Summary of 2025 Field Study

Plant Type: Wollypod Milkweed (A. eriocarpa)

Summary: In 2024, SAI and the greenhouse which germinates the seeds and produces the plants for butterfly habitat restoration, oberved significant improvements (height, width, plant volume, leaf size, root ball size) in the rate of growth of Narrowleaf milkweed (i.e. a primary food for the endangered Western monarch butterfly caterpillar) which were planted with the SAI soil amendments. In 2025, hundreds have been planted in the wild habitats, and are bening monitored. We decided to try these amendments on another species of California native plant, the wollypod milkweed (A. eriocarpa). This plant is of particular interest for habitat restoration; it is typically the first to emerge, often near the coasts, thus the earliest food source for the caterpillars of the migrating Monarch butterflies. On 6 April 2025, the greenhouse gave us 600 plants in 6" long tubes, filled with a planting mix, and were basically dormant rootballs. (photo 1) The tiniest sprouts of green/plant life was just starting to emerge.

Photo 1: 600 wollypod milkweed plants, as received from the greenhouse. Each tube is 6" long by 1" diameter, filled with soil and the roots of plants germinated in 2024. The scraggly grasslike stuff is the above ground plant from 2024. These plants started over from zero in April '25.

These plants were given to gardeners in the following counties: Amador, Merced, San Joaquin, San Mateo, San Francisco, Santa Clara, and Santa Cruz. We've planted them at various ratios of soil: SAI soil amendment, including "control", 8:1, 12:1, 15:1, 20:1, 30:1, and 60:1 (i.e. this one "by the surface area" of the tube). (Not all combinations are reported: e.g. the 30:1 and 60:1 populations were all "eaten" at night by some animal, in Watsonville, Ca.) At each site, the plants were given identical water, fertilizer, and sun exposure; as much as is possible. The only difference was the amount of SAI material used at planting. Nearly all of these plants duplicated the method used in commercial scale habitat restoration: a portable electrical drill, with a 1.5" augur, was used to drill a hole about 7" deep. The SAI materials were dropped in the hole bottom (or not), the plant was removed from the tube and placed in the hole, and the native soil filled the void.

12 August 2025 Update: In late summer, we've examined many plants, at several sites. They are mostly showing the same results: the plants in native soil amended at the 8:1 ratio are generally the tallest, the widest, with more and larger leaves.

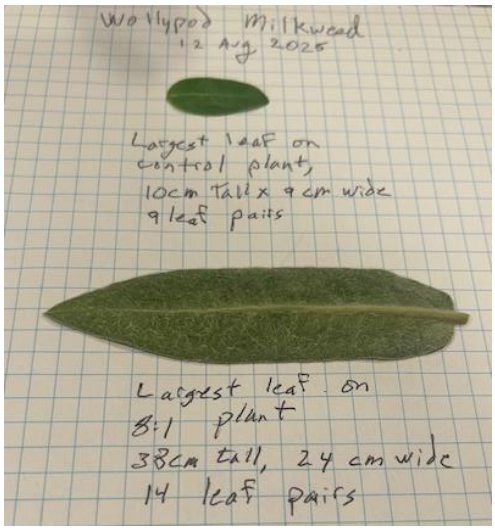

Photo 2 (l): Woolypod milkweeds plants. Top row are a pair of control plants. The middle row are 20:1 (l) and 15:1 (r). The bottom row are at 8:1 (l) and 12:1 (r). The larger of the two control plants is 10cm tall x 9cm wide, for a plant volume of about 90cm2, with 9 pairs of leaves. The 8:1 plant is 38cm tall x 24cm wide, for a plant volume of about 912cm2- roughly 100x the plant volume of the control plant, with 14 pairs of leaves.

Photo 3 (r): the the largest leaves from the larger of the two control plants, compared to the largest leaf from the 8:1 plant. The control leaf has a surface area of about 4.1cm^2, at 9 pairs = about 73.8cm^2 per control plant. The 8:1 leaf has a surface area of about 30cm^2, at 14 pairs = about 840cm^2 per plant, about 11.4 times more caterpillar food/plant- so far.

Preliminary conclusion: we'll be analyzing the other field trials in August, but it appears that in native soils (i.e. low carbon content, relatively infertile), that most plants benefit from a ratio of in the range of 8:1 to 12:1 (planting hole volume, soil to amendment).

9 September 2025 Update:

We measured the size of the wollypod milkweeds, near the end of 2025. The SAI treated plants were much larger, and the leaves were much larger.

Photo 4: wollypod milkweed leaf, planted with SAI soil amendments, in spring ’25.
Photo 5: wollypod milkweed plant, planted in native soil without the SAI soil amendments.

<u>17 September 2025 Update</u>: We have 6 control plants, and 12 SAI treated plants at 6 ratios. The best is at 8:1 (soil volume of the tube which contained the roots:SAI soil amendment), followed by 12:1. The difference in plant height and width, and in leaf area is stunning.

Photo 6: The largest leaf from an SAI treated plant (left, 8.5” long x 2.5” wide, for a plant surface area of 21.25 inches^2, with 76 leaves (some smaller) x 2/3, for a leaf surface area per plant of ~1,083 inches^2 per plant), and from a control plant (right, 1.375” long x 0.5” wide, for a plant surface area of 0.69 inches^2, with 14 leaves (some smaller) x 2/3 for a leaf surface area of ~6.47 inches^2 per plant). The SAI treated plant at 8:1 has about 167.4x more leaf surface area/plant compared to the largest control plant. The 12:1 plants are slightly smaller than the 8:1 plants, and the other ratios also produce decreasingly smaller plants.

6 October 2025 Update: While all the plants continued to grow over the last 2.5 weeks, the SAI treated plants have continued to grow at a faster rate than the control plants. The only additional wollypod milkweed data that we'll record in 2025 will be a survey of as many of the sites that had plants which survived the 2025 season. (e.g. at one site, some animal ate the plants 10 days after they were planted, so that site has no data to report/measure.)

Photo 7: The largest leaves from an SAI treated plant (8:1) on the left, and one of the largest leaves from a control plant.

Grid lines on paper are at 1cm; printed page is ~ ½ actual size.