***Holocarpha macradenia* (Santa Cruz Tarplant) at the Watsonville Airport**
Population Trends and Management Actions
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Background. The Watsonville Municipal Airport, in the City of Watsonville, has existed since 1942 and covers approximately 330 acres. The site was graded as part of Airport construction.

The abundance and distribution of Santa Cruz tarplant at the Airport site prior to grading and construction are not known. The population was first documented in 1993 but had been known to exist for many years. Subsequent censuses were performed in 1994, 1998, 1999, 2000, and 2001. The Airport site presently supports an exceptionally high abundance and extensive distribution of Santa Cruz tarplant, likely resulting at least in part from long-term, ongoing Airport management practices (mowing/grazing), as well as the relative compatibility of the Airport use itself, which requires large tracts of open space and allows minimal disturbance. Tarplant grows between the runways and in adjacent open grasslands, along with Coastal Terrace Prairie.

Population Trends. The 1993 field survey by R. Morgan included visual estimations of plant abundance and mapping of the tarplant, with a total estimate of approximately 459,000 plants occupying 36.05 acres patchily distributed over the majority of the site.

Field observations were made in 1994 by Denise Duffy & Assoc. to provide a qualitative comparison with the 1993 census. The distribution of tarplant on the site was found to be equal to 1993, although the overall density was lower, at approximately 250,000 to 350,000 plants.

In July and August of 1998, botanists with John Gilchrist and Associates (JGA) censused the site using counts of selected areas, extrapolations of totals for selected areas based on quadrat sampling, and visual estimations. The 1998 tarplant population was extremely abundant and extensively distributed, likely a result of heavy rainfall of the 1997-98 El Niño winter. There were just under 28 million tarplant individuals occupying 44.11 acres.

The 1999 survey was conducted by JGA botanists in July and August using methods similar to those used in the 1998 survey. The number of tarplant individuals totaled approximately 8,209,000, distributed on 28.95 acres. Rainfall during this year was roughly half that of the previous (El Niño) year.

As in past years, JGA botanists performed the 2000 tarplant census in July and August. Methods were similar to those used in 1999. Tarplant individuals numbered approximately 4,050,000 and acreage totaled 42.70. Rainfall was similar to that of 1999.

The 2001 survey was performed in July and August by JGA botanists using methods similar to past years. A total of 2,491,000 individuals were estimated to occur at the Airport site. Acreage data have not been calculated but qualitative comparison of field data suggests that the tarplant distribution was similar to 2000. Rainfall was lower than 1999 and 2000.

The six tarplant surveys to date (1993, 1994, 1998, 1999, 2000, 2001) suggest that the Airport population is healthy in spite of decreasing abundance. As an annual species, its reduced abundance since 1998 likely reflects a response to reduced rainfall years after the El Niño, but continued monitoring through years of increased rainfall is needed.

Management and Relocation Activities. The Watsonville Airport has historically performed maintenance mowing and/or cattle grazing on its grasslands on a year-round basis in order to maintain visual clearance for Airport safety and reduce risk of fire. In 1993, after the presence of Santa Cruz tarplant was brought to its attention, the Airport modified its mowing regime to avoid

impacts to the tarplant. Mower height was adjusted to avoid damage to the tarplant during the growing season, spring/summer mowings were timed to discourage competition from annual grasses, and fall mowings were delayed until after seed set.

In the past, selected areas have also been occasionally disced, however, discing during the growing season was observed to be detrimental to established tarplant colonies and it has now been banned except for possible use in unoccupied areas as part of soil preparation for mitigation efforts.

In fall 1995, Watsonville Airport staff independently began a program specifically to establish Santa Cruz tarplant in areas of the Airport where it did not occur. The program was not scientifically designed or documented. It included harvesting of tarplant seed from selected Airport areas and distribution of the seed on other selected sites, as well as informal experimentation with transplanting live plants, different ways of harvesting and storing seed, and site preparation methods. No formal monitoring was performed by Airport staff but observations of success and failure were made.

The seeding attempts resulted in persistent tarplant colonies in the primary seeded area. Seed was collected in late fall by harvesting the mature seed heads. The tarplant seed heads are very sticky and retain their seed until they are very dry, so collecting mature seed heads is an effective way to collect seed. Mowing was preferred in that it was efficient while also allowing seed to remain in harvested areas, as some heads would break apart and scatter during the mowing/raking process. Spreading the collected seed heads and seed on receiver sites was found to be easier if the material was allowed to dry for several weeks in paper bags to reduce clumping due to stickiness. Site preparation by discing was tried, with mixed success. In 2001, approximately 24,000 plants were found growing on just over an acre.

Transplanting of 30 flowering tarplant individuals was attempted in August 1996. After some initial site preparation, the transplants were planted in a small area. They were watered but within two weeks all relocated plants had died. It is doubtful that viable seed was produced from these plants. This trial attempt at transplanting was not repeated due to the apparent failure of the initial attempt, the amount of effort involved, and the relative ease of seeding.

Relocation efforts were discontinued after 1998 pending implementation of the Mitigation Plan. Only the ongoing Airport mowing regime and the population censuses previously described have been performed since that time.

The Airport also experienced two fire events, with negative or no effect on tarplant. The first occurred on October 26, 1996 when a wildfire burned approximately two acres with abundant tarplant. The fire burned very hot and all vegetation was virtually destroyed, leaving the field bare and black. Tarplant has since been found in the burned area of TE-C but it is patchy. The second fire took place in June 1997, when a small square area was intentionally burned for fire control practice. No tarplant had been observed in this area previously but an unknown number of tarplant seedheads were spread on the soil surface after the fire; no tarplant has been observed there since.

Proposed Actions and Mitigation. An Airport Master Plan for improvements over the next 20 years, an associated EIR, and a Tarplant Mitigation Plan are currently in preparation. Permanent easement areas are proposed to protect sensitive species and natural communities. Loss due to development will be mitigated through 1:1 replacement on site using baseline values indexed to reference sites. Plant materials to be used for mitigation will be collected on the project site from areas already released or designated for development. Different site preparation strategies will be tried. The proposed Airport improvements and the associated mitigation efforts will be scheduled in phases so as to avoid or minimize impacts to the sensitive biological resources and to allow time to effectively evaluate the proposed mitigation methods. Both Deb Hillyard of the CDFG and Connie

Rutherford of the USFWS have provided valuable guidance and feedback in development of the Mitigation Plan.

Questions. Issues of concern for the Airport population center on the following broad questions:

1) What has been found to be the most effective technique(s) for establishing tarplant in unoccupied areas?

2) What ongoing management practices are most conducive to long-term viability and enhancement of tarplant populations?

3) What is known about Santa Cruz tarplant demographics, including both natural and experimental populations?