

***ATRIPLEX SPINIFERA* J.F. MACBR.**

COMMON NAMES: SPINY SALT BUSH, SPINESCALE SALT BUSH, MOJAVE SALT BUSH

FAMILY: AMARANTHACEAE (FORMERLY CHENOPODIACEAE)

GROWTH FORM: SHRUB

**PLANTING**

During January 2003, seeds were hand-sown onto mounded planting beds, and a thin layer of soil was then raked over them. Approximately 20 young plants were observed during May 2003, but the majority of the seeds took up to two years to germinate. Within two years, the planted rows had filled in, and approximately 150 plants became established. Some of the plants flowered and formed fruits for the first time during 2005, and the first seed harvest was made during June 2005.

PHENOLOGY

Since *A. spinifera* plants have been established at the nursery for over 5 years and the species has not been replanted, we have had few opportunities to observe the timing of germination. We have observed the species in flower during February and March, with fruits beginning to form during March. Peak time for seed collection is June and July, though we have collected seeds as early as May and as late as September. Fruits are retained on plants for several months after they mature, but a decrease in seed viability may occur over time.

SEED DORMANCY

Professional germination tests performed on three *A. spinifera* seed lots¹ all resulted in zero germination, but tetrazolium chloride (TZ) tests indicated that the seeds lots were 8, 18, and 29% viable, yet in a dormant state. However, the dormancy mechanism is unknown. *A. spinifera* seeds are enclosed within fruiting bracts. The fruits (utricles) have a very hard consistency and may be impervious to water and gas until a certain amount of weathering occurs. At an area of remnant habitat located near the nursery, we observed that *A. spinifera* germinated densely in response to fire.

¹ Two of the seed lots were produced at our native plant nursery, and for the third seed lot, a wholesale seed company shared its seed testing results with us.

SEED HARVESTING

A. spinifera fruits are borne in large clusters on plants and are ready for collection when they turn brown in color and have a hard consistency. Due to the plants' spiny nature, it can be painful to strip fruits from plants by hand, so we typically remove fruit-bearing branches by clipping them from plants. It is advisable to wear gloves and a long-sleeved shirt when harvesting seed from this species.

SEED PROCESSING METHODS

Using a hammer mill, raw plant material is reduced into a coarse but uniform mixture of fruits, chaff (e.g., leaves, floral structures), and pieces of stems and branches. In order to completely remove fruits from branches and stems, the plant material may need to be run through the hammer mill several times. Seeds can then be separated from chaff and woody material using an air screen cleaner such as a Clipper Eclipse (made by the A.T. Ferrell Company).

Fruits per gram = 37²

CULTIVATION OVERVIEW

Numerous *Atriplex spinifera* individuals derived from a single source population have been established in the nursery since 2003, and they have reliably produced seed every year. On average, each plant measures 2.7 meters in diameter. *A. spinifera* establishment would not likely have been successful without substantial manual weed control efforts (hand pulling) during the plants' first few years of growth.

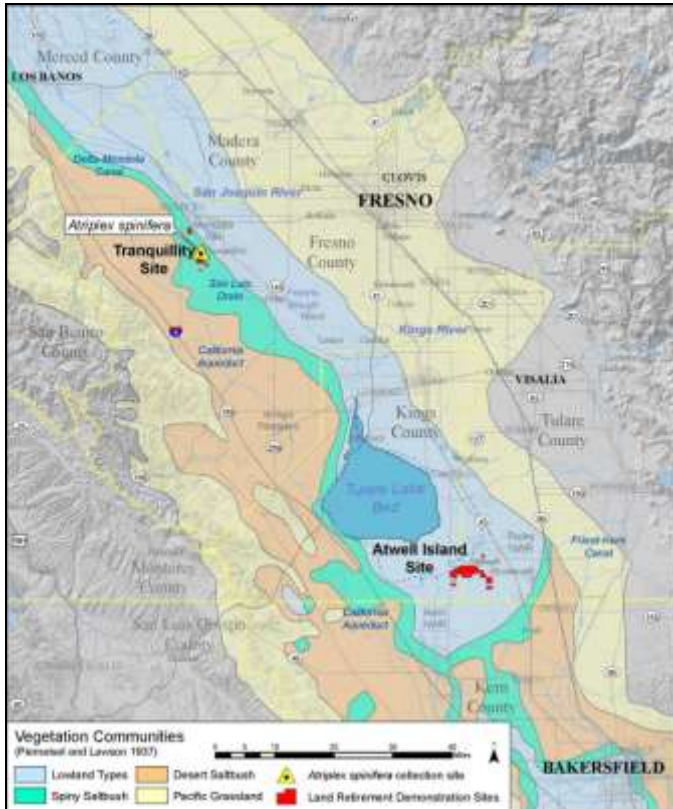
While many other planted natives have spread throughout the nursery via seed dispersal, we have rarely observed *A. spinifera* individuals growing outside of the area where the species is established. We have also rarely observed *A. spinifera* seedlings growing in proximity to the adult plants. These observations imply that seed dispersal was limited or that conditions were not suitable for seedling recruitment. However, during August 2008, we observed young *A. spinifera* plants growing in proximity to adult plants and in areas of the nursery where the species had not been planted. At the time of observation, most of the plants were 7-10 centimeters in height and diameter; we do not know the actual timing of germination. Based on precipitation data from a nearby weather station (California Irrigation Management Information System, Station #105), the amount of rainfall received during January 2008 (7.18 cm) was 64% above the 30-year monthly mean. With the exception of January, precipitation received during every other month between 1 October 2007 and 31 May 2008 was at least 25% below average. It seems possible that the germination of *A. spinifera* seeds from the soil seed bank could be attributed to the above average precipitation received during January 2008.

We have observed that rabbits (either black-tailed jackrabbits or desert cottontails) cause damage to young *A. spinifera* plants by clipping and gnawing the stems, presumably to sharpen their teeth.

² This figure (n = 5; standard deviation = 4) is derived from a seed lot that was harvested from the native plant nursery in 2008.

RARITY OF *ATRIPLEX SPINIFERA* IN WESTERN FRESNO COUNTY

We conducted an extensive search for local native plant populations in the western San Joaquin Valley from which seeds could be collected and planted in the nursery. Within an 80.5 km (50 mi) radius of the nursery site, we identified *A. spinifera* at one location on the valley floor and one location in the foothills. Based on vegetation maps created by Piemeisel and Lawson (1937), the species once occurred over significant expanses of the San Joaquin Valley (Figure 1). The near absence of the species within our search radius speaks strongly to the magnitude of the changes that have occurred in the region.



Vegetation of the San Joaquin Valley in the early 20th century (1937). *Atriplex spinifera* (spiny saltbush) once occurred over significant expanses of the valley. During an extensive search for local native plant populations, we documented *A. spinifera* at a single site on the valley floor. The vegetation map was created by Scott Phillips (ESRP), based on data from Piemeisel and Lawson (1937).

REFERENCES

Piemeisel, R. L. and F. R. Lawson. 1937. Types of vegetation in the San Joaquin Valley of California and their relation to the beet leafhopper. USDA Technical Bulletin No. 557, Washington, D.C. 28 pp.

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PHOTOS



A young *A. spinifera* plant observed at the native plant nursery during August 2008.



Fruits are beginning to form in the light yellow areas that are spongy in appearance.



A. spinifera in flower during February 2009.



A. spinifera at the native plant nursery. *Frankenia salina* (alkali heath) is pictured on the right.



Mature fruits are displayed on the plant.



Each *A. spinifera* seed is enclosed within fruiting bracts. The fruits have a very hard consistency. Scale shown is millimeters.



A. spinifera at the native plant nursery.





We found that after an *A. spinifera* fruit (left) is soaked in water, the outer layer becomes soft and can easily be scraped off, revealing a hard surface underneath (right). Scale shown is millimeters.



A. spinifera seeds that have been removed from their fruits. We did this out of curiosity; we did not extract seeds from fruits before planting them.



We soaked *A. spinifera* fruits in water to soften them, and then cut them open with a scalpel, to view the seeds contained inside.