CALIFORNIA FIRE SCIENCE CONSORTIUM

Research Brief for Resource Managers

Release:	Contact:	Phone:	Email:
June 2016	Jon E. Keeley	(559) 565-3170	*jon_keeley@usgs.gov*
	Marti Witter	(805) 370-2333	*marti_witter@nps.gov*
	Liz van Mantgem		*evanmantgem@usgs.gov*

Central and Southern California Team, USGS Sequoia and Kings Canyon Field Station, Three Rivers, CA 93271

Ecological Correlates With Resprouting and Seeding

Keeley, J. E., V.T. Parker, and M.C. Vasey. 2016. Resprouting and seeding hypotheses: a test of the gap-dependent model using resprouting and obligate seeding subspecies of Arctostaphylos. Plant Ecology 217:743-750. DOI: 10.1007/s11258-015-0551-ze

Management Implications

- In sibling *Arctostaphylos* subspecies, natural selection prefers obligate seeders when the fuel structure is discontinuous whereas resprouting is favored in dense fuel beds.

In fire-prone California chaparral, most of the species within the two largest woody genera (*Ceanothus* and *Arctostaphylos*) lack the capacity to resprout after fire. Instead of resprouting in response to disturbance, as is the common recovery strategy in woody species throughout the world, most of these unique California species can only recover via postfire seedling recruitment. This strategy is called obligate seeding, and it occurs with some combination of fire disturbance and resource availability, like water and space. Because seedling germination success for obligate seeders is so extremely responsive to the immediate environment, they are "of particular interest in an era of rapid climate change." Further, with paired sibling subspecies of *Arctostaphylos* that exhibit the two alternate life strategies (sprouting and obligate seeding), there is a wonderful opportunity to observe how natural selection might favor one life strategy type over another.

Taking advantage of this convenient natural experiment, these researchers sampled sibling *Arctopstaphylos* subspecies stands from northern, southern, coastal, and interior California. For each subspecies stand, they measured five environmental variables within 0.1km diameter, circle shaped plots, including: % bare ground, elevation, annual precipitation, number of fires, and the time between the fires. The field sites were determined via the State of California CAL FIRE FRAP database using the coordinates from herbarium specimens belonging to the California Consortium of the Herbaria, as well as from personal collections. Two sample t-tests were used to compare the sibling subspecies pairs with contrasting life history strategies. In each t-test, the relevant variables were compared to prove or disprove each of three hypothetical models that have been used to explain these life history distribution patterns.

For the **Gap-dependent Recruitment Model**, which focuses on post-disturbance seedling recruitment, the gaps in the vegetation (i.e. % bare ground) were compared. For the **Disturbance Frequency Model**, where there is an assumed fire frequency and fire severity continuum, the number of fires and the average fire interval over the last 100 years for each plot was compared. For the **Resource/Productivity Model**, where it is assumed that an increase in resources would favor the resprouting life history trait, annual precipitation records from the Oregon State PRISM data base were compared.

Only the Gap-dependent Recruitment Model could be supported by these data (Figs. 1&2). This means that a change in fuel structure, like the creation of gaps, will favor the obligate seeding life history strategy (Fig.1b; Fig. 2). Conversely, resprouting is favored when the fuel structure is more dense (Fig.1a; Fig.2).

Fig. 1 Example of vegetation structure in a population of a resprouting subspecies (**a**) and an obligate seeding subspecies (**b**) of *Arctostaphylos parryana*

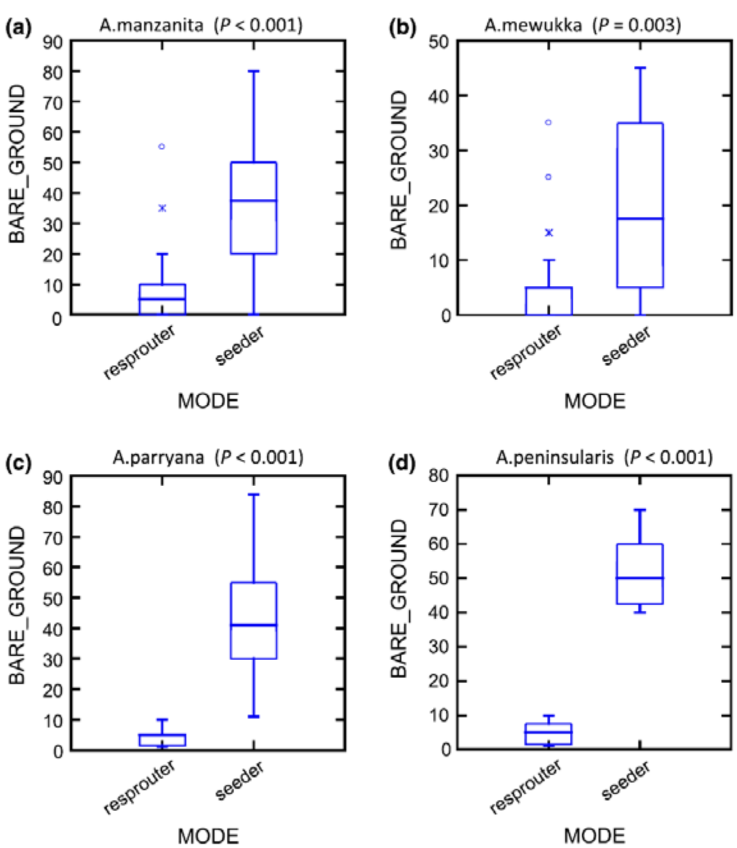

Fig. 2 Bare ground for resprouting and obligate seeding subspecies populations for four species of *Arctostaphylos*