Division of Agricultural Sciences

UNIVERSITY OF CALIFORNIA

ORNAMENTALS FOR CALIFORNIA'S MIDDLE ELEVATION DESERT

M. E. Mathias
W. Metcalf
M. H. Kimball
C. L. Hemstreet
D. E. Gilbert
W. B. Davis

CALIFORNIA AGRICULTURAL
EXPERIMENT STATION

BULLETIN 839

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ORNAMENTALS

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THIS PUBLICATION had its origins in a plant study initiated in 1956 which included many exploratory trips to nearly all settled sections of California's segment of the Mojave Desert. The study revealed a large number of ornamental trees, shrubs, vines, ground covers, and annual flowering plants growing satisfactorily in this rigorous environment. The area, its many climates, and the plants found there by the authors are briefly described here.

Typical home in Middle Elevation Desert area (photo courtesy of Barstow Chamber of Commerce).

March, 1968

THE AUTHORS:

Mildred E. Mathias is Professor of Botany, University of California, Los Angeles.

Woodbridge Metcalf is Extension Forester Emeritus, Agricultural Extension Service, University of California, Berkeley.

Marston H. Kimball is Extension Bioclimatologist Emeritus, Agricultural Extension Service, University of California, Los Angeles.

Chester L. Hemstreet is County Director and Farm Advisor, Agricultural Extension Service, Lake County.

Dewayne E. Gilbert is Extension Bioclimatologist, Agricultural Extension Service, University of California, Davis.

William B. Davis is Extension Ornamental Horticulturist, Agricultural Extension Service, University of California, Davis.

ORNAMENTALS FOR CALIFORNIA'S MIDDLE ELEVATION DESERT¹

CALIFORNIA DESERTS

Sections of three well-known deserts comprise nearly the entire eastern part of California. They lie east of a chain of high mountain ranges, extending from Oregon into Mexico, which form a generally effective barrier to eastward movement of moist Pacific air masses. These deserts all lie in California's PLANTCLIMATE V (figure 1) and include the driest, the hottest, and nearly the coldest sections of California.

In east-central and northeastern California lies the western edge of the Great Basin Desert. This is California's HIGH ELEVATION DESERT, with valleys 4500 to 6000 feet high and plateaus ranging from 6000 to 8000 feet. The climate ranges from arid, cold-temperate to sub-alpine in higher elevations. In east-central and southeastern California are large sections of the Mojave and the Colorado Desert portion of the vast Sonoran Desert complex. The latter is California's LOW ELEVATION DESERT; its climate is subtropical throughout. Its upper elevation (1000 feet above sea level) coincides with the approximate upper climate limit of subtropical conditions. It includes cultivated valleys from 120 to nearly 200 feet below sea level. Death Valley is located in the Middle Elevation Desert but is considered part of the Low Elevation Desert due to its elevation. California's MIDDLE ELEVATION DESERT is nearly half of the Mojave Desert. Its climate ranges from arid-warm-temperate to arid-cool-temperate in higher valleys, and to sub-alpine in high mountains.

In the Middle Elevation Desert, the authors' special attention was paid to fruit and nut growing, as the behavior of almond, apricot, peach, cherry, plum, pear, apple, pecan, walnut and olive trees provides unique information which can be related to behavior of ornamentals. Factors involved in such behavior are: winter temperature effectiveness in breaking dormancy; spring and fall frost conditions; summer temperature; location and boundaries of warm thermal zones or thermal belts (see "Glossary," pages 15-16) on air-drained slopes and low hills; and the effect of such things as varying exposures and mountain shelters.

The High Elevation Desert contains some 9,200 square miles, the Low Elevation Desert about 10,200, and the Middle Elevation Desert approximately 38,800 square miles. The total of all deserts, 58,200 square miles, is about 37 per cent of the state's area.

California's Middle Elevation and Low Elevation Deserts are closely associated geographically and climatically. These two deserts occupy an area about 380 miles long, northwest to southeast, and each desert extends almost the entire distance. East to west they are from 100 to 240 miles wide, narrowing to a point in the extreme north.

The Middle Elevation Desert has an area of about 38,800 square miles—approximately equal to the combined areas of Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut and Delaware plus one-third of Maryland.

THE MIDDLE ELEVATION DESERT

Location and Elevation

The Middle Elevation Desert (as here considered) includes all desert areas between 1000 and 7000 feet above sea level. In the north the boundary is the lower climatic limit of the High Elevation Desert, 7000

feet around Owens Valley to 5500 feet at the south end of the Inyo Mountains. Through central and southern California the western boundary gradually lowers from about 6000 feet on the east face of the Sierra Nevada at the south end of

¹ Submitted for publication April 28, 1967.

Owens Valley, to below 4000 feet in southern San Diego County.

Main valley floors range from 2000 to 4500 feet elevation. The surrounding alluvial slopes rise to varying heights, differing with the size of the valley and with the elevation of the valley floor. These air-drained slopes extend as high as 6000 feet around the north end of Owens Valley. The Middle Elevation Desert includes arid-warm-temperate zone valleys and low mountains in southeastern San Bernardino County, and extends through Riverside into Imperial County to within a few miles of Mexico. It also includes the Owens Valley and smaller arid-cool-temperate zone valleys in Inyo County, where growing conditions and plant behavior are more like the Middle than the High Elevation Desert.

The Middle Elevation Desert has some mountain ranges or peaks higher than 7000 feet, and these result in several small "islands" exhibiting sub-alpine characteristics like those of the High Elevation Desert.

Plant Selection and General Factors

Choice of ornamental plants for each area must be determined by their suitability to the climate. Tolerance to low minimum and high maximum temperature is the most important single factor, but tolerance to dry atmosphere and wind is also important. Any one of the following factors importantly affects growth.

Water supply. Surface or gravity water for irrigation or domestic use is available only in the Palmdale Irrigation District, along the upper reaches of the Mojave River and in limited northern parts of the Owens Valley. In all other sections water for residential, agricultural or industrial uses must be pumped from underground basins. Water conditions are different in each of the more than 50 closed-basin drainage areas. Current water use exceeds annual recharge of the underground basins and is causing pumping levels to drop in many areas. With increases in population, and hence water use, this overdraft presents a serious problem. The California State Water Plan will bring

water into and through the western extension of the Middle Elevation Desert, about 8 miles northeast of Gorman, and will supplement local supplies.

Water quality. Quality of water varies with origin. Water from deep underground basins is of excellent quality, as is gravity-source water. Water from shallow wells is sometimes saline enough to injure plants. Information in water quality in local areas may be available from water companies, present users, and official county and state water agencies. Water of unknown quality should be analyzed before use.

Soils. Soils vary with drainage basins, with coarser materials high on valley slopes, grading usually to silts and clays on the valley floors. Valley bottoms are often lakes after heavy rains, highly saline when dry. Most valley soils are composed of alternate layers of coarse and fine-textured materials; as a result large areas of caliche occur (see "Glossary"). This layered composition can interfere with water penetration and drainage when irrigation is introduced. Localized drainage or saline problems can develop as a result—these require the introduction of drainage and leaching procedures. Some soils are highly calcareous, and cause iron chlorosis in susceptible species.

Management. Good management is vital for ornamental plantings and irrigation is the most important item. The problem is when to irrigate, how much to apply, whether to use basins, a system of small ditches and furrows or, if water under pressure is available, sprinklers to keep roots of plants in moist soil during the entire year. Desert natives (see "Glossary") require special consideration. Other management operations may include mulching to reduce evaporation, fertilizing, pruning, staking, protection from frost, wind and blowing sand, and pest and disease control.

Much information about management practices can be obtained from local nurserymen and landscape organizations. Well-kept home and community plantings can be visited and studied—a successful owner is usually glad to share experience. There are few books on gardening with particular emphasis on desert

Fig. 1. Plantclimate V (includes plantclimate zones 1 to 6).

Fig. 2. Annual average rainfall, Middle and Low Elevation Deserts (courtesy of Environmental Science Services Administration, U. S. Weather Bureau).

problems. The University of California's Agricultural Extension Public Service Office at 2200 University Avenue, Berkeley, 94720, can supply lists of their publications in this field.

General Climatic Conditions

The temperature regimes for the Middle Elevation Desert are shown in graphic form on pages 11–13, and in tabular form on pages 18–23. Daily temperature fluctuations of 30 to 50 degrees or more are normal. Seasonal fluctuations are from 30 to 40 degrees.

Two kinds of cold. Two kinds of cold weather problems occur and are important considerations in plant selection. The first is the normal seasonal low temperature, ranging from 10 to 12 degrees below monthly mean minimums; plants must be able to tolerate these temperatures. The second type of cold is the "once in 50 year" freeze when temperatures drop 20 to 30 degrees below the average of monthly mean minimums. Permanent plantings such as windbreaks and shade trees should be coldhardy for these extremes, as they require years to replace. An average of the lowest recorded temperatures in major subzones will be found on pages 18–23.

Rainfall. In the Middle Elevation and Low Elevation Deserts over 60 per cent of the area receives less than 5 inches of annual rainfall, and only a narrow belt along the west and southwest boundary receives more than 10 inches (see map, page 6). The normal rainy season is late November through March, with a somewhat longer season at high elevations. Summer rain is localized and may be of cloudburst proportions.

Sunshine. The percentage of sunshine is high, with nearly all the area having 250 to 275 clear days, 45 to 70 partly cloudy, and 40 to 50 cloudy days.

Humidity. The high number of days of sunshine, high temperatures and low rainfall results in exceedingly dry atmosphere. As a result, evaporation and plant transpiration are high. Humidity is high only during rainy periods. Humidity in the rainy season is between 30 and 60 per

cent during daylight hours, but is as low as 5 to 20 per cent during the dry season.

Growing season. Page 8 shows the number of days between the last spring and first fall day with a 32 degree minimum. Significantly longer growing seasons occur on air-drained slopes above all valleys, resulting in freedom from 32 degree frosts but more importantly from 28 degree frosts—particularly in spring, which allows fruit growing and successful use of more tender ornamentals. The difference between Palmdale, 2655 feet elevation with a 225 day growing season, and Palmdale Airport, 2517 feet and a 205 day growing season illustrates this point. The bloom of pears and other fruit usually escape spring frost near Palmdale, but are injured by frost too often for commercial orchard operations in the vicinity of the airport, which is about 2 miles out onto the valley floor. Still warmer conditions exist at higher elevations south and west of Palmdale, and there are similar contrasts on slopes above Bishop, Tehachapi, and other places within shorter distances. Growing seasons based on 28 degrees will be from 25 to 50 days longer than on these valley floors.

Wind. Most areas have a prevailing breeze of 10 to 20 miles per hour during the day. In a few sections winds of 40 to 70 miles per hour occur in every month of the year; these greatly restrict choice of ornamentals or commercial crops, although temperatures are not greatly modified. All sections have occasional severe wind storms, mostly in late fall to mid-spring and usually from a northerly direction. Summertime dust storms may also occur, and tornillos (see "Glossary") often cause severe localized damage. An 8 to 12 miles per hour afternoon breeze will increase the amount of water moving from leaves or moist soil into the air, resulting in faster use of soil moisture.

Wind is therefore a consideration in irrigation design and practice. Dry desert winds increase water loss from leaves and are a factor in drought tolerance.

Form and structure characteristics important in wind tolerance are well summarized in the following statement by

GROWING SEASON, RAINFALL, AND ALTITUDE AT VARIOUS U. S. WEATHER BUREAU STATIONS IN MIDDLE ELEVATION DESERT*

Station		Growing season (days)	Annual average rainfall (inches)	Elevation (feet)	Years of record
Plantclimate zone 2, subzones 2.0, 2.1					
(Arid-cool subtropical, and warm temperate slopes and valleys)					
Daggett Airport	(2.0)	255	3.58	1922	17
Hayfield Reservoir	(2.0)	275	3.95	1370	25
Trona	(2.1)	250	4.01	1695	30
Twentynine Palms	(2.0)	259	4.09	1975	25
Plantclimate zone 3, subzones 3.0, 3.0w, 3.1, 3.1w					
(arid-moderate to cool temperate air-drained slopes, foothills, and low mountains†					
Backus Ranch	(3.1w)	212	6.56	2645	24
Barstow	(3.1)	235	4.44	2142	20
Cantil	(3.1w)	230	3.90	2010	5
China Lake	(3.1w)‡	204	2.30	2220	15
Fairmont	(3.1)	253	15.00	3060	30
Haiwee	(3.1)	234	5.94	3810	30
Inyokern	(3.1w)	218	3.85	2440	11
Llano Shawnee	(3.1)	207	6.99	3820	15
Palmdale	(3.1)	225	8.70	2655	28
Pahrump Valley	(3.1)	223	3.16	2830	3
Randsburg	(3.0)	244	5.85	3570	21
Plantclimate zone 4, subzones 4.0, 4.1, 4.2, 4.3, 4.3w					
(arid-cool temperate main valleys and cold-air basins)					
Lancaster	(4.3)	213	4.90	2350	15
Llano	(4.3)	208	9.42	3490	14
Lucerne Valley	(4.2)	192	4.00	3015	8
Palmdale Airport	(4.3)	205	5.42	2517	17
Victorville	(4.3)	193	5.41	2859	22
Plantclimate zone 3, subzones 3.2, 3.2w, 3.3, 3.3w					
(arid-moderate to cool temperate, air-drained slopes, foothills, and low mountains)					
Independence	(3.2)	207	4.99	3950	16
Yucca Grove	(3.2)	201	7.01	3951	18
Plantclimate zone 4, subzones 4.4, 4.5, 4.6					
(arid-cool temperate high elevation valleys)					
Bishop Airport	(4.5)	150	5.50	4108	40
Tehachapi	(4.4)	163	10.66	3975	20

* No data available for plantclimate zone 5. See page 9 for explanation of subzones.

† Valyermo omitted because station is located in cold, narrow canyon. Areas of persistent crop-influencing winds have the letter "w" after their subzone designation.

‡ Data from U. S. Naval Air Station.

Eric Johnson (personal communication):

"Certain forms and structures are common in trees and shrubs that have tolerance for wind. Trees will have a strong single trunk with thick tough bark to withstand the cutting of blowing sand. Branching will be wide-angled rather than with narrow "V" crotches which tend to split. Trees will have the ability to "grow into the wind," thus forming a uniform top without a "lean." Wood will be tough, supple and yielding so it will bend and not break. Plants with brittle wood should be avoided. Small relatively thick, wax-coated leaves, or leaves that are needle-like will offer less wind resistance and hence cause less strain on branches and trunk, and are less likely to be torn and shredded. Root systems should penetrate deep into the soil for a solid foundation and anchor and be wide-spread for water absorption. In shrubs the same factors apply. Many shrubs will be found with gray, hairy leaves, a good indication of drought and wind tolerance."

Wind and drought tolerances of various plants will be found in the plant list (starting on page 24).

Windbreaks. Carefully planned and managed windbreaks add to living comfort and to diversity of plantings, and they can almost eliminate detrimental effects of

winds. A good example of an effective windbreak is the planting on the Los Angeles Bureau of Water and Power headquarters north of Mojave: ornamentals that would not survive outside are growing within the sheltered area with little or no indication of injury. However, the microclimate (see "Glossary") within sheltered areas may result in a pool of relatively still air 2 to 4 degrees warmer in daytime or colder at night. This can be particularly important during blooming season; daytime warmth can advance bloom and pooled nighttime coolness can increase frost hazard enough to necessitate appropriate frost protection.

Windbreaks may require plantings on two or three sides but rarely on four. Because they are permanent, kinds and varieties should be selected not only for tolerance of and resistance to wind, but also for ability to withstand occasional temperature extremes. Windbreaks should be moderately wind-permeable near the ground to avoid the pooling of air; tops should be dense and solid to give equal protection during summer or winter. For single-row plantings where space is limited, closely planted, erect growing evergreens will be most satisfactory. Arizona Cypress, *Cupressus glabra*, planted 4 to 6 feet apart is a good example. Mixed conifers, evergreen, and deciduous trees and shrubs can be selected to serve as a windbreak and source of summer shade.

PLANTCLIMATE ZONES AND SUBZONES

In more developed areas of California, plantclimate zone and subzone boundaries were located as a result of long experience with a wide range of cultivated plants. A subsequent study of temperature data in the subzones revealed only slightly differing temperatures at official Weather Bureau stations many miles apart but having nearly the same elevation and exposure. In the desert, a study of temperature data for widely separated areas having nearly the same elevation also revealed a comparable temperature similarity. Therefore, in large sections of the desert where development

is limited and widely scattered it is necessary to rely on elevation extensions on contour levels to establish the subzone. The authors are confident the resulting subzone boundaries will be close to the actual. Many of the subzone boundaries of the Low Elevation and Middle Elevation Deserts (see folded map, inside back cover) have been established by this method. It must be recognized, however, that within subzones of relatively uniform conditions, there are variations in slope and exposure within short distances which are responsible for conditions normally

experienced in subzones some distance away.

In Plantclimate V, differences in adaptation and behavior of various plant species result in delineation of six progressively cooler plantclimate zones, and these are numbered 1 to 6. Each such zone includes progressively cooler subzones: 1.0, 1.1, 1.2, etc.

Desert plantclimate zones:

1—Low Elevation Desert plantclimate zone, with 10 plantclimate subzones

2, 3, 4, 5—Middle Elevation Desert plantclimate zones, each with two to seven plantclimate subzones

6—High Elevation Desert plantclimate zone, with several plantclimate subzones.

Because Low Elevation and Middle Elevation deserts are so closely associated geographically, and because the division established for this publication is based on plantclimate relations, a brief description of the Low Elevation Desert is included.

LOW ELEVATION DESERT

Plantclimate Zone 1

Under 1000 feet elevation with subtropical temperatures. Normal winter frosts to 26 or 28 degrees with occasional freezes to 15 or 18 degrees (12–15+ year interval). Growing season 300 days or

more. Typical crops: winter lettuce, very early tender vegetables such as summer squash, zucchini, etc. Citrus (principally grapefruit) is adapted to nearly all except lowest, coldest spots. Bermudagrass is the dominant lawn grass.

MIDDLE ELEVATION DESERT

Plantclimate Zone 2. Arid-cool subtropical, warm-temperate slopes and valleys

This is a transition area between subtropical Low Elevation Desert and typical temperate zone conditions of the main valleys of the Middle Elevation Desert. Elevation is 1000 to 2200 feet. Normal winter minimums are as low as 20 to 22 degrees; occasional extremes range from 10 to 14 degrees; growing season is 250 to 280 days. The upper boundary is the climatic limit for the rice-bermudagrass plant association, hence bermudagrass is the dominant lawn grass. Subtropicals such as citrus (*Citrus* sp.), bougainvillea (*Bougainvillea* sp.), evergreen pear (*Pyrus kawakamii*), southern live oak (*Quercus virginiana*), and jujube (*Zizyphus jujaba*) are successful only in warm sheltered south to southwest slopes and are not found much above the 1000 foot level; deciduous fruit with low-chilling requirement such as apricots, almonds, some peaches are grown; blossom injury due

to spring frost has been observed on low-chilling varieties in years of early bloom; and summer heat will cause some loss of fruit quality. In warm sections, common lilac will show some delayed foliation and relatively poor bloom. There are two subdivisions of this plantclimate, 2.0 to 2.1. Subzone 2.0 is under 2000 feet and includes cool subtropical areas. Subzone 2.1 is Hinkley Valley at 2200 feet, Searles (Trona) and Panamint (northeast of Trona) Valleys, a border around Death Valley, and small valleys in southern Inyo County below 2000 feet elevation.

Plantclimate Zone 3. Arid-moderate to cool temperate air-drained slopes, foothills and low mountains

This plantclimate zone could be termed "Desert Deciduous Fruit Plantclimate Zone" because it consists of air-drained thermal zones above cold valley floors. The longer growing season permits bloom and young fruit to escape spring frost.

Fig. 3. Average temperature: cool-subtropical, warm-temperate slopes and valleys of zone **2**, subzones **2.0** and **2.1**, shown on map on inside back cover.

Fig. 4. Average temperature: moderate to cool temperate air-drained slopes, foothills, and low mountains of zone **3**, subzones **3.0**, **3.0w**, **3.1**, and **3.1w**, shown on map on inside back cover (the letter "w" indicates that the subzone has persistent crop-influencing winds).

Fig. 5. Average temperature: cool temperate main valleys and cold-air basins of zone 4, subzones 4.0, 4.1, 4.2, 4.3, and 4.3w, shown in map on inside back cover.

Fig. 6. Average temperature: moderate to cool temperate air-drained slopes, foothills, and low mountains of zone 3, subzones 3.2, 3.2w, 3.3, and 3.3w, shown in map on inside back cover.

Fig. 7. Average temperature: cool temperate high elevation valleys of zone 4, subzones 4.4, 4.5 and 4.6, shown in map on inside back cover.

Similarly, the entire plantclimate zone is suitable for the common Eastern lilac, peonies, and other ornamentals requiring winter chilling. French hybrid lilacs may be somewhat delayed in warmer sections of subzone 3.0. Bluegrass is the dominant lawn grass. Annual flowering plants should not be planted until after spring frost unless protection can be supplied. A wide choice of suitable temperate zone ornamentals is shown in the plant list (page 24).

Four subzones are divided into two groups: 3.0 and 3.1 adjacent to the main valleys, and 3.2 and 3.3 adjacent to high-elevation valleys.

Slopes adjacent to main valleys. Subzone 3.0 ranges from 2000 to 4500 feet elevation. In this subzone it is found that the growing conditions are cooler than those of plantclimate zone 2 due to elevation, but warmer than subzone 3.1 because of cold air drainage. This latter is illustrated by the location of Randsburg, elevation 3520, in subzone 3.0. Records show 244-day growing season compared

to 204 to 235 days, and a monthly mean minimum temperature from 1 to 4 degrees above the average for all stations in the 3.0 and 3.1 grouping that includes Randsburg. In subzone 3.0, where wind is not a physical deterrent, almonds, apricots, grapes, sweet cherries, and medium chilling requiring peaches and pears will be satisfactory—this indicates that common lilac, Bleeding Heart, Peony, and similar medium-chilling-requiring ornamentals will be satisfactory.

Subzone 3.1 occupies thermal slopes above main valley floors of plantclimate subzone 2.1 in southern and eastern Inyo County, with the major portion above plantclimate subzones 4.1 and 4.3 in Los Angeles and Kern counties. Elevations range from about 2700 to 4700 feet. The growing season is from 204 to 235 days, except for Fairmont where the U. S. Weather Bureau station is near a $\frac{1}{4}$ -square mile reservoir which modifies local temperatures. The full range of winter-cold-requiring ornamentals will perform satisfactorily.

Slopes adjacent to high valleys. Elevation of subzone 3.2 ranges from 3000 or 3200 feet at the south end of Owens Valley to 5000 or 5500 feet above Independence. Spring frosts are too frequent for almonds, apricots, and early blooming peaches, but high-winter-chilling varieties of peaches, pears, and apples will usually be satisfactory in the garden. Subzone 3.3 will be too cold for reliable peach and pear production. All ornamentals and garden fruits valued for their spring bloom are somewhat unpredictable.

Plantclimate Zone 4. Arid-cool temperate valleys and cold-air basins

Seven subzones, 4.0 through 4.6, are required to delineate variations found in main valley floors and cold-air basins. The subzones have been divided into two groups—main valleys and high valleys.

Main valleys and cold-air basins. Subzones 4.0, 4.1, 4.1w, 4.2, 4.3 and 4.3w range in elevation from 2300 to 3500 feet. Growing season varies from 192 to 213 days. Crops of the main valleys, hence choice of ornamentals, are limited by late spring frosts which will damage bloom in many years. Normal winter minimums range from 15 to 20 degrees, with occasionally 0 to 10 degrees. Bluegrass will be the dominant lawn grass but Bermuda-grass will survive.

These subzones are the upper limit for Forbes cypress (*Cupressus forbesii*), several junipers (*Juniperus* sp.) and pines (*Pinus* sp.), California live oak (*Quercus agrifolia*), desert willow (*Chilopsis linearis*), oriental sweet gum (*Liquidambar*

orientalis), Chinese elm (*Ulmus parvifolia*), pampas grass (*Cortaderia selloana*), ice plant (*Mesembryanthemum* sp.), lippia (*Phyla nodiflora*), European grape (*Vitis vinifera*), and oleander (*Nerium oleander*).

High elevation valleys and cold-air basins. This section of plantclimate zone 4, namely 4.4, 4.5 and 4.6, ranges in elevation from 3200 to 5000 feet. Growing season varies from 150 to 165 days. Normal winter minimum temperatures range from 7 to 15 degrees with occasionally -3 to 5 degrees. Annual flowers should be planted late or given ample protection.

Plantclimate Zone 5. Mountains

This includes all areas above the estimated upper level of deciduous fruits, and varies from 4500 feet in the south to 6200 feet in the north, with some mountains over 10,000 feet. Mountains are all cool temperate, cold temperate, or sub-alpine at the highest peaks. Mountain areas are non-agricultural except for grazing. Summer rains produce fair pasture grass in some areas between 4500 and 8000 feet elevation. Ornamental plantings will be subject to frosts any month, and species should be selected for cold hardiness. There is a surprising number of conifers, deciduous trees and shrubs, vines, and ground-covers suitable to mountain climates. A few examples are giant sequoia (*Sequoiadendron giganteum*), Japanese flowering quince (*Chaenomeles japonica*), spiarea (*Spiraea* sp.), some lilacs (*Syringa* sp.), Boston ivy (*Parthenocissus tribuspidata*), concord grapes (*Vitis labrusca*), strawberry (*Fragaris* sp.), and peony (*Paeonia* sp.).

PLANT LISTS

Palms, coniferous trees and shrubs, broad-leaved evergreen trees and shrubs, deciduous trees and shrubs, vines and ground covers are listed by groups (starting page 24). No attempt has been made to catalog the large number of herbaceous perennials such as Bleeding Heart, Daffodil, Tulip, etc., or the annual flowering plants. A wide choice of the latter is available for planting in the many microclimates (see

"Glossary") of a windbreak shelter. Success depends on understanding their management requirements.

Plants listed were actually observed by the authors, and most had been growing satisfactorily in the Middle Elevation Desert for 5 years or more. They are scored in three grades of drought tolerance: *drought tolerant* to a high degree, as with desert natives; *moderately drought*

tolerant plants that will use large quantities of water if available, but which will do reasonably well on greatly reduced supplies—olive, oleander, some palms, almond; *not drought tolerant* requiring regular irrigation and plenty of water, such as roses, elms, willows, myrtles, privets or spiraea.

While the many plants listed provide considerable choice in landscape effect, some owners will want to try others. Experienced nurserymen in desert areas will be found to have many new kinds available—your nurseryman is well aware of the need to choose and introduce plants suitable for such areas.

GLOSSARY

CALICHE—A soil having rock-like layers, from a few to many inches thick, of sand and gravel cemented together by calcium carbonate. There are extensive areas of this in deserts, usually a few inches to several feet below the surface. Water may penetrate very slowly, hence the soil above is liable to become saline. Layers will not re-cement if broken. Iron chlorosis is characteristic, even after break-up and the establishment of drainage.

CHILLING REQUIREMENT—Most deciduous trees and shrubs (those which are leafless during the winter) and some other temperate zone plants, such as tulips and daffodils, require varying amounts of cold temperature during their dormancy to condition them for normal spring growth. Severe lack of winter chilling will result in lack of fruit set and exceedingly delayed spring development—a condition known as “delayed foliation” or “dormosis.” Almonds, apricots, and few peach varieties need but relatively short periods below 45° F and are said to have a low chilling requirement. Under these conditions lilacs, daffodils, tulips, Japanese flowering quince, and similar plants may not bloom satisfactorily. Most varieties of peaches, pears, cherries, plums, nectarines, some early apples and Placentia and Ehrhardt walnuts can be considered as having a medium or moderate chilling requirement. Under these conditions, lilacs, daffodils, and tulips will be satisfactory. Late apples, peaches, pears, and Eureka and Franquette walnuts have a high chilling requirement.

CULTIVARS—Plant variant, or variety, resulting from induced or natural mutations, hybridization, etc. and maintained only by cultural operations, such as selection, vegetative propagation, roguing, and isolation.

DESERT NATIVE—Indigenous or naturally introduced plants that live and thrive in various parts of the Middle Elevation desert. They are all significant for their ability to survive on limited, and mostly wintertime, water. Most of them are intolerant of heavy summer watering common to garden irrigation. The desert natives should be planted together and managed as a unit with very limited summer irrigation. All will benefit from deep watering in winter.

GROWING SEASON—The frost-free period between spring and fall minimum temperatures of 32 degrees.

IRON CHLOROSIS—Yellowing of leaf tissue between veins, most noticeable on new growth. In severe cases leaves become almost white, will sunburn and drop. Caused by high lime content of soil preventing the absorption of iron by the plant. Specially prepared iron can be applied to the soil or used as spray to correct the trouble.

LAWN WATERING—With a sprinkler system a lawn is usually watered frequently and with amounts that will penetrate the soil below the grass roots, thus keeping the soils below 6 to 8 inches continually wet. On the other extreme, with hand sprinkling the deeper soils almost always become dry. Both conditions, continually wet or extremely dry, are unfavorable for many trees and shrubs with deep root systems. Differential irrigation between shallow-rooted grasses and deeper-rooted trees and

shrubs is essential. This calls for frequent light irrigations of the lawn. Deep soaking 1 to 2 or 3 months apart, depending upon soil and season, will prevent over-irrigation of the deep rooted plants.

PLANTCLIMATE—A definable physical climate distinguishable from others by kinds of plants and their performance, or conversely plant kinds and performance that can be predicted and described from knowledge of the physical climate. There are five PLANTCLIMATES which are statewide or larger. Each plantclimate has optimum seasonal conditions for specific plant groupings or associations. These same groupings or associations may be found in other plantclimates, but performance is inhibited to varying degrees because of differences in the physical climate. Each major plantclimate is divided into several REGIONAL PLANTCLIMATES within which the groups or associations of plants and their performance are increasingly specific. The same regional plantclimates may exist in more than one major plantclimate. Regional plantclimates are composed of PLANTCLIMATE ZONES. A plantclimate zone is a geographical area in which certain rather broad groups of plants having specific climatic (principally temperature) requirements will grow satisfactorily, soil and water assumed favorable. A PLANTCLIMATE SUBZONE is part of a plantclimate zone in which only a few kinds and varieties of the general plant group and the physical climate are in complete harmony resulting in consistent performance. Within the subzones there are MICRO-plantclimate subzones (or micro-subzones)—small portions of the larger areas that because of exposure or shelter (either natural or man-made) cause a slightly different plant reaction. The differences can be as great as the difference between adjoining subzones, but usually will be less. Micro-subzones vary from a few square miles or less to the area enclosed by an effective windbreak around a homesite. Within these micro-areas are many MINI-plantclimate subzones (mini-subzones). These are small areas of a few square feet, perhaps on the south face of a wall between large sheltering shrubs where reflected heat will accumulate, under an evergreen tree for shade effect, etc.

TEMPERATURE—All temperatures are in degrees Fahrenheit, and data are from U. S. Weather Bureau published records.

THERMAL ZONE, OR THERMAL—In this publication the term is used to indicate a warm zone or belt on hillsides, slopes, and moderate elevations, from which cold air drains to the lower lying valley floor or cold air basin. Thermal zones are often 5, 10 or 15 degrees warmer than their adjacent low areas. This difference is particularly apparent during spring and fall frost periods.

TORNILLO—A small but violent “dust devil,” or whirlwind.

VARIETY—A plant variant found in the wild.

COMMUNITIES VISITED DURING PLANT SURVEY OF MIDDLE ELEVATION DESERT

Community	Plantclimate subzone	Community	Plantclimate subzone
Adelanto	4.1	Barstow*	3.1
Apple Valley	4.0	Big Pine	3.3
Antelope Valley Field Station	4.3	Bishop Airport*	4.5
		Boron	4.3w
Backus Ranch (6 miles northwest of Rosamond)*	3.1w	Barnhart Nursery (near Yucca)	2.0
Baker	1.9		

Community	Plantclimate subzone	Community	Plantclimate subzone
Cantil*	3.1w	Morongo Valley	4.0
Chandler's (Holland Summit)	3.1	Mt. Whitney Fish Hatchery	3.2
China Lake†	3.1w	Mountain Pass	5.0
Cool Water Ranch (near Daggett)	2.0	Neenach	3.1
Daggett Airport*	2.0	Newberry	2.0
Daggett Marine Base	2.0	Olancha	3.2
Edwards Air Force Base	4.3w	Onyx	3.0
Fairmont*	3.1	Oro Grande	4.3
Frazier Park	3.1	Pahrump Valley*	3.1
Fort Tejon	3.1	Palmdale*	3.1
Freeman Gulch	3.1w	Palmdale Airport*	4.3
Gorman	3.1	Pearblossom	3.1
George Air Force Base (near Victorville)	4.3	Pearlands	3.1
Haiwee*	3.1	Phelan	3.0
Hayfield Reservoir*	2.0	Quail Lake	3.1
Hesperia	3.0	Quartz Hill	3.1
Helendale	3.0	Randsburg*	3.0
Hinkley	2.1	Ridgecrest	3.1w
Holland Summit	3.1	Rosamond	4.3
Homestead (Indian Wells)	3.1w	Sandberg (old Forestry Station)	3.1
Hutchinson Nursery (near Barstow)	3.1	Shoshone	2.1
Independence*	3.2	Simi Corners	4.3
Indian Wells (Homestead)	3.1w	Tehachapi (town)*	4.4
Inyokern*	3.1w	Tehachapi (surrounding)	3.3
Jess Ranch (near Apple Valley)	4.0	Three Points	3.1
Joshua Tree	4.0	Trona*	2.1
Lancaster*	4.3	Twentynine Palms*	2.0
Lebec	3.1	Valyermo	3.1
Leona Valley	4.0	Van Dyke Ranch (near Daggett)	2.0
Littlerock	3.1	Victorville*	4.3
Llano*	4.3	Vincent Fire Station	3.1
Llano Shawnee*	3.1	White Water	2.0w
Lucerne Valley*	4.2	Willow Springs	3.1
Lone Pine	3.2	Yermo	2.0
Ludlow	2.0	Yucca	2.0
Mojave	4.3	Yucca Grove*	3.2
Monolith	3.2	Yucca Valley	4.0

* Location of U. S. Weather Bureau cooperative stations; "w" indicates crop-influencing winds.

† Data from U. S. Naval Air Station.

TEMPERATURE DATA FOR PLANTCLIMATE ZONES 2, 3, 4 (ARRANGED TO SHOW PROGRESSIVELY COLDER CONDITIONS)

Plantclimate zone 2, subzones 2.0, 2.1 (arid-cool sub-tropical, warm temperate slopes and valleys)

Station and subzone	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mean Daily Maximum Temperature (°F)												
Daggett Airport (2.0).....	60.5	65.5	71.1	80.7	88.1	97.0	103.7	101.3	96.5	83.5	69.8	62.2
Hayfield Reservoir (2.0).....	64.6	68.6	74.4	83.2	90.5	98.9	104.9	102.8	99.2	87.6	74.7	67.3
Trona (2.1).....	58.6	64.2	72.7	81.6	90.0	99.0	106.6	104.7	98.4	85.0	69.8	59.5
Twentynine Palms (2.0)	61.5	66.0	72.7	81.7	90.0	99.0	104.6	102.8	97.5	84.9	71.5	63.7
Average.....	61.3	66.1	72.7	81.8	89.7	98.5	105.0	102.9	97.9	85.3	71.5	63.2
Mean Daily Minimum Temperature												
Daggett Airport (2.0).....	33.2	37.3	41.7	49.6	56.1	63.8	70.8	68.6	63.8	52.5	40.3	34.2
Hayfield Reservoir (2.0).....	38.1	41.1	45.9	53.2	59.7	66.6	75.3	74.3	67.1	56.4	45.8	40.1
Trona (2.1).....	31.7	37.0	42.2	49.9	57.3	64.2	72.1	69.7	62.2	51.2	38.0	32.6
Twentynine Palms (2.0)	34.9	37.7	42.0	50.1	56.8	64.4	72.1	70.5	64.0	52.7	41.2	36.7
Average.....	34.5	38.3	42.9	50.7	57.5	64.7	72.6	70.8	64.3	53.2	41.3	35.9
Highest Recorded Temperature												
Daggett Airport (2.0).....	80	84	91	101	110	113	115	112	112	100	88	83
Hayfield Reservoir (2.0).....	84	87	98	103	114	117	119	118	120	105	92	86
Trona (2.1).....	78	83	93	102	111	118	118	118	116	106	96	81
Twentynine Palms (2.0)	82	89	92	102	110	117	116	116	114	103	93	86
Average.....	81.0	85.8	93.5	102.0	111.3	116.3	117.0	116.0	115.5	103.5	92.3	84.0

Lowest Recorded Temperature

Daggett Airport (2.0).....	12	17	24	28	40	46	57	55	43	33	21	16
Hayfield Reservoir (2.0).....	14	22	25	36	42	51	58	56	47	33	27	22
Trona (2.1).....	10	19	25	31	33	44	54	52	40	28	18	13
Twentynine Palms (2.0)	11	21	24	32	38	49	56	53	45	32	21	18
Average.....	11.7	20.0	24.5	31.7	38.2	47.5	56.2	54.0	43.7	31.5	21.7	17.2

Plantclimate zone 3, subzone 3.0, 3.0w, 3.1, 3.1w *
(moderate to cool temperate air-drained slopes, foothills, and low mountains)

Mean Daily Maximum Temperature

Backus Ranch (3.1w)*.....	57.0	60.0	64.6	73.2	81.5	90.3	98.6	97.2	92.2	79.4	67.7	59.8
Barstow (3.1).....	59.8	65.0	69.2	79.4	87.1	95.9	103.1	101.3	95.8	83.0	70.2	62.0
Cantil (3.1w).....	60.4	64.2	71.5	77.9	85.2	98.3	103.7	102.9	97.0	86.3	70.3	64.1
China Lake (3.1w).....	56.6	62.8	68.2	78.1	85.3	95.3	102.1	100.3	94.7	81.5	67.6	58.8
Fairmont (3.1).....	51.7	54.5	59.3	66.3	72.3	81.0	90.4	89.8	85.5	73.8	62.0	54.3
Haiwee (3.1).....	49.8	54.6	62.0	70.4	78.3	87.4	94.6	92.7	86.7	74.3	61.0	51.9
Inyokern (3.1w).....	57.1	63.2	69.3	78.6	86.1	96.7	103.1	100.8	95.2	83.1	69.2	59.9
Llano Shawnee (3.1).....	53.8	58.0	62.5	71.8	79.2	88.9	95.7	94.3	88.9	76.0	63.4	56.7
Palmdale (3.1).....	57.5	60.7	66.6	74.0	80.9	89.1	97.9	96.8	91.7	79.9	67.8	59.7
Pahrump Valley (3.1).....	59.3	60.2	74.4	82.8	86.5	101.3	104.1	101.6	95.2	85.9	69.3	63.8
Randsburg (3.0).....	53.7	57.0	63.4	72.7	82.0	91.0	99.0	97.0	90.6	77.1	63.5	55.9
Average.....	56.1	60.0	66.5	75.0	82.2	92.3	99.3	97.7	92.1	80.0	66.5	58.8

Mean Daily Minimum Temperature

Backus Ranch (3.1w).....	29.9	33.3	37.6	45.4	52.4	60.8	67.9	65.6	58.4	47.2	35.9	31.6
Barstow (3.1).....	31.5	34.9	39.5	46.7	53.3	60.4	67.0	64.4	58.6	48.0	36.7	31.8
Cantil (3.1w).....	31.8	36.0	40.7	45.4	52.3	62.7	68.7	64.8	57.4	46.0	32.2	27.9
China Lake (3.1w).....	30.6	35.0	40.6	49.3	56.4	64.5	71.5	68.4	62.2	50.2	37.4	30.9
Fairmont (3.1).....	35.1	37.0	40.3	46.0	51.6	59.3	68.0	66.4	61.5	52.0	42.2	37.3
Haiwee (3.1).....	29.8	33.0	37.9	46.0	52.6	60.3	67.6	65.2	59.3	48.7	37.6	31.7
Inyokern (3.1w).....	30.0	33.1	38.3	45.4	52.1	60.7	66.5	62.6	57.8	47.7	36.8	31.0
Llano Shawnee (3.1).....	33.7	36.1	38.0	44.4	49.2	56.9	64.6	62.7	59.8	50.4	41.1	36.6

* "w" indicates crop-influencing winds.

Palmdale (3.1).....	31.5	34.5	38.3	43.8	49.8	56.8	65.3	63.3	57.1	47.4	37.2	33.0
Pahrump Valley (3.1).....	24.9	29.8	38.0	46.2	49.8	62.4	67.8	62.8	56.2	44.0	35.2	24.4
Randsburg (3.0).....	35.3	36.9	40.6	47.4	53.6	61.5	69.2	67.3	62.4	52.5	42.5	37.5
Average.....	31.3	34.5	39.1	46.0	52.1	60.6	67.6	64.9	59.2	48.6	37.7	32.2

Station and subzone	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
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Highest Recorded Temperature

Backus Ranch (3.1w).....	82	81	84	97	103	110	111	110	110	98	99	87
Barstow (3.1).....	81	83	90	99	107	114	114	113	113	102	91	78
Cantil (3.1w).....	76	83	89	97	103	115	117	112	112	99	88	81
China Lake (3.1w).....	77	80	86	97	107	114	113	110	110	99	85	75
Fairmont (3.1).....	77	77	87	92	99	102	109	109	106	94	88	87
Halwee (3.1).....	74	75	80	91	99	104	107	106	104	92	78	75
Inyokern (3.1w).....	75	81	87	98	106	117	115	113	110	105	85	78
Llano Shawnee (3.1).....	75	76	82	93	100	105	107	107	105	92	83	80
Palmdale (3.1).....	81	82	89	97	107	110	112	112	111	100	89	84
Pahrump Valley (3.1).....	79	73	85	95	103	110	115	110	106	103	87	76
Randsburg (3.0).....	75	86	82	93	103	110	111	109	107	96	81	74
Average.....	77.5	79.7	85.6	95.4	103.4	110.1	111.9	110.1	108.5	98.2	86.7	79.5

Lowest Recorded Temperature

Backus Ranch (3.1w).....	7	14	18	25	31	35	50	46	34	28	16	11
Barstow (3.1).....	1	11	18	29	32	42	51	43	32	30	17	11
Cantil (3.1w).....	12	14	20	25	35	44	50	49	37	24	10	3
China Lake (3.1w).....	9	14	22	28	38	42	55	53	40	32	20	13
Fairmont (3.1).....	11	18	19	26	34	39	48	48	41	31	18	19
Halwee (3.1).....	4	13	18	26	36	40	52	50	37	30	14	12
Inyokern (3.1w).....	6	9	20	24	33	40	50	48	36	30	18	11
Llano Shawnee (3.1).....	10	18	23	27	31	35	46	42	39	29	22	18
Palmdale (3.1).....	9	16	21	28	31	39	43	42	36	27	3	14
Pahrump Valley (3.1).....	10	20	29	35	36	49	54	46	41	30	18	18
Randsburg (3.0).....	4	15	22	23	33	42	51	49	38	32	21	14
Average.....	7.6	14.7	20.9	26.9	33.6	40.6	50.0	46.9	37.4	29.4	16.1	13.8

Plantclimate zone 4, subzones 4.0, 4.1, 4.2, 4.3, 4.3w
(cool temperate main valleys and cold-air basins)

Station and subzone	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mean Daily Maximum Temperature												
Lancaster (4.3).....	56.8	61.8	65.7	74.9	81.3	90.7	99.3	97.5	93.4	80.4	67.0	58.8
Llano (4.3).....	54.8	57.1	64.8	71.1	79.1	86.9	95.3	94.9	88.7	76.8	64.5	56.8
Lucerne Valley (4.2).....	58.0	62.8	68.6	76.1	83.6	94.1	100.1	98.4	93.2	81.6	68.5	60.1
Palmdale Airport (4.3).....	56.7	60.8	65.2	73.8	80.4	89.6	98.1	96.8	92.3	79.4	66.0	58.5
Victorville (4.3).....	57.4	60.9	66.4	74.9	82.2	90.8	98.3	96.8	91.7	79.4	66.6	59.8
Average.....	56.7	60.7	66.1	74.2	81.3	90.4	98.2	96.9	91.9	79.5	66.5	58.8
Mean Daily Minimum Temperature												
Lancaster (4.3).....	28.5	31.9	36.6	44.3	50.5	57.8	64.5	60.5	54.6	44.0	32.5	28.7
Llano (4.3).....	32.4	33.9	37.6	41.8	48.2	54.1	62.8	62.0	55.9	48.0	38.9	34.2
Lucerne Valley (4.2).....	27.7	28.9	33.8	41.6	47.7	55.4	62.5	58.8	52.4	41.0	30.4	26.0
Palmdale Airport (4.3).....	29.2	32.4	36.1	42.6	48.8	55.5	63.5	60.9	55.7	44.8	34.2	29.6
Victorville (4.3).....	27.2	30.4	34.4	40.7	45.9	52.1	58.9	57.9	51.7	42.3	32.0	27.9
Average.....	29.0	31.5	35.7	42.2	48.2	55.0	62.4	60.0	54.1	44.1	33.6	29.3
Highest Recorded Temperature												
Lancaster (4.3).....	79	81	86	98	105	111	114	113	112	100	90	85
Llano (4.3).....	81	75	90	92	98	111	111	109	103	93	80	78
Lucerne Valley (4.2).....	74	80	90	94	100	110	113	109	105	97	88	77
Palmdale Airport (4.3).....	80	79	84	96	104	110	111	109	109	97	86	85
Victorville (4.3).....	84	81	86	95	103	110	112	110	109	96	86	85
Average.....	79.6	79.2	87.2	95.0	102.0	110.4	112.2	110.0	107.6	96.6	86.0	82.0

Station and subzone	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.
Lowest Recorded Temperature												
Lancaster (4.3).....	6	11	18	23	35	39	45	43	27	24	12	11
Llano (4.3).....	8	14	21	25	28	35	39	46	36	25	15	18
Lucerne Valley (4.2).....	10	8	14	20	28	39	49	41	34	23	14	8
Palmdale Airport (4.3).....	4	11	17	24	31	40	44	44	32	26	16	10
Victorville (4.3).....	-1	10	14	20	30	35	41	41	30	22	11	7
Average.....	5.4	10.8	16.8	22.4	30.4	37.6	43.6	43.0	31.8	24.0	13.6	10.8

Plantclimate zone 3, subzones 3.2, 3.2w, 3.3, 3.3w
(moderate to cool temperate air drained slopes, foothills, and low mountains)

Mean Daily Maximum Temperature												
Independence (3.2).....	52.8	55.9	64.8	73.1	80.7	88.9	95.7	94.3	87.7	75.6	63.3	53.4
Yucca Grove (3.2).....	51.8	55.7	61.6	71.5	79.8	88.5	95.7	93.7	87.7	74.3	62.2	54.2
Average.....	52.3	55.8	63.2	72.3	80.3	88.7	95.7	94.0	87.7	75.0	62.8	53.8

Mean Daily Minimum Temperature												
Independence (3.2).....	26.3	29.2	35.2	42.7	49.9	56.7	62.4	60.5	53.9	44.4	33.8	28.2
Yucca Grove (3.2).....	28.3	31.3	34.4	41.4	47.0	54.2	64.0	61.8	54.9	45.3	36.1	31.3
Average.....	27.3	30.2	34.8	42.0	48.4	55.4	63.2	61.1	54.4	44.8	34.9	29.7

Highest Recorded Temperature												
Independence (3.2).....	78	78	83	91	102	107	109	107	104	93	84	76
Yucca Grove (3.2).....	73	76	82	89	100	106	107	112	104	93	81	74
Average.....	75.5	77.0	82.5	90.0	101.0	106.5	108.0	109.5	104.0	93.0	82.5	75.0

Independence (3.2).....	-5	3	17	22	33	37	50	45	37	23	11	6
Yucca Grove (3.2).....	0	6	16	22	21	33	44	42	32	26	9	10
Average.....	-2.5	4.5	16.5	22.0	26.5	35.0	47.0	43.5	34.5	24.5	10.0	8.0

Plantclimate zone 4, subzones 4.4, 4.5, 4.6
(cool temperate high-elevation valleys)

Mean Daily Maximum Temperature												
Bishop Airport (4.5).....	52.7	57.2	63.4	72.2	78.5	87.8	94.8	92.6	86.7	75.9	64.0	55.3
Tehachapi (4.4).....	50.2	53.1	56.6	64.1	70.8	79.2	88.3	86.8	83.0	70.7	60.7	53.0
Average.....	51.5	55.2	60.0	68.2	74.7	83.5	91.6	89.7	84.9	73.3	62.4	54.2

Mean Daily Minimum Temperature												
Bishop Airport (4.5).....	20.9	25.7	29.1	36.2	42.2	48.7	54.8	51.7	46.8	36.7	27.0	22.2
Tehachapi (4.4).....	28.3	30.8	32.6	37.3	42.9	49.6	56.2	52.8	47.9	40.2	33.7	30.8
Average.....	24.6	28.2	30.8	36.7	42.5	49.1	55.5	52.2	47.3	38.4	30.3	26.5

Highest Recorded Temperature												
Bishop Airport (4.5).....	77	79	85	93	101	109	108	109	106	95	89	81
Tehachapi (4.4).....	76	78	81	89	97	102	105	104	102	93	85	81
Average.....	76.5	78.5	83.0	91.0	99.0	105.5	106.5	106.5	104.0	94.0	87.0	81.0

Lowest Recorded Temperature												
Bishop Airport (4.5).....	-15	-3	10	15	25	28	36	34	26	18	5	-9
Tehachapi (4.4).....	-4	4	9	20	28	33	36	34	22	17	6	9
Average.....	-9.5	0.5	9.5	17.5	26.5	30.5	36.0	34.0	24.0	17.5	5.5	0

PLANTS KNOWN TO GROW SATISFACTORILY IN MIDDLE ELEVATION DESERTS

Coniferous trees and shrubs

Scientific name	Common name	Subzone adaptability*							Drought tolerance†	Remarks
		Warm			Cold					
		2.0	3.0	4.0	3.2	4.4	5.0			
		2.1	3.1	4.3	3.3	4.6	5.2			
<i>Abies concolor</i>	White fir	—	x	—	x	x	—	—	3	Grows best in colder subzones
<i>Calocedrus decurrens</i>	Incense cedar.....		x	x	x	—	—	—	2	California native, thrives in cultivation; slow growth formerly <i>Libocedrus decurrens</i>
<i>Cedrus atlantica</i>	Atlas Mountain cedar		—	—	x	—	—	—	3	Very slow grower
<i>Cedrus atlantica</i> 'Glauca'	Blue Atlas cedar		x	—	—	—	—	—	3	Good garden material for blue color
<i>Cedrus deodara</i>	Deodar cedar	x	x	x	x	x	—	—	3	Best performance in cooler areas; will not tolerate salinity
<i>Cedrus libanensis</i>	Cedar of Lebanon		—	—	x	—	—	—	3	Excellent specimen tree
<i>Chamaecyparis lawsoniana</i>	Port Orford cedar		—	—	x	—	—	—	3	Tolerates heat; tall spreading tree
<i>Chamaecyparis lawsoniana</i> 'Ellwoodii'	Ellwood cypress		—	x	x	—	—	—	3	Bluish foliage; shrub
<i>Chamaecyparis lawsoniana</i> 'Fletcheri'	Fletcher cypress		—	x	—	—	—	—	3	Blue-green foliage; shrub needs an open location
<i>Cupressus forbesii</i>	Forbes cypress	x	x	x	—	—	—	—	2	Smooth, shiny, cherry-red bark; no colder than climate 4.3
<i>Cupressus funebris</i>	Mourning cypress		—	x	—	—	—	—	2	Pendulous branches; not wind tolerant
<i>Cupressus glabra</i>	Smooth Arizona cypress	x	x	x	x	x	—	—	2	Usually sold as <i>C. arizonica</i> ; useful windbreak; good wind tolerance
<i>Cupressus macrocarpa</i>	Monterey cypress	—	x	x	—	—	—	—	2	Susceptible to cypress canker; slight injury may occur due to late frosts
<i>Cupressus sempervirens</i>	Italian cypress	x	x	x	x	—	—	—	2	Varied growth habit; normally columnar
<i>Ginkgo biloba</i>	Maidenhair tree		x	—	x	—	—	—	2	Plant only male trees; golden autumn foliage; deciduous; named selections available; good wind tolerance
<i>Juniperus californica</i>	California juniper	x	—	—	—	—	—	—	2	Desert native, large shrub; good wind tolerance
<i>Juniperus chinensis</i>	Chinese juniper	—	—	x	—	x	—	—	2	<i>J. chinensis</i> 'Kaizuka' more desirable variety

* An "x" indicates the plant was found in that zone; a dash indicates that in the authors' opinion the plant will be satisfactory in that zone.

† 1 = drought tolerant; 2 = moderately drought tolerant; 3 = not drought tolerant.

<i>Juniperus chinensis</i> ‘Pfitzeriana’ ..	Pfitzer juniper	x	x	—	x	—	—	2	Spreading shrub, good wind tolerance
<i>Juniperus chinensis</i> ‘Kaizuka’	Twisted Chinese juniper	x	x	x	x	x	—	2	Desirable decorative form
<i>Juniperus communis</i>	English juniper	—	x	x	—	—	—	2	Excellent windbreak
<i>Juniperus communis</i> ‘Stricta’	Irish juniper	x	x	x	—	—	—	—	Columnar form; good wind tolerance
<i>Juniperus excelsa</i> ‘Stricta’	Greek juniper	x	—	x	x	—	—	2	Glaucous foliage
<i>Juniperus horizontalis</i>	Creeping juniper	—	x	x	—	—	—	3	Used as ground cover; good wind tolerance
<i>Juniperus osteosperma</i>	Utah juniper	—	x	x	x	—	—	1	Desert native
<i>Juniperus sabina</i>	Savin juniper	x	x	—	—	—	—	2	Used primarily as ground cover; good wind tolerance
<i>Juniperus sabina</i> var. <i>tamariscifolia</i>	Tam juniper	—	x	x	—	—	—	2	Mound-like shrub, foliage gray-green; good wind tolerance
<i>Juniperus scopulorum</i>	Rocky Mt. juniper	x	—	—	—	—	—	1	Available in many cultivars; good wind tolerance
<i>Juniperus squamata</i> var. <i>meyeri</i> ..	Meyer juniper	—	x	—	—	—	—	2	Blue-green irregular shrub; good wind tolerance
<i>Picea abies</i>	Norway spruce	—	—	—	x	x	—	3	Large tree, usually pendulous branches; many forms available; best in coldest areas
<i>Picea glauca</i> ‘Densata’	Black Hills spruce	—	—	—	—	x	—	3	Compact habit; slow growing
<i>Picea pungens</i>	Colorado spruce	—	—	—	—	x	—	3	Does poorly in warm areas
<i>Picea pungens</i> ‘Glauca’	Colorado blue spruce	x	x	x	—	—	—	3	Better growth and vigor in colder areas
<i>Pinus attenuata</i>	Knobcone pine	x	x	x	—	—	—	2	Hardy native pine
<i>Pinus canariensis</i>	Canary Island pine	—	x	x	—	—	—	3	Fast grower
<i>Pinus coulteri</i>	Coulter pine	—	x	x	—	x	—	2	Hardy native pine; good wind tolerance
<i>Pinus edulis</i>	Pinyon pine	—	x	—	—	—	—	1	Edible pine nuts; good wind tolerance
<i>Pinus halepensis</i>	Aleppo pine	x	x	x	—	x	—	1	Fast grower, open growth; good wind tolerance
<i>Pinus jeffreyi</i>	Jeffrey pine	—	—	—	x	x	—	2	Good wind tolerance
<i>Pinus lambertiana</i>	Sugar pine	x	—	—	—	—	—	3	Limited ornamental use; best in colder areas
<i>Pinus monophylla</i>	One-leaved pinyon	—	x	x	x	—	—	2	Desert native; small tree; good wind tolerance
<i>Pinus mugo</i> var. <i>mughus</i>	Dwarf mugo pine	—	x	x	—	x	—	3	Dwarf variety
<i>Pinus pinea</i>	Italian stone pine	—	x	x	—	—	—	2	Slow-growing, round-crowned tree; good wind tolerance
<i>Pinus pinaster</i>	Cluster pine	—	x	x	—	—	—	2	Large tree
<i>Pinus ponderosa</i>	Ponderosa pine	—	x	x	—	x	—	3	Native yellow pine; good landscape tree
<i>Pinus radiata</i>	Monterey pine	x	x	x	—	—	—	3	Young plants in Bishop area; best in wind-sheltered areas of subzone 3.0-3.1
<i>Pinus sabiniana</i>	Digger pine	—	x	—	—	—	—	2	Open, gray-foliage; good wind tolerance
<i>Pinus sylvestris</i>	Scot’s pine	—	—	—	x	—	—	3	Easy to transplant; susceptible to iron chlorosis
<i>Pinus thunbergi</i>	Japanese black pine	—	x	—	—	—	—	3	Should have wide adaptability; slow compact grower
<i>Podocarpus macrophyllus</i>	Yew podocarpus	—	—	x	—	—	—	3	Should be in protected area

Coniferous trees and shrubs—continued

Scientific name	Common name	Subzone adaptability						Drought tolerance	Remarks
		Warm → Cold							
		2.0	3.0	4.0	3.2	4.4	5.0		
		2.1	3.1	4.3	3.3	4.6	5.2		
<i>Pseudotsuga menziesii</i>	Douglas fir		x	—	x	—	—	3	Native; good landscape tree
<i>Sequoia sempervirens</i>	Coast redwood	—	x	—	x	—	—	3	Dry winds may cause excess needle drop; may be relatively short-lived; not well adapted to the desert
<i>Sequoiadendron giganteum</i>	Giant sequoia		x	x	x	—	—	2	Adaptable to desert cultivation
<i>Taxus baccata</i>	English yew		x	—	—	x	—	3	Numerous forms available; good specimens found in protected areas
<i>Taxus baccata</i> 'Fastigiata'.....	Irish yew		—	—	x	—	—	3	Neat habit
<i>Taxus cuspidata</i>	Japanese yew	x	—					3	Many forms available
<i>Thuja orientalis</i> (cultivars).....	Arborvitae	x	x	x	x	—	—	2	Shrub and tree forms; young plants will tip burn
<i>Thuja plicata</i>	Giant arborvitae	x	x					3	Large tree; good wind tolerance

Evergreen Trees

<i>Acacia baileyana</i>	Fern-leaf acacia	—	—	x				3	Will not tolerate saline soils; limited to climates 4 and warmer; short-lived; blue-gray foliage, yellow flowers; liable to wind breakage
<i>Acacia decurrens</i> var. <i>dealbata</i>	Silver wattle		—					3	Yellow flowers, gray-green foliage; liable to wind breakage
<i>Arbutus unedo</i>	Strawberry tree	x	x	x				2	Fine red fruit, white flowers
<i>Brachychiton populneum</i>	Kurrajong bottle tree	x						2	Several forms; weeping form best
<i>Brachychiton rupestris</i>	Bottle tree	x						2	Slow growing
<i>Casuarina cunninghamiana</i>	Beefwood	—	x					3	Good wind tolerance; will tolerate moderately brackish and alkaline soils; slender tree
<i>Citrus aurantium</i>	Sour orange	x						3	Warm sheltered locations only; ornamental use only
<i>Citrus limon</i>	Lemon	x						3	Commercial fruit tree; warm sheltered locations only
<i>Citrus paradisi</i>	Grapefruit	x						3	Commercial fruit tree; warmer slopes
<i>Citrus sinensis</i>	Sweet orange	x						3	Commercial fruit tree; warmer slopes
<i>Eriobotrya japonica</i>	Loquat	x	x	x				3	Edible and decorative fruit; sheltered, warm slopes in climate 4

<i>Eucalyptus camaldulensis</i>	Red gum	x	x	x	2	Severe winter may kill young eucalyptus trees; good wind tolerance; withstands flooding
<i>Eucalyptus pulverulenta</i>	Silver-leaved gum	-	-	x	2	Useful for cut foliage; good wind tolerance, but leaves may be damaged
<i>Eucalyptus rudis</i>	Desert gum	x	x	x	2	Attractive blue-gray foliage; good wind tolerance
<i>Eucalyptus tereticornis</i>	Forest red gum	-	x	-	2	One of the more hardy species; good wind tolerance
<i>Eucalyptus viminalis</i>	White gum	x	x	-	2	Tall tree with good form; good wind tolerance
<i>Grevillea robusta</i>	Silk oak	x	-	-	2	Large tree; golden flowers; will stand lawn watering; a compact form is available
<i>Laurus nobilis</i>	Grecian bay tree	-	-	-	2	May be clipped as screen or hedge
<i>Magnolia grandiflora</i>	Southern magnolia	-	x	-	3	Large, fragrant, white flowers; avoid high lime soils; several cultivars available
<i>Olea europaea</i>	Olive	x	x	x	2	Vigorous shoot growth may receive frost injury when young; good wind tolerance
<i>Parkinsonia aculeata</i>	Jerusalem thorn	x	x	x	1	Green stems, golden flowers; avoid wet conditions; good wind tolerance
<i>Prunus caroliniana</i>	Carolina cherry laurel	x	x	x	3	Need shade and shelter for good appearance in desert
<i>Prunus lyonii</i>	Catalina cherry	x	x	x	2	Cherry-like fruit; useful as screen plant; sheltered location colder than climate 4
<i>Pyrus kawakamii</i>	Evergreen pear	x	-	-	3	Weeping habit; white flowers
<i>Quercus agrifolia</i>	California live oak	x	x	x	3	Native of foothill areas; prefers acid soils
<i>Quercus ilex</i>	Holly oak	x	-	x	3	Round-headed tree
<i>Quercus suber</i>	Cork oak	x	x	x	3	Slow growing
<i>Quercus virginiana</i>	Southern live oak	x	x	x	3	Large tree; needs adequate water
<i>Schinus molle</i>	California pepper	x	x	x	3	Red fruits, weeping branches; tolerant of moderate wind; liable to frost injury when young
<i>Tamarix aphylla</i>	Athel	x	x	x	1	Good windbreak, need pruning; subject to freeze damage; usually sprouts from base of trunk; good wind tolerance
<i>Umbellularia californica</i>	California bay	x	x	-	3	Leaves are a substitute for bay in cooking

Deciduous Trees

<i>Acer negundo</i>	Box elder	x	x	-	x	3	Defoliates in late summer
<i>Acer platanoides</i> 'Crimson King'..	Crimson King maple	-	-	x	-	3	Few have been tried

Deciduous trees—continued

Scientific name	Common name	Subzone adaptability											Drought tolerance	Remarks
		Warm —————→ Cold												
		2.0	3.0	4.0	4.0 to 4.3	3.2 to 3.3	4.4 to 4.6	5.0 to 5.2						
<i>Acer saccharinum</i>	Silver maple	x	x	x	x	x	x	-	-	-	-	3	Subject to chlorosis; bark burns in hot sun	
<i>Aesculus glabra</i>	Ohio buckeye	x	-	-	-	-	-	-	-	-	-	3	Flowering	
<i>Ailanthus altissima</i>	Tree of Heaven	x	x	x	x	x	-	-	-	-	-	2	Needs pruning; roots invasive; plant only male trees to avoid seedling propagation; good wind tolerance	
<i>Albizia julibrissin</i>	Silk tree	-	x	x	x	x	-	-	-	-	-	3	Attractive pink to rose flowers; fern-like leaves; good wind tolerance	
<i>Aleurites fordii</i>	Tung-oil tree	x	-	-	-	-	-	-	-	-	-	3	Probably for protected areas only	
<i>Alnus rhombifolia</i>	California alder	-	x	-	-	-	-	-	-	-	-	3	Best with ample water; shade trunk from sunburn when young	
<i>Bauhinia purpurea</i>	Orchid tree	-	x	-	-	-	-	-	-	-	-	3	Lavender to purple flowers; avoid alkaline areas	
<i>Betula nigra</i>	River birch	-	-	x	x	-	-	-	-	-	-	3	Best with ample water; not for alkaline or caliche soils	
<i>Betula verrucosa</i>	European white birch	-	-	x	x	-	-	-	-	-	-	3	Best with ample water; not for alkaline or caliche soils	
<i>Broussonetia papyrifera</i>	Paper mulberry	-	x	x	-	-	-	-	-	-	-	2	Large-leaved, vigorous-growing shade tree; root suckers badly	
<i>Carya illinoensis</i>	Pecan	x	x	x	-	-	-	-	-	-	-	3	Mahan, Burkett, Success varieties; needs deep soil; fruits in climate 2	
<i>Castanea dentata</i>	American chestnut	-	-	-	-	-	-	-	-	-	-	3	Good shade tree	
<i>Catalpa bignonioides</i>	Catalpa	x	x	x	x	x	x	-	-	-	-	2	Large clusters of flowers later forming large seed pods	
<i>Catalpa speciosa</i>	Western catalpa	x	x	x	x	x	x	-	-	-	-	3	Good flowers; wind damage to leaves	
<i>Celtis douglasii</i>	Hackberry	-	-	-	-	-	-	-	-	-	-	2	Good shade tree; good wind tolerance	
<i>Celtis sinensis</i>	Chinese hackberry	x	-	-	-	-	-	-	-	-	-	2	Good shade tree; good wind tolerance	
<i>Cercis canadensis</i>	Eastern redbud	-	-	x	x	-	-	-	-	-	-	3	Red flowers before the leaves	
<i>Chilopsis linearis</i>	Desert willow	x	x	x	-	-	-	-	-	-	-	2	Small tree or large shrub; flowering; good wind tolerance	
<i>Cornus nuttallii</i>	Pacific dogwood	-	-	-	-	-	-	-	-	-	-	3	White flowers	
<i>Cotinus coggygria</i>	Smoke tree	x	x	x	-	-	-	-	-	-	-	3	Pinkish fruiting clusters cover tree in late summer	

<i>Crataegus oxyacantha</i>	English hawthorn	x	x	-	x	-	-	3	Single white flowers; upright growth branches; good wind tolerance
<i>Crataegus oxyacantha</i> 'Paul's Scarlet'.....	Paul's Scarlet hawthorn	-	x	x	x	-	-	3	Double red flowers
<i>Cydonia oblonga</i>	Quince	-	x	-	x	-	-	3	Fragrant yellow fruit; will be shrubby if not pruned
<i>Elaeagnus angustifolia</i>	Russian olive	x	x	x	-	-	-	2	Useful as a wind break
<i>Ficus carica</i>	Fig	x	x	x	x	x	-	2	Fruit in climate 2; freezes back in colder subzones
<i>Fraxinus pennsylvanica</i>	Green ash	-	-	x	-	-	-	3	Useful shade tree; good wind tolerance
<i>Fraxinus velutina</i>	Arizona ash	x	x	x	x	-	-	2	Hardy shade tree; good wind tolerance
<i>Fraxinus velutina</i> var. <i>coriacea</i>	Montebello ash	-	-	-	-	x	-	2	Good wind tolerance
<i>Fraxinus velutina</i> 'Modesto'.....	Modesto ash	x	x	x	x	x	-	2	Recommended selection for shade tree; good wind tolerance
<i>Gleditsia triacanthos</i>	Honey locust	-	-	x	x	-	-	2	Open shade tree with thorns and large pods; good wind tolerance
<i>Gleditsia triacanthos</i> 'Moraine'.....	Moraine locust	x	-	-	x	-	-	2	Thornless and fruitless clone; good wind tolerance
<i>Halesia carolina</i>	Silver bell	-	-	x	-	-	-	3	White flowers
<i>Juglans californica</i>	Southern California black walnut	-	x	-	-	-	-	2	Native of foothill areas; small tree
<i>Juglans hindsii</i>	Northern California black walnut	x	-	x	x	-	-	2	Nuts will shrivel if too short of water; nuts edible, but small
<i>Juglans nigra</i>	Eastern black walnut	-	x	x	-	-	-	3	Edible nuts, moderate size, needs deep soil
<i>Juglans regia</i>	English or Persian walnut	-	x	x	-	-	-	3	Low chilling varieties in cold parts of climate 2; medium and high chilling varieties in climates 3, 3.1, 4.0. Spring frost damage likely elsewhere.
<i>Koechreuteria paniculata</i>	Golden rain tree	-	-	x	-	x	-	2	Golden flowers; yellow-brown, bladder-like capsules
<i>Laburnum anagyroides</i>	Golden chain tree	-	-	x	-	-	-	3	Long chains of yellow flowers persist into winter
<i>Liquidambar orientalis</i>	Oriental sweet gum	-	-	x	-	-	-	3	Good fall foliage; subject to iron chlorosis
<i>Liquidambar styraciflua</i>	Sweet gum	-	-	x	-	x	-	3	Leaves have excellent fall color; not tolerate summer frost; liable to iron chlorosis
<i>Liriodendron tulipifera</i>	Tulip tree	-	-	x	-	-	-	3	Yellow flowers in early summer
<i>Maclura pomifera</i>	Osage orange	x	x	x	-	-	-	2	Large, warty fruit; branches heavily thorned; good wind tolerance
<i>Malus</i> sp.....	Crabapple	-	x	x	-	-	-	3	Edible fruit

Deciduous trees—continued

Scientific name	Common name	Subzone adaptability										Drought tolerance	Remarks
		Warm					Cold						
		2.0	3.0	4.0	3.2 to 4.3	4.4 to 5.0	3.2 to 4.3	4.4 to 5.0	4.6 to 5.2				
<i>Malus sylvestris</i>	Apple	—	x	x	x	x	x	x	x	x	3	Select variety suitable for area and climate	
<i>Melia azedarach</i>	China-berry	—	x	x	x	x	x	x	—	—	2	Will stand lawn watering; lavender flowers, orange fruits; good wind tolerance, except leaves blow off readily but come back	
<i>Melia azedarach</i> ‘Umbraculifera’ ..	Texas umbrella tree	x	x	x	x	x	x	x	—	—	2	Needs thinning; dense shade	
<i>Morus alba</i>	White mulberry	x	—	x	x	x	x	x	—	—	2	Fruit can be a nuisance and subject to spring frost damage; will suffer from persistent winds	
<i>Morus alba</i> ‘Fruitless’	Silkworm mulberry	x	x	x	x	x	x	x	—	—	2	Good shade tree but subject to spring frost damage; persistent winds will damage; fast growing	
<i>Morus alba</i> ‘Pendula’	Fruitless mulberry	x	x	x	x	x	x	x	—	—	2	More sensitive to wind than other forms	
<i>Morus alba</i> ‘Tatarica’	Weeping mulberry	x	x	x	x	x	x	x	—	—	2	Good shade tree; good wind tolerance	
<i>Morus rubra</i>	Russian mulberry	—	x	x	x	x	x	x	—	—	2	Good wind tolerance	
<i>Pistacia chinensis</i>	Red mulberry	x	x	x	x	x	x	x	—	—	2	Colorful foliage in fall; male and female trees; good wind tolerance	
<i>Pistacia vera</i>	Chinese pistachio	x	x	x	x	x	x	x	—	—	2	Commercial nut tree; male and female trees necessary for production; good wind tolerance	
<i>Platanus x acerifolia</i>	Pistachio	x	x	x	x	x	x	x	—	—	3	Good lawn tree	
<i>Platanus occidentalis</i>	London plane tree	x	x	x	x	x	x	x	—	—	3	Shade tree	
<i>Platanus orientalis</i>	American sycamore	—	—	—	—	—	—	—	x	x	3	Shade tree	
<i>Platanus racemosa</i>	European sycamore	x	x	x	x	x	x	x	x	x	3	Good lawn tree, stands heavy pruning	
<i>Populus x alba</i>	California sycamore	x	x	x	x	x	x	x	x	x	3	Used as windbreak; good wind tolerance	
<i>Populus canadensis</i>	White poplar	x	x	x	x	x	x	x	—	—	3	Will stand heavy watering; good wind tolerance	
<i>Populus fremontii</i>	Carolina poplar	x	x	x	x	x	x	x	x	x	3	Native along watercourses; good wind tolerance	
<i>Populus nigra</i> ‘Italica’	Cottonwood	x	x	x	x	x	x	x	x	x	3	Subject to borers; short-lived, particularly in warm climates	
<i>Prosopis glandulosa</i> var. <i>torreyana</i>	Lombardy poplar	x	x	x	x	x	x	x	x	x	1	Good wind tolerance; desert native, spreading tree; avoid wet conditions	

<i>Prosopis pubescens</i>	Screwbean	x	-	1	Good wind tolerance; desert native, small tree
<i>Prunus amygdalus</i>	Almond	x	x	2	Needs only slight chilling; blooms early; easily damaged by spring frost
<i>Prunus armeniaca</i>	Apricot	x	x	3	Needs more chilling than almonds; avoid areas of spring frost and early summer heat which may damage fruit
<i>Prunus avium</i>	Sweet cherry	x	-	3	Fruit subject to spring frost
<i>Prunus cerasifera</i> 'Atropurea'.	Purple-leaf plum	x	x	3	Good lawn tree
<i>Prunus cerasus</i>	Sour cherry	x	x	-	Grown for fruit, but good ornamental forms available
<i>Prunus persica</i>	Flowering peach	x	x	3	Many color forms and double or single flowers; subject to spring frost and damage with fruiting varieties
<i>Prunus persica</i> var. <i>nectarina</i>	Nectarine	x	-	3	Grown for fruit
<i>Prunus serrulata</i> var. <i>lannesiana</i> ..	Japanese flowering cherry	-	-	3	Fragrant pinkish flowers
<i>Prunus</i> sp.....	Plum and Plumcot	x	x	3	Grown for fruit
<i>Pyrus communis</i>	Pear	-	x	3	Commercial fruit tree; coldest areas of 2 through 3.2; good wind tolerance
<i>Quercus douglasii</i>	Blue oak	x	-	2	Will not withstand wet soil
<i>Robinia pseudoacacia</i>	Black locust	x	x	3	Hardy; white, fragrant flowers; good wind tolerance
<i>Robinia pseudoacacia</i>					
'Decaisneana'	Pink locust	-	-	3	Fragrant pink flowers; good wind tolerance
<i>Salix babylonica</i>	Weeping willow	x	x	3	Takes large quantities of water; good wind tolerance
<i>Salix babylonica</i> 'Crispa'	Ring-leaf willow	-	x	3	Novelty leaf form; good wind tolerance
<i>Sorbus aucuparia</i>	European mountain ash	-	x	3	Large clusters of red berries; good wind tolerance
<i>Tilia americana</i>	American linden	-	-	3	Large shade tree
<i>Ulmus americana</i>	American elm	x	x	3	Large shade tree
<i>Ulmus x hollandica</i>	Dutch elm	-	x	3	Large shade tree; good wind tolerance
<i>Ulmus parvifolia</i>	Chinese elm	x	x	3	May be evergreen in warm protected area, needs careful pruning. Will stand some wind
<i>Ulmus procera</i>	English elm	-	x	3	Large shade tree; good wind tolerance
<i>Ulmus pumila</i>	Siberian elm	x	x	2	Needs annual pruning; cut back to strong laterals to reduce length of long, weak branches; good wind tolerance if pruned
<i>Ulmus thomasi</i>	Rock elm. Cork elm	x	x	3	Large tree; good wind tolerance
<i>Zizyphus jujuba</i>	Jujube	x	-	3	Edible fruit; good lawn tree; good wind tolerance

Evergreen Shrubs

Scientific name	Common name	Subzone adaptability						Drought tolerance	Remarks
		Warm			Cold				
		2.0 to 2.1	3.0 to 3.1	4.0 to 4.3	3.2 to 3.3	4.4 to 4.6	5.0 to 5.2		
<i>Abelia x grandiflora</i>	Glossy abelia	x	x	x	-	x		2	Killed back to ground in very severe winters; may become half-deciduous in coolest areas; good wind tolerance
<i>Acacia cultriformis</i>	Knife-blade acacia	-	x					3	Silver-gray foliage; leaves resemble small paring knife blades stuck to the stem; good wind tolerance
<i>Acacia greggii</i>	Cat's claw	x	-	x				1	Desert native, useful as barrier; good wind tolerance
<i>Aloysia triphylla</i>	Lemon verbena	-	x					3	Aromatic foliage
<i>Arctostaphylos</i> sp.....	Manzanita	x	x	x	-	x	-	2	Rich reddish or purplish bark
<i>Atriplex hymenelytra</i>	Desert holly	x	x	-				1	Tolerant of alkaline soil; useful for cut foliage; desert native; good wind tolerance
<i>Atriplex</i> sp.....	Saltbush	x	-	x				1	Desert natives; useful for hedges; good wind tolerance; tolerant of alkaline soils
<i>Aucuba japonica</i>	Japanese aucuba	-	x	x				3	Best in shaded, protected location; showy red fruits
<i>Berberis darwinii</i>	Darwin's barberry	-	-	x	-	-		3	Slowest of the <i>Berberis</i> ; clusters of orange-yellow flowers in early spring
<i>Buddleia davidii</i>	Buddleia	-	x	x	x	-		3	Freezes to ground in very severe winters; good wind tolerance
<i>Buxus harlandii</i>	Korean boxwood		-	x				2	Useful hedge plant
<i>Buxus microphylla</i> var. <i>japonica</i> ..	Japanese boxwood	-	x	x	x	x		2	Leaves turn bronze color at 20°F
<i>Buxus sempervirens</i>	English boxwood	x	-	-	x	-		2	May be damaged during severe winters; good wind tolerance
<i>Callistemon citrinus</i>	Lemon bottlebrush	x						2	Only for warmest areas in protected locations of climates 2-3.0; good wind tolerance; showy red flowers
<i>Camellia japonica</i>	Japanese camellia	x	x	-	-	x		3	Protect from sunburn; used in shaded areas; acid soil
<i>Cassia artemisioides</i>	Feathery cassia	x	-	x				2	Feathery gray foliage, showy yellow flowers; good wind tolerance
<i>Ceanothus arboreus</i>	Catalina ceanothus	-	x					2	Most <i>C. arboreus</i> sold in the trade are hybrids

<i>Ceanothus griseus</i> var. <i>horizontalis</i>	Carmel creeper	-	x	2	Given plenty of room to spread will not exceed 30 inches in height
<i>Ceanothus spinosus</i>	Green-bark ceanothus	x	x	2	California native; blue to white flowers
<i>Cestrum nocturnum</i>	Night-blooming jasmine	x	-	3	Creamy white flowers, very fragrant. Ivory-white fruits; use in shaded areas
<i>Choisya ternata</i>	Mexican orange	-	x	3	Once well-established, will recover quickly from severe winter damage; white flowers
<i>Cistus ladaniferus</i> var. <i>maculatus</i> .	Brown-eyed rockrose	x	x	3	White flowers with dark crimson spots at base of each petal; good wind tolerance
<i>Cistus x purpureus</i>	Orchidspot rockrose	x	x	3	Reddish-purple flowers with red spots at base of each petal; good wind tolerance
<i>Cotoneaster harroviana</i>		-	x	2	Useful as natural arching hedge; red fruits; good wind tolerance
<i>Cotoneaster horizontalis</i>	Rock cotoneaster	-	x	2	Semi-evergreen; wide-spreading; seldom grows higher than 3 feet; deciduous at higher elevations
<i>Cotoneaster microphylla</i>	Rockspray cotoneaster	-	x	2	Dark green leaves above, gray beneath; low spreading shrub; good wind tolerance
<i>Cotoneaster pannosa</i>	Silver-leaf cotoneaster	x	x	2	Good wind tolerance; silver-gray foliage, arching in habit
<i>Cotoneaster parneyi</i>	Parney cotoneaster	-	x	2	Dark green foliage; large clusters of red berries from Oct. through Dec.; good wind tolerance
<i>Crotalaria agatiflora</i>	Canary-bird bush	x	-	3	Damaged by frost, but recovers quickly
<i>Cytisus fragrans</i>		-	x	2	White, fragrant flowers; good wind tolerance
<i>Cytisus scoparius</i>	Scotch broom	x	x	2	Wind tolerant; yellow flowers; damage occurs during severe winters, but recovers quickly
<i>Dalea californica</i>	Indigo bush	x	x	1	Desert native; purple flowers; good wind tolerance
<i>Dalea spinosa</i>	Smoke tree	x	-	1	Desert native to 15 ft. tall, gray branches, purple flowers; good wind tolerance
<i>Daphne odora</i>	Winter daphne	-	x	3	Protect from sun; fragrant flowers
<i>Daphne odora</i> 'Alba'.....	White winter daphne	-	-	3	Waxy, white flowers; susceptible to injury from soils high in salt
<i>Elaeagnus commutata</i>	Silver berry	x	-	2	Silvery leaves and fruit shrubs without spines; good wind tolerance
<i>Elaeagnus pungens</i>	Silver berry	-	x	2	Leaves are rusty or gray-green above, silvery-rusty beneath; mostly spiny shrubs; good wind tolerance

Evergreen shrubs—continued

Scientific name	Common name	Subzone adaptability							Drought tolerance	Remarks
		Warm			Cold					
		2.0 1.2	3.0 3.1	4.0 4.3	3.2 3.3	4.4 4.6	5.0 5.2			
<i>Encelia farinosa</i>	Incienso	x	—	—					1	Desert native, golden sunflower-like in spring; good wind tolerance
<i>Euonymus japonica</i>	Evergreen euonymus	x	x	x	—	—			3	Protected location; many cultivars; bright green leaves susceptible to mildew in shaded areas
<i>Fatsia japonica</i>	Japanese aralia	—	x	x					3	True subtropical for protected areas only
<i>Feijoa sellowiana</i>	Pineapple guava	—	x	x					3	A relatively hardy shrub for a subtropical; edible fruit; good wind tolerance
<i>Fremontia californica</i>	Flannel bush	x	x	—					2	California native; yellow flowers
<i>Fremontia mexicana</i>	Southern fremontia	x	x	—					2	Large yellow flowers; not for wet soils
<i>Gardenia jasminoides</i> 'Mystery'...	Mystery gardenia	—	x	x					3	Acid-loving plant which thrives in full sun even with temperatures of 100°F; best grown in peat moss in partial shade
<i>Genista aethnensis</i>	Etna broom	x	—	—					2	Rush-like branches, fragrant yellow flowers; good wind tolerance
<i>Hebe</i> sp.....	Veronica	—	x	—					3	Will require shade
<i>Helianthemum</i> sp.....	Sun rose	—	—	x					2	Good low border plant
<i>Ilex aquifolium</i>	English holly	—	x	x	x	—			3	Prefers acid soil; must have male and female plants for berries
<i>Ilex cornuta</i>	Chinese holly	x	x	x	—	x			3	Excellent for scarlet fruit; occasionally self-fertile
<i>Ilex cornuta</i> 'Burfordii'.....	Burford holly	—	x	x	—	—			3	Almost spineless leaves; good for fruits; self-fertile
<i>Ilex crenata</i>	Japanese holly	—	—	x	—	—			3	Black fruits
<i>Isoneris arborea</i>	Bladderpod	x							1	California native; gray foliage, yellow flowers; good wind tolerance
<i>Itea ilicifolia</i>	Holly-leaf sweetspire	—	x	x					3	Best in partial shade
<i>Jasminum humile</i>	Italian jasmine	—	x	x	—	x			3	Yellow fragrant flowers; needs support; can be used as ground cover
<i>Lantana camara</i>	Lantana	x	x	x					3	Many color selections available; use in protected areas only; freezes readily; good wind tolerance

<i>Larrea divaricata</i>	Creosote bush	x	x	x	1	Desert native; good in cultivation; dark green foliage, yellow flowers
<i>Lavandula officinalis</i>	Lavender	-	x	-	2	Grown for fragrance of dried flowers
<i>Leptospermum laevigatum</i>	Australian tea tree	-	-	x	2	White flowers; best handled as a small tree
<i>Leucophyllum frutescens</i>	Texas sage	x	x	x	1	Well adapted to desert soils; quite tolerant of wind, cold, and heat
<i>Ligustrum japonicum</i>	Wax-leaf privet	x	x	x	2	Some leaf damage in cold winter or severe frosts
<i>Ligustrum lucidum</i>	Glossy privet	x	x	x	2	Large hedge or small tree
<i>Mahonia aquifolia</i>	Oregon grape	-	x	x	2	Highly adaptable shrub; yellow flowers and bluish fruit in clusters; best in moderate shade
<i>Myrtus communis</i>	Myrtle	x	x	x	3	Very common well-adapted shrub; white flowers
<i>Myrtus communis</i> 'Compacta'....	Compact myrtle	x	x	-	3	Slower growing, compact shrub with small leaves
<i>Nandina domestica</i>	Heavenly bamboo	-	x	x	3	Choose for winter color
<i>Nerium oleander</i>	Oleander	x	x	x	2	Will freeze back during severe winter; available in many colors; good wind tolerance
<i>Nerium oleander</i> 'Variegatum'....	Variegated oleander	-	x	-	2	Will freeze back during severe winter; available in many colors; good wind tolerance
<i>Nicotiana glauca</i>	Tree tobacco	x	-	x	2	Weedy, slender shrub; yellow flowers
<i>Osmanthus heterophyllus</i>						
'Illicifolius'.....	False holly	x	x	-	3	Slow growing; holly-like leaves; fragrant flowers
<i>Photinia serrulata</i>	Chinese photinia	x	x	x	3	Part shade in warmest areas; larger leaves and flower clusters than toyon
<i>Pittosporum tobira</i>	Japanese pittosporum, tobira	x	x	x	2	Large shrub or small tree; fragrant creamy-white flowers
<i>Pittosporum tobira</i> 'Variegata'...	Variegated tobira	-	x	x	2	Gray-green leaves outlined in white; less vigorous in growth habit
<i>Portulacaria afra</i>	Elephant bush	-	x	x	2	Succulent; good low windbreak or groundcover
<i>Prunus ilicifolia</i>	California cherry	x	x	x	2	Large shrub or tree; new growth may be damaged by late frosts
<i>Pyracantha</i> sp.....	Pyracantha	x	x	x	2	Many species, varieties and cultivars adaptable; grown for winter berries
<i>Rhamnus alaternus</i>	Italian buckthorn	x	-	x	2	Tolerant of wind, heat and drought

Evergreen shrubs—continued

Scientific name	Common name	Subzone adaptability							Drought tolerance	Remarks
		Warm —————→ Cold								
		2.0	3.0	4.0	3.2	4.4	5.0			
		2.1	3.1	4.3	3.3	4.6	5.2			
<i>Rhamnus californica</i>	Coffeeberry		—	x	x	—		3	Plant in partial shade; plants extremely variable; good wind tolerance	
<i>Raphiolepis indica</i>	Indian hawthorn	x	x	x				2	Will recover from severe winter damage; pinkish flowers	
<i>Raphiolepis umbellata</i>	Yeddo hawthorn	—	x	—				2	White flowers	
<i>Rhus ovata</i>	Sugar bush	x	x	x				2	Good foliage plant; moderate wind tolerance	
<i>Rosmarinus officinalis</i>	Rosemary	—	x	—	x			2	Rugged shrub, seldom reaches 6 ft. high	
<i>Salvia leucantha</i>	Sage	—	x	—				2	Wooly purple or lavender flower clusters	
<i>Salvia microphylla</i>	Sage	—	x	x				2	Red flowers	
<i>Solanum pseudo-capsicum</i>	Jerusalem cherry	x	x	x	x			3	Scarlet or yellow fruit	
<i>Spartium junceum</i>	Spanish broom	x	x	x	x	x		2	Almost leafless shrub with bright yellow flowers	
<i>Tamarix parvifolia</i>	Salt cedar	x	—	x	x	—		2	Feathery pink flower clusters in spring	
<i>Viburnum suspensum</i>	Sandankwa viburnum	x	x	x	x			2	White flowers; fast growing good hedge	
<i>Viburnum tinus</i>	Laurestinus	x	x	x	—	x		3	Withhold water in late summer to reduce frost damage	
<i>Vitex negundo</i>	Chaste tree	x	x	x	—	x		3	May be deciduous	
<i>Xylosma congestum</i>	Shiny xylosma	x	x	x	x	—	x	3	A very tolerant shrub of climatic and soil variations; good foliage plant	

Deciduous Shrubs

Scientific name.....	Common name	Subzone adaptability							Drought tolerance	Remarks		
		Warm		Cold		to	to	to				
		2.0	3.0	4.0	3.2	4.4	5.0	5.2				
<i>Aesculus californica</i>	California buckeye	—	x						2	Shrub or small tree; deciduous in summer; showy white flowers in spring; good wind tolerance		
<i>Berberis thunbergii</i>	Japanese barberry	x	x	x	—				2	Red and purple-leaved forms available and more decorative; good wind tolerance		
<i>Calycanthus floridus</i>	Sweetshrub	—	x	x	—				3	Fragrant, inconspicuous flowers		
<i>Chaenomeles japonica</i>	Japanese flowering quince	x	x	x	x				3	Scarlet flowers; good wind tolerance		

<i>Chamaebatiaria millefolium</i>	Fern bush	x	-	-	-	1	Desert native; white flowers
<i>Cornus stolonifera</i>	Red osier dogwood	-	x	-	-	3	Needs adequate water
<i>Daubentonia tripetii</i>	Scarlet wisteria tree	-	x	-	-	3	Usually a small tree; subject to spring frost; striking red flowers
<i>Deutzia</i> sp.....	Deutzia	-	x	-	-	3	Flowers may frost; white to pinkish flowers
<i>Euonymus atropurpureus</i>	Burning-bush	-	-	x	-	3	Pale yellow foliage in fall
<i>Euonymus nanus</i>	Dwarf euonymus	-	x	-	-	3	Low, useful for ground cover
<i>Forsythia suspensa</i> var. <i>fortunei</i> ..	Golden bells	x	x	x	x	3	Yellow flowers in early spring; arching branches
<i>Fouquieria splendens</i>	Ocotillo, Devil's coach-whip	x	x	-	-	1	Desert native useful as specimen plant; red flowers; not for cold valleys
<i>Hibiscus syriacus</i>	Rose of Sharon	-	x	x	x	3	Many forms available; evergreen in warmer sections
<i>Hydrangea macrophylla</i>	Garden hydrangea	-	-	x	x	3	Many colors available; moderate shade gives better results
<i>Kerria japonica</i>	Japanese rose	-	-	x	x	3	Double and single flower forms available; golden yellow flowers; good wind tolerance
<i>Kolkwitzia amabilis</i>	Beauty bush	x	x	-	x	3	Pink flowers
<i>Lagerstroemia indica</i>	Grape myrtle	-	x	x	x	2	May be developed as a multi-stemmed small tree; many color forms; good wind tolerance
<i>Ligustrum ovalifolium</i>	California privet	-	x	x	x	2	Useful hedge plant; evergreen in warmer sections climate 2-3
<i>Ligustrum ovalifolium</i> 'Aureum'....	Golden privet	-	x	-	-	2	Evergreen in climate 2
<i>Ligustrum vulgare</i>	English privet	x	-	-	-	2	Evergreen in climate 2
<i>Lonicera tatarica</i>	Tatarian honeysuckle	-	x	-	x	2	Flowers red; good wind tolerance
<i>Magnolia x soulangeana</i>	Saucer magnolia	-	-	x	-	3	Can be trained to small tree
<i>Paonia suffruticosa</i>	Star magnolia	-	-	-	-	3	Can be small tree
<i>Philadelphus coronarius</i>	Tree peony	-	x	-	-	3	Many cultivars available
<i>Poinciana gilliesii</i>	Sweet mock orange	x	x	x	x	3	Fragrant white flowers; good wind tolerance
<i>Prunus andersonii</i>	Bird-of-Paradise shrub	x	x	x	x	3	
<i>Prunus glandulosa</i>	Desert peach	-	x	-	-	1	Pink flowers in spring; desert native
<i>Prunus lamellosa</i>	Flowering almond	-	-	x	x	3	Pink or white flowers
<i>Punica granatum</i>	Downy cherry	-	-	x	x	3	
	Flowering pomegranate	x	x	x	x	2	Edible fruit; red flowers; good wind tolerance

Deciduous shrubs—continued

Scientific name	Common name	Subzone adaptability							Drought tolerance	Remarks
		Warm			Cold					
		2.0	3.0	4.0	3.2	4.4	5.0	to to to		
		2.1	3.1	4.3	3.3	4.6	5.2			
<i>Rhododendron</i> sp.	Azalea		x	x	x	x	x	3	3	Many color forms available; best in pure peat moss in partial shade
<i>Ribes grossularia</i>	Gooseberries		x	x	x	x	x	3	3	Grown for edible fruit
<i>Ribes sativum</i>	Currants		x	x	x	x	x	3	3	Grown for edible fruit
<i>Robinia hispida</i>	Rose acacia	x	x	x	x	x	x	2	2	Rose to purplish flowers; good wind tolerance
<i>Rosa</i> sp.	Rose	x	x	x	x	x	x	3	3	Many named varieties; winter protection needed in all areas
<i>Sambucus caerulea</i>	Blue elderberry		x	x	x	x	x	2	2	Native; white flowers, bluish fruit; good wind tolerance
<i>Spiraea x bumalda</i>										
'Anthony Waterer'	Dwarf pink spiraea		x	x	x	x	x	3	3	Dwarf shrub; good wind tolerance
<i>Spiraea cantoniensis</i>	Reeves spiraea	x	x	x	x	x	x	3	3	White flowers; 4-5 ft. shrub
<i>Spiraea thunbergii</i>	Thunberg spiraea		x	x	x	x	x	3	3	3-5 ft. shrub; white flowers
<i>Spiraea x vanhouttei</i>	Vanhoutte spiraea	x	x	x	x	x	x	3	3	Arching stems; white flowers
<i>Symphoricarpos albus</i>	Snowberry	x	x	x	x	x	x	2	2	Showy white fruits, persistent into winter
<i>Syringa x persica</i>	Persian lilac		x	x	x	x	x	3	3	Occasional spring frost damage in climate 3 with frequent damage in climate 4. Good wind tolerance
<i>Syringa vulgaris</i>	Common lilac	x	x	x	x	x	x	3	3	Plant in cooler locations of climate 2. Flowers often frosted in climates 4 and 5. Good wind tolerance
	French hybrids	x	x	x	x	x	x	3	3	Spring frost damage frequent in climates 4 and 5. Many cultivars. Good wind tolerance
<i>Tamarix gallica</i>	French tamarisk	x	x	x	x	x	x	2	2	Summer flowering, feathery white to pink flower clusters which occasionally frost in cooler areas; good wind tolerance
<i>Viburnum x burkwoodii</i>										
<i>Viburnum carlesii</i>	Burkwood viburnum		x	x	x	x	x	3	3	White to pink flowers
<i>Viburnum opulus</i>	Korean spice viburnum		x	x	x	x	x	3	3	Fragrant white to pink flowers
<i>Vitex agnus-castus</i>	Snowball	x	x	x	x	x	x	3	3	Large heads of white flowers
<i>Weigela florida</i>	Blue chaste tree	x	x	x	x	x	x	3	3	Lilac flowers; good wind tolerance
	Pink weigela	x	x	x	x	x	x	3	3	Deep rose-colored flowers; good wind tolerance

Vines

<i>Asparagus sprengeri</i>	Asparagus fern	x	x	-	-	2	Low growing; evergreen; ground cover; or container plant
<i>Bougainvillea</i>	Bougainvillea cultivars....	x				2	Many varieties will recover after mild freeze; evergreen
<i>Calonyction aculeatum</i>	Moon flower	-	-	x	-	3	Perennial—usually treated as an annual
<i>Campsis grandiflora</i>	Chinese trumpet creeper	x	x			3	Large, scarlet flowers; deciduous
<i>Campsis radicans</i>	Trumpet vine	x	x	x	-	3	Orange flowers; deciduous
<i>Campsis x tagliabuana</i>							
'Madame Galen'.....	Madame Galen trumpet creeper	-	x			3	Larger orange and scarlet flowers than <i>C. radicans</i>
<i>Celastrus loeseneri</i>	Bittersweet	-	-	-	x	3	Colorful fruit; deciduous
<i>Celastrus orbiculatus</i>	Oriental bittersweet		-	-	x	3	Yellow fall foliage; deciduous
<i>Convolvulus mauritanicus</i>	Ground morning glory	x				3	Prostrate, twining; semi-deciduous
<i>Fatsihedera liza</i>	Botanical wonder	x	x			3	Use in protected areas; evergreen
<i>Hedera canariensis</i>	Algerian ivy	x	x			3	Needs shade and moisture; evergreen; more tender than <i>H. helix</i>
<i>Hedera helix</i>	English ivy	x	x	-	x	2	Also used as a ground cover; evergreen; best in partial shade
<i>Hedera helix</i>							
'Argenteo-Variegata'.....	Silverleaf ivy	-	x	-	-	3	Several cultivars; evergreen; best in partial shade
<i>Hedera helix</i>							
'Hahn's Self-branching'.....	Hahn's ivy	x	x			3	Small leaves; evergreen; best in partial shade
<i>Ipomoea purpurea</i>	Common morning glory	-	-	x		3	Dies back in winter; deciduous
<i>Jasminum mesnyi</i>	Primrose jasmine	-	x			3	Single yellow flowers; semi-evergreen
<i>Lonicera x heckrottii</i>	Everblooming honeysuckle	-	-	-	x	2	Vinelike shrub; evergreen
<i>Lonicera japonica</i>	Japanese honeysuckle	x	x	x	-	2	Fragrant flowers; evergreen
<i>Lonicera japonica</i> 'Variegata'.....	Variegated honeysuckle	-	-	-	x	2	Variegated leaves; evergreen
<i>Parthenocissus quinquefolia</i>	Virginia creeper	-	x	x	-	2	Good wall cover; deciduous; bright red leaves in fall
<i>Parthenocissus quinquefolia</i>							
'Engelmannii'.....	Engelmann creeper	x	x	-	-	2	Smaller leaflets than the species; evergreen
<i>Parthenocissus tricuspidata</i>	Boston ivy	-	x	-	-	2	Good wall cover; deciduous
<i>Pertiloca graeca</i>	Silk vine	x				3	Twining shrub-like plant; deciduous; purple flowers

Vines—continued

Scientific name	Common name	Subzone adaptability						Drought tolerance	Remarks
		Warm → Cold							
		2.0	3.0	4.0 to 5.0	3.2 to 4.4	5.0 to 5.2			
		2.1	3.1	4.3	3.3	4.6	5.2		
<i>Polygonum aubertii</i>	Silverlace vine	x	x	x				2	Small white flowers in large clusters; deciduous
<i>Tecomaria capensis</i>	Cape honeysuckle	—	x					2	Orange flowers; dark foliage; evergreen
<i>Vitis labruscana</i>	Grape		x	x	—	—	—	2	Deciduous; needs annual pruning; Concord most common variety, but most varieties will fruit well
<i>Vitis vinifera</i>	European grape	x	x	x				2	Deciduous; needs annual pruning; Thompson seedless, Perlette, Delight, Black Monucca, Ribier recommended varieties
<i>Wisteria sinensis</i>	Chinese wisteria	x	x	x	x	—	—	2	Heavy, deciduous vine; blue flowers

Palms or Palm-like

<i>Cordyline australis</i>	Dracaena palm	-	-	x				3	Not a true palm; recommended for container use; move to house in winter; climates 2.0 to 2.4; good wind tolerance
<i>Erythea edulis</i>	Guadalupe palm	x	x	x	-			3	Slow grower, good wind tolerance
<i>Phoenix canariensis</i>	Canary Island date palm	x	x	x				2	Heavy trunk—wide spreading; moderately saline tolerant; good wind tolerance
<i>Phoenix dactylifera</i>	Date palm	x	x	x	x			2	Good wind tolerance; moderately saline tolerant; Halawi, Saidy, Zahidi, Barbi recommended for home use
<i>Trachycarpus fortunei</i>	Windmill palm	x	x					2	Highly adaptable in landscape use; good wind tolerance
<i>Washingtonia filifera</i>	California fan palm	x	x	x				2	Heavy trunk; good wind tolerance; moderately saline tolerant
<i>Washingtonia robusta</i>	Mexican fan palm	x	-					2	Slender trunk; good wind tolerance; moderately saline tolerant

Ground Covers and Others

<i>Acanthus mollis</i>	Bear's breech	x	—	x	x	3	Perennial; best in shade and protected area
<i>Agave americana</i>	Century plant	x	—	x	x	2	Leaves sharp-pointed; variegated forms will stand wind; best known of agaves; produces flower stalks up to 40 feet after several years in the garden
<i>Ajuga reptans</i>	Carpet bugle	—	—	x	—	3	Low ground cover with blue flowers; grow only in shaded areas under trees
<i>Arundo donax</i>	Giant reed	x	x	x	—	2	Bamboo-like plants; perennial, temporary wind break and screen; variegated forms will stand wind
<i>Baccharis pilularis</i>	Mule fat	—	x	—	—	2	Similar to <i>B. vininea</i>
<i>Baccharis vininea</i>		—	x	x	—	2	Adaptable shrub-ground cover; strong deep roots hold soil, sand dunes or hillsides
<i>Calharianthus (Vinca) roseus</i>	Madagascar periwinkle	x	—	—	—	3	More tender than <i>Vinca</i> sp. Rose-colored flowers
<i>Centaurea cineraria</i>	Dusty miller	—	x	x	—	2	Compact perennial with white foliage mostly in a basal clump; moderately tolerant of wind
<i>Cerastium tomentosum</i>	Snow-in-summer	—	—	x	—	2	Silvery-gray leaved ground cover; drought resistant
<i>Clerodendron bungei</i>	Rose glory-bower	—	x	—	—	2	May freeze to ground but will sprout from roots
<i>Colocasia antiquorum</i>	Elephant ears, Taro	x	x	x	—	3	Plant only in areas protected from sun and wind
<i>Cortaderia selloana</i>	Pampas grass	x	x	x	x	2	Large clump grass to several feet with large flowering plumes; perennial; will tolerate wind
<i>Cynodon dactylon</i>	Bermudagrass	x	x	x	x	2	Dominant lawn grass in lawns only in climate 2; brown dormant period 6 weeks in climate 2, to 3 months in climate 4
<i>Cyperus alternifolius</i>	Umbrella plant	x	x	—	—	3	Will stand heavy watering; good near or in pools; tender
<i>Cyperus papyrus</i>	Egyptian paper plant	x	—	—	—	3	Will stand heavy watering; used in aquaria; climate 3.0 is about cold limit
<i>Dichondra repens</i>	Dichondra	x	x	x	—	3	Grass substitute; will recover after warm winters, or seed itself once established; will grow in moderate shade
<i>Festuca ovina</i> var. <i>glauca</i>	Blue fescue	x	—	—	—	2	Powdery-blue clump grass to 1 foot; used for borders

Ground covers and others—continued

Scientific name	Common name	Subzone adaptability							Tolerance	Remarks
		Warm			Cold					
		2.0	3.0	4.0	3.2	4.4	5.0			
		2.1	3.1	4.3	3.3	4.6	5.2			
<i>Fragaria</i> sp.....	Strawberry	x	x	—	—	—	—	2	Tolerant of cold; may suffer from dry hot sun in warmer areas	
<i>Hypericum calycinum</i>	Aaron's beard	x	—	x				2	Planted as single small shrub or mass planted as ground cover; yellow flowers	
<i>Mesembryanthemum</i> sp.....	Ice plant	x	x	x	x			2	Ground cover for flat areas; stems do not root, hence poor for holding soil against erosion	
<i>Miscanthus sinensis</i>	Eulalia	x	—	x				2	Several varieties; tall perennial grass with terminal feathery panicle, or seed head	
<i>Opuntia</i> sp.....	Barrel cactus	—	x	x				1	Plant with other desert plants where overwatering can be avoided; climate 4 is about limit of cold	
<i>Opuntia bigelovii</i>	Cholla cactus	—	x	x				1	Exceedingly spine-covered, yellowish colored; group with other cacti; climate 4 is about limit of cold	
<i>Paonia</i> sp.....	Peony		x	x	—	x	—	2	Many varieties and colors; tops die in winter	
<i>Phormium tenax</i>	New Zealand flax	x	x	x	x			2	Sword-like stiffly vertical leaves forming a large clump	
<i>Phyla nodiflora</i>	Lippia	x	x	x				2	Rapid spreading, low ground cover or lawn substitute; will attract large numbers of bees when it blooms	
<i>Phyllostachys</i> sp.....	Bamboo	—	x	x				2	Several varieties, from slender yellow stems to giant bamboo; perennial; good as wind-break or screen	
<i>Pluchea sericea</i>	Arrow weed	x	—	x	x	x	—	3	Dark green lawn grass, best adapted to temperate climatic areas or climates where summer night temperatures are 50°F or less	
<i>Poa pratensis</i>	Kentucky bluegrass	—	x	x				2	Can be trained to small evergreen tree or dense shrub for windbreak around home yard	
<i>Portulacaria afra</i>		x	x	x				2	Perennial in climate 2; handled as an annual in cooler areas; seeds and 3-week-old plants poisonous; excel-	
<i>Ricinus communis</i>	Castor bean

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