TABLE 1. VIABILITY OF STORED POLLEN OF *Sisyrinchium* AS ASCERTAINED BY GERMINATION TESTS. *600 grains examined per sample (200/trial).

Number of days in storage at 5°C	Total number of pollen grains germinating*	Mean germination
0	579	96.5% (96–97.5)
2	579	96.5% (95–97.5)
10	581	96.8% (95–99)
15	513	85.5% (84–87.5)
30	440	73.3% (70–76)
60	264	44.0% (38–49)

Pollen remained strongly viable through 10 days; thereafter, germination decreased with continued storage (Table 1). For short-term pollen storage, a desiccant is not necessary.—ANITA F. CHOLEWA, Department of Biological Science, University of Idaho, Moscow 83843. (Received 21 Oct 1983; accepted 14 Feb 1984.)

INFLUENCE OF SLOPE ASPECT ON POSTFIRE REPRODUCTION OF *Encelia farinosa* (ASTERACEAE).—Chaparral shrub species regenerate rapidly after fire by vegetative sprouting from root crowns, or germinating from dormant seed (Hanes, Ecol. Monogr. 41:27–52. 1971; Keeley and Zedler, Amer. Midl. Naturalist 99:142–161. 1978; Howe and Carothers, S. Calif. Acad. Sci. 79:5–13. 1980; Keeley and Keeley, Amer. J. Bot. 68:524–530. 1981). The proportion of sprouts and seedlings produced by the different sprouting species following fire varies (Keeley and Zedler 1978; Keeley and Keeley 1981; Westman et al., *in* Margaris and Mooney, eds., Components of productivity of Mediterranean-climate regions. 1981). Hanes (1971) found that the amount of sprouting following fire varies with slope aspect. The percentage of sprouts was greater on coastal north-facing slopes than on the other coastal exposures due to differences in irradiation and available moisture. Also, the fraction of shrubs derived from seedlings was lowest on the coastal north-facing slopes. Seedlings appear to have an advantage on xeric south-facing slopes when compared with sprouters. Hanes (1971) reported sprouting in 43% of southern California chaparral species but did not observe any for *Encelia farinosa.*

Encelia farinosa, which is very abundant on dry slopes of creosote bush scrub and coastal sage scrub communities of southern California (Munz, A flora of southern California. 1974), regenerates following fire as a sprouter (Westman et al. 1981). Little is known about the fire response of *E. farinosa.* The purpose of this project was to locate an area in which *E. farinosa* occurred and to study the regeneration of this species with respect to slope aspect. It was anticipated that there would be a significant difference in the amount of sprouts and seedlings of *E. farinosa* on different slope exposures following fire, particularly between the mesic north-facing slopes and the more xeric south-facing slopes.

Approximately 15 ha of coastal sage scrub located in the hills south of Loma Linda, California burned in a wildfire on 15 June 1981. Species of the burned plants could be identified from standing dead stems. Nearly all of the *E. farinosa* growing in this

TABLE 1. MEAN POINT TO PLANT DISTANCE ($\bar{d}$ IN METERS) AND MEAN DENSITY OF PREBURN AND POSTBURN *Encelia farinosa* ON DIFFERENT SLOPE ASPECTS IN LOMA LINDA, CALIFORNIA.

	$\bar{d}$		Density (no./ha)	
Slope aspect	Preburn	Postburn (1.5 yr)	Preburn	Postburn (1.5 yr)
North	6.49 ± 5.25	32.38 ± 7.87	237	<10
South	2.03 ± 1.24	2.28 ± 1.76	2422	1924
East	2.01 ± 1.30	1.46 ± 1.21	2456	4695
West	2.15 ± 1.46	1.50 ± 1.03	2171	4444

area was topkilled. Pure stands of *E. farinosa* were situated on exposures facing east, west, and south.

Sampling was begun in October 1981 using the point-quarter method (Cox, Laboratory manual of general ecology. 1980). Different 30° slope exposures were sampled within the burn area to obtain the preburn density of *E. farinosa.* Dead plants were measured and the percentage of these that had sprouted from root crowns was noted. Comparisons were then made for the amount of sprouting *E. farinosa* between the different slope aspects. Eleven, 13, 46, and 18 points were measured on the north, south, east, and west exposures respectively, from transects running perpendicular to slope aspect. Several slopes of the same aspect were added together to obtain a total for that direction. East-facing slopes predominated in this area, so there is an unequally large number of points taken on the eastern exposure. No seedlings of *E. farinosa* were present at this time.

In February 1983, point-quarter sampling was repeated on the same slopes measured in October 1981 to obtain the density of regenerated *E. farinosa* from both sprouts and one-year-old seedlings. On each of the four slope aspects 30 points were measured. Due to the extremely low density on north-facing slopes, when plants were not encountered within 35 m from the point, a ">35 meters" was recorded. Statistical comparisons were made between sprouting and seedling populations of north, south, east, and west exposures using the chi-square contingency analysis (Cox 1980).

The preburn *Encelia* densities for south, east, and west exposures were virtually identical, but density was extremely low on the preburn north-facing slopes (Table 1). *Salvia mellifera* was most common on this slope face. Postburn *Encelia* densities for east and west exposures show a 91% and 105% increase when compared with preburn densities for the same aspects (Table 1). The postburn south-facing slopes had recovered 79% of the preburn *Encelia* density. The greatest reduction in postburn *Encelia* density was seen on the north-facing slopes where only 4% of the preburn plants had recovered.

The percentage of topkilled *E. farinosa* that sprouted from plants measured in October 1981 is presented in Table 2. There was a significantly higher percentage of sprouting observed on the north exposure when compared to the percentage of sprouting on the south, east, and west exposures ($p < 0.01$). Percentage of sprouting on north-facing slopes was over 4 times that of east and west exposures, and over 7 times that of southern exposure.

Numerous seedlings of *Encelia* were found in the postburn exposures in February 1983. The proportion of *Encelia* sprouts and seedlings found on the east and west exposures was almost identical with 93% of the plants being seedlings (Table 2). An even higher proportion of *Encelia* seedlings was seen on the southern aspect which was composed of 96% seedlings. Only 23% of the *Encelia* on the northern exposure were seedlings. This proportion of sprouts and seedlings was significantly different ($p < 0.01$) when compared to sprouts and seedlings on south, east, and west exposures.

TABLE 2. PERCENTAGE OF TOPKILLED *Encelia farinosa* SPROUTING IN OCTOBER 1981 AND PERCENTAGE OF REGENERATED *E. farinosa* PRODUCED BY SPROUTS (SPROUTS/SPROUTS AND SEEDLINGS) IN FEBRUARY 1983 ON DIFFERENT SLOPE ASPECTS.

	October 1981		February 1983	
Slope aspect	n	% sprouting	n	% sprouts
North	44	29.6	13	77.0
South	52	3.9	120	4.2
East	184	7.1	120	7.5
West	72	8.3	120	6.7

The percentages of seedlings on the south, east, and west exposures were 4 times that of the northern aspect. Numerous seedlings of *S. mellifera* were observed on north-facing postburn slopes in February 1983.

Hanes (1971) previously reported *Encelia farinosa* as a nonsprouter. However, it is apparent that sprouting does occur and varies with slope aspect. He proposed that sprouters may have an advantage on mesic sites (north exposure) when compared with more xeric sites (south exposure) because of lower fire temperature and less shrub death due to cooler and moister conditions. Since death of shrubs above ground would be greater on the xeric southern exposure, reproduction would then be more advantageous by seeding versus sprouting (Hanes 1971, Howe and Carothers 1980). Although the postburn density of *Encelia* on the south exposure was less than that observed on east and west exposures, the fraction of seedlings was higher.

Encelia farinosa could be categorized as a weakly-sprouting species because only 4–30% of the topkilled shrubs in this study regenerated by crown sprouting, compared to 12–100% in sprouting chaparral species reported by Keeley and Keeley (1981). However, unlike chaparral, the percentage of topkilled shrubs that sprout in coastal sage scrub varies greatly with fire intensity (Westman, Ecology 62:170–184. 1981a; Westman, USDA For. Serv. Gen. Techn. Rep. PSW-58. 1981b; Westman et al. 1981). More intense fires suppress shrub sprouting, whereas more frequent fires favor shrub sprouting by lowering fuel loads and fire intensities (Westman 1981a). *Salvia mellifera,* which is known to sprout (Westman 1981a; Westman et al. 1981; Gray, Madroño 30:43–49. 1983), was not sprouting in this particular burn. This indicates that fire intensity was severe enough that levels of sprouting *E. farinosa* could have been higher than 30% had fire intensity been less.

Survival of *E. farinosa* on all slope aspects of coastal sage scrub communities is a result of its drought tolerance and its ability to recover from fire. However, the likelihood of recovery from sprouts is greater on the cooler more mesic sites, and less on the hotter more xeric sites.—BRADFORD D. MARTIN, Department of Biology, Loma Linda University, Loma Linda, CA 92350. (Received 11 May 1983; accepted 27 Dec 1983.)

Ipomopsis pinnata (POLEMONIACEAE) IN THE UNITED STATES.—Examination of herbarium specimens (GH, NMC, NY, US) indicates that *Gilia campylantha* Woot. & Standl. is conspecific with the Mexican species *Ipomopsis pinnata* (Cav.) V. Grant.

A new collection of was made ca. 25 km n. of the type locality of *Gilia campylantha*: