

Population dynamics of Desert Elkweed *Frasera albomarginata* S. Watson in Mojave National Preserve



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INTRODUCTION



Flowers of *Frasera albomarginata*.

Desert Elkweed, *Frasera albomarginata* S. Watson, is a pretty little plant which is found occasionally in Pinyon-Juniper woodlands of southwestern USA deserts. It grows low to the ground with a rosette of green leaves. You can see the rosette in the photograph at upper right. The leaves have a small white edge, or margin, around the green leaf; hence the name *albo-* (white) *-marginata* (-marginated). However, *F. albomarginata* is not the only *Frasera* with white margined leaves. Other common *Frasera* with white margined leaves are *F. paniculata* and *F. puberulenta*, shown elsewhere on this poster. The three species are occasionally mistaken for each other. Though Desert Elkweed grows for more than one year, it does not form woody tissue, which makes it a perennial herb.

When *F. albomarginata* flowers it sends up a stem which is 8 to 24 inches (2-6 dm) tall and has very thin leaves arranged around the stem in a whorl. The flowers are about 1 inch (2.5 cm) in diameter, with greenish white petals that have purple dots. Nectar, to attract pollinating insects, is secreted in pits which are located well out on the petals, as can be seen in the photograph above.

F. albomarginata flowers only once in its life history and then dies, and is therefore called semelparous, if you like Latin, or monocarpic, if you like Greek. Sometimes *F. albomarginata* is described as a biennial. This may be true especially near the center of its range. However, in the eastern Mojave, it rarely flowers in its second year.

The genus name of *Frasera*, by the way, is named for J. Fraser, a Scottish collector of North America plants, 1750–1811.

For much of its history, *Frasera* has bounced back and forth between *Frasera* and *Swertia* (cf., Card, 1931, and Post, 1956). However, recent molecular work (Chassot, et al., 2001) has shown that *Swertia* in the broad sense is highly paraphyletic and that *Frasera* probably should stand on its own as a North America genus of Gentianaceae.



Typical rosette of leaves. Stake is ¼" in diameter.



Frasera albomarginata in bloom at Pinto Mountain, Mojave National Preserve, San Bernardino County, California.



North face of Wild Horse Mesa, Mojave National Preserve, San Bernardino County, California.



Typical habitat at Wild Horse Mesa, Mojave National Preserve, San Bernardino County, California.

At right, a typical road berm habitat for *F. albomarginata* near the center of its range. This one is near Beaver Dam State Park, Lincoln County, Nevada.

FIELD WORK

Two 25 m² plots were established in 1996 in Mojave National Preserve: one on the north face of Wild Horse Mesa, and the other on the south face of Pinto Mountain.

Individuals of *Frasera albomarginata* are marked with a numbered stake. Initially observations were made two or three times per year. However, it soon became evident that such frequent visits were damaging the meager soil. Visits were scaled back to once a year, in late Spring when the species is likely to be flowering.

Data collected include: Date, plant number, dimensions of the plants in three dimensions, number of basal leaves, and life stage. Data is entered into a data base, analyzed and then exported for preparation of charts.

At the present time, there is 16 years of continuous yearly data for the two plots. I expect to continue this study, adding to the data set, for the foreseeable future.

Weather data (Summary of the Day) was obtained for Mitchell Caverns, also called Providence Mountains State Park, for the years 1959 through 2010. Mitchell Caverns is 15 km southwest of, and 50 m lower than, the north face of Wild Horse Mesa.

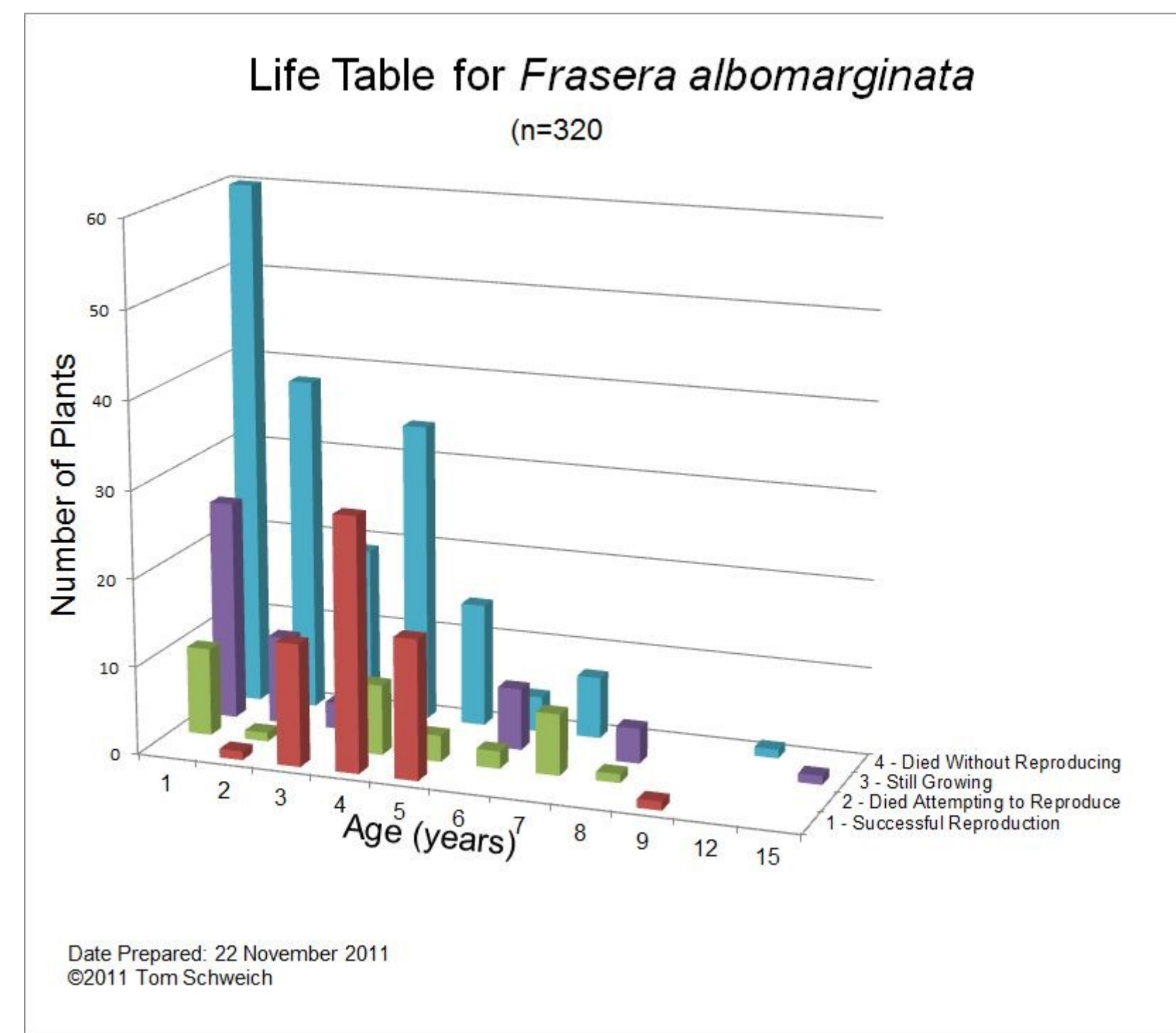
RESULTS

Life for *Frasera albomarginata* in Mojave National Preserve is uncertain.

Life for *Frasera albomarginata* is uncertain. More than a third of plants I have studied died in the first year of life, and less than a quarter successfully reproduced. Of 320 plants in my data set:

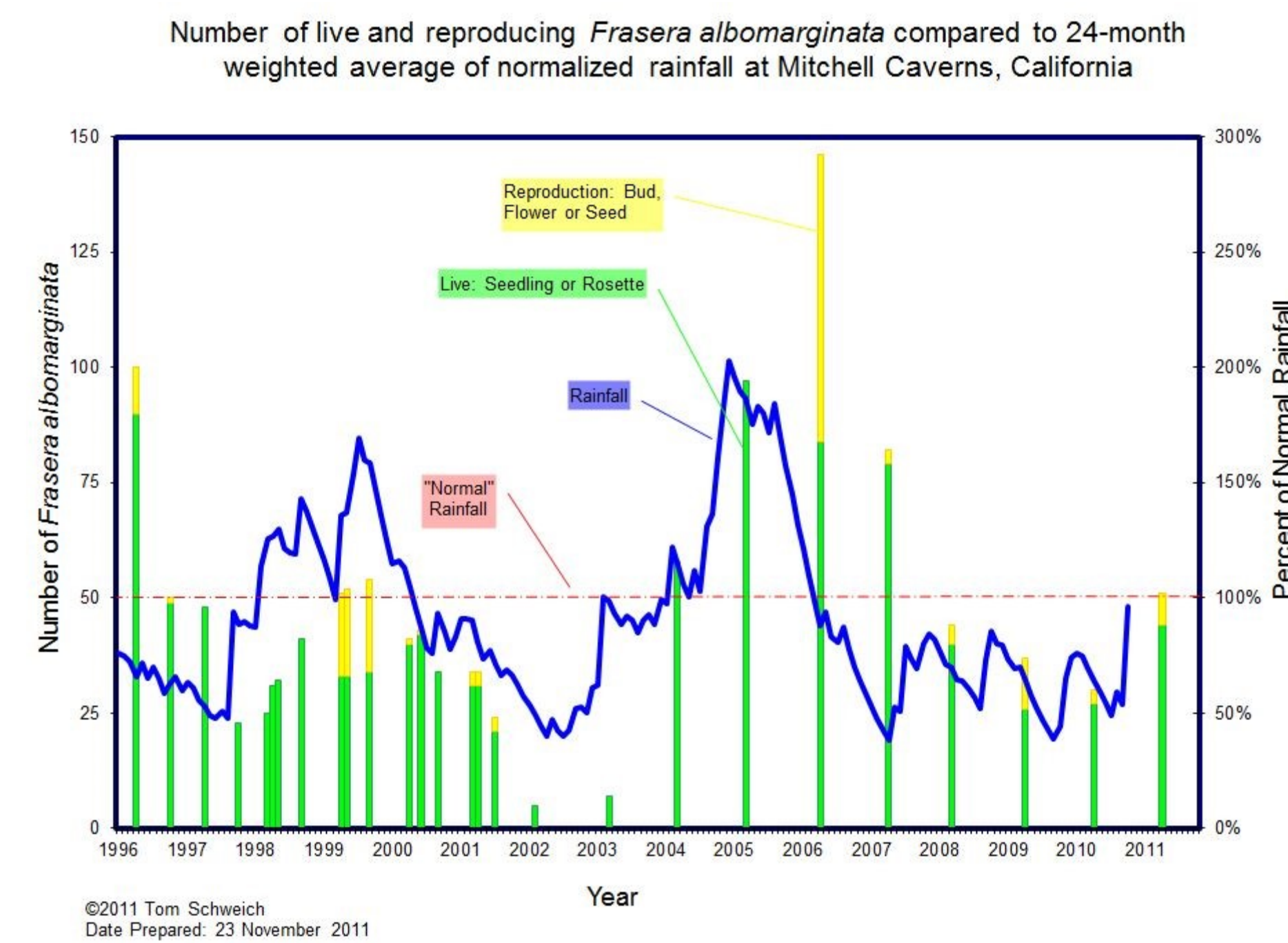
- 109 (34.1%) died in the first year of life.
- 177 (55.3%) died without ever attempting to reproduce.
- 32 (10.0%) dried up and died while attempting to reproduce.
- 61 (19.1%) successfully reproduced (set seed).
- 50 (15.6%) are still alive and have not attempted to reproduce.

Over 16 years of observations, plants at Wild Horse Mesa and Pinto Mountain have produced a substantial quantity of seed in only 2 years.



RESULTS

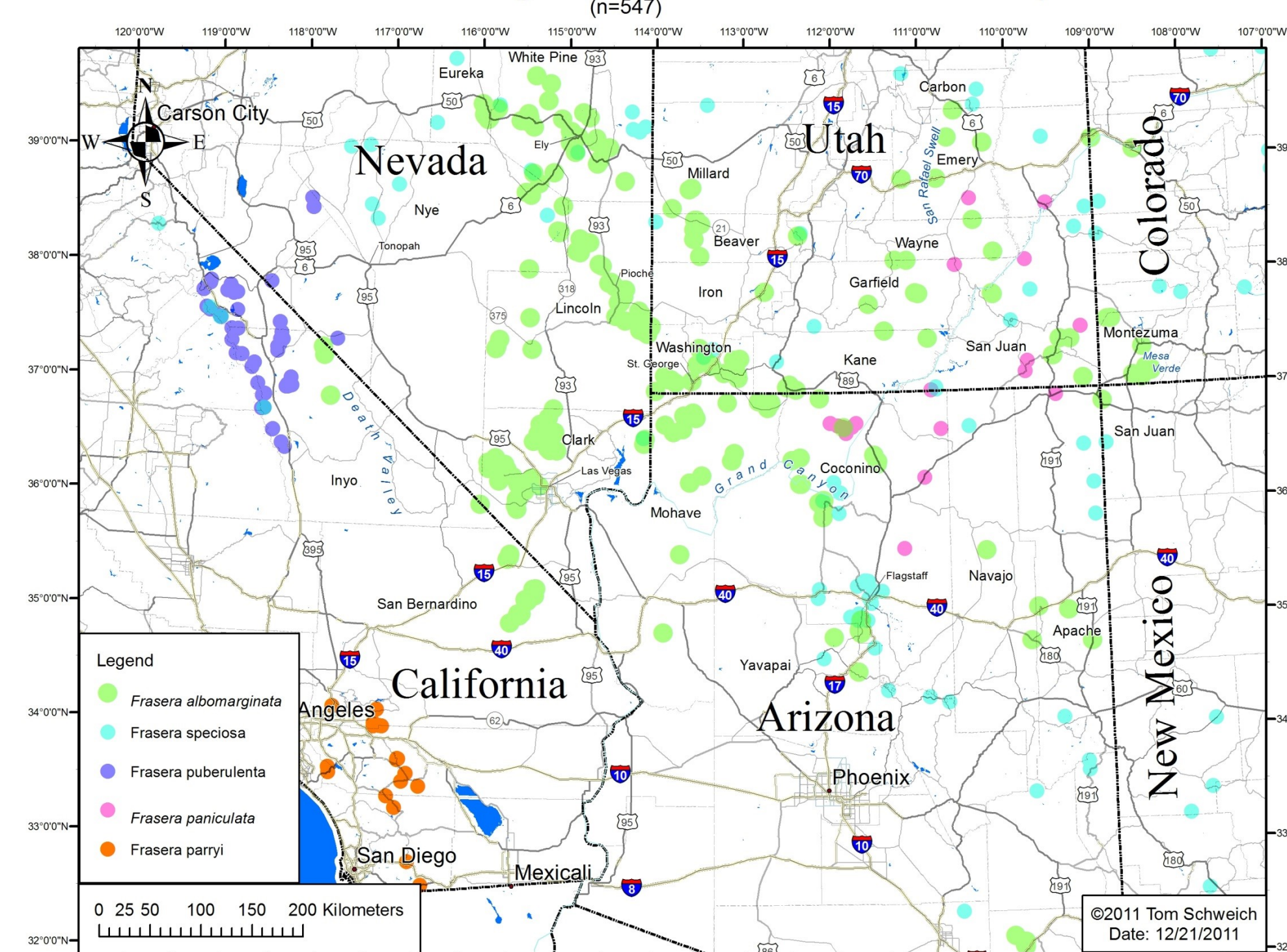
Population and reproduction are highly variable and dependent upon rainfall.



DISCUSSION

Frasera albomarginata is one of several semelparous *Frasera* found in the American Southwest.

Distribution of *Frasera albomarginata* S. Watson and other semelparous *Frasera*. (n=547)



Frasera puberulenta Davidson, shown at right, is very similar to *F. albomarginata* and was at one time named *F. albomarginata* var. *purpurea* Jepson. It is found along the eastern Sierra and at a few locations in the western Great Basin.



Frasera puberulenta in the Mono Craters, Mono County, California.



Frasera speciosa in Tuolumne Meadows, Yosemite National Park.

Frasera paniculata Torr. (Syn: *F. utahensis* M. E. Jones) is another common species of desert *Frasera* and is sometimes confused with *F. albomarginata*. It is found in northern Arizona and southern Utah. Reports of *F. paniculata* occurring in Nevada, such as that found in GBIF and EOL, result from misidentification of a single collection by Marie Gentry, near Panaca, Nevada, on June 21, 1941. *F. paniculata* is generally found in sandier habitats that is *F. albomarginata*.

The desert species of *Frasera*, including *F. albomarginata*, *F. paniculata*, and *F. puberulenta* of the eastern Sierra Nevada, are thought to have evolved from *Frasera speciosa* Griesb. (Kartesz, 1988). *Frasera speciosa* is sometimes called Monument Plant because of its shape and size. Another common name is Elkweed, from which I extrapolate a common name of Desert Elkweed for *F. albomarginata*.



Frasera paniculata near Grosvenor Arch, Kane County, Utah.

CONCLUSIONS

Frasera albomarginata is a attractive, delicate-appearing forb that appears to be restricted to carbonate-based soils in the eastern Mojave Desert. Freezing winters with snow the primary source of precipitation, and long, hot, dry summers, with an unpredictable cloudbursts, present unique challenges for a plant whose family -- Gentianaceae -- is normally associated with mild, moist climates. Being semelparous, *S. albomarginata* must establish and maintain a seed bank in the soil that can maintain the species over several "bad" years. Its presence adds to the beauty of the desert experience, and its ecology should be instructive in how organisms cope with a difficult and unpredictable desert environment.

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