

RESEARCH ABSTRACT

**Principal Investigator(s):**

David Chapin  
Environmental Associates  
Engineering, Science, and Technology  
8520 154th Ave. NE  
Redmond, WA 98052  
(206) 869-2194

Larry C. Bliss  
Department of Botany  
University of Washington  
Seattle, WA 98195  
(206) 543-8917

**Study Title:** Physiological and population ecology of two subalpine herbs on Mount St. Helens

**Key Words:** terrestrial plant upland herbs subalpine  
physiology population ecology water relations nutrients seedling  
vegetative archives

**Abstract:** This study examined the different adaptive strategies of two subalpine herbs in a stressful environment. The study site received tephra in the May 1980 eruption. *Polygonum newberryi* and *Eriogonum pyrolifolium* have markedly different morphological characteristics. The former is deciduous and has a large deep root system, the latter is wintergreen and has a shallow root system.

These two species have corresponding differences in physiology and population ecology, as well. Although the large, deep root system of *Polygonum* gives it the ability to avoid drought, *Eriogonum* is more drought tolerant. This does not affect adult mortality rates in either species but does lead to greater survivorship of *Eriogonum* seedlings. *Eriogonum* is also more tolerant of nutrient stress, an important adaptation in nutrient poor volcanic soils.

*Polygonum* has below ground meristems making it more tolerant of burial by tephra. Therefore *Polygonum* is more effective at recovery from volcanic disturbance by resprouting from surviving plants, while *Eriogonum* is more effective by seedling re-establishment.

*Polygonum* is longer-lived and better adapted to the short growing season typical of its habitat. These plants store food in their roots over the winter and produce new shoots rapidly in spring. *Eriogonum*, by contrast, depends on current year photosynthesis for early season development of shoots.

**Type of Measurement(s):** Individual plants or 1 meter square quads were chosen at random within 10 meter square subplots of a 50 meter square plot. Measurements: xylem pressure potential (megapascals, Mpa); leaf conductance (mmole/M<sup>2</sup>/second); soil moisture (MPa); % seedling survival; number of leaves/plant/season; nitrogen, phosphorous, potassium, and carbohydrate concentrations in roots, stems, leaves; laboratory studies measured seedling growth rates, leaf water conductance, biomass partitioning.

**Frequency of Measurement(s):** 1982-1984, generally several times per growing season.

**Data Storage:** Data has been published; floppy disks in LOTUS in personal possession.

**Long-term plans:** Data available for collaborative efforts: No future plans for research. Data are available for collaboration.