SPECIES	***Salvia mellifera* Greene**

NRCS CODE: SAME3

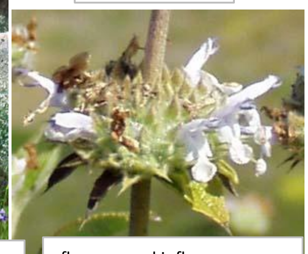
Family: **Lamiaceae**
Order: **Lamiales**
Subclass: **Asteridae**
Class: **Magnoliopsida**


fruiting inflorescence with


mature shrub, A. Montalvo , Riverside Co.


juvenile plant

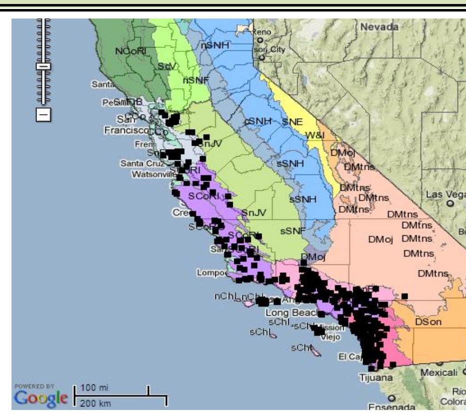

seedling


flowers and inflorescences

Subspecific taxa	None. Two taxa previously recognized as part of *S. mellifera* have been elevated to species status (USDA Plants). *S. munzii* includes what was known as *S. mellifera* subsp. *jonesii* Abrams or *S. m.* var. *jonesii* Munz; and *S. brandegeei* Munz includes what was known as *S. m.* Greene ssp. *revoluta* (Brandegee) Abrams.
Synonyms	*Audibertia stachyoides* Benth., *Audobertiella s.* Briq. (noted in Munz & Keck 1968)
Common name	black sage (other names have been used less often such as California black sage and coastal black sage (JepsonOnline, Painter 2010)).
Taxonomic relationships	There are currently 22 taxa of *Salvia* recognized in California (JepsonOnline) and about 900 species recognized worldwide (JepsonOnline).
Related taxa in region	*Salvia apiana* Jeps., *S. brandegeei* Munz (in Channel Islands), *S. munzii* Epling (in San Diego Co. and Baja California), *S. clevelandii* (A. Gray) Greene (Los Angeles Co. s. into Baja California in s South Coast and s Peninsular Ranges of San Diego Co.), *S. leucophylla* Greene (coastal foothills from the Chino Hills of Orange Co. north to San Luis Obispo Co. and where it has been planted out of range in restoration projects such as in coastal San Diego Co.)
Taxonomic issues	None.
Other	The specific epithet "mellifera" means "honey producing" and refers to its use by nectar foraging bees. The widest ranging species of shrubby *Salvia* (Sawyer et al. 2009).

GENERAL

Map	Data provided by the participants of the Consortium of California Herbaria represent 578 records with coordinate data out of 1112 records retrieved; data accessed 9/11/10. See Berkeley Mapper: http://ucjeps.berkeley.edu/consortium



Geographic range	Common from Contra Costa Co., CA (San Francisco Bay area) south into northern Baja California (Munz & Keck 1968, Hickman 1993).
Distribution in California; Ecological section and subsection	Jepson general areas of CA: San Francisco Bay Area, Inner and Outer South Coast Ranges, Western Transverse Ranges, South Coast, Channel Islands, Peninsular Ranges, and lower elevations of San Gabriel, San Bernardino, and San Jacinto Mountains. Ecological Section/subsection: http://www.fs.fed.us/r5/projects/ecoregions/ca_sections.htm: Central California Coast (261A, all subsections), Central Coastal Ranges (M262A, all subsections), Southern California Coast (261B), Southern California Mountains and Valleys (M262B, all but high elevation subsections such as e and h).
Life history, life form	Polycarpic, perennial shrub. Long-lived with a reproductive range of about 2-50 years (Sawyer et al. 2009).
Distinguishing traits	Shrubs are highly aromatic, open, 1 to 2 m tall with twisted, furrowed woody stems at the base, and herbaceous greenish branch tips that are square in cross section. Twigs and leaves are glandular, highly aromatic, and opposite. The oblong-elliptical blades are diagnostic. They are 2 to 6 cm long, dark green and rugulose above (convex between obvious veins) with crenulate (finely scalloped) margins, and taper to a few to 12 mm long petiole (Munz & Keck 1968). The many small, 6 to 12 mm long, two-lipped flowers occur in compact clusters subtended by green bracts and are spaced 2 to 6 cm apart along the often branched inflorescence. Corollas vary from pure white to pale blue or lavender. The style and stamens extend just beyond the corolla tube. Flowers bear four oblong nutlets (single–seeded fruits) within a persistent calyx. Nutlets vary from mottled gray to dark brown and are about 1mm wide and 2 mm long. (modified from Montalvo & McMillan 2004).
Root system, rhizomes, stolons, etc.	Shallow, fibrous branched tap root system spreads horizontally more than deep (Hellmers et al. 1955).
Rooting depth	Measured maximum depth at 2 feet, but only two plants excavated (Hellmers et al. 1955).
HABITAT	
Plant association groups	Black sage occurs as a dominant or co-dominant plant in the shrub canopy in coastal sage scrub, alluvial scrub, and lower montane chaparral shrubland associations and alliances: in coastal sage scrub and alluvial scrub shrub layers, it occurs primarily with *Artemisia californica, Mimulus aurantiacus, Encelia californica, Eriogonum fasciculatum, Lotus scoparius, Malacothamnus fasciculatus, Opuntia littoralis, Salvia apiana,* and *Yucca whipplei;* in chaparral, it occurs primarily with *Malosma laurina* and *Adenostoma fasciculatum* (e.g., Sawyer et al. 2009).
Habitat affinity and breadth of habitat	Black sage occurs on dry slopes and alluvial fans within interior and coastal sage scrub and lower montane chaparral (Munz & Keck 1968, Hickman 1993). On leeward slopes of the Coast Ranges it extends into desert scrub (Keeley 1986). It is one of the dominant shrubs of sage scrub (Westman 1983) and can form dense, nearly monospecific stands on steep slopes (Montalvo & McMillan 2004). In areas of contact with *S. apiana* , *S. mellifera* tends to occur in flatter and wetter microsites, while *S. apiana* occurs on drier slopes (Epling 1947a, Anderson & Anderson 1954, Grant and Grant 1964, Meyn & Emboden 1987, Gill & Hanlon 1998). Hybrids between the two species occur in recently disturbed areas, suggesting that hybrids are adapted to intermediate habitats (Anderson & Anderson 1954, Meyn & Emboden 1987). Within a hybrid zone, Gill and Hanlon (1998) found that xylem pressure potential was significantly higher in white than in black sage and that putative hybrids were intermediate to the two parental species.
Elevation range	Sea level to 1200 m (3,900 ft) (Munz & Keck 1968, Hickman 1993).
Soil: texture, chemicals, depth	Plants occur on a variety of soils derived from sandstone, shale, granite, and especially serpentinite and gabbro basalt (Westman 1981).
Drought tolerance	Plants are drought tolerant by leaf curling rather than drought avoiding through leaf drop (Gill & Hanlon 1998). Leaf drop is drought induced, possibly due to embolisms that occur in xylem tissues (Kolb & Davis 1994).
Precipitation	Occurs in areas with as little as 10 in annual precipitation (southern California valleys) to more than 30 in normal precipitation (e.g., along Central California Coast).
Flooding or high water tolerance	Not generally flood tolerant. Plants occur on middle to upper alluvial terraces along waterways and on alluvial fans where flooding is infrequent.
Wetland indicator status for California	None.
Shade tolerance	Generally full sun but can withstand partial shade.

GROWTH AND REPRODUCTION

Seedling emergence relevant to general ecology	Seedlings emerge in clearings between shrubs in the absence of fire, but most emerge in the first to second rainy season following fire, primarily in mid-winter to early spring (e.g., Keeley 1986, Westman & O'Leary 1986). Seedlings tend to emerge within 1 m of established shrubs (Schultz 1996). Emergence following soaking rains in cool weather can be rapid. In a large experiment in Riverside, CA under ambient temperatures in an unheated greenhouse in January-February, seedlings began to emerge in 5 days, with most germination by the end of two weeks (A. Montalvo, pers. obs.).
Growth pattern (phenology)	Seed germination and most vegetative growth is during the cool, wet winter, and new plants flower after two or more growing seasons. Time of flowering is variable but generally occurs mid spring, tending to wane by mid-May depending on the year and location. Plants mature seeds in June to August and enter dormancy in the hot, dry summers (Grant & Grant 1964, Gill & Mahall 1986). In one study of plants in Santa Barbara Co., most leaves senesced between May and July, 32 % persisted into the following growing season, leaf curling and uncurling was related to water stress, and leaf drop was more related to photoperiod than to low xylem potentials (Gill &Mahal 1986; but see Kolb & Davis 1994).
Vegetative propagation	Plants do not have any specialized structures for vegetative reproductive, but burned plants can sometimes resprout (see below). The green stems are easy to root for propagation (A. Montalvo, pers. obs.).
Regeneration after fire or other disturbance	Facultative seeder (Keeley et al. 2006). Recruitment after wildfires is by seed and resprouts from the base (Went et al. 1952, Keeley 1986). In coastal sage scrub, especially near the coast, many plants resprout from the base after fire, supplementing establishment from seed (Keeley 1986). The relative frequency of these modes varies among sites and may be tied, in part, to the density of vegetation and intensity of fire. In a review of the literature, Keeley (1986) reported that in dense, interior populations, shrubs tend to be killed by fire and depend more on seedling recruitment, while near the coast, resprouting tends to be more common with variable seedling recruitment. In a survey of 90 post fire sites ranging from coast to inland valleys, he found that resprouting success was only 15.8% and completely failed at some sites. Shrubs that resprouted had significantly smaller basal diameters, suggesting plants lose the ability to resprout as they age (Keeley 1998). In a five year study at 25 coastal sage scrub sites, 73% of seedling recruitment occurred in the first year after fire and was about 2.6 times lower than at 29 denser, chaparral sites (Keeley et al. 2006). Black sage made up the same proportion of the vegetation postfire as it did before fire.
Pollination	Flowers are pollinated by small to medium-sized solitary bees in families Andrenidae, Anthophoridae, Halictidae, Megachilidae, and Xylocopinae as well as introduced honey bees (Grant & Grant 1964, Moldenke & Neff 1974). Rarer visitors include large-bodied *Bombus* and *Xylocopa* bees (pollinators of white sage), syrphid and bombyliid flies, and Anna's hummingbirds (Montalvo & McMillan 2004). Black sage has small, two-lipped flowers that are rarely visited by these large-bodied bees. *S. apiana*, with which black sage is known to hybridize, has larger, highly modified flowers that are pollinated almost exclusively by large bees in *Xylocopa* and *Bombus*. Also, *S. apiana* flowers later than black sage, limiting opportunities to hybridize (Grant & Grant 1964).
Seed dispersal	Each flower produces up to four seeds that are gravity dispersed in June through August from the dry, persistent calyces, and they can be secondarily dispersed by harvester ants (Schultz 1996, Montalvo & McMillan 2004). In a seed trap experiment in a wild population, fewer than 1% of the seeds fell to 1 m beyond the edge of the canopy, and no seeds were found at 2 m, consistent with gravity dispersal distances being very short (Schultz 1996).
Breeding system, mating system	The self-compatible flowers are hermaphroditic with stamens dispersing pollen before stigmas become receptive, that is, the flowers are "protandrous" (Montalvo & McMillan 2004). In a study of allozyme variation in 12 black sage populations, the low inbreeding coefficient ($f = 0.072$) suggests that the protandry facilitates outbred pollination by insects (Montalvo & McMillan 2004).
Hybridization potential	High. Black sage hybridizes with the shrubs *S. apiana* Jeps. (n = 15), *S. leucophylla* Greene (2n = 30), and *S. clevelandii* (Gray) Greene (2n = 30), and rarely with annuals *S. columbariae* Benth (n = 13) and *S. carduacea* Benth (n = 16) (Epling 1938, 1947a, Epling et al. 1962, Munz & Keck 1968). Most hybridization is with *S. apiana,* which serves as the pollen parent. These hybrids are fully viable but suffer reduced pollen fertility (Epling 1947a, Meyn & Emboden 1987) and numbers of seeds/flower in F_1 back crosses to parental species (Grant & Grant 1964). Hybrids differ from both parental species by a range of intermediate floral, leaf, and anatomical traits (Epling 1947a, b; Anderson & Anderson 1954, Webb & Carlquist 1964). Most are thought to be F_1 hybrids (first generation) or backcrosses to *S. mellifera* and tend to grow near parental types. Hybrid zones can be stable in location but may shift in morphology (Meyn & Emboden 1987). This suggests differences in the relative success of hybrids and backcrossed progeny over time. The influence of gene exchange on floral form of black sage does not appear to extend beyond hybrid zones (Epling 1947a, b).

Inbreeding and outbreeding effects	A. Montalvo and P. McMillan (unpublished data) detected inbreeding depression in seed set but did not detect outbreeding depression. Plants were grown from seeds collected from six southern California source populations and used in a crossing experiment to determine if the genetic or environmental distance between source populations affected seed set of a cross. Crosses were made among plants from all six populations, including the same source population as the pollen recipient plant. The study also included self-pollinations. Neither genetic distance or the similarity of source environment had a significant effect on seed set (proportion of ovules setting seeds); however, there were significant differences in seed set among plants from different source populations, and average seed set ranged from 46 to 62% for the six populations. Self-pollen donors (pollen from same plant as seed parent) produced the lowest seed set in these trials (44% success compared to outcross pollen sources ranging from 52 to 56% success), indicating inbreeding depression in seed set.
BIOLOGICAL INTERACTIONS	
Competitiveness	Seedling emergence and establishment is inhibited by competition with invasive, non-native grasses. Cione et al. (2002) conducted a seeding experiment that included hand weeding, herbicide treatments of grasses before seeding, and unweeded controls. Seedling density was nearly 20 times lower in all the treatments where weeds were not controlled, and within a year there were no shrubs in the unweeded treatments.
Herbivery, seed predation, disease	Seed predation can be high, such as in the Santa Monica Mountains in 1993 when many seeds were lost to predation by the larvae of insects (A. Montalvo pers. obs.).
Palatability, attractiveness to animals, response to grazing	Plants produce numerous volatile compounds, including camphor, cineole, terpenes, and sesquiterpenes (Neisess et al. 1987, González et al. 1992, Arey et al. 1995), some of which may be important to herbivore or pathogen defense. Arey et al. (1995) noted that sesquiterpenes are important to attraction of wasps that parasitize herbivorous insects in herbivore-injured corn seedlings and proposed that changes in emission of volatile compounds could be in response to phenology or aphid infestations in black sage.
Mycorrhizal? **Nitrogen fixing nodules?**	Roots are readily colonized by arbuscular mycorrhizal fungi (AM fungi), and plants are considered to be highly dependent on the beneficial interaction. The roots of black sage can easily be inoculated by addition of fresh soil collected from under wild plants. After 4 months of growth in a greenhouse, root and shoot mass was higher in seedlings inoculated with AM fungi than in controls, but in younger plants the opposite occurred (E. Allen, L. Egerton-Warburton, A. Montalvo, unpublished report to Metropolitan Water District). The roots of black sage were found to receive compounds from the roots of oaks by way of hyphal connections between the species (Egerton-Warburton et al. 2007).
ECOLOGICAL GENETICS	
Ploidy	2n=30 (Epling et al. 1962).
Plasticity	Timing of flowering appears to be controlled by a combination of genetics and the environment. Shifts in flowering time occur in years with contrasting rainfall patterns (Meyn & Emboden 1987); however, common garden studies with 12 populations revealed that date of first flowering varies with source population and ranged from early February to early May (A. Montalvo, unpublished data). Also, plants are semi-drought deciduous and can drop some leaves and become dormant depending on the severity of drought. At Stanford, CA, leaves began to senesce and drop in October in both irrigated and unirrigated treatments, leaf stomata did not control transpiration when xylem water potentials were low, and rates of photosynthesis did not decline until after leaf drop (Gigon 1979).
Geographic variation (morphological and physiological traits)	Populations cluster by genetic similarity (based on allozymes), and this is somewhat mirrored by distribution patterns of morphological variation and timing of flowering. Flowers from populations in the Santa Monica Mountains and Simi Hills can be strikingly bluish. In the drier, more interior hills and valleys of Riverside Co., flowers tend to be white to pale blue or lavender, and plants flower earlier. These differences are retained in common gardens. Plants from contrasting populations also smell different, likely due to differences in composition of volatile chemicals.
Genetic variation and population structure	Black sage is genetically variable in both morphology and allozymes (protein genetic makers) over its geographic range. In a survey of 12 populations (Montalvo, Clegg, & Ellstrand unpublished data for 14 allozyme loci and 60 individuals per population), expected heterozygosity was high (H_e = 0.23), and alleles averaged 2.81 per locus. Only about 4% of the variation was due to differences among populations, a result consistent with a relatively high level of historical gene flow [Theta-p (~F_{ST}, sites relative to total population) = 0.041, F (F_{IT}) = 0.125] (Montalvo & McMillan 2004).

Phenotypic or genotypic variation in interactions with other organisms	In a reciprocal common greenhouse experiment, plants grown from seeds collected from a source population on non-serpentine soil differed in degree of colonization by mycorrhizal fungi compared to plants grown from seeds collected from a population on serpentine soil (A. Montalvo, J. Skillman, and J. Bever, V. Claassen, unpublished data). Sampling showed root colonization averaged about 62%.
Local adaptation	Montalvo & McMillan (2004) summarized the results of a study by A. Montalvo and N. Ellstrand (University of California, Riverside) that evaluated seedling survival, growth and reproduction of plants grown from seeds of 12 southern California source populations in a common garden at Fallbrook, San Diego Co., CA. A combination of climatic data and soil traits was used to calculate environmental similarity among garden and source sites. After three growing seasons, populations from sources most similar to the garden site were the most successful (measured as survival rate times number of flowers produced by survivors). The effect was small ($r^2 = 0.18$) but was consistent with the presence of weak adaptive differences among source populations.
Translocation risks	Observed genetic differences in flowering time and plant chemistry very likely contribute to the success of plants under particular environments. Differences in the timing of flowering could affect seed production of translocated populations if pollinator activity, seed predation, or important physical environmental factors differ from home sites.
SEEDS	Rancho Santa Ana Botanic Garden Seed Program, seed image: http://www.hazmac.biz/050919/050919SalviaMellifera.html
General	Up to four small nutlets (one-seeded indehiscent fruits that look like single seeds) form at the base of each flower. They vary from mottled gray to dark brown and are about 1 mm wide and 2 mm long (Montalvo & McMillan 2004). Unfilled achenes are frequently produced, and seed filling is variable from year to year. Meyer (2008) lists maximum germination as 69%. Standard purity of 70% and germination of 50% are used as a seed industry standard (Jody Miller, S&S Seeds, pers. com.).
Seed longevity	Nine seed lots stored for two years under ambient warehouse conditions in Carpinteria, CA, had an average of 41.3% germination in the first year and 35.1% in the second year (Jody Miller, S&S Seeds, pers. com.). Black sage seeds form a persistent seed bank in nature and can be expected to be long-lived. Meyer (2008) reported that seeds of the related white sage showed little loss in viability during 5 to 7 years of sealed warehouse storage.
Seed dormancy	Physiological dormancy (Baskin & Baskin 1998). Seeds remain dormant in the seed bank until stimulated to germinate, often by fire (Keeley 1986).
Seed maturation	Seeds ripen sequentially, lagging behind flowering that often lasts over a month. Meyer (2008) reported that seeds of shrubby salvias tend to ripen about 6 weeks after full flower.
Seed collecting an harvesting	Seeds are collected from June-August, depending on location, after the inflorescences with their persistent calyces become dry and brown. Seeds are retained inside the calyx for several weeks, making it possible to collect seeds from plants with a range of phenologies at the same time (A. Montalvo, pers. obs.). Mature seeds can be harvested by clipping, hand-stripping, or shaking seed heads into open containers (Meyer 2008, A. Montalvo pers. obs.).
Seed processing	Seeds should be cleaned to remove seed predators. If whole inflorescences or "seed heads" are collected, the material must be well dried before handrubbing (small lots) or passing through a hammermill or barley debearder (large lots) to break it up (Meyer 2008). After initial sieving of the broken up material, air separation can be used to remove lighter unfilled seeds that are sometimes abundant (Montalvo & McMillan 2004). For seed banking, Wall & Macdonald (2009) recommend first rubbing floral material over a medium screen, then rub and sift through #12 and #25 sieves before air separation; the blower speed can be set to 1.5, but higher speed may be needed to separate out the unfilled, sterile seeds.
Seed storage	Store under cool, dry conditions. Longevity is increased under cold storage.

Seed germination	Treatment of seeds with dry or liquid smoke or gibberellic acid increases germination substantially. Seeds should be air-dried before sowing when liquid treatments are used, because compounds on the seed coat become sticky when soaked. The dormant seeds of black sage often have low germination rates unless exposed to light or components of fire such as charred wood, smoke, or KNO_3 (Keeley 1986, Thanos & Rundel 1995, Keeley & Fotheringham 1998). Exposure to dry cool smoke for 5 min (Keeley & Fotheringham 1998) yields higher germination than charred wood. A 12 to 15 hour soak in a 1:25 dilution of Regen 2000 Smokemaster, a liquid smoke product, also breaks dormancy (A. Montalvo, pers. obs.). Heat of fire may reduce germination of seeds from sage scrub (Keeley & Fotheringham 1998). Oddly, seeds from desert populations, where fires are less frequent, were stimulated to germinate by heat and charred wood, but not by light (Keeley 1986). Emery (1988) used GA at 400 ppm, 1-hour soak to improve germination. In a study of seeds from 12 coastal sage scrub populations, seeds were exposed to three different treatments (A. Montalvo, unpublished data). Seeds treated with 250 ppm gibberellic acid (GA) had 66% germination compared to 42% treated with plain, cool water and 50% percent for seeds treated with boiling water. When one-year-old seeds were incubated at 19/26ºC on moist filter paper, 36% germinated after 500 ppm overnight GA treatment, 26% germinated after cold smoke treatment, and 20% germinated in pure water (J. Burger, pers. obs., unpublished data). Peak germination occurred 6-9 days after imbibition. Generic germination tests for shrubby sages incubate seeds at 15/25^{o}C alternating night and day temperatures (Meyer 2008).
Seeds/lb	520,000 seeds/lb (S&S Seeds 2010, http://www.ssseeds.com/database/index.html). 600,000 seeds/lb (Stover Seed Co. 2010, http://www.stoverseed.com/websearch/specieslist.cfm#P). 413,000 seeds/lb (Meyer 2008).
Planting	Treated or untreated seeds can be sown shallowly (to 1/8 in deep) in flats for subsequent transplanting or directly sown into the ground in the fall (Montalvo & McMillan 2004). Hydroseeding works well. Hand sowing after scarifying the soil with a springtooth harrow and then dragging the harrow upside down over the sown seed was successful in a plot in western Riverside Co. (Montalvo, pers. obs.). Container plants or seedling plugs can easily be established when planted after the beginning of the rainy season and given supplemental water to ensure that the roots do not dry out before they grow into the native soil.
Seed increase activities or potential  young plant in Orange Co. field, J. Burger	Potential is high. Plants are easy to establish in agricultural fields. In a research plot at the University of California, Riverside, one-gallon sized plants were planted in rows spaced 10 feet apart and received supplemental water the first year. The large spacing allowed a cultivator to weed between rows of plants. Plants reached maturity by the second year and seed filling was high (A. Montalvo, pers. obs.). Plants are long-lived and, if occasionally provided supplemental water in the winter, can be expected to flower and produce good seed crops. In a seed multiplication trial in Orange County, 2 1/2 inch liners were transplanted at three foot spacing in November. After occasional applications of supplemental water, the majority of plants flowered within the first year in June (J. Burger, pers. com.). Plants tend to forego flowering in drought years. cultivated plants at U.C. Riverside, A. Montalvo 
USES	
Revegetation and erosion control	Black sage is used for erosion control along roadsides, after mining, and after construction (McMurray 1990). Newton & Claassen (2003) recommend its use for land rehabilitation in central western and southwestern California.
Habitat restoration	Black sage is important for restoration of coastal sage scrub, alluvial scrub, and chaparral vegetation within its natural range in California (McMurray 1990, Montalvo & McMillan 2004).

Horticulture or agriculture  young plant in 2 inch wide D-40 pot, UC Riverside, A. Montalvo	Plant production: Plants can be started easily from seeds or cuttings. If cuttings are used to propagate plants for restoration or production fields, the cuttings must be taken from many wild parents, otherwise genetic variation in the planting stock will be very low. Seedling plugs can be produced rapidly from seed to transplant size. To produce plants with mycorrhizal roots, the soil in seedling flats can be inoculated with fresh whole soil collected from under healthy wild adult plants before sowing seeds, or young seedlings can be inoculated when shifted into larger pots by mixing about a half teaspoon of whole soil into the top two inches of soil before planting seedlings (A. Montalvo, pers. obs.). Black sage is used in native landscape gardening. Plants grow in well-drained soil in sunny locations and can tolerate hot weather and some summer water in a garden (JepsonOnline 2010). Pruning a quarter to third of the stems is best done in the first few years in late fall or early winter, changing to less cutting and more dead-heading after old wood develops (O'Brien et al. 2006). Prostrate cultivars selected from plants along the wind-swept coastal bluffs of central coastal California are used as ground covers (e.g., Clebsch 1997, Perry 2010) and should not be used in restoration. *S. m.* 'Terra Seca' has a spreading form; a hybrid with *S. sonomensis* is called *Salvia* 'Mrs. Beard' (Perry 2010).
Wildlife value	Plants provide cover and seeds for wildlife, and in western Riverside Co. the listed California gnatcatcher frequently nests in vegetation containing black sage (Weaver 1998). Gnatcatchers nested most frequently in sites with a high proportion of *Eriogonum fasciculatum* or *Encelia californica*, rather than a high proportion of *S. mellifera.*
Plant material releases by NRCS and cooperators	None.
Ethnobotanical	The seeds were eaten and the leaves used for flavoring by native California tribes such as the Cahuilla and Luiseno (Bean & Saubel 1972). In addition, the leaves have a long history of medicinal use by native tribes (Bocek 1984); for example, the Costanoan people made an infusion of the leaves to treat coughs, and a poultice of the leaves was applied to the neck for sore throat (NAE, http://herb.umd.umich.edu/). The Chumash people placed crushed leaves and stems of black sage in hot water and soaked feet and lower legs to relieve pain (Adams & Garcia 2005). The diterpene compounds in the plants also have antimicrobial activity against gram (+) bacteria (Moujir et al. 1996).

ACKNOWLEDGMENTS

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CITATION

Montalvo, A. M., and J. L. Beyers. 2010. Plant Profile for *Salvia mellifera.* 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.rcrcd.com/index.php?option=com_content&view=article&id=88&Itemid=190

LINKS TO REVIEWED DATABASES & PLANT PROFILES

(last accessed September 2010)

Fire Effects and Information System (FEIS)	http://www.fs.fed.us/database/feis/plants/shrub/salmel/all.html
Jepson Flora, Herbarium (JepsonOnline)	http://ucjeps.berkeley.edu/cgi-bin/get_cpn.pl?43071
Jepson Flora, Herbarium, Second Edition Review	http://ucjeps.berkeley.edu/tjm2/review/treatments/lamiaceae_salvia.html#43071
USDA PLANTS	http://plants.usda.gov/java/profile?symbol=SAME3
Native Plant Network Propagation Protocol Database (NPNPP)	http://www.nativeplantnetwork.org/network/ViewProtocols.aspx?ProtocolID=2059
Native Seed Network (NSN)	http://www.nativeseednetwork.org/
GRIN (provides links to many resources)	http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?430895
Wildand Shrubs	http://www.fs.fed.us/global/iitf/wildland_shrubs.htm
Flora of North America (FNA) (online version)	No matches. http://www.efloras.org/flora_page.aspx?flora_id=1
Native American Ethnobotany (NAE)	http://herb.umd.umich.edu/
Woody Plant Seed Manual	http://www.nsl.fs.fed.us/nsl_wpsm.html
Calflora	http://www.calflora.org/

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