



# Air, Water and Aquatic Environments Science Program

Rocky Mountain Research Station



## Focus: Air Quality in Mountain Ecosystems - Ozone

Research

Technology Transfer

Science Application

### Key Findings:

- **Ozone at Colorado high elevation ecosystems is at concentrations that can exceed the National Ambient Air Quality Standard.**
- **Ozone concentrations in remote ecosystems in Colorado increase with elevation.**
- **Passive ozone samplers can be used to indicate loading of ozone at remote locations.**
- **Portable battery powered active ozone monitors can be used for determining actual ozone values at remote locations.**

### Challenge

Ozone is a pollutant that is highly toxic to vegetation. The amount of ozone in mountain ecosystems is largely unknown, because high elevation ecosystems do not have electric power necessary to operate ozone monitors.

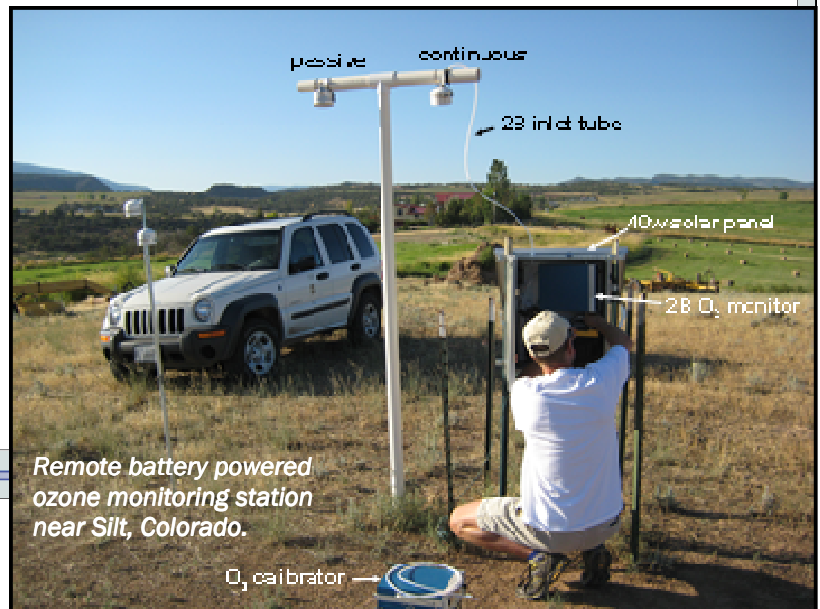
### Context

The monitoring of ozone in remote ecosystems is problematic since continuous ozone monitors need electric power to operate. Two solutions to this problem exist. The first is to use passive samplers to estimate ozone loading. Passive samplers utilize a chemical

reaction of ozone with nitrite to form nitrate. The amount of nitrate indicates the amount of ozone loading. Nitrite-coated filters are exposed for 1-2 weeks and then analyzed for nitrate. The second method is to use portable battery powered ozone monitors for continuous monitoring.

### Actions

We have designed a portable monitoring system to house the battery powered monitor to evaluate ozone concentration in mountain ecosystems. The solar powered system continuously records ozone, and these data can be related to data from the passive samplers.



Remote battery powered ozone monitoring station near Silt, Colorado.

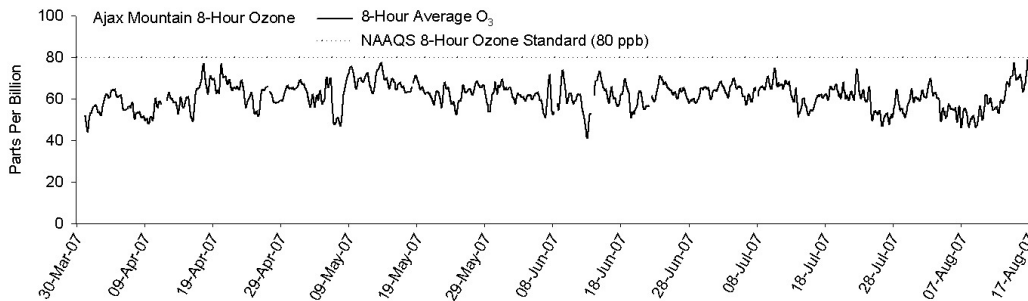
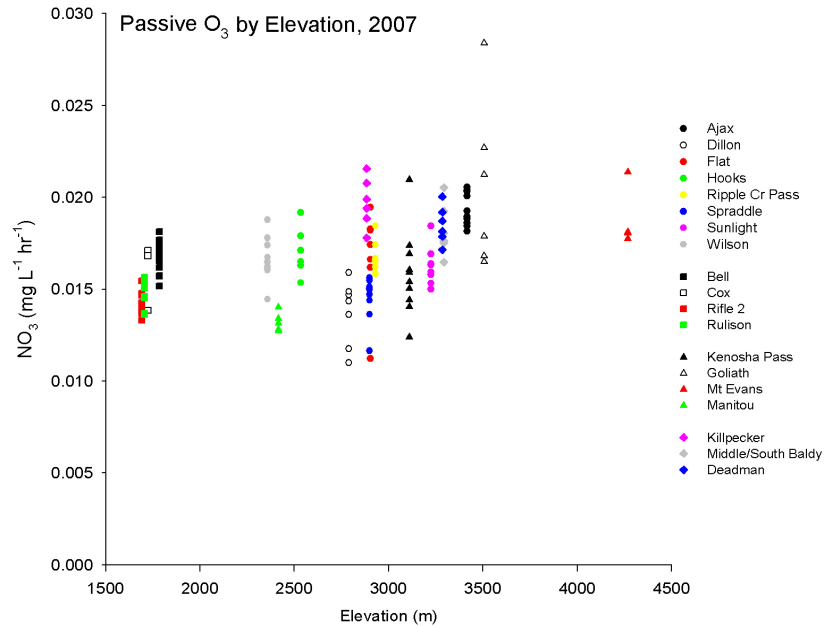


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# Results

Preliminary data suggest that ozone concentrations increase with elevation. The levels of ozone in Colorado high elevation ecosystems are sometimes near levels that exceed the National Ambient Air Quality Standard (currently 80 ppb for 8 hrs, soon to be 75 ppb for 8 hrs).

**Figure 1: Ozone increases with elevation.**



**Figure 2: Ozone concentration at Ajax Mountain, Aspen, Colorado, 2007.**

Care must be taken in relating passive ozone sampler data to continuous data; since this relationship differs by location.

## Project Publications

Musselman, R.C.; Lefohn, A.S.; Massman, W.J.; Heath, R.L. 2006. [A critical review and analysis of the use of exposure- and flux-based ozone indices for predicting vegetation effects.](#) *Atmospheric Environment* 40: 1869-1888.

## Project Science Team



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