Author: Bianca Lee Martínez, M.S. (Ph.D. Student)

Institution: Desert Research Institute, Reno Campus (2215 Raggio Pkwy, Reno, NV 89512)

Title: **Chemical Speciation of Biomass Burning Emissions from Shrubland Vegetation**

Team: Fire Emissions and Atmospheric Aging (FEAA)

Mentors: Andrey Khlystov, PhD

Introduction: Wild and prescribed fires occur throughout the western and central United States (US), where over 60% of the landscape is occupied by shrubland and grassland vegetation. The purpose of this study is to determine emission factors (EFs) from burning shrubland vegetation, as data on fire emissions from these landscapes is lacking.

Methods: Four fuels common for these ecosystems were used: sagebrush, bitterbrush, rabbitbrush, and horsebrush. The burning experiments were performed in an 8 m^3 chamber at the Desert Research Institute. Samples were collected for various chemical classes, such as: carbonyls, terpenes, volatile organic compounds, and polycyclic aromatic hydrocarbons. Carbonaceous aerosols were also collected for fresh and aged biomass burning smoke. Collected samples for carbonyls were extracted and analyzed using high performance liquid chromatography coupled with a photodiode array detector; while for the other classes, the collected samples were extracted and analyzed using gas-chromatography coupled with mass spectrometry. Online measurements of carbon monoxide and carbon dioxide were used to calculate the modified combustion efficiency and to obtain the carbon-based EFs from measured pollutant concentrations.

Results/Discussion: Highest formaldehyde and acetaldehyde EFs were produced by horsebrush, followed by bitterbrush, sagebrush, and rabbitbrush. A similar trend was observed for carbonaceous aerosols. The organic to elemental carbon ratio increased after aging the smoke indicating secondary production. Among terpenes, emissions of alpha-pinene, camphene, and eucalyptol were high for sagebrush, while beta-myrcene, and beta-pinene showed higher emissions for rabbitbrush.

Conclusion: Emission factors were obtained for the selected fuels. Emissions varied among compounds and vegetation types. Secondary aerosol production was detected during smoke aging.