

Ozone Garden at UCCS Collects Ground-Level Ozone through Citizen Scientists

By Jennifer Cowan

The Ozone Garden is a student-run, Green Action Funded project located in the front yard of the Sustainability Demonstration House that collects data for the National Center for Atmospheric Research (NCAR) in Boulder, CO. NCAR collects data from multiple sites across Colorado to measure the effects of ground-level ozone on plant life.



There is a reason NCAR is collecting this data: ozone levels in the Denver Metro/Front Range Region have been out of compliance with the US Environmental Protection Agency since 2007. Understanding the effects of rising ozone levels is an active area of research for NCAR.

The plants growing in the Ozone Garden are particularly sensitive to ozone, showing damage when high levels of ozone are present in the air around us. Because they give us information, they are called bioindicator plants. What has been planted is *Asclepias syriaca* (common milkweed), *Ratibida pinnata* (yellow coneflower), *Phaseolus coccineus* (scarlet runner beans), and *Solanum tuberosum* (potatoes). Damage appears as either brown or dark green, circular spots on the leaves that do not cross the veins of the leaf. Leaves breathe through stomata, small pores on the bottoms of the leaves: they exhale water vapor and inhale carbon dioxide. The carbon dioxide is used to make sugars for plant energy. When a plant breathes in ozone instead, it damages the parts of the leaves that make the sugars.

Data is collected weekly and sent to NCAR to be added to their database. The individual plants are counted and examined for ozone damage. This is calculated as a percentage of plants that are damaged by ozone. A sampling of ten

leaves per plant type are also examined, to determine degree of damage. The degree is estimated by the amount of the leaf that is covered by spots and given a number one through four. Over ten leaves, the indicator numbers are added together and divided by ten, giving a damage indication. This is how we quantify the damage and it enables us to track whether damage is getting worse or better.



The ozone damage stunts the growth of plants, possibly even killing plants. In an article by Ghude, et. al. published in 2014, ozone pollution in India killed enough food crops to feed 94 million people. Understanding how ozone is impacting our lives can give scientists the information they need to reduce levels of pollution around the globe.