

RESEARCH ABSTRACT

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**Study Title:** Population ecology of the aphid *Aphthargelia symphoricarpi* on Mount St. Helens

**Key Words:** terrestrial plant animal upland herb  
invertebrate arthropod insect aphid ant population  
ecology pyroclastic flows archives

**Abstract:** I have examined the ecology of the aphid *Aphthargelia symphoricarpi* in terms of its interactions with its host plant *Polygonum newberryi* and its major predator, the ant *Formica fusca*. My approach involves a combination of field experimentation and observation with mathematical modelling.

Interspecific interactions between ants and aphids may be either predatory or mutualistic, depending on the particular species involved, and for some pairs of species, depending on the density of the aphids. The interaction of *Formica* and *Aphthargelia* was overwhelmingly the dominant biotic factor influencing the *A. symphoricarpi* population during both years of this study. Over 30% of the *Polygonum* plants were infested by aphids at the study site. If a plant was infested by aphids, ants were almost certainly found there as well; the converse was also the case. Analysis of 1985 ant and aphid censuses suggested higher ant counts on plants harboring growing aphid populations than on plants with declining aphid populations.

The strong association of *Formica* with *Aphthargelia* in disturbed communities at Mount St. Helens is a manifestation of predator-prey interaction rather than mutualism. Predation by ants reduced growth rates of aphid populations by 27% and final densities by 64%. I predict that while the current relationship between this ant and aphid is essentially predatory, as the community recovers and other protein sources become more abundant for the ant, the interaction will switch to mutualism.

**Type of Measurement(s):**

Field observations: six 10 m x 10 m plots--mapped every individual of *Polygonum newberryi*, recorded presence or absence of ants and aphids; two 10 m x 10 m plots--daily counts of *A. symphoricarpi* populations on individual *Polygonum* plants, counts of age classes of aphids on each plant, number of ants per plant.

Field experiment: 36 plants in 50 m x 50 m area--naturally present aphid density, number of aphids placed on plants, ants excluded or not excluded.

- Frequency of Measurement(s):** 1985 and 1986; frequent population counts during the growing season.
- 2) Phenological weekly flower and fruit production, pollinator visitation, herbivore damage.
  - 3) Genetic allozyme variation at eight loci, used for estimating population genotype frequencies and mating

**Data Storage:** Long-term plans, Data available for collaborative efforts: My future plans include continued research on Mount St. Helens. With David M. Wood, I plan to begin a study of the pumice plains area on the north side of the mountain. The basic question of interest will be "How does a barren landscape fill up with species?" The unique environment of the north side of Mount St. Helens provides an unparalleled opportunity to examine the colonization of an ecological "tabula rasa". Our work will include field experiments, sampling of seed rain, mapping of developing vegetation, statistical analysis of spatial data, and mathematical modeling of population spread. The study will encompass aspects of population, community, and landscape ecology simultaneously.