

SPECIES		<i>Amsinckia menziesii</i> (Lehm.) A. Nelson & J.F. Macbr. var. <i>intermedia</i> (Fischer & C. Meyer) Ganders	
NRCS CODE: AMMEI2	 seedling, A. Montalvo Dec. 2009	Family: Boraginaceae Order: Lamiales Subclass: Asteridae Class: Magnoliopsida	 <i>A. m. var. menziesii</i>  A. Montalvo 2009, <i>A. m. var. intermedia</i>   M. Bedalian 2009
Subspecific taxa		This profile is for a subspecific taxon.	
Synonyms		listed in USDA PLANTS (2010): <i>A. arizonica</i> Suksd., <i>A. demissa</i> Suksd., <i>A. echinata</i> A. Gray, <i>A. intactilis</i> J.F. Macbr., <i>A. intermedia</i> Fisch & C.A. Mey. var. <i>echinata</i> (A. Gray) Wiggins, <i>A. microphylla</i> Suksd., <i>A. nana</i> Suksd., <i>A. rigida</i> Suksd. Additional synonyms listed in DiTomaso and Healy (2007): <i>A. attenuata</i> Eastw., <i>A. californica</i> Suksd., <i>A. campestris</i> Greene, <i>A. hansenii</i> Brand., A., <i>A. intermedia</i> Fisch & C.A. Mey., <i>A. irritans</i> Brand., <i>A. longituba</i> Brand., <i>A. obovallata</i> Greene, <i>A. valens</i> Macbr.	
Common name		common fiddleneck; coast fiddleneck, coast buckthorn, fingerweed, fireweed fiddleneck, rancher's fireweed, tarweed, yellow burweed, yellow forget-me-not, yellow tarweed, zaccoto gordo, (DiTomaso & Healy 2007)	
Taxonomic relationships		<i>A. menziesii</i> (Lehm.) Nels. & Macbr. var. <i>menziesii</i> (Menzies' fiddleneck) (DiTomaso & Healy 2007). Homostylous species such as <i>A. menziesii</i> , which produce only one flower morph, have apparently evolved several times from heterostylous ancestors (Ray & Chisaki 1957c, Schoen et al. 1997). Based on molecular data, Shoen et al. (1997), placed <i>A. lunaris</i> as the closest heterostylous relative of <i>A. m. var. intermedia</i> .	
Related taxa in region		<i>A. menziesii</i> (Lehm.) Nels. & Macbr. var. <i>menziesii</i> (Menzies' fiddleneck) occurs below 400 m in CA and var. <i>intermedia</i> can occur up to 1700 m (DiTomaso & Healy 2007). These two varieties sometimes occur in the same locations in California, but they can be distinguished by flower size and color. <i>A. m. var. menziesii</i> differs from <i>A. m. var. intermedia</i> in having smaller, pale yellow flowers that are 4-7 mm long and 2-3 mm wide at the top compared to more or less orange flowers, 7-11 mm long and 4-10 mm wide at the top in AMMEI2 (Hickman 1993). <i>A. m. var. menziesii</i> also lacks the reddish marks inside the corolla (see AMMEI2 description below).	
Taxonomic issues		There is an editorial note on JepsonOnline (23 April 2010) that the 2nd edition may need to use the name <i>A. intermedia</i> because the name <i>A. menziesii</i> var. <i>intermedia</i> may not have been validly published. However, the new treatment states that the taxon would be best treated as a variety of <i>A. menziesii</i> .	
Other		This common, ruderal plant is highly variable in morphology over its extensive range. There are over 100 named and indistinguishable variants of <i>A. menziesii</i> (Hickman 1993). The variation among populations is likely due to its habit of selfing (self-pollination) which creates homogeneity within populations and notable difference among populations (e.g., Stebbins 1965). The species is recognized as a weed in agricultural fields in California and has federal weed status in Australia (DiTomaso & Healy 2007).	
GENERAL			
Map	Data provided by the participants of the Consortium of California Herbaria represent 736 records with coordinate data out of 1193 total records retrieved for AMMEI2; data accessed 3/6/10. See Berkeley Mapper: http://ucjeps.berkeley.edu/consortium		

Geographic range	Widespread native of North America from Alaska and western Canadian provenances, south to California, Arizona, and Mexico, and east to Idaho, Utah, and Arizona. Also occurs in Hawaii, Texas and some central and northeastern states (Hickman 1993, DiTomaso & Healy 2007, JepsonOnline 2010) where it may be naturalizing (Calflora 2009: http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=327).
Distribution in California; Ecological section and subsection	Widespread and common throughout CA below 1,700 m in many ecological regions (Munz & Keck 1968, Hickman 1993, DiTomaso & Healy 2007). Primarily in the Inner North Coast Ranges, Central Western CA., Southwestern CA, Sierra Nevada Foothills, and the Great Valley.
Life history, life form	Winter annual herb (Munz & Keck 1968, DiTomaso & Healy 2007)
Distinguishing traits	Erect, usually < 0.6 m tall, fast growing annual with stiff, bristly hairs on stems, leaves, and calyx. The sessile, alternate leaves are first produced in a rosette. They become entire and separated along the stem at maturity once the central stem elongates and produces the inflorescence. Inflorescences bear yellow to orange tubular flowers (often with red-orange markings on the inside of the corolla) in one-sided coiled cymes, reminiscent of the end of a fiddle, hence the common name "fiddleneck". Unlike several other species of <i>Amsinckia</i> , the flowers have five calyx lobes, radial symmetry, and are homostylous, that is, all flowers in a population have similar style lengths (Hickman 1993). Each flower produces up to four small nutlets.
Root system, rhizomes, stolons, etc.	Taproot (DiTomaso & Healy 2007).
Rooting depth	Taproot generally less than 0.5 m deep.
HABITAT	
Plant association groups	Common understory component of blue oak-coast live oak woodlands in northern California (Vreeland & Tietje 2004). Common in openings of many vegetation types from coast to desert, including grassland, chaparral, coastal sage scrub, creosote bush scrub, yellow pine forest (Calflora).
Habitat affinity and breadth of habitat	Abundant in open, disturbed, dry habitats, within grasslands, openings in shrublands, agricultural areas, roadsides, pastures, and vineyards (Hickman 1993, DiTomaso & Healy 2007). Cox and Allen (2008) found many more seedlings per unit area in grassland plots than in shrubland plots.
Elevation range	Below 1700m (Hickman 1993)
Soil: texture, chemicals, depth	<i>A. m.</i> var. <i>intermedia</i> tends to occur in shallower and drier soils of hillsides than <i>A. m.</i> var. <i>menziesii</i> (DiTomaso & Healy 2007). The latter variety has more of an affinity for old fields and crops. Plants can be common in soil types and textures derived from a variety of parent materials, such as granite and gabbro (A. Montalvo, pers. obs.).
Drought tolerance	Plants are drought tolerant, but are drought avoiders in that they finish their life cycle and mature seeds before summer drought. In low rainfall years and in porous soils, plants are smaller and produce fewer flowers and seeds than in high rainfall years and in finer textured soils (A. Montalvo, pers. obs.).
Precipitation	Tolerant of a wide range in precipitation; occurs in areas with less than 10 in. to more than 25 in normal rainfall.
Flooding or high water tolerance	
Wetland indicator status for California	None.
Shade tolerance	Plants require full sun (Hickman 1993).
Other (e.g., fuels)	Brooks (1999) found that the standing dried up stems of the related weedy forb, <i>A. tessellata</i> in the Mojave Desert were intermediate in ability (rated similarly to <i>Hirshfeldia incana</i> and <i>Brassica tournefortii</i>) to carry fire between scattered shrubs and causing ignition. Weedy <i>Bromus madritensis</i> carried fire more easily than these large forbs and small annual forbs.
GROWTH AND REPRODUCTION	
Seedling emergence relevant to general ecology	Seedlings emerge from fall through early spring depending on the pattern of rainfall (DiTomaso & Healy 2007, A. Montalvo, pers. obs.).
Growth pattern (phenology)	In southern California, inflorescences begin to bolt from the rosettes in late January-March; open flowers can be found as early as late February on east-facing slopes; most flowering occurs March-April, but can extend into June at higher latitudes and elevations, or cooler otherwise more moist conditions; most fruits are mature May- June. (A. Montalvo, pers obs., Hickman 1993). Connor (1965) found that growth and flower production were controlled by changes in day length.
Vegetative propagation	None.

Regeneration after fire or other disturbance	Plants can be abundant after mechanical soil disturbance (DiTomaso & Healy 2007). They come up in dry, disturbed, open sites, including highly disturbed agricultural lands, roadsides and frequently disked empty lots in urban areas. Cox and Allen (2008) found more than twice as many seedlings in burned compared to unburned experimental plots in western Riverside Co., CA.
Pollination	The genus <i>Amsinckia</i> is visited especially by Bombyliid flies and bees in the genera <i>Anthophora</i> , <i>Osmia</i> <i>Bombus</i> , and <i>Synhalonia</i> ; butterflies also visit flowers (Moldenke 1976).
Seed dispersal	AMME is used as an example of a species that has seeds without adaptations to long distance dispersal (van Rheede et al. 2007). Seeds are relatively heavy for their size and fall to the ground when detached from the plant. They may be secondarily dispersed by animals, human clothing, and agricultural equipment (DiTomaso & Healy 2007).
Breeding system, mating system	Self-compatible (Ray and Chisaki 1957a). Unlike some other <i>Amsinckia</i> , this species is homostylous rather than heterostylous. Moldenke (1976), and DiTomaso & Healy (2007) say plants self-pollinate. Johnson and Schoen (1996) found much variation in outcrossing rates among species of <i>Amsinckia</i> and sometimes among populations within species. <i>A. menziesii</i> has high variability in flower size within var. <i>intermedia</i> , which could influence visitation by bees and potentially result in variable outcrossing rates (A. Montalvo, pers. obs.).
Hybridization potential	There is no evidence of hybridization among the two varieties (DiTomaso & Healy 2007) but they are known to hybridize with <i>A. lycopsoides</i> (Hickman 1993). Plants are highly selfing, so hybridization potential is likely low, but Emparan (1971) reported natural hybridization and hybrid swarms.
Inbreeding and outbreeding effects	Experimental hybridizations between strains with different numbers of chromosomes resulted in fertile progeny (Ray & Chisaki 1957c). Johnston and Schoen (1996) studied the effects of self-pollination and inbreeding in four heterostylous and four homostylous species of <i>Amsinckia</i> . Inbreeding depression was not significant for seedling emergence or survival to flowering, but it was significant for number of flowers produced and for the number of selfed seeds produced. Inbreeding depression was lower for the four highly selfing populations than for the five moderately selfing populations. Given that <i>A. menziesii</i> is homostylous and self pollinated, it is likely that inbreeding depression will also be low in this species.
BIOLOGICAL INTERACTIONS	
Competitiveness	Plants are highly competitive. AMME12 is a serious agricultural weed that can cause decreases in crop yields (Meadly 1968). Plants emerge early in the cool rainy season (autumn-early spring), occupy space, and obtain a competitive advantage (Connor 1965). In restoration of coastal sage scrub, this fast growing, cool season annual can overtake and shade out the slower emerging and slower growing shrubs (A. Montalvo, pers. obs.). Gillespie and Allen (2008) found that AMME12 had a very negative effect on seed production of the rare native annual <i>Erodium macrophyllum</i> . In direct competition, <i>A. grandiflora</i> and <i>A. menziesii</i> var. <i>intermedia</i> showed equal ability to capture resources, as measured by increase in biomass, but <i>A. menziesii</i> var. <i>intermedia</i> produced many more seeds than <i>A. grandiflora</i> (Pantone et al. 1995). In the self-fertilizing <i>A. menziesii</i> var. <i>intermedia</i> , almost all flowers produce the maximum number of seeds (four per flower), so the most important determinant of fitness is the number of inflorescences per plant. This has been shown to be influenced by competition with exotic grasses (Pantone et al. 1989).
Herbivory, seed predation, disease	Plants on north-facing slopes often develop mildew late in the rainy season (A. Montalvo, pers. obs.). The fly <i>Schizomyia macrofila</i> lays eggs in the developing flower buds and forms galls (Clarke et al. 2007). The nematode, <i>Anguina amsinckia</i> , also produces flower and leaf galls on AMME12 and has been considered as a biological control agent (Nagamine & Maggenti 1980).
Palatability, attractiveness to animals; response to grazing	Seeds and herbage toxic to livestock. Alkaloids in fruits can be toxic to horses and cows (DiTomaso & Healy 2007). Plants can cause decreases in the yield of livestock (Meadly 1968). The herbage and seeds contain hepatotoxic alkaloids, which are toxic to livestock when eaten as forage or when seeds contaminate grain (Culvenor and Smith 1966, Fuller and McClintock 1986). Cases of liver damage from eating <i>Amsinckia</i> have been reported in pigs, horses and cattle in California (Culvenor & Smith 1966). Wild burros are known to eat <i>Amsinckia</i> sp. throughout the year (Woodward & Ohmart 1976).
Mycorrhizal? Nitrogen fixing nodules?	Two thirds of species in Boraginaceae are probably mycorrhizal, but less than half had been examined as of 1987 (Harley & Harley 1987).
ECOLOGICAL GENETICS	
Ploidy	2n=30, 34, 38. Chromosome numbers tend to be highly variable, with diploid counts of 2n=30, 34, and 38 (Ray & Chisaki 1957c, Hickman 1993).
Plasticity	Size of plants varies with growing conditions and rainfall. Conner (1965) found a highly significant relationship between plant size and flower number for <i>A. m.</i> var. <i>menziesii</i> (= <i>A. hispida</i>).

Geographic variation (morphological/physiological traits)	Local populations are sometimes very uniform in appearance, while in other locations distinct forms appear to be mixed without intermediates, although intermediate forms may be found in yet other populations (Ray & Chisaki 1957c).
Genetic variation and population structure	Progeny traits seen from crosses made by Ray and Chiaski (1957b), suggest that self-pollination retains particular traits within populations and that most variation is among populations.
Phenotypic or genotypic variation in interactions with other organisms	No information found.
Local adaptation	No information, however, plants have broad tolerances.
Translocation risks	This is a weedy, highly selfing colonizing species that appears to have broad tolerances. Consider if the species can become more aggressive with mixing of many populations or if it is more aggressive in some parts of its range. Risks to populations of the same species following translocation within ecoregions are likely low.
SEEDS	Rancho Santa Ana Botanic Garden Seed Program, seed image: http://www.hazmac.biz/081201/081201AmsinckiaMenziesiiIntermedia.html
General	The 2-3 mm long and somewhat triangular nutlets (single seeded, indehiscent fruits) with obvious attachment scar are covered with tubercles (photograph in DiTomaso & Healy 2007 and link above). Seeds are toxic and can cause liver cirrhosis (McCulloch 1940).
Seed longevity	Seeds store in soil seed banks, so they are expected to have a long shelf life.
Seed dormancy	Seeds may have physiological dormancy (Baskin & Baskin 1998) based on the report of cold stratification improving seed germination in Australian study by Connor (1965).
Seed maturation	Seeds tend to mature in late spring to early summer. The nutlets sometimes stay on the erect, dry plants into the next winter (DiTomaso & Healy 2007).
Seed collecting	Whole inflorescences can be collected into open containers or breathable bags when seeds are mature.
Seed processing	Information on another species, <i>Amsinckia vernicosa</i> var. <i>furcata</i> , suggests rubbing flower material over sieves (#12 and #25) and then using a blower (Oregon Blower unit) at speed 1.75+ (Wall & MacDonald 2009).
Seed storage	No data found. These seeds are expected hold viability under cold dry conditions.
Seed germination	In studies of <i>A. hispida</i> (a synonym of <i>A. menziesii</i> var. <i>menziesii</i>) in Australia, Connor (1965) found optimum temperature for germination was 12-13°C; most seeds overwintered, and germination was increased significantly by cold stratification.
Seeds/lb	230,000 seeds/lb (S&S Seeds 2010, http://www.ssseeds.com/database/db_testvv.php3?uid=28). 310,000 seeds/lb (Stover Seed Company 2010, http://www.stoverseed.com/itemsheet.cfm?ic=AMMENI).
Planting	In experiments, Pantone et al. (1995) scarified seeds with sandpaper and planted them 1 cm deep in December at a density of five seeds/m ² . Plants with mature seeds were harvested in May. Detailed data on seed yield and weight were collected and analyzed, but data were not reported.
Seed increase activities or potential	Plants are so common in disturbed locations that seed farming is not likely needed.
USES	
Revegetation and erosion control	Seeds are sometimes added to seed mixtures used for erosion control and restoration. Recommended for stabilizing soil (Hickman 1993).
Habitat restoration	Seeds are sometimes added to seed mixtures for restoration of shrubland and grassland habitats.
Horticulture or agriculture	Sometimes included in commercial wildflower seed mixes. This may be one of the sources of the species' range extensions.
Wildlife value	Food item for California quail in Eastern WA (Crispens et al. 1960) and pheasant (Einarsen 1945).
Plant material releases by NRCS and cooperators	None.
Ethnobotanical	The hairs on mature or dead plants can be very irritating.
Recommendations	In revegetation projects, seeds should be used at low density in seed mixtures so that plants do not outcompete other desirable plants. Due to toxicity, avoid use in areas frequented by livestock and horses.

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CITATION	Montalvo, A. M., L. K. Goode, and J. L. Beyers. 2010. Plant Profile for <i>Amsinckia menziesii</i> var. <i>intermedia</i> . 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: http://www.rccrd.com/index.php?option=com_content&view=article&id=88&Itemid=190 .
LINKS TO REVIEWED DATABASES & PLANT PROFILES (last accessed September 2010)	
Fire Effects Information System (FEIS)	No matches: http://www.fs.fed.us/database/feis/
Jepson Flora, Herbarium (JepsonOnline)	http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?2030,2031,2037,2038
Jepson Flora, Herbarium 2nd Edition Review (JepsonOnline 2nd Ed.)	http://ucjeps.berkeley.edu/tjm2/review/treatments/boraginaceae_may_6.html#13131
USDA PLANTS	http://plants.usda.gov/java/profile?symbol=AMMEI2
Native Plant Notebook	No matches: http://www.fs.fed.us/r6/uma/native/
Native Plant Network Propagation Protocol Database (NPNPP)	No matches: http://nativeplants.for.uidaho.edu/network/
Native Seed Network	http://www.nativeseednetwork.org/viewtaxon?taxon_code=AMMEI2
GRIN	http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?453243
Calflora	http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=327
Flora of North America (FNA) (online version)	No matches: http://www.efloras.org/flora_page.aspx?flora_id=1
Rancho Santa Ana Botanic Garden Seed Program, seed photos	http://www.hazmac.biz/rsabghome.html

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