

## I.M.P.A.S.S.E.

### Isotopic Mobilization in Polluted Atmosphere and Soil Settings in Ecosystems

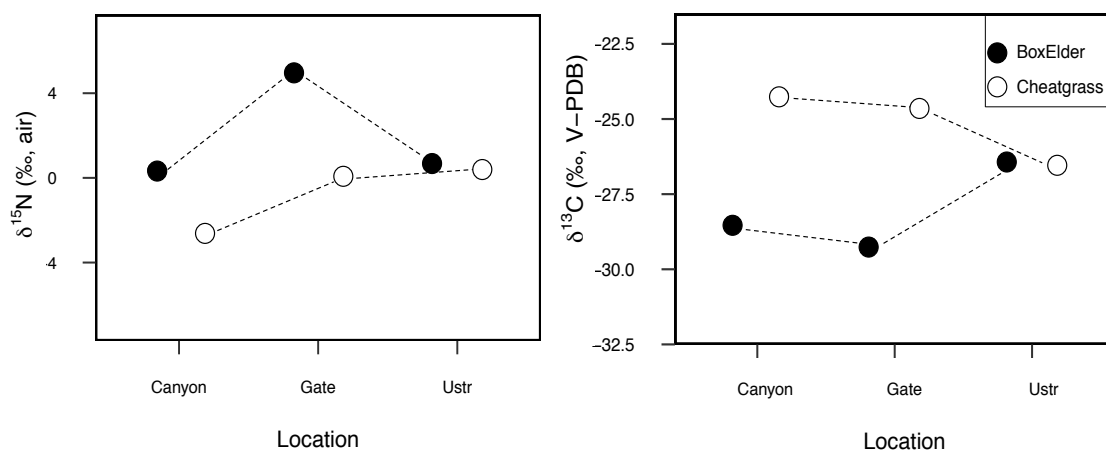
**Question:** What is the impact of human activity on  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  in two  $\text{C}_3$  plant species?

**Hypothesis:** Plant  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  will increase due to urban pollution and soil fertilization. Additionally,  $\delta^{13}\text{C}$  will increase due to water stress and this effect will be greatest in deep-rooted species.

**Materials:** We collected Box Elder (*Acer negundo*) sun leaves and Cheatgrass (*Bromus tectorum*)

- 1) Red Butte Canyon Natural Research Area that is nearly untouched by human activity
- 2) Near the entrance of the canyon which is closer to the urban environment
- 3) U-Street near Thure Isosourcerer Research in Ecology Domicile (T.I.R.E.D.), which is subjected to urban pollution, soil fertilization, and other activities.

**Results:**



**Figure 1.**  $\delta^{15}\text{N}$  (left) and  $\delta^{13}\text{C}$  (right) in Box Elder and Cheatgrass in three locations.

A species-specific offset was observed for  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  in the Canyon and the Gate sites, but not at the urban location (Ustr). Box Elder  $\delta^{15}\text{N}$  increased at the Gate site, but was similar among other locations; Cheatgrass  $\delta^{15}\text{N}$  was lower at Canyon relative to other sites. For carbon, Box Elder  $\delta^{13}\text{C}$  was lower at the Canyon and Gate Site, but increased at the urban Ustr site. Conversely, Cheatgrass  $\delta^{13}\text{C}$  was depleted at Ustr relative to other locations.

**Interpretation:**

The offset in  $\delta^{13}\text{C}$  values in the Cheatgrass and Box Elder may reflect differences in physiology related to difference in the life histories of these plants, one being an annual monocot and the other a deciduous dicot living 40-80 y (Dawson, pers. comm.). Water stress can increase  $\delta^{13}\text{C}$ , and higher Cheatgrass  $\delta^{13}\text{C}$  in natural habitats (Canyon, Gate) supports this conclusion. In the urban landscape (Ustr), Cheatgrass benefits from human-derived water and runoff, whereas Box Elder suffers as roadways can affect soil hydrology for deep-rooted trees. Low  $\delta^{15}\text{N}$  values in Canyon Cheatgrass may reflect  $\text{N}_2$ -fixation in neighboring legumes, whereas a higher  $\delta^{15}\text{N}$  in Box Elder suggest exhaust pollution near the Gate parking lot entrance.