

Propagation and Outplanting Trial Report: *Cirsium occidentale* (Cobweb Thistle)



Background

In our continued work to help increase the availability of plant materials for pollinator conservation, Xerces staff conducted propagation and outplanting trials on *Cirsium occidentale* (cobweb thistle), an important nectar plant for pollinators. Cobweb thistle provides critical pollen and nectar resources for monarchs and other declining pollinators. However, it has very limited commercial availability and thus is not widely used in restoration projects. Many nurseries report that *C. occidentale* is difficult to grow and weakly rooted when grown in standard plugs (1" x 1" x 1"). Building from this industry knowledge, we sought to find ways to produce more successful transplants for this species.

This project began in 2024 with propagation trials supported by a partner nursery. The propagation trials focused on comparing different container sizes to see how they would affect initial germination and seedling development.

Following the propagation trials, we conducted outplanting trials at the USDA NRCS Plant Materials Center (CAPMC) in Lockeford, CA, in fall 2024 and spring 2025. The outplanting trials focused primarily on testing the efficacy of utilizing different container sizes for outplanting and planting at different stages of seedling maturity. This explored whether allowing the plants to grow and develop longer at the nursery and having a prolonged period for root development would impact outplanting success.

Following the initial outplanting, Xerces staff continued to maintain and monitor these plots through to seed set/plant dormancy in fall 2025. Now that these initial propagation and outplanting trials are complete, our goal is to continue to manage and monitor the outplanted plot to establish a foundation plot from which seeds can be collected for future use.



TOP TO BOTTOM—Cobweb thistle in bloom; skipper butterfly on a cobweb thistle; cobweb thistle seedlings. (Photos: Dan and Raymond, Flickr [CC BY-NC-SA 2.0]; Laura Camp, Flickr [CC BY-SA 2.0]; Xerces Society / Jessa Kay Cruz.)



Propagation Protocol

Treatments

All seeds were cold-stratified from February 29–March 29, 2024. A total of 574 seeds were divided into four replicates, with 150 seeds per plug replicate (large plug trays; treatment A) and 137 seeds per Deepot D16H replicate (treatment B). All of the seeds were sown using the standard Heritage Growers soil mix. Each of the container sizes had two different outplanting timelines, the first after approximately six months of growth (“six-month seedlings”) and the second after approximately one year of growth (“one-year seedlings”). Thus, the variables tested were container size (large plug trays [A]; Deepot D16H [B]) and duration between sowing and outplanting (six months; one year).

Table 1—Treatments: *Cirsium occidentale*

	LARGE PLUG TRAY (A)		DEEPOT D16H (B)	
Outplanting Timeline	6 months	1 year	6 months	1 year
Quantity	150	150	137	137

Materials

- ☞ Total # of *Cirsium occidentale* seeds: 574
- ☞ Seed origin: Rumsey Canyon, Yolo County
- ☞ Soil: Standard nursery soil mix (Heritage Growers)
- ☞ Container sizes:
 - ☞ Treatment A: large plug trays (1 ½" × 1 ½" × 2 ½")
 - ☞ Treatment B: Deepot D16H containers (2" × 7"), 16 in.³ volume

Data Collection

We collected germination data weekly for all plants and both treatments for the first eight weeks after sowing the seeds. These data included the number of newly germinated plants as well as the number of plants that had previously germinated and died. Anything past the eight-week mark was considered dead/not germinated.

After the eight-week germination period, monitoring shifted to a monthly assessment of plant health and vigor, including root development. One plant from each treatment was removed from its pot to be visually assessed, recorded, and photographed to track root development. Plant health and vigor were assessed, recorded, and photographed across treatments. We used a scoring system of 1 (poor) to 4 (excellent). Monthly monitoring continued throughout the one-year period of seedling development at the nursery (excluding the dormancy period), which was approximately from October until March of the following year.

Results

Overall, we observed low germination rates in both container size treatments, but significantly higher germination rates in the D16H containers (B, 32.8%) versus the large plug trays (A, 18.3%). Once germinated, the seedlings from both treatments did equally well and had high survival rates, with average health and vigor scores of 3.3 (good) for both container types.



The container sizes (left—large plug [A]; right—D16H container [B]) used in the *Cirsium occidentale* propagation and outplanting trials. (Photo: Xerces Society / Deedee Soto.)

Table 2—Seed Germination and Seedling Health and Vigor: *Cirsium occidentale*

	GERMINATION RATE	AVERAGE HEALTH AND VIGOR SCORE
Large plug trays (A)	18.3%	3.3 (good)
Deepot D16H containers (B)	32.8%	3.3 (good)

Discussion

Germination rates were significantly higher in the Deepot D16H containers (treatment B) compared with the large plug trays (treatment A). This difference may be related to seeds being splashed out of their containers due to poor irrigation techniques. We found many seed tags on the floor and evidence of splashing, suggesting that irrigation pressure was too high. Although this could have affected seeds in both container types, the D16H containers have a higher lip at the top of the container, which may better protect seeds and help contain them in the pot.

Across both treatments, germination rates were lower than expected. It is possible that a longer stratification period would result in a higher germination rate, which could be tested in future propagation trials. We also noticed that the initial seed quality was low. Many of the seeds were small and shriveled, pointing to underdeveloped or poorly stored seed, which may have influenced germination results.

Cirsium occidentale grew quickly once germinated and developed a strong root system regardless of container treatment. Overall, the seedlings in both container types scored equally in terms of health and vigor. However, plug seedlings were starting to show signs of becoming rootbound toward the end of the propagation trials, with most of the container space taken up by the roots. What seems most critical for this species is to outplant them promptly once the root system develops.

Outplanting Protocol

Treatments

Seedlings were outplanted on two separate occasions: October 2024 for the “six-month seedlings” and March 2025 for the “one-year seedlings.” All seedlings were planted at CAPMC. The project area was prepped with light tillage to remove existing vegetation and then followed up with sheet mulching, using a layer of wood mulch on corrugated cardboard. Irrigation lines were installed immediately after transplanting, and irrigation was provided by gravity flow from a mobile water tank. Seedlings were irrigated immediately after transplanting, and irrigation was provided as needed in the fall. The site was visited regularly to observe growth and development, and managed regularly to facilitate general plant health. These activities were conducted until November 2025, at which point the plants entered their natural dormancy period.

Preparing the site for outplanting; seedlings at the time of outplanting; outplanted plants blooming. (Photos: Xerces Society / Deedee Soto.)



Results

The six-month (fall-planted) seedlings established significantly better than one-year (spring-planted) seedlings for both container types. Combined survivorship at the end of the data collection period was 91.0% for six-month seedlings and just 29.0% for one-year seedlings.

Table 3—Outplanting Survival Rates Spring vs. Fall: *Cirsium occidentale*

	FALL (6-MONTH) OUTPLANTING SURVIVAL RATE	SPRING (1-YEAR) OUTPLANTING SURVIVAL RATE
Large plug trays (A)	91.0%	29.0%
Deepot D16H containers (B)		

Discussion

Fall-planted seedlings from both container treatments grew well once outplanted, despite large plug trays (A) showing initial signs of being rootbound. The Deepot D16H (B) seedlings did not show signs of being rootbound and had well-developed long, straight roots. Planting time did have a significant difference in the development and survivorship of seedlings. The fall-planted seedlings, regardless of container type, had significantly higher survivorship as compared to the spring-planted seedlings. Spring-planted plants were stunted and grew slowly in comparison, and many did not survive through the summer. This could be due, in part, to poor irrigation because of low water pressure and wildlife disturbance of irrigation lines in a portion of the spring-planted seedlings.

Cirsium occidentale is typically a biennial species, and most of the plants seemed to die back at the end of 2025. We will monitor outplanting sites in 2026 to see if original seedlings regrow, and determine if any natural recruitment from seeding occurs. We observed that the plot was very popular with wildlife, and there was an abundance of pollinators and other invertebrates both visiting and inhabiting the *C. occidentale* plants and plot.

Conclusion

These trials were meant to determine which containers work best for growing *Cirsium occidentale* for successful propagation and outplanting. They were also meant to compare outplanting times to determine if a longer growth period in the pots allowed for better root development. *Cirsium occidentale* showed higher germination rates in larger containers such as D16Hs as compared to plugs, but grows well and quickly in either container size once germinated. Considering how vigorous it is, we recommend germinating in larger containers and/or closer to a fall planting date so that it can be transplanted as quickly as possible to avoid seedlings becoming rootbound. Additionally, it would be beneficial to add a medium such as sand on top of the seed and to use a very light irrigation spray to keep the seeds from falling out of their pots during watering events.

Based on the results and observations made throughout this trial, we conclude that both large plug trays and D16Hs can be suitable for propagating and outplanting *C. occidentale* seedlings. Overall, fall planting was much more successful than spring planting, leading us to conclude that leaving the plants in the containers for a longer period of time does not necessarily result in better establishment.

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AUTHORS: Deedee Soto and Jessa Kay Cruz. **EDITORS:** Raven Larcom, Matthew Shepherd, and Sara Morris. **DESIGNERS:** Raven Larcom and Sara Morris. Special thanks to the USDA-NRCS Lockeford Plant Materials Center, Heritage Growers, and Escondido Nursery for their participation in these trials. This material is based upon work supported by a California Wildlife Conservation Board grant under agreement number WC-2348CR. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the California Wildlife Conservation Board.

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