SPECIES	*Encelia farinosa* A. Gray ex Torr

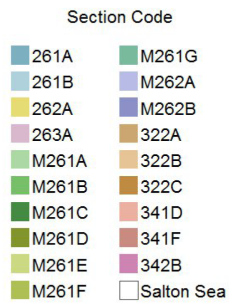
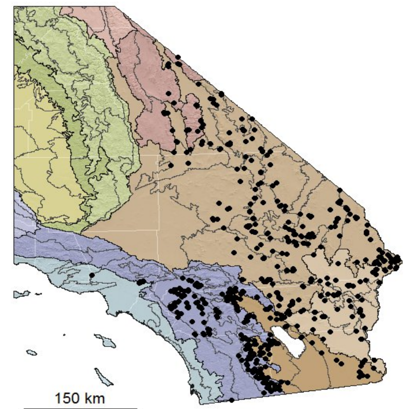
NRCS CODE: ENFA

Tribe: **Heliantheae**
Family: **Asteraceae**
Order: **Asterales**
Subclass: **Asteridae**
Class: **Magnoliopsida**

juvenile plant, 3/3/2010, Riverside Co.

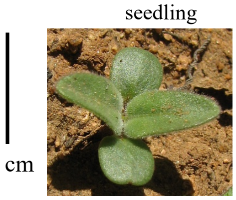
A. Montalvo , 2003-2010, Riverside Co.

Subspecific taxa	None currently accepted (JepsonOnline 2nd Ed. 2010).
Synonyms	*Encelia farinosa* Torry & A. Gray corrected to current authorship (JepsonOnline) ENFAF *Encelia farinosa* A. Gray ex Torr. var. *farinosa* brittlebush ENFAP *Encelia farinosa* A. Gray ex Torr. var. *phenicodonta* (S.F. Blake) I.M. Johnst. brittlebush ENFAR *Encelia farinosa* A. Gray ex Torr. var. *radians* Brandegee ex S.F. Blake
Common name	brittlebush Also: brittle bush, brittle-bush, brittlebush encelia, incienso, incienso brittlebush, common brittlebush, white brittlebush; brown-center brittlebush for what was considered to be variety *phenocodonta* ; incienso is used for taxa in multiple families and desert encelia is also used for other species of *Encelia* (Painter 2009).
Taxonomic relationships	There are seven other species of *Encelia* in North America plus additional species in South America (JepsonOnline 2010). The genus *Encelia* is in the large tribe Heliantheae which also contains the native sunflower, *Helianthus annuus* L. Phylogenetic studies based on DNA show that *Enceliopsis* and *Geraea* are closely related genera and that diversification of species of *Encelia* has been quite recent (Fehlberg & Ranker 2007). Relationships among the various species of *Encelia* confirmed hypotheses by Clark (1998) based on chemical and morphological traits.
Related taxa in region	Four species and spontaneous hybrids of *Encelia* occur in southern California and may overlap with *E. farinosa* in some part of its range (FNA 2010, JepsonOnline 2010): *E. actoni* Elmer (in the southern Sierra Nevada, Tehachapi and Western Transverse Ranges, San Gabriel and San Bernardino Mountains, Mojave and Sonoran Deserts, and Desert Mountains; overlaps with *E. farinosa* in the Peninsular Ranges, base of the San Jacinto Mountains, and deserts; occurs above 800 m, often where winters are colder than withstood by *E. farinosa* and has solitary heads with yellow centers.) *E. californica* Nuttall (Central Coast, South Coast, Western Transverse and Peninsular Ranges; overlaps in the most western portion of the range of *E. farinosa* and in the hills between the Perris Plain and Temescal Canyon in Riverside Co., but has often been planted eastward within *E. farinosa* habitat; distinguished by its smaller, greener leaves and solitary heads with brown-purple centers. Spontaneous hybrids tend to have less pubescent leaves than *E. farinosa* and brown-purple disk flowers.) *E. farinosa* X *E. frutescens* (Mojave and Sonoran Deserts, Desert Mountains, inflorescences in panicles) *E. frutescens* (A. Gray) A. Gray (Mojave and Sonoran Deserts, Desert Mountains; overlaps with *E. farinosa* in desert regions below 800 m, but inflorescences are solitary and heads lack ray flowers). *E. virginensis* A. Nelson (eastern Mojave Desert and Desert Mountains; occurs above 500 m and inflorescences have solitary heads with yellow centers.)
Taxonomic issues	Munz & Keck (1968) recognized two varieties based on work by Blake (1913): *E. f.* var. *radians* Bdg. ex Blake (from southeastern California with glabrate leaves and involucre and with yellow disk flowers), and *E. f.* var. *phenocodonta* (Blake) Jtn. (from the southern Colorado desert with purple-brown disk flowers). Mixed and segregated populations exist, with no obvious reproductive isolation (Kyhos 1971). These have since been combined into a single taxon by Clark (in Hickman 1993, FNA 2010, JepsonOnline 2nd Ed. 2010). However, phylogenetic work with DNA showed *Encelia farinosa* var. *phenicodonta* clustered into a different subclade than *E. f.* var. *farinosa* and *E. f.* var. *radia ns* (Fehlerg & Ranker 2007).
Other	The name brittlebush refers to the plant's weak branches, incienso to its fragrant resin, and desert encelia to its affinity to desert and B9

GENERAL	
Map (map updated 3/2020) 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	Widespread, common. Brittlebush occurs within the inland valleys and foothills of southern California, eastward and southward into arid habitats of the Sonoran and Mojave deserts and into Arizona, northwestern mainland Mexico, Baja California, southern Nevada, and southwestern Utah (Munz & Keck 1968, Hickman 1993, Sandquist & Ehleringer 1997). Plants have been introduced to Hawaii (Tesky 1993).
Distribution in California; Ecological section and subsection	Jepson general areas of CA: primarily of the Mojave Desert, Sonoran Desert, Desert Mountains, and lower elevations of the Peninsular and inner Southcoast Ranges. Ecological Section/subsection (Goudey & Smith 1994; Cleland et al. 2007): especially in Colorado Desert (322CA b, CD), Mojave Desert (322A), Sonoran Desert (322B), Southeastern Great Basin (341Fd-e), Southern California Mountains and Valleys (M262Bi-l, Bp) (Sawyer et al. 2009). Brittlebush has been extending westward to the coast and northward due to roadside and utility corridor revegetation plantings (Koehler & Montalvo 2004). Plants have occasionally been erroneously included in place of *E. californica* in coastal restoration projects from San Diego to Santa Barbara Counties (Montalvo, pers. obs.). Roberts (2008) notes that Orange Co. specimens are from plantings. Sensitivity to cold temperatures helps to limit its distribution.
Life history, life form	Perennial, subshrub (woody at base). Polycarpic, reproducing from 3 to 30 years (Tesky 1993, Sawyer et al. 2009).
Distinguishing traits	Suffrutescent shrubs, 0.3 to 1.5 m tall, with one to several many-branched stems, dense rounded canopies, and alternate whitish to greenish-gray leaves clustered near stem tips. Leaves have woolly, appressed hairs, are simple, 3 to 8 cm long, ovate to rhombic in outline, with wavy margins, and short petioles; leaves have three main veins from the base. Stems contain a clear, yellowish resin that has a pungent odor when stems are broken. Heads are arranged in loose, naked panicles and have both disk and ray flowers subtended by green, glandular bracts that embrace the flat, obovate, 4.5 mm long achenes with long hairs that point to the broad end. Involucre bracts are imbricate in three to four series. Disk florets are yellow or rich purple-brown and are surrounded by 8 to 12 mm long yellow ray florets (Munz & Keck 1968, Hickman 1993, Koehler & Montalvo 2004).
Root system, rhizomes, stolons, etc.	Taproot. The stout taproot can branch and produce lateral roots (Cannon 1911).  taproot of juvenile shrub, A. Montalvo , 2010, Riverside Co.
Rooting depth	Roots are generally shallow, but the taproot and branches can extend to about 1 m (Cannon 1911).
HABITAT	
Plant association groups	Occurs as a component of many plant alliances within a variety of shrublands, including the drier parts of coastal sage scrub (such as in western Riverside and San Bernardino Counties), desert scrub, alluvial scrub, pinyon-juniper scrub, grasslands, and oak woodlands (Tesky 1993). Occurs as a dominant in the *Encelia farinosa* shrubland alliance; depending on location, it may be codominant with *Agave deserti, Ambrosia dumosa, Artemisia californica, Eriodictyon crassifolium, Eriogonum fasciculatum, Salvia apiana,* and several other shrubs; also occurs in the *Larrea tridentata-Encelia farinosa* alliance in the Colorado Desert (Sawyer et al. 2009)

Habitat affinity and breadth of habitat	A colonizing plant of semiarid and desert habitats that is common on dry, rocky, or gravelly slopes and mesas (Tesky 1993). In sage scrub, brittlebush occurs on flats and slopes; in the desert it occurs on rocky slopes, flats, well-drained alluvial fans, and in washes (Munz & Keck 1968, Hickman 1993, Sawyer et al. 2009). In sage scrub plants occur most frequently on slopes with a south-facing aspect. Plants are not tolerant of freezing or frost; stems and leaves are damaged in freezes or by repeated frost (Tesky 1993).
Elevation range	Below 1500 m. In coastal sage scrub, plants tend to be absent below 500 ft. (154 m) and occur most often above 1000 ft. (309 m) (Kirkpatrick & Hutchinson 1980).
Soil: texture, chemicals, depth	Primarily on well drained weathered sandstone, granite, diorite, volcanic, and alluvial deposits (Munz & Keck 1968, Hickman 1993, Tesky 1993). In coastal sage scrub, plants tend to favor granitic substrates (Kirkpatrick & Hutchinson 1980). Performs poorly on clay soils (Tesky 1993).
Drought tolerance	High. There are many studies on the morphological and physiological traits that allow this plant to grow in dry environments (see Ecological Genetics section below). Plants are drought adapted and respond quickly to water addition through rapid CO_2 uptake, leaf production, and stem growth (Nobel et al. 1998).
Precipitation	Generally in areas with 10 inches or less annual precipitation, in desert and lower rainfall portions of mediterranean-climate environments. Across its range, plants grow in areas with contrasting precipitation patterns, including summer dry areas of California's interior valleys and summer monsoon regions of Baja California and Arizona. Sanquist & Ehleringer (2003b) note that rainfall increases and drought length decreases along a transect from Death Valley, California southwest into Arizona.
Flooding or high water tolerance	No
Wetland indicator status for California	None
Shade tolerance	Grows best in full sun (Tesky 1993, Keator 1994).

GROWTH AND REPRODUCTION

Seedling emergence relevant to general ecology	Seedlings emerge and become established in open areas during the cool months of the winter rainy season.
Growth pattern (phenology) seedling  1 cm	Plants emerge in winter after winter rains, and most growth is in the rainy season (Tesky 1993). Plants become dormant and drop many leaves during the dry season and then sprout new leaves with the onset of winter rains. Plants can reach maturity within 2 years and often live for 10 to 15 years. Brittlebush flowers primarily from March through May (Munz & Keck 1968). Plants react to seasonal increase in water stress at the end of the rainy season by replacing the larger, less hairy leaves produced earlier in the growing season with more pubescent leaves that are smaller and thicker (Sandquist & Ehleringer 1997, 1998; Housman et al. 2002). This reduces water loss and regulates leaf temperature, but it also decreases photosynthetic capacity. Prolonged drought leads to dormancy and leaf drop.
Vegetative propagation	Plants can resprout from the root crown (Tesky 1993), but there are no specialized vegetative structures.
Regeneration after fire or other disturbance	Facultative seeder. In sage scrub vegetation, resprouting success of shrubs from the base is inversely related to fire intensity (Westman et al. 1981, Martin 1984). In one study, 2 to 30% of brittlebush resprouted on slopes previously dominated by the shrub, and resprouts and seedlings surpassed prefire densities within 2 years (Martin 1984). For coastal sage scrub in general, both resprouting and seedling emergence from a soil seed bank are negatively correlated with fire intensity (Keeley 1998). Seedling recruitment also increased steadily for 5 years after fire (Keeley et al. 2006). Plants do best where fire-return interval is more than 10 years (Sawyer et al. 2009).
Pollination	Insects. Flowers are visited by various insects including butterflies, moths, flies, bees, wasps, and beetles (Kyhos 1971, Moldenke 1976). In one study, a beetle (Malachiidae) was found to be 10 times more common in flowers than all other insect species combined (Kyhos 1971). These potential pollinators do not discriminate between plants with different disk flower color (Kyhos 1971).
Seed dispersal	Seeds are primarily gravity dispersed but can be dispersed by strong winds when fruiting heads are ripe. Kangaroo rats eat seeds (Tesky 1993) and may cache seeds, which often results in some dispersal. Birds pluck achenes from ripe seed heads, which may scatter seeds.
Breeding system, mating system	Self-incompatible; individuals must be cross-pollinated in order to produce seed (Ehleringer & Clark 1988, Clark 1998). In a study of three stands of plants in Arizona, mean inbreeding coeficients F_{IS} and F_{IT} were low (0.091 and 0.096, respectively), consistent with outbreeding (Monson et al. 1992). However, values for expected heterozygosity (H_e) were somewhat low (mean H_e = 0.215), and there were significant deviations from expected values at three of five loci examined. There may be some selection at the three loci, or seed dispersal is low and sampling reflected some family groups.

Hybridization potential	Brittlebush hybridizes with E. *fructescens* (A. Gray) A. Gray, E. *californica* Nutt. and E. *actoni* Elmer (Ehleringer & Clark 1988, Hickman 1993). Intergeneric hybrids with the annual *Gerea canescens* have also been reported (Kyhos 1967). In cultivation, all species of *Encelia* are interfertile (Clark 1998).
Inbreeding and outbreeding effects	Clark (1998) reports that hybrids among species are fertile but that hybrids beyond the first generation (F1) are rare except in disturbed locations. Kyhos et al. (1981) suspected that hybrids between Baja California species of *Encelia* were kept in control by strong selection after seed dispersal. Although not tested, they expected backcrossed progeny are selected against.
BIOLOGICAL INTERACTIONS	
Competitiveness	Seed production is influenced by water stress heightened by competition. In a desert study in which nearby neighbors were removed, shrubs experienced lower water stress, had higher survival, grew to nearly twice the mass, and produced 53% more flower heads per twig and 220% more achenes per head than shrubs with brittlebush neighbors within 2 m (Ehleringer 1984). Competitive with the grass *Cenchrus ciliarus* (Buffel grass) (Tesky 1993). Growth from seeds can produce vegetative cover relatively quickly. However, seed mixtures should be balanced carefully because overuse can retard establishment of other species (Went 1942, Gray & Bonner 1948, Montalvo pers. obs.) and reduce habitat value for forage (Tesky 1993).
Herbivory, seed predation, disease	The dominant herbivores on brittlebush leaves are the larvae and adults of the beetle *Trirhabda geminata* (Wisdom 1985, Redak et al. 1995, Bethke & Redak 1996). The fly *Neotephritis finalis* Loew lays its eggs between the florets, and the larvae feed on the achenes (Goeden et al. 1987). Seeds eaten by some kangaroo rats.
Palatability, attractiveness to animals, response to grazing	Although used as browse by mule deer and desert bighorn sheep, it has little value for domesticated livestock (Tesky 1993). Plants do not respond well to mowing, but populations recover quickly from seed (Tesky 1993).
Mycorrhizal? Nitrogen fixing nodules?	Associated with arbuscular mycorrhizal fungi (Valencia 2009), but the relationship is facultative (Egerton-Warburton & Allen 2000).
ECOLOGICAL GENETICS	
Ploidy	Diploid with n = 18 chromosomes (Hickman 1993).
Plasticity	Common garden studies with populations from contrasting environments showed that variation in type and number of leaf hairs is controlled in part by genes and in part by plastic response to environmental conditions (Housman et al. 2002). Leaves produced in the dry season are smaller and more hairy than leaves produced in the wet season; plastic response allows plants in mesic gardens to grow less-pubescent leaves than sibling plants in desert gardens, a response that allows them to take advantage of higher water availability with increased photosynthetic ability because of leaf-hair reduction (Ehleringer & Clark 1988). Also, water use efficiency can change from seedling to adult stages (Sandquist et al. 1993).
Geographic variation (morphological and physiological traits)	The frequency of plants with purple-brown disk flowers relative to yellow flowers was described as clinal by Kyhos (1971). Leaf morphological and physiological traits vary on both local and regional scales (e.g., Ehleringer & Cook 1990, Monson et al. 1992, Sandquist & Ehleringer 1997, 2003b). The degree of leaf pubescence varies across regions with different mean annual rainfall, and variation in number of leaf hairs is both a plastic response and genetically determined. Leaves of plants growing in arid regions are more pubescent, thereby having greater control over leaf temperature and water loss, but they have lower photosynthetic capacity due to higher reflectance of light than plants from more mesic regions. Differences are maintained when offspring are planted together in common gardens (Sandquist & Ehleringer 1997, Housman et al. 2002). Sanquist & Ehleringer (2003b) conducted a common garden experiment with seeds of maternal plants from three populations found along a precipitation gradient from Death Valley, CA, into Arizona. They detected heritability (in the broad sense) for leaf absorptance that differed in degree among populations. Variation was greatest at the driest site.



Genetic variation and population structure	At small spatial scales, high levels of gene dispersal may prevent the development of patterns (genetic structure) based on neutral traits, but large differences in the environment may influence structure in adaptive traits. In a study in the Sonoran Desert of Arizona, there was no significant population structure based on variation at five isozyme loci in stands of plants along three parts of a topographic gradient: wash, slope, and ridge (Monson et al. 1992). An analysis of allozyme variation showed that the proportion of variation within populations was essentially the same as among populations (F_{ST} = 0.004; G_{ST} = 0.010). Such lack of pattern suggests that historical levels of pollen and/or seed dispersal were high between the stands. However, wash plants had a significant deficit of heterozygotes for two loci, and physiological traits differed significantly among greenhouse-grown transplants from the different stands. The authors concluded that there was potential genetic differentiation between stands for the pattern of water use. Most work has focused on patterns in potentially adaptive traits. Brittlebush shows variation among individuals and populations in carbon isotope ratio difference (Δ), an indicator of water-use efficiency (the ratio of photosynthesis to transpiration) (Sandquist & Ehleringer 2003a). There may also be some structuring of populations with respect to flower color, for which the variation changes across an environmental gradient, a pattern known as "clinal variation" (Kyhos 1971). Disk flower color is genetically controlled; hybridization of yellow and purple flowered plants resulted in progeny ratios consistent with dominance of purple over yellow (Kyhos 1971). Plants also vary in leaf pubescence (hairs) and resulting light absorption values within and among populations. Variation in leaf pubescence may result from selection caused by differences in water availability at both local and geographical levels (Sanquist & Ehleringer 2003b).
Phenotypic or genotypic variation in interactions with other organisms	Koehler & Montalvo (2004) reviewed evidence for clinal variation in production of chemical compounds that provide defense against herbivores. From north to south in Baja California and east to west from the Sonoran desert to coastal regions of California, plants produce progressively less of a sequiterpene and more of a chromene toxin, which may influence local resistance to herbivores (Wisdom 1985, Kunze et al. 1995). Variation in compounds and their seasonal production may also influence herbivores (Wisdom & Rodriquez 1982, 1983). There are higher concentrations of these chemicals and nitrogen in young tissues. In addition, populations differ in the relative amount of different compounds. The specialist beetle *Trirhabda geminata* Horn experienced lowered larval growth rates when fed higher levels of the secondary compounds.
Local adaptation	There is evidence for adaptive differences among populations. Adaptation to local environments has been documented for many brittlebush traits. In particular, geographic variation and adaptation to water availability has been well demonstrated, including genetic differentiation in Δ (carbon isotope ratio difference), an indicator of water use efficiency (Sandquist & Ehleringer 2003a). Individuals with a high Δ have a higher growth response if water stress is decreased but perform poorly in response to drought stress, while those with a low Δ show lower growth response under low water stress and a greater capacity to survive drought conditions (Ehleringer 1993). Individuals with brown-purple disk florets (var. *phenicodonta*) occur in areas with higher levels of soil moisture and are replaced by the yellow-disked form (var. *farinosa*) in drier sites. This pattern may involve natural selection in response to water availability (Kyhos 1971), but may also be linked to the lower frost tolerance of var. *phenicodonta* (Sandquist & Ehleringer 1996). Similarly, Monson et al. (1992) found localized physiological and genotypic differences in water use between plants at the base and the top of a slope that coincided with a moisture stress gradient.
Translocation risks	Gene flow is high, but there is ample evidence for adaptation to different environmental conditions in this species. This suggests seed material for wildland restoration should be collected from within the same ecological zone and vegetation type as the targeted planting site to maximize success of planting projects. Because of potential competition and hybridization, it is also important that correct native species are specified and used. Mistaken plantings of *E. californica* instead of brittlebush, or vice versa, abound (authors' observation), and hybrids between species have been found in such locations (personal communication with A. Sanders, University of California, Riverside). Improper seed choices can compromise the success of restoration efforts and the genetic integrity of wild populations.
SEEDS	For seed image: http://www.hazmac.biz/030922a/030922aEnceliaFarinosa.html http://www.hazmac.biz/rsabghome.html
General	Often with standard purity and germination of 50% and 60%, respectively (Jody Miller, S & S Seeds, pers. com.). Low germination rates in the species have been tied to the production of empty achenes (Padgett et al. 1999). Seed viability varies among years, with as little as 35 percent of seeds viable (personal communication with M. Wall, Rancho Santa Ana Botanical Garden, Claremont, CA).
Seed longevity	Viability at room temperature or in a warehouse at ambient conditions is likely to decline significantly within four years. Seed viability of the related *E. actoni* approximately halved after 20 year storage in glass vacuum vials (M. Wall, RSABG, pers. com.).

Seed dormancy	Some authors report seed germination without pretreatment (Mirov & Kraebel 1939, Emery 1988), but pretreatment can increase otherwise low germination rates. Padgett et al. (1999) found that seed stored for 6 months at room temperature had 2 to 4 percent germination while seed stored at 5 to 10 ºC in a refrigerator had 10 to 12 percent germination. In addition, treatment with gibberellic acid (GA at 100 ppm in water) or $Ca(NO_3)_2$ increased germination of both warm- and cold-stored seeds approximately two-fold, and leaching with water for several days increased germination by about 50 percent. Before soaking 30 min in GA, seeds were soaked in warm water for 30 min.
Seed maturation	Seeds (achenes) fall easily from the heads when mature.
Seed collecting and harvesting	Achenes are collected from May to July (Mirov & Kraebel 1939), depending on the onset of flowering and the onset of drought. Seeds are often mature in early summer in the foothills and inland valleys, but may differ greatly in desert regions. Entire heads can be collected, or seeds can be shaken into open containers.
Seed processing	Seeds fall easily from heads and can be air-separated or screened to remove chaff from achenes.
Seed storage	Studies on seed storage of the very similar *E. virginensis* var. *actonii* (now called *E. actonii)* and *E . frutescen* found that under ambient warehouse conditions seeds, seed germination decreased significantly after three years. Under cold storage (-15 °C and 4 °C) germination was still good after 14 years for the former and after 4 years for the later species (Rodgers & Miller 2008).
Seed germination	Seed germination of the related *E. virginensis* var. *actonii* occurred primarily at 10, 15 and 20 °C, with much lower to no germination at 5 °C and below or at 25 °C and above (Rodgers & Miller 2008). Achenes of *E. farinosa* from Arizona populations stored at room temperature in paper bags germinated at higher rates than freshly collected seeds (Szarek et al. 1996). They also tested seeds under a variety of treatments. There was no germination at less than 5 °C or above 25 °C; maximum germination was at about 15 °C. Mean days to germination was 6.8 d under the best conditions. Cold stratification at 4 °C for various amounts of time did not increase germination, nor did treatment with gibberelic acid at standard concentrations. Germination was also testing under diurnal fluctuations of 15/15, 18/12, and 21/9 °C and was lowest under the largest fluctuation. Leaching seeds for 13 days on a mist bench under warm conditions, then exposing to cooler germination temperatures, resulted in the highest germination (76%). In a study of seeds from different populations and after leaching seeds, current-year seeds took longer to germinate (12 vs. 7 days) than seeds stored 2 years (Szarek et al. 1998). Germination time varied among populations.
Seeds/lb	350,000 seeds/pure live seed lb (S & S Seeds 2010). 770,000 bulk seeds/kg (personal communication with S&S seeds, Carpinteria, CA).
Planting	Field: Maximum growth of roots occurs in the winter and early spring (Drennan & Nobel 1996), so plants will establish best if sown in late fall. Horticulture: Seed germination and seedling survival appear to do best in sterile, nutrient poor media (Padgett et al. 1999). At Joshua Tree National Park, plants grown in 30-inch tall tubes in a mixture of sand, perlite, and mulch with slow-release fertilizer performed better after outplanting than those grown in 1-gal and 4-gal pots; plants required hardening off prior to outplanting (Rodgers & Miller 2008). In addition, in seed tests, seedling emergence was significantly better for seeds planted at a depth of 1 cm compared to 2 cm, and no plants emerged 4 cm.
Seed increase activities or potential?	Extensive populations are still available for wildland seed collection, populations appear to be increasing within shrublands of Riverside County, and populations are extensive in desert areas. Plants would be easy to cultivate for seeds, but this may not be necessary.
USES	
Revegetation and erosion control	Used for erosion control, roadside revegetation and rehabilitation of disturbed lands in southern California and Arizona (Tesky 1993, Newton & Claassen 2003).
Habitat restoration	Used extensively in restoration of coastal sage scrub, desert scrub, and alluvial scrub habitats.
Horticulture or agriculture	Horticulture: Included in drought-tolerant landscaping (e.g., Brenzel 2001, O'Brien et al. 2006, Perry 2010). The rounded form with striking yellow flowers is attractive near the back of borders or rock gardens, and it is especially suitable on dry slopes (Keator 1994, Perry 2010). Plants can be established quickly from seed or containers (Newton & Claassen 2003, Perry 2010). Provision of occasional summer water allows plants to remain attractive throughout the year (Keator 1994).
Wildlife value	Brittlebush feeds numerous pollinators and herbivores. It is an important nectar and pollen source of the bee, *Calliopsis pugionis* Cockerell, which is the host of the rare bee, *Holcopasites ruthae* Cooper in Riverside Co., California (Visscher & Danforth 1993). Mountain sheep eat brittlebush, but it is only found in fecal pellets in spring, summer, and fall in trace amounts (Perry et al. 1987).

Plant material releases by NRCS and cooperators	None.
Ethnobotanical	Brittlebush was used by native tribes for medicinal and other purposes. The resinous gum, heated or made into a salve, was applied to the chest to relieve pain and loosen bronchial mucous. A decoction of boiled blossoms, leaves, and stems was held in the mouth to relieve gum and tooth ache (Bean & Saubel 1972, Moore 1989). In addition, tea made from the gum has a numbing effect and was used to relieve arthritic pain (Moore 1989). The resin was also burnt as incense or melted and used as a varnish (Moore 1989, Hickman 1993).
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CITATION	Montalvo, A. M., C. E. Koehler, and J. L. Beyers. 2010. Plant Profile for *Encelia farinosa.* 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	
Fire Effects Information System (FEIS)	https://www.fs.fed.us/database/feis/plants/shrub/encfar/all.html
Jepson Flora, Herbarium (JepsonOnline)	https://ucjeps.berkeley.edu/cgi-bin/get_cpn.pl?Encelia%20farinosa
Jepson Flora, Herbarium, Second Edition (JepsonOnline 2nd Ed.)	https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=2557
USDA PLANTS	https://plants.usda.gov/core/profile?symbol=ENFA
Native Plant Network Propagation Protocol Database (NPNPP)	https://npn.rngr.net/propagation/protocols
Native Plant Journal	https://npn.rngr.net/journal
Native Seed Network (NSN)	https://nativeseednetwork.org/
GRIN--provides links to many recources	https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?id=15137
Wildand Shrubs	https://www.fs.usda.gov/treesearch/pubs/27005
Flora of North America (FNA) (online version)	http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250066497
Native American Ethnobotany Database (NAE)	http://naeb.brit.org/uses/search/?string=Encelia+farinosa
Woody Plant Seed Manual	https://www.fs.usda.gov/nsl/nsl_wpsm.html
Calflora	https://www.calflora.org/index.html
Rancho Santa Ana Botanic Garden Seed Program, seed photos	http://www.hazmac.biz/rsabghome.html
IMAGES	

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