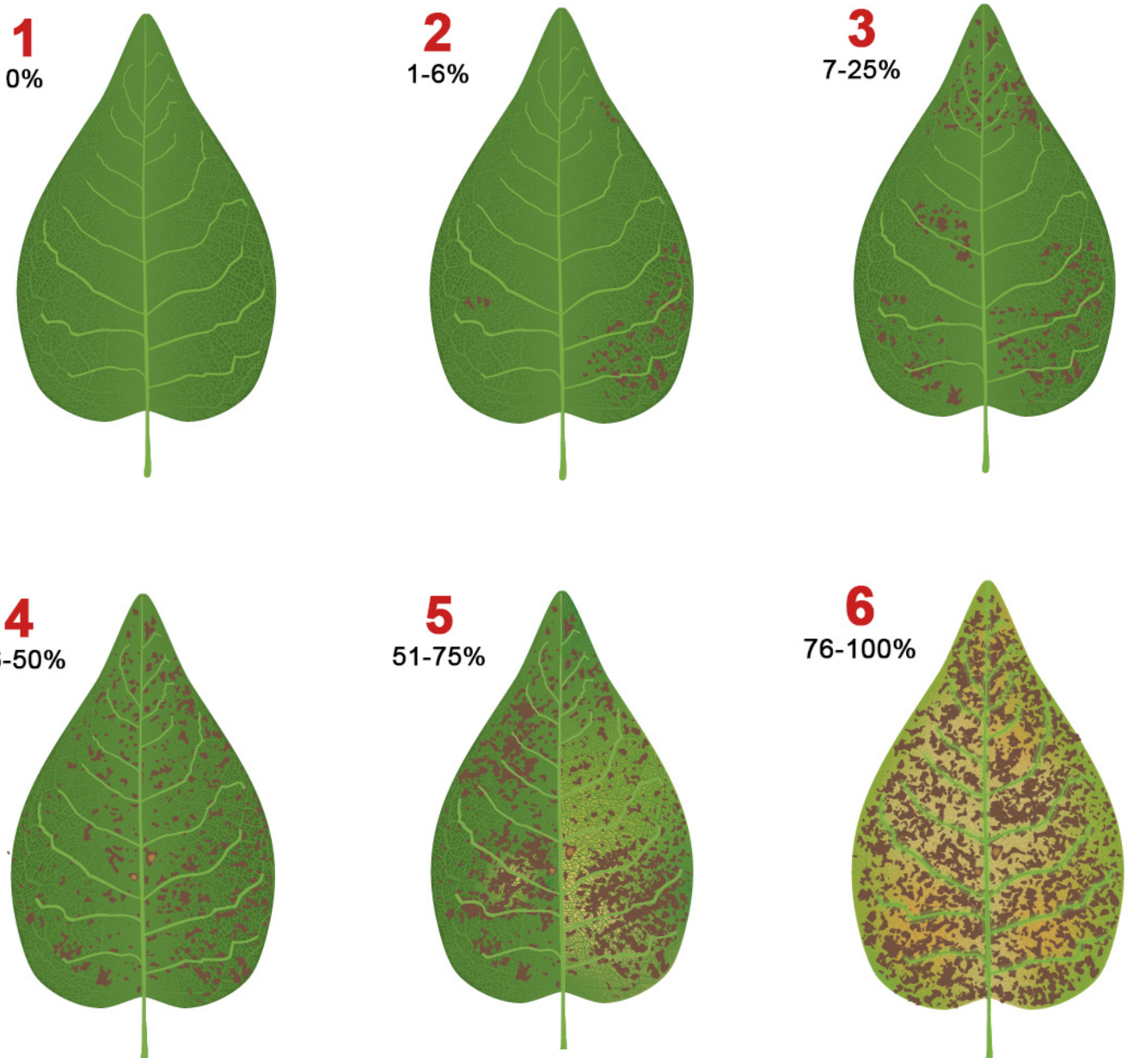
- Try to select leaves from the middle to lower part of the plant. Newer leaves towards the top likely won't have visible ozone damage.
- You can choose leaves from different plants of the same species to sample.
- Be careful to collect data from each leaf only once to avoid re-sampling.

5. **For each leaf, determine the estimated percent of leaf area that has visible ozone damage.**

Use the images on the next page to select the injury index that best matches the amount of damage you see on each of the 10 leaves you have selected. Record the index value for each leaf in the table below the images.

INJURY INDEX SCALE

Index Number = Percent Affected



Leaf	Injury Index (1–6)	Leaf	Injury Index (1–6)
1		6	
2		7	
3		8	
4		9	
5		10	