New World Salvias For Cultivation in Southern Arizona

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Abstract

A compilation of information on New World Salvias which are adaptable for cultivation in southern Arizona is presented. Southern Arizona is restricted to mid- and low-elevation desert regions. Description, taxonomy, and horticulture of the genus are discussed. A key to species is provided for identification. Detailed descriptions, locale of native occurrence, and cultivation of twenty-seven taxa are included.

Literature Review

Salvia, with nearly 800 species, is the largest genus in the Labiatae, a family characterized by square stems; opposite leaves; a zygomorphic, sympetalous corolla; two or four stamens; and a superior, four-lobed ovary (Peterson, 1978).

Species of *Salvia* vary in habit from annual, biennial, or perennial herbs to subshrubs and small to large shrubs. Leaves are simple or pinnate with toothed or pinnatisect margins. (Bailey, 1902; Bailey, 1928; Synge, 1969; Taylor, 1961)

In subgenus *Calosphace*, the inflorescence is a series of reduced cymes, called cymules. Each node bears two cymules which together appear to form a whorl of flowers, variously called a verticillaster, a glomerule, or a false whorl (Peterson, 1978). The verticillasters may be arranged in terminal racemes (*S. greggii*, **Figure 3**), or axillary racemes (*S. regla*, **Figure 6**). The verticillasters may be congested along the axis (*S. lavanduloides*, **Figure 7**) or more or less evenly spaced (*S. greggii*, **Figure 3**). Each verticillaster is subtended by a pair of bracts which may be persistent, deciduous, or caducous. The bracts range from minute, green, and deciduous (*S. azurea*) to large, colored, and persistent (*S. splendens*). In subgenus *Audibertia* the flowers are congested into compact glomerules which are subtended by many, persistent bracts. These glomerules may be solitary and terminal (*S. mohavensis*, **Figure 4**), spikelike and terminal (*S. munzii*, **Figure 5**), or paniculate (*S. apiana*, **Figure 2**).

Salvia has a distinctive, bilabiate calyx. The upper calyx lip is either three-toothed or entire; the lower lip has two small teeth. The shape of the calyx varies from ovoid to tubular to campanulate. Calyx size and color is also variable; it may be small and green (*S. mellifera*) or large and brightly colored (*S. splendens*). (Bailey, 1902; Bailey, 1928; Synge, 1969; Peterson, 1978)

The corolla is sympetalous and bilabiate. The tube may be included in the calyx or exserted from it. The upper corolla lip consists of two fused petals, the lower lip of three. In some species, the flowers gape wide open (*S. regla*, **Figure 1a**), but in others are nearly tubular (*S. leucantha*, **Figure 1b**). The lower lip may be shorter than the overhanging upper lip (*S. leucantha* **Figure 1b**), or it may be larger and showier (*S. greggii*, **Figure 1c**). Corolla color varies from scarlet through purple and violet to azure-blue. Rarely it is white or yellow. (Bailey, 1902; Bailey, 1928; Synge, 1969; Taylor, 1961)

There are two fertile stamens which may be either exserted from the corolla or included in it. An elongated connective separates the two anther cells. Usually only the uppermost theca is fully fertile; the lowermost theca may be fully fertile, rudimentary, or absent. The style is two-cleft, slender, and exserted. (Peterson, 1978)

Taxonomy Of The Genus

In 1753, Linnaeus described 28 species and officially designated the genus *Salvia*. In his *Labiatarum*, Bentham (1832-1836) attempted a natural arrangement of the species and placed them in 14 sections. By 1876, Bentham had revised his concept of sections and in *Genera Plantarum* elevated some to subgenera. New World species, which I treat here, were assigned to the subgenera *Calosphace* and

Salvia greggii.

Salvia clevelandii.

Salvia greggii in landscape.

Salvia regla.

Salvia chamaedryoides.

Salvia farinacea.

Leonia and to the genus *Audibertia* by Bentham (1876). Sixty-seven species of subgenus *Calosphace* have been cultivated of which 16 are treated here. Two hybrids of species within *Calosphace* are also considered. Subgenus *Leonia,* as interpreted by Bentham (1876), included four New World species which have since been cultivated. These four species were placed in three sections by Bentham (1876), *Echinosphace, Pycnosphace,* and *Heterosphace.* One species of *Heterosphace* is cultivated and treated here.

Although Bentham (1876) placed six shrubby species from the California chaparral in the genus Audibertia, Epling (1938) treated them in the genus *Salvia.* As defined by Epling (1938), section *Audibertia* includes these six species as well as Bentham's *Echinosphace* and *Pycnosphace.* The many taxonomic ambiguities within *Audibertia* as interpreted by Epling (1938) are currently under investigation by Dr. Kathleen Peterson at the University of Montana. Fifteen of the eighteen species and two of the ten hybrids in *Audibertia,* as treated by Epling (1938), have been in cultivation, while seven species and one hybrid are treated here.

Distribution

The genus *Salvia* occurs worldwide in temperate, tropical, and subtropical regions. Its three centers of diversity are southwest Asia, Sino-Himalaya, and the New World (Synge, 1969). According to Epling (1939a), New World species range continuously from the Great Lakes in North America to the Argentine Plains in South America.

Species of section *Audibertia* are major components of chaparral and coastal sage scrub from Washington and Idaho south into northern Baja California (Epling, 1938; Epling and Lewis, 1942). Subgenus *Calosphace* is concentrated in the Brazilian highlands, the Andes, and the Mexican highlands (Epling, 1939a). fifteen of the sixteen species of *Calosphace* treated here are from the southwestern United States and the Mexican Highlands; the other species is from the Brazilian highlands.

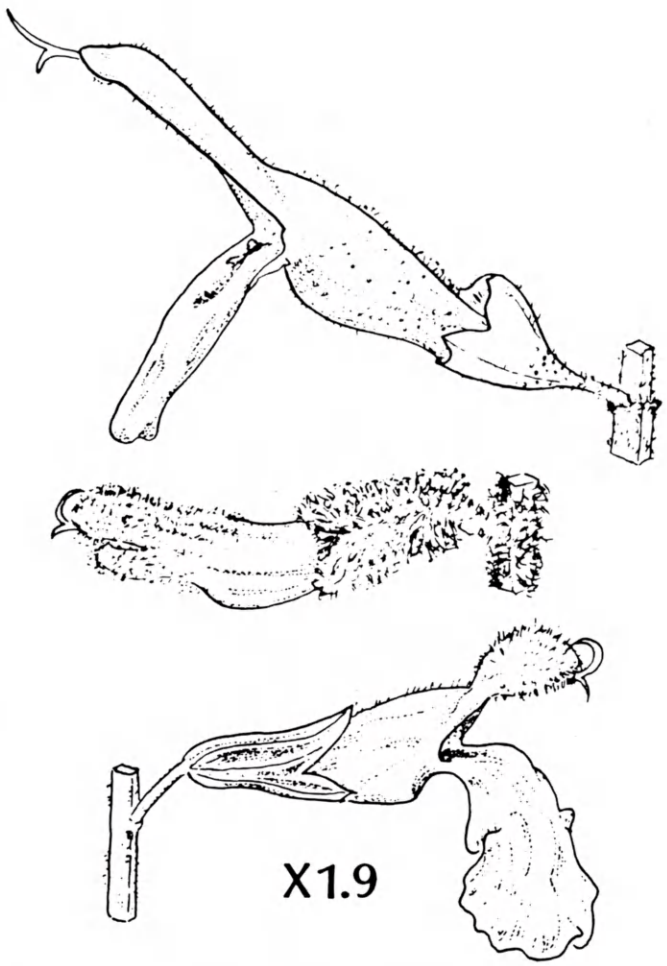

Figure 1. *Corolla variation in* Salvia. ***A (above):*** *flowers gaping wide open as in* Salvia regla. ***B (center):*** *flowers nearly tubular and lower lip shorter than upper lip as in* Salvia leucantha. ***C (below):*** *lower lip larger and showier as in* Salvia greggii.

Horticulture

Horticulturally, salvias can be grouped as tender or hardy. Tender species are generally used as summer- and fall-flowering bedding plants. Many are herbaceous perennials or shrubs from tropical and subtropical areas in Mexico, Central America, and South America. Hardy species are used as border plants or spring- and summer-flowering shrubs. Most are shrubs from cold regions in North America.

Salvias can grow in full sun, filtered light, or partial shade. Species from arid chaparral in southern California and Baja California and from arid scrub in the Mohavean and Chihuahuan Deserts can tolerate full sun. Those from the tropics and subtropics require some shade in summer in southern Arizona. Water use by salvias also depends on place of origin. Plants from California chaparral and the Mohavean and Chihuahuan Deserts generally require very little supplemental water once established. Tropical and subtropical species, which come from high rainfall areas, require regular supplemental watering in southern Arizona. While the plants are becoming established, their water requirements vary with soil type, temperature, and age of plant as well as watering regime.

All salvias grow best in a well-drained soil rich in organic matter. Salvias grow rapidly and can make a mature specimen after one or two growing seasons in the ground.

Propagation can be accomplished by seeds, cuttings, or divisions. Most species are easily propagated by seed sown during the growing season or in the greenhouse in spring. Seedlings may be planted out after all danger of frost is past, but require careful attention for the first year. Seedlings may also be grown in standard #1 containers for the first year, then planted out in the spring of the second year. Cuttings of perennial and shrubby species are easily rooted under mist in a greenhouse if taken from actively growing shoots. Cuttings should be grown in standard #1 containers for one season, then planted out the second season. According to Taylor (1961) perennial species can be propagated by rootstock divisions just before dormancy or in spring prior to new growth.

Horticultural Literature Search

A survey of nineteen horticultural manuals was made to determine which New World species have been cultivated for ornament since the introduction of *Salvia coccinea* in 1774. Seventy-three New World taxa (71 species and 2 hybrids) were found in the literature, and thirteen species and two more recent hybrids which have not been reported in the literature have been cultivated in the United States.

In 1826, Hemsley was the first to give an account of cultivated salvias when he listed 65 species (Bailey, 1902). The earliest treatment I was able to find was that of Nicholson (1887-1889) when he gave descriptions of 45 New World species. Bailey (1902) gave descriptions and distributions for seven salvias new to cultivation and a total of 36 New World species. In his most comprehensive treatment, Bailey (1928) added six species not previously listed in horticultural manuals. Seven more new salvias with good descriptions were included by Chittendon (1956).

No new American salvias were treated in horticultural manuals until 1979 when the staff of the L. H. Bailey Hortorium compiled brief descriptions and synonyms for 36 species. Fifteen were previously unknown in horticultural manuals, including ten from the chaparral of California and Baja California.

In the interim years, four manuals treated New World salvias, each one making some contribution to our knowledge of the genus and its cultivation. Coats (1968) discussed dates of introduction for some common species, but did little else for *Salvia* cultivation. Pizzetti and Cocker (1968) gave good descriptions, distributions, and cultural information for eight New World species. Hay (1969) listed only three New World salvias, but included good descriptions of them and their varieties, as well as horticultural notes. In a book for gardeners, Thomas (1976) provided descriptions, distributions, date of original collection, and cultural notes for thirteen species.

Two manuals have treated *Salvia* cultivated in the United States. Bush-Brown and Bush-Brown (1980) treated two perennial species in depth, giving good descriptions and horticultural notes for both. Graf (1982) was the most recent author to treat cultivated salvias in an encyclopedic fashion. He included black-and-white photographs and very brief descriptions of fifteen species, including eight from the New World. He also provided common names and generalized distributions for each species.

Field Studies

A survey of cultivated species was made by visiting six nurseries, five botanic gardens, and two arboreta in Arizona and California. At each locality visited, fresh flower color, size of plant, exposure, and amount of fresh growth were noted. Amount of fresh growth was used to determine growth rate relative to other shrubs in the vicinity. Arboreta and botanic garden records were consulted when possible for notes such as original collection date and site, soil type, and planting exposure. Fifty-one pressed specimens of thirty-five taxa were made and deposited at the University of Arizona herbarium.

Correspondence

Benny Simpson at Texas A&M Research Center in Dallas, Dr. Richard Dufresne, and Betsy Clebsch, collectors of salvias, provided horticultural information for forty-two species of *Salvia*, including water requirements, planting location, growth rate, cold hardiness, size, and blooming times.

As a result of the literature search, field studies, and correspondence with other Salvia collectors, a total of 88 taxa (84 species and 4 hybrids) were found to have been or are currently in cultivation in the United States. Of these, 24 species and 3 hybrids are treated here as being adaptable to the climate of low and mid elevation deserts as defined by Duffield and Jones (1981).

Key To Species

The following key is designed to be used for the identification of cultivated New World Salvia species presented in this paper without the aid of a microscope.

There are a few terms used in the key which need some clarification. The terms glomerule, verticel, and verticillaster have similar meanings. All the terms refer to the cluster of flowers at one node of the inflorescence, however, as used here, they are separated on the relative density of flowers. A glomerule is a whorl of numerous flowers, while a verticel or verticillaster is a whorl of few flowers.

All colors and sizes are for fresh material, whether they be corolla, calyx, bract, inflorescence, or leaves. Leaf measurements are for the leaf blade, excluding the petiole. The cultivars are not in the key, but they are flower color variants of the more commonly cultivated species and should be readily recognized.

1. Plants with hollow stems, flowers white or pale lavender, the stamens long exserted, leaves generally clustered near the ends of the branches ..... **S. apiana**
1. Plants with solid stems, flower and leaf combination not as above **2**
2(1). Flowers congested into dense, compact, many-flowered glomerules, these subtended by many, persistent bracts **3**
2. Flowers contracted into 2-many flowered verticels, these subtended by two persistent or deciduous bracts **8**
3(2). Leaf blade entire, not rugose, usually broader above the middle ..... **S. dorrii**
3. Leaf blades crenulate to crenate, rugose, usually broader below the middle **4**
4(3). Stamens included or barely exceeding the upper corolla lip; corolla 8-12 mm long **5**
4. Stamens far exserted from the upper corolla lip; corolla 15-25 mm long **6**
5(4). Leaves green above, canescent tomentose beneath, 3-6 cm long ..... **S. mellifera**
5. Leaves cinereous pubescent on both surfaces, 2-3 cm long ..... **S. munzii**
6(4). Calyx teeth wholly united ..... **S. leucophylla**
6. Calyx teeth free **7**
7(6). Lower leaf surfaces ashy tomentose **S. clevelandii**
7. Lower leaf surfaces green; glabrous or hispidulous, but not ashy tomentose with appressed hairs ..... **S. mohavensis**
8(2). Corolla red, scarlet, purplish-red, or pinkish .. **9**
8. Corolla not red, scarlet, purplish-red, or pinkish, commonly blue, violet, or purple **15**

9(8). Corolla longer than 4 cm **10**
9. Corolla shorter than 4 cm **12**
10(9). Calyx not inflated ..... **S. splendens**
10. Calyx inflated **11**
11(10). Leaves broadly deltoid-ovate, less than 5 cm long ..... **S. regla**
11. Leaves ovate, 5-12 cm long ..... **S. sessei**
12(9). Corolla tube swollen **13**
12. Corolla tube not swollen **14**
13(12). Leaves narrowly oblong, linear-oblanceolate, or broadly elliptic, margins entire, commonly cultivated ..... **S. greggii**
13. Leaves ovate, margins serrate or crenulate-serrate, uncommon in cultivation ..... **S. microphylla**
14(12). Leaves coarsely repand-toothed or crenately incised, lower leaves with 2-3 leaflets ..... **S. roemeriana**
14. Leaves entire, crenate, or serrate .... **S. coccinea**
15(8). Corolla longer than 40 mm .. **S. 'Purple Majesty'**
15. Corolla less than 40 mm long **16**
16(15). Calyx 15 mm long or longer ..... **S. mexicana**
16. Calyx shorter than 15 mm **17**
17(16). Calyx broadly funnelform in fruit, leaves broadly deltoid-ovate, shrubs with woody branches .. **18**
17. Calyx nearly tubular to campanulate in fruit, leaves not broadly deltoid-ovate, herbs or shrubs **19**
18(17). Leaves green and rugose above, densely stellate-tomentose beneath ..... **S. ballotaeflora**
18. Leaves not rugose above, green and glabrate on both surfaces ..... **S. pinguifolia**
19(17). Calyx densely blue or purple lanate **20**
19. Calyx glabrous or pubescent, but not densely blue or purple lanate **21**
20(19). Leaves linear-lanceolate, glabrate and rugose above, white-tomentose beneath, corolla densely pubescent and about 25 mm long .. **S. leucantha**
20. Leaves linear to ovate, green and glabrate on both surfaces, corolla 15-25 mm long .... **S. farinacea**
21(19). Leaves linear to narrowly-oblanceolate **22**
21. Leaves elliptic to ovate or lanceolate **23**
22(21). All leaves linear, entire, and fascicled **S. reptans**
22. Lower leaves lanceolate, or oblong-lanceolate, with denticulate or serrate margins, upper leaves sometimes rather linear ..... **S. azurea**
23(21). Leaves elliptic, 10-16 mm long, canescent-tomentose, plants with a grayish cast ..... **S. chamaedryoides**
23. Plants glabrous or sparsely pubescent, but not canescent-tomentose, plants with a green cast . **24**
24(23). Flowers opposite, in racemes ..... **3. lycioides**
24. Verticels with 3 or more flowers.. **S. 'Indigo Spires'**

Species Descriptions

1. **Salvia apiana** Jepson. WHITE SAGE, GREASEWOOD.

White sage is a subshrub or shrub to 1-3 m tall that is woody at the base, and has herbaceous upper branches. The leaves are 3-10 cm long, lanceolate-oblong in outline; acute or obtuse at the apex and rounded at the base. The leaves are petiolate, and mostly crowded near the base of the branch. The inflorescence is composed of lax glomerules arranged in thyrsoid panicles 2-15 dm long. Bracts are 5-20 mm long, ovate-lanceolate to narrowly oblanceolate and reflexed in age. Calyx 5-7 mm long; the upper lip truncate to shallowly three-toothed; the lower lip with two triangular teeth. The white or pale lavender flowers are 12-21 mm long. The stamens and style are both well exserted. White Sage grows in sandy washes and on rocky hillsides from southern California to northern Baja California. (Bailey et al., 1978; Dufresne, pers. comm.; Munz, 1974; Shreve & Wiggins, 1964)

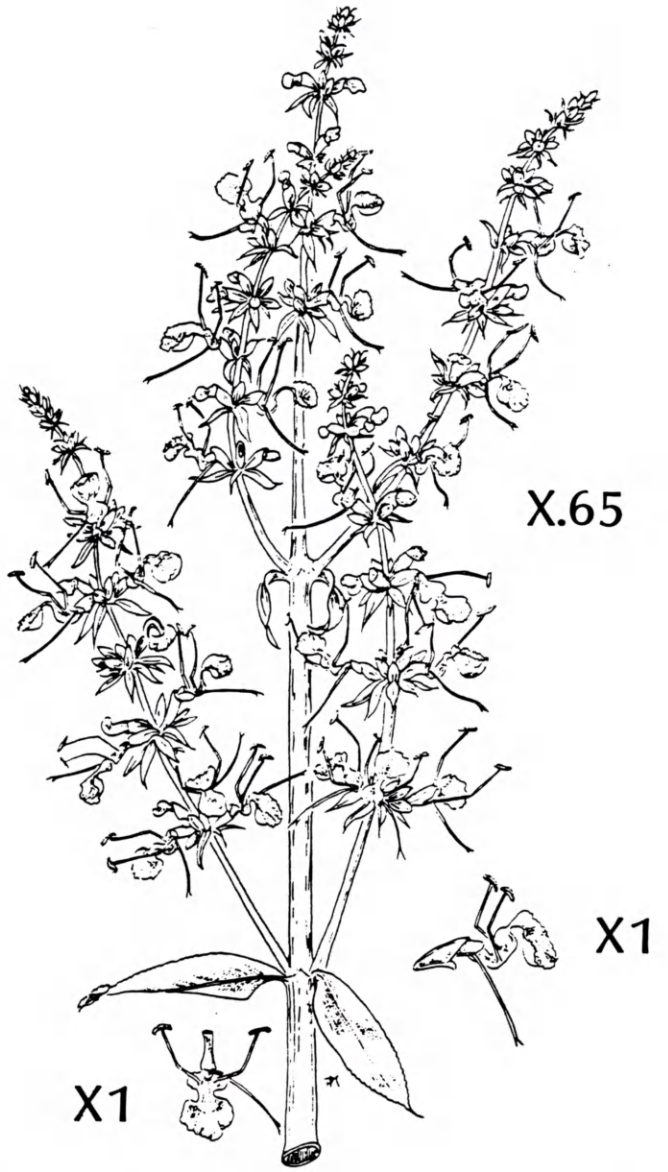

Figure 2. *Glomerules arranged in a panicle as in* Salvia apiana.

Salvia apiana is cultivated infrequently in southern Arizona, but has performed well. Plants are moderately fast growing, reaching a height of 1 meter after 1-2 years in the ground, and require little supplemental watering since they are winter growers. They remain evergreen over the winter, and bloom in late winter or spring. The flowers are not showy, but the plant itself is quite attractive if pruned and kept dense. According to Munz (1974) and Epling (1938) *S. apiana* hybridizes freely with any other species it comes in contact with resulting in a variety of forms.

(Continued on page 184)

Salvias

Continued from page 171

2. **Salvia azurea** Michaux ex Lam. BLUE SAGE, BLUE SALVIA.

Blue Sage is an herbaceous perennial with erect stems that grow to 0.3-2 m tall. Leaves are up to 10 cm long and 4 cm wide, linear, lanceolate, or oblong-lanceolate in outline; obtuse or acute at the apex and cuneate at the base; the margins are denticulate or serrate. The inflorescence is either simple or paniculate, individual spikes 5-30 cm long; whorls are composed of 1-18 flowers and spaced 0.3-4 cm apart. The deciduous bracts are linear-lanceolate, 2-4 mm long and 0.5-2 mm wide. The calyx is 4.5-10 mm long, oblong-campanulate, and appressed-hispidulous. It is obscurely bilabiate. Flowers are a deep cerulean blue or rarely white,15-25 mm long; tube exserted beyond calyx, 6.5-12.5 mm long; upper lip 4-8 mm long; lower lip 8-20 mm long, three-lobed and emarginate. Blue Sage is widespread in the eastern and southern United States. (Bailey, 1902; Bailey, 1928; Bailey, 1949; Bailey et al., 1978; Bush-Brown and Bush-Brown, 1980; Chittendon, 1956; Clark, 1979; Correll and Johnston, 1970; Dufresne, pers. comm.; Everett, 1960; Nehrling, 1964; Nicholson, 1887-1889; Peterson, 1978; Pizzetti and Cocker, 1968; Synge, 1969; Taylor, 1961; Thomas 1976).

Salvia azurea is a highly variable species and is currently divided by Peterson (1978) into two subspecies:

ssp. **azurea**

S. angustifolia Michx. *non* Cav.

S. azurea Michx. var. *angustifolia*

This has glabrous or minutely and sparsely hirtellous stems with a lax inflorescence, and verticillasters consisting of 6 or fewer flowers. Some plants cultivated as *Salvia angustifolia* Cav. may actually be *S. reptans* Jacq. which can be distinguished by its shorter, narrower leaves and axillary fascicles of numerous leaves.

ssp. **pitcheri** (Torr. ex Bentham.) Epling

S. azurea Michx. var. *grandiflora*

S. pitcheri Torr.

S. pitcheri Torr. var. *angustifolia*

This is characterized by weakly cinereous stems, a densely appressed-hirtellous calyx, and a more congested inflorescence, with 16-18 flowers in each verticillaster. Some material offered as *S. azurea* var. *grandiflora* may actually be *S. farinacea,* which can be distinguished by the stem leaves with petioles longer than 1 cm. (Bailey, 1902; Bailey, 1928; Chittendon, 1956; Peterson, 1978)

Salvia azurea was introduced to the horticulture trade in 1806 (Chittendon,1956) and has been cultivated widely ever since. The species is hardy to 10 degrees F, and fast growing. When topped by the long, dense spikes of blue flowers, the plants are quite showy. They can be planted in full or filtered sun, but require some supplemental water in the summer months.

3. **Salvia ballotaeflora** Bentham. MEJORANA, CRESPA, BLUE SAGE.

Mejorana is a shrub to 2.5 m tall with tomentose-canescent stems. Leaves are 1-4 cm long, broadly ovate-deltoid to oblong-elliptic. They are obtuse at the apex; truncate-cuneate to subcordate at the base, and have crenate to coarsely dentate margins. The leaf blades are rugose, green and glabrate above; white stellate-tomentose beneath; petioles 3-12 mm long. The inflorescence is a dense or lax spicate raceme 1-5 cm long with 1-3 flowers in each verticillaster. The caducous bracts are 1-2 mm long. The broadly funnelform calyx is 5-10 mm long; tomentulose and glandular-punctate; with three broadly ovate, obtuse, and subequal lobes; calyx pendulous in fruit. Flowers are bluish or purplish, about 12 mm long. The tube is 4-6 mm long and somewhat inflated, the upper lip 4-5 mm high; lower lip 4.5-6.5 mm long. Blooms from January to October. Mejorana grows in rocky, sandy, or gravelly soil from western Texas south throughout the Chihuahuan Desert to San Luis Potosi and Hidalgo, Mexico. (Correll and Johnston, 1970; Epling, 1939b; Simpson, pers.. comm.)

Salvia ballotaeflora has been grown at the Texas Experimental Station since 1974. Plants are grown in full sun and are hardy to 30 degrees F. They are slow compared to other Salvias, taking two years to reach mature size. The plants are quite drought tolerant and require little supplemental water once they are established. (Simpson, pers. comm.) I have not grown the species in Tucson yet, but expect that it would be adaptable to our climate, and should be tested.

4. **Salvia chamaedryoides** Cav. GERMANDER SAGE.

Germander Sage is an herbaceous perennial or subshrub which grows to 20-50 cm tall with many stems ascending from a woody base. Leaves are 10-16 mm long and 4-7 mm wide. They are elliptic or oblong in outline, obtuse at the apex and cuneate at the base with entire or crenulate margins. Leaf blades are canescent-tomentose, and subsessile or on petioles to 2 mm long. A 10-30 cm long spicate raceme, with 4-6 flowered verticillasters top the plants in the summer and fall. Bracts are small, being 5-6 mm long, and deciduous. The 7-12 mm long calyx is cylindrical-campanulate; gray-green and tinged with blue or violet towards the teeth. The upper lip is about 4 mm long and entire, while the lower lip is about 3 mm long with two teeth. Flowers are deep violet-blue and 15-17 mm long. The tube is 7-8 mm long, upper lip 4-9 mm high, and lower lip 8-9 mm long, 10 mm across. Germander Sage occurs from 2300-3000 meters in central and southern parts of the Chihuahuan Desert Region. (Epling, 1939b; Nicholson, 1887-1889; Standley, 1920; Synge, 1969).

Introduced into European horticulture in 1795 and recently reintroduced into horticulture in the southwestern United States. Plants have been tested for their landscape potential for the last five years and have thus far proven to be readily adaptable to the climate of southern Arizona. Plants are evergreen, and fast growing, reaching mature size in one or two seasons in the ground. They are drought tolerant and hardy to at least 25 degrees F. The small blue flowers top the numerous ascending branches throughout the warm season.

5. **Salvia clevelandii** (Gray) Greene

A rounded shrub growing to 1 m tall and wide, with pubescent stems. The 1-3 cm long leaves are elliptic-oblong or obovate in outline; obtuse at the apex and narrowed at

the base. The margins are crenulate. The blades are rugose above, grayish tomentulose beneath, on petioles 3-6 mm long. A single terminal glomerule or sometimes 2-3 glomerules are arranged in an interrupted spike. Bracts are ovate and shorter than the calyx. The 8-10 mm long calyx is glandular-hispidulous. Dark violet-blue flowers are 21-22 mm long. The tube 12-18 mm long, upper lip 6-8 mm high, and lower lip 3-4 mm long. Native to chaparral and coastal sage scrub communities in southern California and northern Baja California. (Bailey et al., 1978; Clark, 1979; Epling, 1938; Munz, 1974)

Salvia clevelandii has been cultivated in the southwest since 1949. According to the files at the Rancho Santa Ana Botanic Garden, the plants have been short-lived, needing replacement every 5-10 years. In southern Arizona, *Salvia clevelandii* is an evergreen, fast growing shrub. Growth occurs in winter and spring, and flowers appear in spring and early summer. Plants should be planted in the fall to get them established before summer dormancy. The species has proven to be hardy and requires little supplemental water once established. Plants should be given a well aerated soil to reduce the chances of root rot in the hot, wet summer months.

6. **Salvia coccinea** Juss. ex Murr. TROPICAL SAGE, SCARLET SALVIA, TEXAS SAGE.
S. pseudococcinea Jacq.

Tropical Sage is an annual, or perennial and subshrubby to 0.6-1 m tall with stems glabrate to canescent-pubescent near the top, and hirsute with long, spreading hairs at the base of the plant. Leaves are ovate or deltoid-ovate, 2.5-7 cm long, 5 cm wide. Blades are acute or obtuse at the apex, and truncate or cordate at the base, with crenate margins. They are soft tomentose beneath, with petioles 1-3.5 cm long. The inflorescence is a spicate raceme, with 6-10 flowered verticillasters spaced 3-5 cm apart. Bracts are small and ovate-acuminate. The tubular-campanulate calyx is about 7 mm long; upper lip is entire and purplish; lower lip with 2 acute teeth. Deep scarlet flowers are about 25 mm long. The tube 13-20 mm long, upper lip 3.5-5 mm long, and lower lip 7-10 mm across. Stamens and style are exserted. The species occurs in a wide variety of habitats in the south-eastern United States, south through Mexico, Central America, and into Peru. (Bailey, 1928; Bailey, 1949; Bailey et al., 1978; Chittendon, 1956; Correll and Johnston, 1970; Epling, 1939b; Everett, 1960; Graf, 1982; Nicholson, 1887-1889; Simpson, pers. comm.; Standley and Williams, 1973; Synge, 1969; Taylor, 1961)

S. coccinea includes many horticultural cultivars some of which may not still be in cultivation:

'**Bicolor**'—has a white upper corolla lip and brilliant carmine-red lower corolla lip.

'**Lactea**'—has white flowers.

var. **major** Regel was considered by Bailey (1928) to be a subshrub to 1.5 m tall, less canescent-pubescent and have larger scarlet red flowers than the type, but Epling (1939b) considered this variety to simply fall within the range of variation for the species.

'**Nana**'—is dwarf and bushy.

'**Nana Carminea**'—was available in 1928.

'**Nana Compacta**'—compact and bushy.

var. **pseudococcinea** Gray is considered a synonym by Epling (1939b).

'**Punicea**'—is a larger, more slender plant with bright red flowers, a denser inflorescence, and later flowering than the typical form.

'**Punicea Nana**'—is dwarf and dense.

'**Rosea Nana**'—had been available.

'**Splendens**'—a synonym of var. *punicea*
(Nicholson, 1887-1889; Bailey, 1902; Bailey, 1928; Chittendon, 1956)

The form of *Salvia coccinea* that I have seen being grown in southern Arizona is a perennial which will stay evergreen in mild winters. Plants are fast growing and may reach a height of up to 1 meter. They will reseed and become somewhat weedy in areas with enough moisture for seedling establishment. The plants bloom continuously with enough warmth and moisture.

7. **Salvia dorrii** (Kellogg) Abrams. GRAY BALL SALVIA.
S. carnosa Douglas ex Greene

Gray Ball Salvia is a low, rounded, much-branched shrub, reaching 1-7 dm tall and 2-15 dm wide. Leaves are variable in size and shape. They may be obovate, spathulate, or linear to narrowly obovate, 6-30 mm long, 5-13 mm wide. Blades are truncate to emarginate at the apex; and obtuse, rounded, or acute at the base; margins are entire or occasionally crenulate. The inflorescence is composed of 1-5 verticillasters in terminal or axillary interrupted spikes; glomerules 8-15 mm long, 15-30 mm wide, and spaced 6-25 mm apart. Bracts are variable in shape, ranging from orbicular to ovate, obovate, or elliptic, 5-16 mm long and 3-15 mm wide. They are papery, and purple, blue, or rose. The calyx is purple, blue, rose, or even greenish-yellow, 5-12 mm long, and 2-6 mm wide. Flowers are bluish to deep purple or rose, seldom white; 9-118 mm long. The cream or white tube is 5-13 mm long. Stamens are exserted 1-5 mm. Gray Ball Salvia occurs in arid, sandy, or rocky places from eastern and central Washington south to southern California, east to western Idaho, western Utah, and northern Arizona; at elevations ranging from 300-3050 meters. (Bailey et al., 1978; Epling, 1938; Strachan, 1982)

Gray Ball Salvia has been in cultivation at the Rancho Santa Ana Botanical Gardens since May 1957 and has recently been cultivated at Mountain States Nursery in Glendale, Arizona. The species is an evergreen, hardy, shrub. Plants are moderately fast growing and require some supplemental watering. According to Strachan (1982) there are two subspecies and four varieties of *S. dorrii*, which should provide a diversity of material for cultivation.

8. **Salvia farinacea** Bentham. MEALY SAGE, MEALY CUP SAGE.

Mealy Sage is an herbaceous perennial to 12 cm tall and 6 dm across; stems minutely and canescently puberulent. Leaves are linear to ovate-lanceolate, or ovate. Blades are up to 10 cm long and 3 cm wide, acute or obtuse at the apex, and obtuse, cuneate, or rarely subcordate at the base. Margins are coarsely and irregularly serrate. Slender petioles to 4 cm long. The inflorescence is a dense terminal spicate-raceme to 15 cm long, each verticillaster with 6 flowers. Bracts are small and deciduous. The tubular calyx is 5-8 mm long; densely white or purplish tomentose when fresh,

turning brown or tan in age. Dark violet-blue flowers are 15-25 mm long; tube 6-9 mm long; upper-lip 3-6 mm long; lower lip 8 mm long and 10 mm wide. Plants bloom from April until they are killed back by frost. Mealy Sage occurs in a wide variety of habitats in central and east Texas and into New Mexico. (Bailey, 1902; Bailey, 1928; Bailey, 1934; Bailey et al., 1978; Bush-Brown and Bush-Brown, 1980; Chittendon, 1956; Correll and Johnston, 1970; Dufresne, pers. comm.; Epling, 1939b; Nicholson, 1887-1889; Peterson 1978; Pizzetti and Cocker, 1968; Synge, 1969; Taylor, 1961; Thomas, 1976).

There are three cultivars which have been offered in the nursery trade:

'Alba'—has white flowers.

'Blue Bedder'—to 60-75 cm tall, with darker blue flowers than the typical species.

'Victoria'—to 40-60 cm tall and 45 cm wide.

Cultivars 'Blue Bedder' and 'Victoria' are quite similar; both are smaller and more compact than the type, with 'Victoria' being the smaller of the two. 'Victoria' seems to be the most common cultivar being grown although plants are rarely labelled to cultivar. 'Victoria' is a fast growing compact perennial, reaching a height of 60-75 cm tall. Flowers appear on new growth throughout summer and fall. They should be cut back to remove old flowering spikes, and prevent them from becoming top heavy. They will continue to bloom until frost, when stems should be cut to ground level. Cultivar 'Alba' is being grown in southern Arizona and is available in the nursery trade. Plants I have seen were slightly larger than 'Victoria', but maintained a dense bushy appearance. Mealy Sage is best grown in filtered light to reduce water consumption. Plants grown in full sun require ample water, but are more compact. *Salvia farinacea* is sometimes confused with *Salvia azurea* (Blue Sage) from which it differs by having the densely pubescent calyx and petioles 1 cm long or longer.

9. **Salvia greggii** A. Gray. AUTUMN SAGE, TEXAS SAGE, RED SALVIA.

Autumn Sage is an evergreen shrub which grows to 0.3-1.5 m tall. Leaves are linear-oblong or elliptic in outline, 1-3.5 cm long. Leaf blades are obtuse at the apex, narrowed at the base, and have entire margins. They occur on short axillary shoots and appear fascicled. Flowers are arranged in loose, 5-15 cm long terminal racemes. The ovate bracts are small and deciduous. The narrowly campanulate calyx is 10-12(15) mm long, and slightly pubescent or glandular. Flower color varies from red to purplish red or white in one cultivar. Individual flowers are somewhat large and showy, each measuring 25-35 mm long. The tube is swollen near the middle and 18-22 mm long. The upper corolla lip is 7-10 mm long, while the lower lip is larger and showier, measuring 10-15 mm long and 10-13 mm across. Autumn Sage occurs in rocky soil from 1500-2600 meters from southwest Texas south throughout the Chihuahuan Desert into San Luis Potosi, Mexico. (Bailey, 1902; Bailey, 1928; Bailey, 1949; Bailey et al., 1978; Epling, 1939b, Everett, 1960, Chittendon, 1956; Clark, 1979; Correll and Johnston, 1970; Dufresne, pers. comm.; Graf, 1982; Nicholson, 1887-1889; Pizzetti and Cocker, 1968; Synge, 1969; Taylor, 1961; Thomas, 1976)

Four cultivars are currently in cultivation:

'Alba'—has white flowers.

'Cherry Red'—has red flowers.

'Furmans Red'—has dark red flowers when first open.

'Rosea'—has pale red flowers.

Salvia greggii has been in cultivation since 1885 according to Nicholson (1887-1889), and has proven to be a reliable shrub for the southwestern United States. Autumn Sage is a small, evergreen shrub which looks best when pruned periodically to keep plants dense and about 60 cm tall. As with most other Salvias, *S. greggii* blooms on new growth, so the denser the plant, the more flowering spikes there are. Plants will bloom from spring through summer and into fall. Typical *Salvia greggii* is perfectly hardy in mid and low elevation areas of southern Arizona, and is quite drought tolerant once established. Cultivar 'Cherry Red' is slower growing and less floriferous than typical *S. greggii.* Plants bloom sporadically throughout the warm part of the year, with the best floral display in the fall. It seems to be best suited for shadier spots (east and northeast exposures) and is an excellent addition to horticulture. Cultivar 'Rosea' is rare in cultivation, but may be available periodically through nurseries in Texas and southern Arizona. Cultivar 'Alba' is now readily available through some nurseries in southern Arizona. I have one plant of cultivar 'Furmans Red' which has darker red flowers than typical *Salvia greggii.* The flowers are slightly larger, and the color has more blue than the typical plants commonly found in cultivation. I am working with a peach colored form of *S. greggii* and hope to have plants available in the near future. available in the near future.

10. **Salvia leucantha** Cav. MEXICAN BUSH SAGE.

Mexican Bush Sage is a small shrub or herbaceous perennial to 6-12 dm tall and 6 dm wide. Leaves are linear-lanceolate, 6-15 cm long, 8-16 mm wide. Leaf blades are acute at the apex, rounded at the base, and have serrulate margins. They are rugose above and white-tomentose beneath giving a striking appearance to the leaves. Flowers are arranged into a dense spicate raceme to 15-50 cm long, each verticillaster with 3-6 flowers. Bracts are ovate-elliptic, 7-8 mm long, and densely lanate with violet or lavender hairs. Flower color is typically white or purple in one form. Flowers are densely covered with white wool, and have an overall length of 25 mm. The tube is 13-14 mm long and swollen at the throat. Mexican Bush Sage is reported to occur in tropical and subtropical conifer forests in eastern and central Mexico. (Bailey, 1902; Bailey, 1928; Bailey, 1949; Bailey et al., 1978; Chittendon, 1956; Clark, 1979; Epling, 1939b; Everett, 1960; Graf, 1982; Nicholson, 1887-1889; Pizzetti and Cocker, 1968; Synge, 1969; Taylor, 1961; Thomas, 1976).

A plant collected by C. G. Pringle in Morelos, Mexico was described as forma *iobaphes* by Fernald (1901), and differs from typical *Salvia leucantha* in having a deep violet calyx and corolla. This form seems to be the most commonly cultivated although I have seen both colors in southern California. Stems of *Salvia leucantha* will freeze in Tucson and should be cut in the winter, but plants will sprout from the base and reach full size the next season. Plants generally start blooming in late summer or fall and continue on until frost. The species is a prolific bloomer and well worth cultivating, especially if planted with

evergreen shrubs. Mexican Bush Sage can be planted in either full or part sun, and is somewhat drought tolerant once established. According to Epling (1939b), *Salvia bicolor* Sesse & Moc. is a synonym of *Salvia leucantha*; this is not to be confused with *Salvia bicolor* Lam. which is native to Spain and northern Africa.

11. **Salvia leucophylla** Greene. GRAY SAGE, PURPLE SAGE

Gray Sage is a shrub to 1-2 m tall and wide, with white stems and a whitish overall appearance. Leaf blades are rugose above, deltoid-oblong or oblong-lanceolate in outline, and 2-6 cm long. They are obtuse at the apex, truncate at the base, and have crenulate margins. The inflorescence is composed of 3-5, many-flowered whorls spaced 3-6 cm apart. The numerous bracts are oval to oblong, and often purplish. The 8-11 mm long calyx is whitened with minute, branched hairs. Flower color is rose-lavender, each one measuring about 2 cm long. Stamens are long exserted. Gray Sage occurs in chaparral scrub below 1000 meters elevation in southern California. (Bailey et al., 1978; Bailey 1949; Clark, 1979; Epling, 1938; Munz, 1974; Wolf, 1943)

Salvia leucophylla has been grown periodically in the southwest and has proven to be a reliable shrub. Plants tend to die out after 5-15 years and need replacing; however, this does not present any real problem since mature specimens can be obtained after one season in the ground. A well drained soil is essential to reduce the risk of root rot during hot and wet periods for the winter growing *Salvia leucophylla*. Plants bloom in late spring and summer, providing long lasting color. They should be planted in the fall to help establish them before they go dormant in the summer heat. Plants are quite drought tolerant once established and seem to survive on rainfall alone in Tucson.

12. **Salvia lycioides** A. Gray. CANYON SAGE.

Canyon Sage is a slender perennial 3-6 dm tall, with herbaceous stems. The oblong-elliptic leaves are 1-3 cm long, and 1-2 cm wide. The glabrous or minutely puberulent blades are obtuse or rarely acute at the apex, and cuneate at the base, and have entire or coarsely crenulate-serrulate margins. The slender, elongate interrupted racemes grow to 15 cm long, with flowers opposite at the nodes. The 6-8 mm long calyx is glandular-punctate, and often tinged with blue. Flowers are blue to indigo-blue, about 17 mm long. The tube is 10 mm long, upper lip 4-4.5 mm high, and lower lip 7 mm long. Occurs in canyons, on rocky slopes, and ledges in mountains of the Trans-Pecos in Texas, also in New Mexico and northern Mexico. (Correll & Johnston, 1970; Epling, 1939b)

Salvia lycioides has been cultivated at the Texas Agriculture Experiment Station since 1976 and according to Simpson (pers. comm.) has survived -15 degrees C without damage. Plants require little water, and bloom from April to October. Canyon Sage is related to *Salvia chamaedryoides* and *Salvia greggii*, and shows promise as a landscape plant.

13. **Salvia melissodora** Lag.

S. scorodoniaefolia Poir.

Large shrub to about 2 m tall, the stems usually floccose-tomentose or rarely glabrous. Leaves are 4-6 cm long, oblong-ovate or rarely deltoid-ovate. Blades are obtuse at the apex, rounded at the base, and bullate-rugose above and tomentose below. The spicate-raceme is 5-12 cm long, each whorl with 3-6 flowers. The small, 6-7 mm long, calyx is usually glandular. Small blue flowers, measuring 10-13 mm long, appear in late summer or fall. The species ranges from Chihuahua south to Oaxaca, Mexico. (Epling, 1939b)

Figure 3. *Verticillasters arranged in a terminal raceme and evenly spaced along the inflorescence axis in* Salvia greggii.

I am growing one plant grown from seed collected in Guanajuato, Mexico. The plant grew to 1.75 m tall in one growing season in the ground. Stems froze back about halfway when winter lows reached about 32 degrees F. Recovery was quick in the spring, and the plant reached full size by July. The plant bloomed in the fall its first year in the ground, and began blooming in October its second year in the ground. A dense spike of blue flowers top this medium sized shrub, and make quite a display. My plant is in a northeast exposure and grows quite well. It receives weekly drip irrigation and does not show signs of stress. I am propagating the species and intend to test it in a variety of exposures, but expect it will be adaptable to southern Arizona. I also have one clone from Tarahumar country in Chihuahua which may prove to be more desirable.

Figure 4. *Solitary and terminal glomerules as in* Salvia mohavensis.

14. **Salvia mellifera** Greene. BLACK SAGE.

Black Sage is a rounded shrub to 1-2.5 m tall with cinereous-tomentose to glabrate twigs. The leaves are 3-6 cm long with oblong-elliptic to oblong-lanceolate blades which are obtuse at the apex, and narrowed below the middle. Blades are rugose and dark green above, cinereous-tomentulose beneath, and have crenate margins. The inflorescence is an interrupted spike, with glomerules 2-4 cm across and spaced 2-6 cm apart. The greenish to purplish bracts are reflexed at maturity. The calyx is small, 5.5-8 mm long, and somewhat hidden by the bracts. Flowers are pale blue sometimes tinged with rose and measure 10-12 mm long. The tube is 5.5-9 mm long, upper lip 2-3 mm long, and lower lip 4-5 mm long. Stamens are slightly exserted beyond the corolla. Black Sage is a component of the coastal sage scrub and chaparral in southern California and northern Baja California. (Bailey et al., 1978; Epling, 1938; Munz, 1974; Shreve and Wiggins, 1964).

Black Sage has been cultivated at the Rancho Santa Ana Botanical Gardens since 1949 and according to their files, is a fast grower, and has survived 15 degrees F without damage. Plants have required little supplemental water, and tolerated soils ranging from a clay loam to sandy and rocky. In Tucson, Black Sage grows rapidly and makes a 1 m tall shrub after only 1 season in the ground. Plants should be grown in a well drained soil to reduce the chances of root rot during the hot, wet summer months. Planting should be done in the fall to establish plants before they go dormant in the summer. *Salvia mellifera* is closely related to *Salvia munzii* and cultural requirements are similar for both species. Cultivar 'Terra Seca' is a low growing, almost prostrate selection being tested at the Boyce Thompson Arboretum near Superior, Arizona.

15. **Salvia mexicana** L.

Salvia mexicana is a shrubby perennial which grows to 1-4 m tall with stems that are finely and densely grayish pubescent. Leaves are ovate-oblong in outline, 6-15 cm long and 5-8 cm wide, upper leaves smaller. Leaf blades are acute or shortly acuminate at the apex, and rounded at the base. They are dark green and minutely hairy on the upper surface, and obscurely to densely tomentellous on the lower surface. The inflorescence is a terminal raceme 20-40 cm long with 8 or more whorls, and 6-12 flowers per whorl. Subtending bracts are small and caducous. The calyx is 16-20 mm long, and often deep purple-violet. The rich violet-blue or deep blue flowers range from 16-40 mm long, the tube exserted beyond the calyx. The species occurs in arid subtropical regions of north-central Mexico south to tropical areas in central Mexico. (Epling, 1939b; Chittendon, 1956; Bailey et al., 1978; Curtis Botanical Magazine, 1956)

Two varieties of *S. mexicana* are recognized by Epling (1939b).

var. **minor** Bentham—is distinguished by its smaller (16-20 mm long) flowers. It comes from north-central Mexico, and seems to have the most potential as a landscape plant in southern Arizona. It is hardier and blooms more freely than var. *major*. I have been growing this variety which I received from The Huntington Botanical Gardens in June of 1983. Plants survived the winters of 1983 and 1984 in 1 gallon containers and have recently been planted for more testing. It seems to grow best in filtered sun and can tolerate low water once established. Growth rate varies with amount of water given and plants watered heavily may grow as much as 2 meters in one season according to Dufresne.

var. **major** Bentham—has larger flowers, 32-40 mm long, and comes from more tropical Mexico. It does not have as much landscape potential as var. *minor* and is not being tested in the Tucson area.

Both varieties are well adapted to the climate of coastal California and make large shrubs there. According to Dufresne (pers. comm.) the species is hardy to 30 degrees F without damage, and will recover quickly if damaged at temperatures below that. *S. mexicana* is fast growing, and may make a large shrub in one or two seasons in the ground. Plants can tolerate full sun or partial shade in North Carolina.

16. **Salvia microphylla** H.B.K. CHERRY SAGE, BABY SAGE.

Cherry Sage is a perennial herb with a woody base, or shrub to 1-1.3 m tall and 1 m across. Leaf shape varies from ovate to elliptic or oblong. Blades measure 1-2.5 cm long,

and are obtuse at the apex and acute or obtuse at the base. Terminal racemes with 2-flowered whorls may reach 20 cm long, but are generally 10-15 cm long. Subtending bracts are small and caducous. The calyx is green, densely glandular-puberulent, and 10-15 mm long. Flower color has been variously described as rose-red, scarlet-crimson, or bright magenta-crimson. Flowers are about 25-35 mm long, the tube measuring 16-18 mm long, the upper lip 6-12 mm long, and the lower lip larger and showier. Cherry Sage occurs in the mountains of eastern, western, and southern Mexico, and in south-eastern Arizona. (Bailey, 1949; Bailey et al., 1978; Chittendon, 1956; Graf, 1982; Standley and Williams, 1973; Synge, 1969; Taylor, 1976)

Epling (1939b) considered *S. microphylla* to consist of three geographical forms.

var. **microphylla** occurs in central Mexico, and seems to be the form most commonly found in cultivation. It is well adapted to the climate of coastal California, but not southern Arizona.

var. **wislizeni** Gray occurs at high elevations in south-eastern Arizona and northwesten Mexico, and is cultivated periodically. This form is more cold tolerant, but is heat sensitive and dies out in the summer in mid and low elevation deserts of southern Arizona. I have not been able to grow any plants through the summer in Tucson. This variety looks quite similar to *Salvia greggii* which is an exceptional landscape plant for southern Arizona.

var. **neurepia** Epling occurs in the Chihuahuan Desert Region and appears to have the most potential as an outdoor landscape plant in southern Arizona. I have not been able to obtain any material of this variety for testing, but think it would make an adequate addition to landscape shrubs for southern Arizona.

Overall the species is fast growing and blooms in summer and fall, usually from June to October. Plants are hardy to about 30 degrees F. Propagation is by cuttings (Dufresne pers. comm.). Plants that I have seen look similar to *Salvia greggii* 'cherry red' and may be confused with it. *S. greggii* 'cherry red' is a fine substitute for *S. microphylla* until it becomes available.

17. **Salvia mohavensis** Greene

A compact, much branched shrub to 1 m tall. The bright green, rugose leaves are lance-oblong to ovate-oblong, 1-2 cm long. They are obtuse at the apex, truncate at the base, and have crenulate margins. The inflorescence consists of a single, many-flowered, terminal glomerule. The ovate, membranaceous bracts are greenish or whitish. The calyx is 7-12 mm long, hirtellous and ciliate. Flowers are pale blue or lavender, 15-16 mm long with a slender tube which flares near the throat. Native to southern Nevada, south-eastern California, central Arizona, and northwestern Sonora, Mexico. (Epling, 1938; Munz, 1974)

Salvia mohavensis has been cultivated at the Rancho Santa Ana Botanic Gardens since 1956 and according to their records the plants are moderately fast growing. They are drought tolerant and cold hardy. Plants grow best in full sun, making a bright green, rounded shrub.

18. **Salvia munzii** Epling

A rounded, compact shrub to 0.5-2.5 m tall with purplish or reddish twigs. The 2-3 cm long leaves are oblong-obovate or oblanceolate in outline, rounded at the apex and narrowed at the base. Leaf blades are rugose and dark green above, reticulate beneath, and punctate-glandular and cinereous-pubescent on both surfaces. Interrupted spikes of 1-5 glomerules are 12-17 cm long. The bracts are oblong-elliptic and foliaceous. The 4-6 mm long calyx is hirtellous. Clear blue flowers are 9-14.5 mm long, the tube 7-9.5 mm long, the upper lip 2-2.5 mm long and the lower lip 4-5 mm long. *Salvia munzii* occurs in coastal sage scrub in northern Baja California and southern California. (Bailey et al. 1978, Epling 1935, Epling 1938, Munz 1974, Shreve & Wiggins 1964).

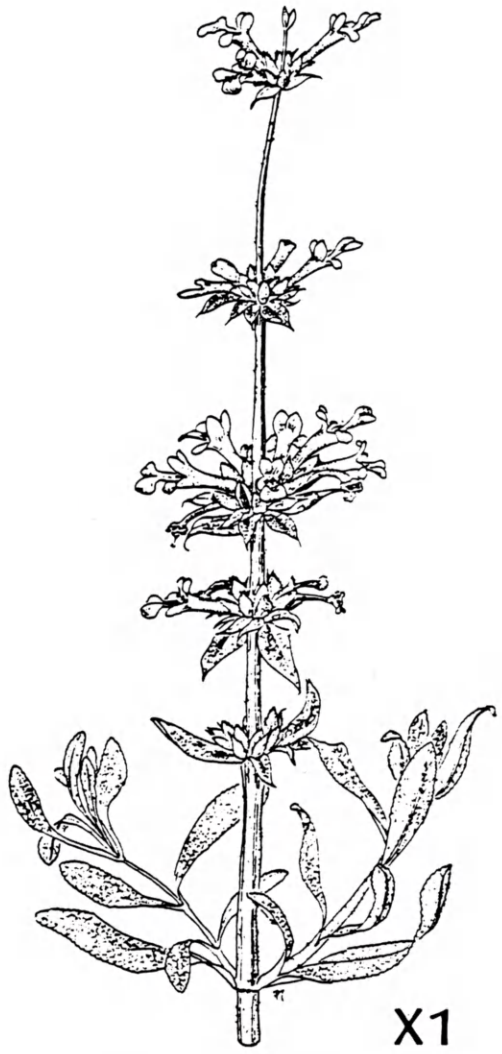

Figure 5. *Glomerules arranged in terminal and spikelike inflorescence as in* Salvia munzii.

Salvia munzii was introduced at Rancho Santa Ana Botanic Gardens in 1941 and according to their records, the plants were fast growing, reaching about 1 m in height in two seasons, but they were short lived, lasting about 10 years before they needed replacing. *S. munzii* is another winter grower that is best planted in the fall. Plants I am growing are from cuttings collected in northern Baja California. They are in full sun and a well drained soil. They

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Salvias

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survived a winter low of 26 degrees F. Plants were in full flower during the winter months. The flowers but not foliage were damaged at 26 degrees F. Recovery was rapid and plants were blooming again within 1-2 months.

19. **Salvia pinguifolia** (Fern.) Woot. & Standl. ROCK SAGE.

Rock Sage is a shrub to 15 dm high, the stems and branches puberulent with whitish hairs. Leaves are broadly deltoid-ovate, 2-5 cm long, and about as broad. Blades are obtuse at the apex and truncate to broadly cordate at base, with crenate-serrate margins, and conspicuously glandular-punctate beneath. Flower spikes are 3-8 cm long, with crowded verticils. The broadly flaring calyx is 6.5-10 mm long, canescent with minute, simple, appressed hairs. Flowers are lavender-purple, about 9.5-14.5 mm long. The tube is 5-8 mm long, upper lip 4.5-5 mm high, and lower lip 4.5-6.5 mm long. Blooming from August through September. Rock Sage is an uncommon species in rocky soils from western Texas to southeastern Arizona and Northern Mexico. (Correll and Johnston, 1970; Shreve and Wiggins, 1964)

Rock Sage has been grown at the Texas A&M Research Center since 1976. Plants are in full sun and require monthly irrigation. They reached mature size in two growing seasons and have survived -15 degrees C without sustaining damage (Simpson pers. comm.). *Salvia pinguifolia* is related to *Salvia ballotaeflora*, and would also make a fine addition to the nursery trade in southern Arizona.

20. **Salvia regla** Cav. MOUNTAIN SAGE.

Mountain Sage is a shrub to 2 to 2.5 m tall. The broadly deltoid-ovate leaves are 2.5-5 cm long and wide, with an obtuse apex, and truncate base. Blades are wrinkled and slightly hispid above, pubescent on the nerves beneath, and have coarsely crenate margins. The calyx is subinflated, 1-2 cm long, reddish above and green below. Scarlet flowers are axillary or in short terminal racemes, 3.5-5 cm long. The tube 2.5-4 cm long, upper lip 1.5 cm long, lower lip 1.3 cm long. Native to the mountains of Big Bend in Texas, south to north-central Mexico. (Correll and Johnston, 1970; Epling, 1939b; Nicholson, 1887-1889; Synge, 1969)

Mountain Sage was introduced into cultivation in 1839 (Nicholson, 1887-1889) and is still being grown. Simpson (pers. comm.) started growing the species in 1974. His plants are being grown in filtered sun, and require monthly watering. They are somewhat slow growing for a Salvia, and are hardy to 15 degrees F without being damaged. Dufresne (pers. comm.) is growing two forms of Mountain Sage. The southern form, from Hidalgo, Mexico, grows to about 1.5 meters tall, is hardy to 30 degrees F, blooms late and is very showy. The Texas form grows to 1.25 meters tall, is hardy to 10 degrees F, and has smaller flowers. I grew a few plants in Tucson, but they did not survive in containers long enough to be planted in the ground. Mountain Sage would seem to be a species suitable for planting on the east and north sides of buildings, and should be tested in mid- or high-elevations in southern Arizona.

21. **Salvia reptans** Jacq.

A perennial herb with decumbent or erect stems to 1 m long or tall. Linear to narrowly oblanceolate leaves are 1.5-8 cm long and 1.5-6 mm wide. The inflorescence is an interrupted spike 15-30 cm long, with 1-4 flowered verticillasters spaced 1-4 cm apart. The 4-6 mm long calyx is glabrous or hispid, frequently blue tinged. Sky blue or cobalt blue flowers are 9.5-26 mm long. The tube measures 6-11 mm long, upper lip 3.5-6 mm long, and the broadly expanded lower lip 8-15 mm long. Native from west Texas south to southern Mexico. (Bailey, 1902; Bailey, 1928; Chittendon, 1956; Correll and Johnston, 1970; Epling, 1939b; Nicholson, 1887-1889; Peterson, 1978; Synge, 1969)

Salvia reptans has long been known as either *Salvia angustifolia* or *S. leptophylla* in cultivation, and according to Peterson (1979) consists of two varieties.

var. **reptans** is native to central and southern Mexico, was introduced in 1816, and was called *S. angustifolia* by Nicholson (1887-1889), Bailey (1902, 1928) and Chittendon (1956) or *S. leptophylla* by Synge (1969). This is the most commonly cultivated form and according to Dufresne (pers. comm.) is moderate to fast growing and hardy to about 25 degrees F. His plants are growing in full sun and require monthly watering. I am growing this form collected in Michoacan, Mexico. It blooms in summer and fall and is hardy to at least 26 degrees F. The plants are prostrate with ascending stem tips, and grow moderately fast. They are in partial shade and receive weekly drip irrigation. With its prostrate habit, *S. reptans* var. *reptans* is an ideal plant for desert rock gardens and gentle slopes. Propagation is easily achieved by either seeds or cuttings. This variety is available in southern Arizona.

var. **glabra** (A. Gray) K.M. Peterson is the upright growing form from Texas and is uncommon in cultivation. It has broader leaves, smaller flowers, and makes a rounded shrub. This variety would make an attractive addition to the cultivated Salvias of southern Arizona.

22. **Salvia roemeriana** Scheele. CEDAR SAGE.
S. prophyrantha Decne.
S. porphyrata Hook.

Cedar Sage is an herbaceous perennial to 7 dm tall. Roundish or reniform-cordate leaves are 2.5-5 cm wide, coarsely repand-toothed or crenately incised. Lower leaves with 2 or 3 lateral leaflets. The inflorescence is a loose, elongated raceme. The somewhat pubescent calyx is about 15 mm long. Deep scarlet, narrowly tubular-funnel form flowers are 25-35 mm long. Cedar Sage occurs in west Texas and adjacent Mexico. (Bailey, 1928; Chittendon, 1956; Correll and Johnston, 1970; Nicholson, 1887-1889; Synge, 1969)

Cedar Sage was introduced into cultivation in 1852 (Nicholson, 1887-1889) and is currently being grown by Dufresne. His plants are growing in full or filtered sun and require low to moderate watering. They are fast growing and hardy to 10 degrees F. The flowers are dimorphic. Fully developed flowers appear in the spring and fall, and produce the best floral display then. Cleistogamous flowers appear

during the summer. The plants reseed freely and may become a pest in moist situations.

23. **Salvia sessei** Benth.
S. roezlii Scheidw.

This shrub grows to 5 m tall, and has ovate leaves to 5-12 cm long and 2.5-6 cm wide. Leaf blades are acuminate at apex, round at base, and have crenate-serrate margins. Opposite flowers are arranged in a short panicle. Bracts are ovate and caducous. The brick red calyx is 15-20 mm long and 10-11 mm broad at the middle when in flower, enlarging to 20-25 mm long and 14-15 mm broad in fruit. The scarlet flowers are 4-5.5 cm long, the tube 28-35 mm long, upper lip 15-18 mm, and lower lip 17-19 mm long. (Bailey, 1902; Bailey, 1928; Epling, 1939b)

Salvia sessei is being grown by Dr. Dufresne (pers. comm.). His plants are in full sun and require monthly irrigation. They take two years to reach 1.3 meters tall and have survived 25 degrees F. Plants bloom in the fall and may attract hummingbirds.

24. **Salvia splendens** Sellow ex. Roem. SCARLET SAGE.
S. braziliensis Spreng.
S. colorans of gardens

In the wild, Scarlet Sage is an herbaceous perennial, or sub-shrub to 2-8 feet tall, with glabrous branches. The ovate leaves are 5-12.5 cm long, acuminate at the apex, and cuneate, rounded, subcordate, or attenuate at the base. The inflorescence is a terminal raceme to 15 cm long with 2-6 flowered whorls. The bracts are large, 1-2 cm long, and scarlet. The inflated calyx is also large, 1.5-2 cm long, and scarlet. The spikes of bright scarlet flowers are a familiar sight in many cities across the United States. Individual flowers measure 5-6.25 cm long. The 3-4 cm long tube is exserted from the calyx. The upper lip measures 7-9 mm long, the lower lip is shorter than the upper. (Bailey, 1902; Bailey, 1928; Bailey, 1949; Bailey et al., 1978; Chittendon, 1956; Clark, 1979; Crockett, 1981; Epling, 1939b; Everett, 1960; Graf, 1982; Hay, 1969; Nicholson, 1887-1889; Pizzetti and Cocker, 1968; Shewell-Cooper, 1976; Standley and Williams, 1973; Synge, 1969; Taylor, 1961; Wilder, 1937)

Salvia splendens is probably the most widely cultivated species of *Salvia*. It is a tender perennial grown as an annual in most places. Plants are propagated by seed sown in February or March at a minimum of 60 degrees F. Transplant seedlings into individual pots 1-2 weeks before planting out in the summer. Cuttings may be taken in the summer or fall and rooted in the greenhouse under mist. They should be overwintered at a minimum of 50 degrees F. Pinch the tips when plants reach 3-5 inches tall. Plants can then be planted out in the summer. (Everett, 1960)

Plants can be grown in full sun and require a rich, well-drained soil and ample water. They are fast growing and bloom in the summer and fall.

There are many horticultural cultivars, some of which may no longer be in cultivation, which are summarized below.

'Alba'—has white flowers.
'Atropurpurea'—dark violet-purple flowers.

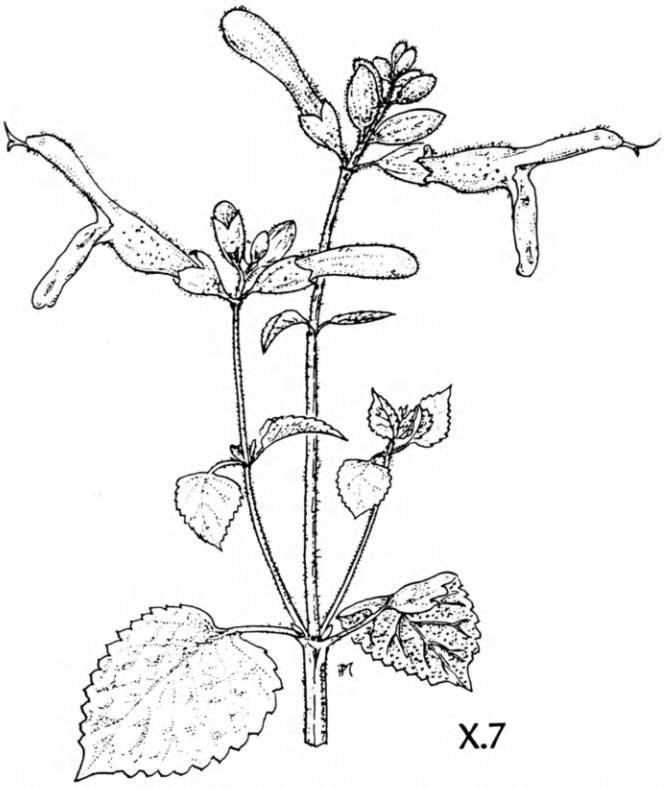

Figure 6. *Verticillasters arranged in an axillary raceme in* Salvia regla.

'Atrosanguinea'—has dark crimson flowers.
'Bicolor'—large spikes of scarlet and white flowers.
'Blaze Of Fire'—early flowering, with brilliant scarlet flowers, and growing to 0.3 meter tall.
'Bruantii'—dwarf habit, bright scarlet flowers, introduced in 1881.
'Calypso'—a pink flowered form.
'Compacta'—to about 25 cm tall; with numerous, dense racemes, and brilliant scarlet flowers.
'Compacta Alba'—white flowered dwarf.
'Compacta Erecta'—dwarf form, dark scarlet flowers.
'Fireball'—dwarf, with scarlet flowers.
'Grandiflora'—tall growing form, to 1 m tall, with flowers to 5 cm long.
'Gypsy Rose'—with dusky rose flowers.
'Harbinger'—to 0.5 meter tall, with scarlet flowers.
'Issanchon'—dwarf habit, with a white calyx, and a red and rose-white striped corolla.
'Lavender Love'—long, dense spikes of light lavender flowers; erect to 50 cm tall; blooms eight weeks after planting.
'Nana'—dwarf habit; early blooming.
'Parma Violet'—purple flowers.
'Purple Blaze'—reddish purple flowers.
'Purpurea'—no information available.
'Pyramidalis'—no information available.
'Red Blazer'—no information available.
'Rosea Carminea'—no information available.
'Rosy Gem'—bright rose flowers.
'Royal Purple'—purple flowered form.
'Salmon Beauty'—salmon colored flowers.
'Salmon Pygmy'—dwarf form to 23 cm tall, deep salmon colored flowers.
'Scarlet Pygmy'—dwarf form to 23 cm tall, with scarlet flowers that bloom early.

'Semperflorens'—early blooming, flowers continuously throughout the season.
'Souchetii' Planch.—white variant of 'Compacta'; probably synonymous with 'Compacta Alba'.
'Tom Thumb'—to 15 cm tall, with scarlet flowers.
'Violacea'—purplish flowers.
(Bailey, 1902; Bailey, 1928; Bailey et al., 1978; Chittendon, 1956; Graf, 1982; Hay, 1969; Nicholson, 1887-1889; Pizzetti and Cocker, 1968)

25. **Salvia 'Allen Chickering'**

A hybrid of *S. clevelandii* x *S. leucophylla* produced at the Rancho Santa Ana Botanic Garden. Third generation seed collected on June 19, 1949. Plants are rounded shrubs which are intermediate between the two parent species. The hybrid has since been cultivated by cuttings with best results from tip cuts of actively growing shoots. Plants are hardy and fast growing, and would appear to be adaptable to cultivation in southern Arizona. However, plants are not readily found in the nursery trade. (Epling, 1938; Rancho Santa Ana Botanic Garden records)

26. **Salvia 'Indigo Spires'**

Salvia 'Indigo Spires' becomes a large shrub, growing to 1.5 m tall, with stems woody below and herbaceous above. Leaf shape varies from ovate to ovate-lanceolate. Main stem leaves are 6-9 cm long, the upper leaves being reduced to 3 cm long. Leaf blades are broadly acute at the apex and cuneate at the base, with crenate-serrate margins. The inflorescence is an interrupted spikelike raceme to 10-30 cm long, becoming somewhat congested at the apex, with 10-12 flowered verticillasters spaced 1-3 cm apart. The narrowly campanulate, bluish calyx is 7 mm long; pubescent outside, glabrous inside. Dark violet-blue flowers are 15-17 mm long. The tube measures 10 mm long, upper lip 5 mm long, and the three-lobed lower lip 6-7 mm long and broad. Stamens and style are both included.

A spontaneous hybrid of *Salvia longispicata* x *Salvia farinacea* at Huntington Botanical Garden in 1979, and accessioned as HBG 46029. The plant I saw growing in the garden of Betsy Clebsch from cuttings of HBG 46029 was 1.5 meters tall with stems herbaceous above. I am currently growing *Salvia* 'Indigo Spires' in a greenhouse and am attempting backcrosses to *S. farinacea*. I have not grown *Salvia* 'Indigo Spires' outdoors in Tucson yet, but believe it has promise as a summer flowering perennial.

27. **Salvia 'Purple Majesty'**

A shrub to 1 m or more tall. The ovate leaves are 5-8 cm long, 3-5 cm wide, acute to short acuminate at the apex, and rounded, truncate, or slightly cordate at the base. The spikelike raceme is 15-30 cm long with 8-10 flowered verticels spaced 2-5 cm apart. Deciduous bracts subtend individual flowers. The 12-17 mm long calyx is green towards the base and dark blue towards the tip. Rich violet flowers are about 47-48 mm long, the tube 30-31 mm long, upper lip 16-17 mm long, and lower lip 13-14 mm long.

This hybrid was observed at Huntington Botanical Gardens in July 1983. According to their records, HBG 39897 is a plant grown from seed collected on the grounds in 1977 and is recorded as a hybrid of *S. guaranitica* (HBG 37837) and *S. gesneraeflora* 'Tequila' (HBG 30868). This is an artificial cross made by Fred Boutin in 1977. HBG 46672 is a plant received from Logees Greenhouses in Connecticut as *Salvia ambigens*. The plant was grown as *S. guaranitica* (S. ambigens) until 1982 when it flowered and proved to be *Salvia* 'Purple Majesty'.

I received cuttings of *Salvia* 'Purple Majesty' in July 1983 and am growing it outdoors in Tucson. The plant I have grows well in the summer, but goes dormant and freezes in the winter. It recovers quickly in the spring and makes a small shrub about 1 meter tall. The plant begins to bloom in the summer and continues until first frost. It is in a location which receives full sun at midday, and early morning and late afternoon shade. The plant is watered sparingly, and may grow faster and larger with more water. It would appear to be best treated as a summer and fall perennial. The plant will be propagated and tested in a variety of exposures and watering patterns.

Conclusions

New World Salvias, with nearly 580 species, range continuously from the Great Lakes in North America to the Argentine Plains in South America. Only 85 species (14.5%) have been cultivated, but one can be found to fit almost any climate in the southwestern United States. The high population areas I am concerned with include mid and low elevation areas in southern Arizona. High elevation areas in southern Arizona are sadly neglected with regards to the introduction of new landscape plants, but there are few *Salvia* species which would be adaptable to higher elevations. However, if known, I did mention in the individual discussion which species would be expected to perform well at higher elevations.

The climate of mid and low elevation areas in southern Arizona generally eliminates tropical and subtropical species from consideration as plants which could be used in the basic framework in most landscapes. They can be used in the warmest microclimates, or treated as summer flowering perennials. Most of these species freeze to ground level in open, exposed locations, and recover when the temperature warms up in the spring. For that reason, tropical species were not discussed in this paper. Species from the chaparral of California grow quite well in southern Arizona. They grow and flower in the winter and spring without much supplemental watering, generally surviving on the winter rainfall. New growth or flowers may be damaged if subject to temperatures below about 25 degrees F. Since they grow in an area which receives mostly winter rainfall, chaparral Salvias go dormant in the summer. However, they will grow in the summer if they receive some water, and in southern Arizona we receive enough summer rainfall that the Salvias require very little supplemental water. Again these species grow better in a soil rich in organic matter yet one that is also well drained. These species are capable of growing in southern Arizona and should be used more often in landscapes. *Salvia* species from the Chihuahuan Desert are generally well adapted to the climate of southern Arizona. Since they occur in a colder desert, they can tolerate the low winter temperatures which we receive. They also can survive the summer heat without much supplemental water once they are established in the ground. However they will grow better

and flower more profusely if watered regularly in the warmest months of summer. The Chihuahuan Desert Region seems to be an area that is receiving more attention for potential landscape plants.

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Figure 7. *Verticillasters crowded along the inflorescence axis in* Salvia lavanduloides.

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