



## Research Brief for Resource Managers

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## Shrubs That Recruit in the Understory of Chaparral

Keeley, J.E. 1992. Recruitment of seedlings and vegetative sprouts in unburned chaparral. *Ecology* 73:1194-1208; & Keeley, J.E. 1992. Demographic structure of California chaparral in the long-term absence of fire. *Journal of Vegetation Science* 3:79-90.

Historically it was commonly believed that old, unburned chaparral stands were unhealthy, trashy and unnatural. Without fire it was widely held that chaparral species are unable to recruit new resprouts or seedlings and thus chaparral is unsustainable in the absence of fire. In the interest of testing this assumption, Jon Keeley investigated the age structure of chaparral unburned for at least half a century.

A dozen chaparral stands from San Diego to Lake counties and ranging in age from 56 – 118 yrs of age were studied. Parameters of particular interest were the age structure of stems on resprouting shrubs and the extent of seedling recruitment.

Results showed that all resprouting species had an age structure of stems indicating continuous resprouting throughout the life of the plant (Fig. 1). Although fire is often considered to have a rejuvenating effect on chaparral, it is clear that in the absence of fire some species are capable of rejuvenating their canopies by resprouting.

One other important finding was that some species recruit seedlings in these older stands. These are species normally described as *obligate resprouters* in response to fires and include *Rhamnus ilicifolia*, *R. californica*, *Prunus ilicifolia*,

### Management Implications

- Unburned chaparral stands greater than 50 years old are healthy, relatively stable plant communities.
- Resprouters continue to produce new resprouts throughout their life in the absence of fire.
- *Postfire obligate resprouters* produce seedlings in older chaparral.
- These *old-growth chaparral* stands play a key role in the long term sustainability of these ecosystems.

*Quercus* spp., among others. Other previous studies seldom if ever have reported seedlings of these species and this apparently is because seedlings are rare in younger chaparral. In older stands the microhabitat characteristics most strongly correlated with seedling recruitment are litter depth and biomass (Table 3). One other characteristic was the dependence on shady understories and avoidance of gaps (Table 4).

These studies showed that all species in chaparral recruit seedlings. Shrubs that recruit after fire (*Adenostoma*, *Arctostaphylos*, *Ceanothus* spp.) are often referred to as 'seeders' but are perhaps best described as *postfire seeders*. These taxa established no seedling in the older chaparral stands in this study. *Postfire resprouters* are seeders but only in the fire-free interval.

TABLE 3. Correlation of seedling and sapling density with stand characteristics for all sites except the highly disturbed Sequoia Site no. 9 (Spearman's rank correlation,  $N = 11$  sites; \* =  $P < .05$ , \*\* =  $P < .01$ ).

	Correlation coefficient
Latitude	0.10
Longitude	0.01
Elevation	-0.22
Precipitation	-0.08
Slope inclination	0.34
Stand age	0.26
Basal coverage	-0.51
Percentage dead basal coverage	0.17
Percentage bare ground	0.00
Litter depth	0.76**
Litter biomass	0.57*
Percentage rock	0.36
Soil organic matter percentage	0.09
Percentage sand	-0.27
Percentage clay	0.02
Soil pH	0.01

TABLE 4. Seedling and sapling density, irradiance, and litter depth in canopy gaps and beneath the shrub canopy at the San Ignacio Site (means  $\pm 1$  SD).  $N = 50$  plots of  $2 \times 2$  m.

	Canopy gaps	Beneath canopy	$P$
No. seedlings and saplings/plot	$0.0 \pm 0.0$	$12.6 \pm 9.5$	<.001
Irradiance (% of full sun)	$95 \pm 7$	$22 \pm 11$	<.001
Litter depth (mm)	$1 \pm 5$	$69 \pm 32$	<.001

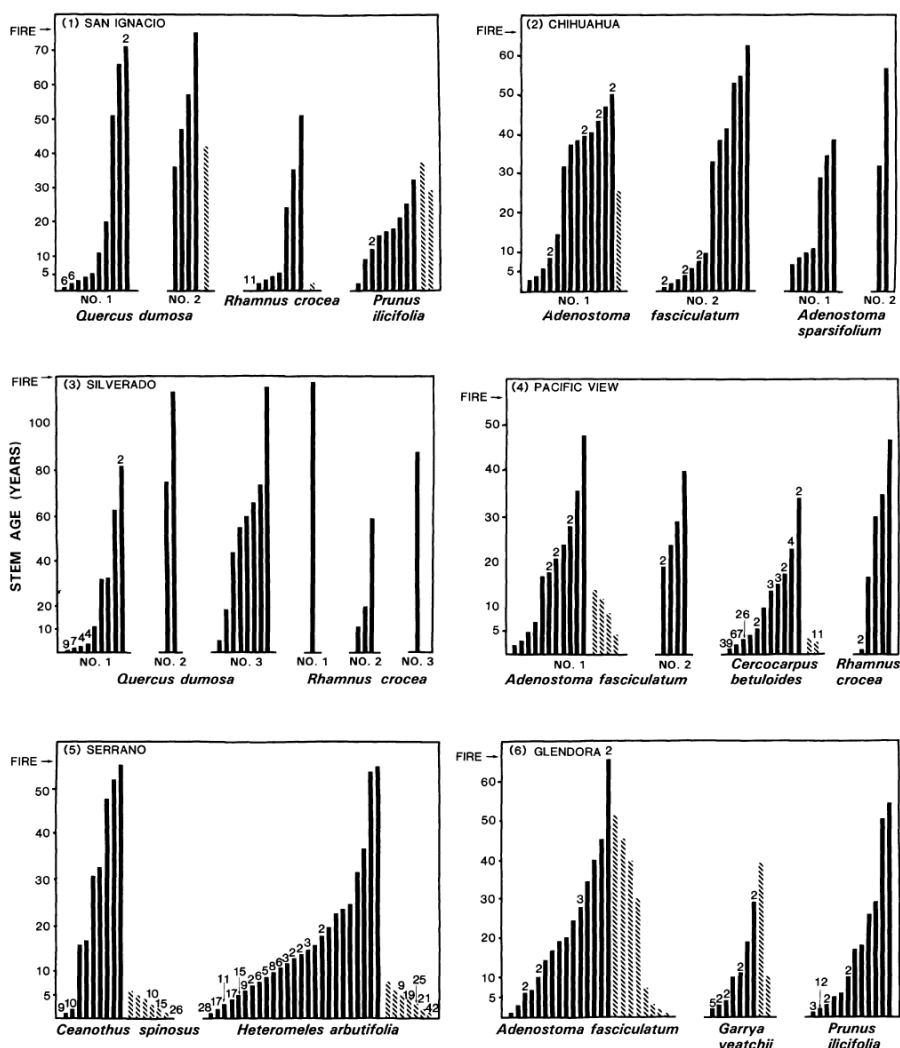


FIG. 1. Age distribution of all stems on a single shrub for selected sprouting species at the 12 sites. Each solid bar represents one live stem, unless topped with a number (the number of stems of that age); + atop bar indicates minimum age for stems with a rotten core. Hatched bars indicate dead stems. Multiple shrubs of the same species are indicated #1, #2, etc. above the species name.