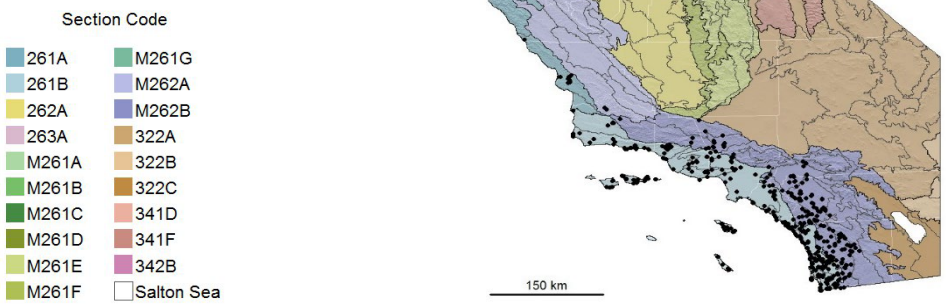
SPECIES	*Deinandra fasciculata* (DC) Greene
NRCS CODE: DEFA2  juvenile plant (all photos by A. Montalvo)	**Tribe: Helenieae** **Family: Asteraceae** **Order: Asterales** **Subclass: Asteridae** **Class: Magnoliopsida**   
Subspecific taxa	None currently recognized.
Synonyms	*Hemizonia fasciculata* (D.C.) Torrey & A. Gray; *Hartmannia fasciculata* DC, *H. glomerata* Nutt., *Hemizonia ramosissima* Benth., *H. fasciculata* var. *ramosissima* Gray (Hickman 1993, JepsonOnline 2010, USDA PLANTS 2010)
Common name	Fascicled tarweed, slender tarweed, clustered tarweed
Taxonomic relationships	*D. fasciculata* is most closely related to other species of *Deinandra* that were formally considered a part of the genus *Hemizonia,* section *Deinandra* and to species of *Centromadia,* formerly known as *Hemizonia* , section Centromadia.
Related taxa in region	Other species placed in the genus *Deinandra* which are native to southern CA include: *D. paniculata* (A. Gray) Davidson & Moxley, *D. conjugens* (Keck) B. G. Baldwin, *D. floribunda* (A. Gray) Davidson & Moxley, *D. kelloggii.* (E. Greene) E. Greene (Rebman & Simpson 2006), and *D. mohavensis* (D.D. Keck) B.G. Baldwin (Roberts et al. 2004). Related species of *Hemizonia* recently shifted to *Centromadia* include: *H. pungens* (Hook. & Arn.) Torrey & A. Gray ssp. *pungens,* ssp. *laevis* Keck, *H. p.* ssp. *septentrionalis* Keck, *H. p.* ssp. *congdonii* , and *H. p.* ssp. *australis* (DiTomaso & Healy 2007); *Hemizonia fitchii* A. Gray, *H. parryi* Greene ssp. *parryi* and *H. parryi* ssp. *rudis* Keck (DiTomaso & Healy 2007).
Taxonomic issues	Baldwin (1999) revised the taxonomy of the tarweeds and elevated the species in *Hemizonia* section *Centromadia* to genus *Centromadia,* and species of the sections *Zamora* and *Deinandra* to the genus *Deinandra* , inlcuding *D. fasciculata* . There is not complete concensus for placement within the genus *Deinandra* vs. *Hemizonia.* USDA PLANTS (2010) uses *Hemizonia;* however, many other recent floras, checklists and databases recognize *Deinandra fasciculata,* including Roberts et al. (2004), Rebman & Simpson (2006), Clarke et al. (2007), FNA (2009), and JepsonOnline 2nd Ed (2010).
Other	The tarweeds (formally in the tribe Madiinae) produce pungent exudates on leaves and stems which have, in part, earned these plants their common names of "tarweed" or "tarplant." Terpenes (Boersig & Norris 1988) in the exudate give the plants their distinctive smell. It has been suggested that the exudate protects these summer-growing plants from desiccation, predation (likely due in part to flavinoids, which can be toxic to animals), and possibly also from ultraviolet radiation (flavinoid compounds in the exudate absorb ultraviolet radiation) (Boersig & Norris 1988). Seed palettes for restoration should be balanced carefully so that the plants do not become too dense and restrict growth of other desirable species.
	  

GENERAL	
Map (map updated) Legend has Ecological Sections; black lines are subsections. (Goudey & Smith 1994; Cleland et al. 2007)	Map includes validated herbarium records (CCH 2016) as well as occurrence data from CalFlora (2016) and field surveys (Riordan et al. 2018). 
Geographic range	CA and northern Baja California (Munz 1974, Hickman 1993)
Distribution in California; ecological region and subregion	Common, primarily in southwestern CA. Ranges from Monterey south through Central and South Coastal Ranges, SW Peninsular, and Transverse Ranges and south to central Baja CA (Hickman 1993). Ecological Section/subsection: Goudey & Smith 1994, Cleland et al. 2007): Central California Coast (261A), Southern California Coast (261B), Central California Coast Ranges (M262A), and Southern California Mountains and Valleys (M262B).
Life history, life form	Annual herb, rosette forming.
Distinguishing traits	The entire plant is sparsely stiff-haired to more or less smooth and, like other tarweeds, has a tar-like odor and displays its yellow flowers in mid-late summer. The three to many heads clustered near the ends of secondary branches, each having 5 yellow ray flowers (usually three teeth at the end of the limb) and 6 yellow disk flowers (generally all male), help to distinguish this species from other tarweeds. Plants are erect, 0.1 to 1 m high, branching first near the middle of the main stem, with branches sharply rising and generally having few secondary branches. Plants initially grow as a rosette, with leaves 3-15 cm long, narrow, tooth-edged or lobed, and bristle-haired, from which the plant bolts. Rosette leaves are usually dried up by the time the plant flowers. Upper, stem leaves are alternate, simple and small. Most seeds are produced from ray flowers.
Root system, rhizomes, stolons, etc.	Taproot (Clarke et al. 2007).
Rooting depth	Deep taproots form in this and three other related grassland species (Gordon & Rice 1993).
HABITAT	
Plant association groups	Occurs as a dominant or co-dominant plant in the herbaceous layer of grasslands, forblands, openings of coastal sage scrub and oak woodland with other species such as *Amsinckia mensiesii, Atriplex argentea, Cressa truxillensis, Lasthenia gracilis, Corethrogyne filaginifolia,* and various non-native weedy species, but also in an alliance with the rare *Hordium depressium* and *Atriplex coronata* var. *notatior* (Sawyer et al. 2009).
Habitat affinity and breadth of habitat	Weedy native plant of coastal plains, foothills, alkali flats and valleys (Tanowitz 1985, Sawyer et al. 2009). Common in dry grasslands, shrublands, and edges of vernal pools on sandy to clay loams (Tanowitz 1985); grows well on disturbed/compacted sites as well as undisturbed sites.
Elevation Range	Below 900 m (Hickman 1993).
Soil: texture, chemicals, depth	Populations occur on variety of soils in western Riverside Co, but primarily on fine sandy to clay loams derived from weathered basalt, latite-porphyry, and gabbro (A. Montalvo, pers. obs.). Plants may also occur on alkaline soils (Sawyer et al. 2009). Roberts et al. (2004) say locally dense stands occur on fine-grained and clay soils in western Riverside Co; Roberts (2008) says plants occur on clay soils in Orange Co.
Drought tolerance	High. Plants are able to grow and complete their life cycle during the hot summer dry season.
Precipitation	Plants occur in areas with average annual precipitation of about 10 in to 25 in. Plants can form extensive dense stands in areas with only 10 in rainfall in western Riverside Co.

Flooding or high water tolerance	Broad moisture and soil drainage tolerances; plants sometimes occur at the edges of vernal pools and may be tolerant of standing water due to poor drainage (Bauder 2000).
Wetland indicator status for California	None.
Shade tolerance	Prefers full sun (USDA PLANTS 2010, JepsonOnline 2010)

GROWTH AND REPRODUCTION

Seedling emergence relevant to general ecology	Seedlings emerge early to late in the rainy season. In an open air greenhouse study using wild-collected soil from vernal pools, germination was observed in February and March and twice that amount in April (Bliss & Zedler 1998). Seedlings have been observed in January after ample rainfall in western Riverside County as well as later in the rainy season (A. Montalvo, pers. obs.)
Growth pattern (phenology)	Seedlings grow primarily into rosettes during the winter and spring. As with many tarweeds, most bolting and growth occurs in the late spring and summer. Flowering occurs May-Sept (Munz & Keck 1968), and seeds typically mature in August (Stevens & O'Brien 2006).
Vegetative propagation	None.
Regeneration after fire or other disturbance	Plants establish from seeds. This may be one of the species that Native Americans managed for seed production by burning areas in September and October after seed gathering and seed dispersal (Stevens & O'Brien 2006).
Pollination	Bees; *Exomalopsis nitens* nests in *H. fasciculata* habitat (Rozen & Snelling 1986). Honey bees (*Apis melllifera*) and bublebees (*Bombus* workers) visit flowers (A. Montalvo, pers. Obs.).
Seed dispersal	Seeds are primarily gravity dispersed. The mature achenes tend to fall from the seed heads (A. Montalvo, pers. obs.) but may also be animal dispersed (Sawyer et al. 2009).
Breeding system, mating system	Self-incompatible (Tanowitz 1977, 1985); obligate outcrosser.
Hybridization potential	Yes, hybridizations within and between species of *Hemizonia, Deinandra,* and *Centromadia* occur. Within these related genera (*Hemizonia* in the broad sense) plants tend to be more or less freely interbreeding (Venkatesh 1958, Clausen 1962). *D. fasciculata* interbreeds freely with other species of *Deinandra,* but hybrids tend to be highly sterile (Clausen 1962). Robust but sterile hybrids are produced from artificial crosses with the two perennials, *H. clementina* and *H. minthornii* (now = *Deinandra*) (Tanowitz 1985). Natural hybrids with *H. pungens* (n=9, now = *Centromadia pungens*) are reported to form readily and are fertile enough to produce segregating traits in the F2 generation (Clausen 1962). Crosses with *H. fitchii* (n=13, now = *C. fitchii*), section Centromadia, may also be common (Clausen 1962). However, in the field, there is no evidence of blurred species lines through introgression (Tanowitz 1977), likely due to the low fertility of hybrids.
Inbreeding and outbreeding effects	Outcrossing with other species results in varying, but generally low levels of fertility in the hybrid offspring, making isolation distances between seed-increase plots a necessity. Hybrids with *Centromadia* suffer a high degree of sterility and meiotic irregularities due to different haploid chromosome numbers of parental species.

BIOLOGICAL INTERACTIONS

Competitiveness	Competes with other species (e.g., oaks) for soil moisture. Non-native annuals, especially in fertilized areas out-compete this species (Allen et al. 1998).
Herbivory, seed predation, disease	Included in diet of pocket gophers in early spring, right after germination (9 and 12% of upland and vernal pool diets); not consumed late spring through early autumn (Hunt 1992). Seeds are eaten by birds (Stevens & O'Brien 2006). Seeds may be dispersed by a variety of the seed-eating birds and small mammals that utilize seeds for food.
Palatability, attractiveness to animals; response to	Flavinoids and terpenes may deter grazers (Boersig & Norris 1988).
Mycorrhizal?	No studies found.

ECOLOGICAL GENETICS

Ploidy	Diploid; 2n=24 (Tanowitz 1985, Hickman 1993).

Plasticity	Plants grow larger and produce more flowers in wet years than in dry years (A. Montalvo, pers. obs.).
Geographic variation (morphological and physiological traits)	Highly variable in size, habit, and branching, across its range (Tanowitz 1982, 1985). Tanowitz (1982) considered this to be the most morphologically, ecologically, and geographically variable species in its section of the genus *Hemizonia* . This taxon was once treated as two species, *H. fasciculata* and *H. ramosissima* , with *H. ramossisima* apparently able to occupy more coastal and higher elevation sites than *H. fasciculata* (Munz & Keck 1968).
Genetic variation and population structure	No studies found.
Correlates of genetic variation	No studies found.
Phenotypic or genotypic variation in interactions with other organisms	No studies found.
Local adaptation	No studies found.
Translocation risks	There appears to be geographic variation in this species, but studies about the genetic basis of observed morphological differences among populations are lacking, and we did not uncover any tests of populations in multiple locations. This obligate outcrossing species is common, weedy, and occurs in a variety of soils and plant communities, which suggests it has relatively broad tolerances. Ploidy does not vary. Seeds have low dispersability but pollen movement is likely fluid. Together, these traits suggest that translocation distances can be relatively unrestrained within regional ecological zones and elevational bands with similar habitats. However, this species is a good competitor, is insect pollinated, and hybridizes freely with related taxa. The demonstrated low fertility of hybrids suggests that populations of more narrowly distributed species, such as *D. paniculata* , would be at risk from a combination of hybridization and competitive displacement. Avoid substituting this species for other closely related species of *Deinandra* in restoration projects, and avoid using it as a component of seed mixtures when restoring habitat for rare species of *Centromadia* .
SEEDS	
General	Plants are prolific seeders (Stevens & O'Brien 2006). Average purity of 10% and germination of 25% (Stover Seed Company 2009). Average germination for five seed lots in the first year was 66.6% (Jody Miller, S&S Seeds, pers. com.).
Seed longevity	Seeds store well at ambient coastal conditions for three full years and possibly 4 years with little loss in germination. Annual seed test data from S&S Seeds under ambient warehouse storage in coastal, Carpinteria, CA: mean % germination: five seed lots, year 1 and 2 = 66.6% and 63.8%, respectively; three of the five seed lots, year three = 62.7% germ; two of the three seed lots, yr four = 68%; two of the three seed lots, yr five = 45%, one seed lot, year 6 = 1% (this lot had 77, 75, 66, 64, 22, and 1 % germ from year 1 to year 6, respectively. Longevity is expected to be longer under cold, dry storage.
Seed dormancy	Seeds build up in the soil seed bank and are very likely to have a dormancy mechanism.
Seed maturation	Seeds ripen in summer. The heads turn brown at maturity and seeds fall easily from the heads in August in Riverside Co. (A. Montalvo, pers. obs.).
Seed collecting	Seeds can be hand stripped from plants into open bags or containers.
Seed processing	The seed heads can be rubbed through a #18 screen and winnowed to separate seeds from debris.
Seed storage	Cool, dry storage.
Seed germination	No pre-treatment needed; % germination =40% (Walters et al. 1977).
Seeds/lb	1,600,000 (Stover Seed Company 2009). 900,000/ pure live seed lb (S&S Seeds 2009).
Planting	Seeds can be planted at the soil surface or 1/8" to 1/4" deep in a well-drained soil (Stevens & O'Brien 2006).
Seed increase activities or potential?	This species should be easy to grow.

USES	
Revegetation and erosion control	Sometimes used in revegetation projects in southern California.
Habitat restoration	Incorporated as early successional species for restoration plantings. Seedlings emerge and form rosettes early in the cool rainy season, providing early erosion control and competition for early emerging non-native grasses (M. Griswold, pers. com.). Seeding needs to be at low enough density to avoid hindering establishment of later emerging native shrubs.
Horticulture or agriculture	Used in gardens. It is best to direct plant the seeds or to transplant young seedlings to avoid damaging the long tap root.
Wildlife value	A variety of birds and small mammals eat the seeds and rabbits, ground squirrels, and chipmunks eat the plants (Stevens & O'Brien 2006).
Plant material releases by NRCS and cooperators	No information available.
Ethnobotanical	The Cahuilla boiled and ate plants (Bye 1985). Bean & Saubel (1972) note such use as a famine food. The Chumash and other tribes harvested the seeds and often ground them into a meal (Timbrook 2007). The seeds or meal were generally eaten raw but sometimes seeds were toasted. Stevens & O'Brien (2006) describe various uses.
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CITATION	Montalvo, A. M., L. H. Goode, and J. L. Beyers. 2010. Plant Profile for *Deinandra fasciculata.* Native Plant Recommendations for Southern California Ecoregions. Riverside-Corona Resource Conservation District and U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Riverside, CA. Online: https://www.rcrcd.org/plant-profiles.
LINKS TO REVIEWED DATABASES & PLANT PROFILES **(links updated 3/23/2020)**	
Fire Effects Information System (FEIS)	No matches: https://www.feis-crs.org/feis/
Jepson Flora, Interchange (JepsonOnline)	https://ucjeps.berkeley.edu/cgi-bin/get_cpn.pl?77592
Jepson Flora, Herbarium, 2nd Edition (JepsonOnline 2nd Ed)	https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=77592
USDA PLANTS	https://plants.usda.gov/core/profile?symbol=HEFA
Native Seed Network	https://nativeseednetwork.org/
GRIN	https://npgsweb.ars-grin.gov/gringlobal/search.aspx?
Flora of North America (FNA) (online version)	http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250066466
Calflora	https://www.calflora.org//
Rancho Santa Ana Botanic Garden Seed Program, seed photos	http://www.hazmac.biz/rsabghome.html
Images	

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