

1977
Dear ADS members,

Welcome to the San Francisco Bay area. Your tour from San Francisco to Walnut Creek will take you along the steepest climatic gradient in the world. A meteorology book described the gradient as follows: A 40 mile trip from the Northern Californian coast directly east to the interior in July will take you from the climate of North Scotland to that of North Africa in just 40 miles.

Our climate is unique in other respects and the enclosed reprint describes a garden that is designed to match our climate. Daffodils are particularly suited to our climate and the Brewer garden has over a thousand different varieties of daffodils growing naturally in a wild garden.

A wild garden poses some problems for a tour group. The plantings are not arranged in neat labeled rows and the paths through the garden are designed more for directing the deer than for large groups of humans. As many of the bulbs are still emerging and can be damaged, please do not leave the paths which are marked by pine needles and dried grass. None of the recent novelties will be found in the garden as the plantings are mostly up to 20 years old and no daffodils have been planted in recent years. As with all of the other plantings in the garden, everything is on its own once it is put in the ground. Bulbs are never watered except by natural rainfall. The severe drought which is in its second year has reduced the vigor of the plantings to a small extent, but there has been no significant effect so far. If you look closely, you will note a number of miniature species such as N. rupicola and N. scaberulus on the banks along the road. N. serotinus, N. viridiflorus, Grand Soleil d'Or, and the early N. bulbocodium forms have already bloomed, but all of the other early daffodils should be in bloom at the time of your visit. Because of the dispersion of so many varieties, it may be difficult to check the identification of all of the flowers in bloom, but we will do our best to answer your questions.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

AMARYLLIDS IN CENTRAL CALIFORNIA
WINTER-RAINFALL GARDEN

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Twelve years ago we began an experiment to determine if it is possible to have a large attractive garden in central California which would persist on natural rainfall alone and which would not require much time for maintenance. We have gathered up plants not only from California but from dry-summer areas all over the world. The acre garden is divided into woodland areas, which are dominated by native conifers; shrubby areas, which are dominated by *Arctostaphylos* and *Ceanothus* along with *Fremontia*, *Romneya*, *Dendromecon*, *Carpenteria*, and many other Californian shrubs; and the grasslands, where most of the members of the Amaryllis, Lily, and Iris families are planted.

Although twelve years is a short time for the slow growing plants results to date. This article deals with our experience with members of the Amaryllis family.

To help in the projection of our results to other situations, it might be valuable to define our garden conditions. The garden is three miles east of the center of the University of California campus on the east side of the Oakland-Berkeley hills at 1200 feet altitude. As the hills to the west range from 1700' to almost 2000' in altitude, we are shielded from much of the summer fog of the Bay area and our climate is not moderated by the ocean as much as most of the San Francisco Bay area. Our summers are hotter and drier with the temperature reaching 90°F a number of times during the summer and our winters are colder and wetter with the temperature dropping below freezing during most winters. The annual average rainfall is 35 inches, but it is concentrated in the winter and the garden is situated on a knoll from which the rain runs off very quickly. The average rainfall in June, July, August, and September is, respectively, 0.3, 0.02, 0.06, and 0.2 inches. However, these averages are the result of rare moderate rain storms and no rain at all falls in most years. On an average, every other year has a five month drought with less than 0.5 inches of rain. Six month droughts with a total of less than one inch of rain occur on an average of every four years. The real test of such a garden is a drought of eight to nine months with less than one inch of rain which comes possibly once in fifty years. Our garden has successfully weathered one such drought.

The knoll on which the garden is situated was originally part of the natural grasslands with no shrubby plants except for some poison

oak, which was removed. The many oak, maple, and other seedlings which are found each spring are unable to get their roots deep enough to survive the hot dry summer. However, trees and shrubs which were watered during the first summer were able to persist without additional care. Most plantings were made in the late fall so that the winter rains could establish the plants. Mulches were used to retain moisture during the first summer. Most bulbous plants generally received no artificial water even during their first summer.

There are several general remarks about cultural practices that apply to most plants from dry-summer climates. They have not had to develop resistance to fungi which develop rapidly under warm moist conditions such as some of the *Fusarium*, *Stagonospora*, *Sclerotinia*, *Ramularia* and especially the widespread *Sclerotium rolfsii* Sacc. Most books advise light soils for dry-climate plants even though they are usually found in heavy soil naturally, but such advice is based on experience in English gardens where the summer rain would quickly bring on rot if drainage were not perfect. Under our central California conditions, most of the plants that we have tried prefer our normal heavy adobe clay soil to any soils which have been lightened by large additions of sand and humus. The heavy soil retains more of the winter moisture through the spring growing season and yet does not promote fungus diseases if the soil is kept bone-dry during the summer. Experimental watering experiments have demonstrated that summer watering is fatal to many of the plants from dry-summer climates.

The next general remark has to do with tender plants. We have concentrated on plants with winter growing habits to take advantage of our winter rain. However, freezing spells often severely damage the winter growth, particularly of many of the South African bulbs. At our altitude we do not experience the severe freezes as low as 15° F which occur in the valley below us, but we can expect 25° F at least every five or ten years. The lowest temperature at our altitude in the last 25 years has been 22° F. These cold spells come during a time of a very cold dry air mass over California. We have observed that exposure to the sky is the most important factor which determines frost damage. Any weeding which removes grass cover causes much greater frost damage. Plants close enough to shrubs or trees which shield a portion of the sky show much less frost damage. If the plants need full sun, they can be planted on the south side of a shrub which will shield them from the night sky.

In the early years, it was our practice to dig in compost and fertilizer below the bulbs. This has been discontinued since it appears to promote fungus growth, tends to cause concentration of root growth too close to the surface, and generally does not seem to be worth the trouble. Many books recommend peat moss. Although our soil is only slightly acid, peat moss seemed to be detrimental to many amaryllids under our conditions. Our present planting procedure is to dig as deeply as possible with a pick and to insert the bulb with no additional soil preparation. Planting depth varies considerably, but generally we

tend to plant deeply, particularly if the bulb is tender, if birds or rodents eat the bulb, or if the bulb is not very drought resistant. Also bulbs which tend to divide too quickly and to become crowded are planted deeply to discourage excessive division. Normally plants are never disturbed once they have been planted.

It is perhaps most convenient to discuss our results with amaryllids by considering related bulbs together. The Allieae tribe has contributed importantly to our garden. Most *Allium* species are not sufficiently drought resistant to perform well in the grassland areas in full sun. White flowering *A. zebdanense* takes full sun, but *A. cowanii*, which is the showiest white, and *A. neapolitanum* need some shade. *A. triquetrum* grows in full shade here and spreads rapidly. It is delicious in salads and we have to eat it as fast as we can to keep it from becoming a nuisance. *A. tuberosum*, an evergreen onion from North India, also has white flowers and is excellent for salads. Yellow flowering *A. moly* is persistent here on north slopes where the ground does not dry out too soon in the spring. Blue flowering *A. azureum* has been a complete failure here. We have about twenty pink-lavender-purple *Allium* species growing here, but we do not find many of the colors attractive. *A. roseum grandiflorum* and the Californian *A. unifolium* are very attractive here with considerable shade on slopes which retain moisture late into the spring. *A. giganteum* is very showy. The Texan natives *A. drummondii* and *A. zenobiaca* are very attractive here.

One attempt has been made to establish *Nothoscordum*, but it appears to have failed. *Leucocoryne ixioides* has provided us with gorgeous floral displays each spring. The species *Muilla*, *Triteleia*, *Bloomeria*, *Brodiaea*, and *Dichelostemma* play a very important role in the grassland areas. Several were already growing naturally on our land and we have introduced additional species to a total of about 20. They bloom from early March into June. In favorable years the grass is blue with their flowers. Except for *Triteleia lactea* and its lilac variety and for *T. penduncularis*, the others grow in full sun. However, most grew better with either a little shade or a site that did not dry out too soon in the spring. They all do well in heavy soil, even very heavy sterile sub-soil banks. *Bessera* and *Muilla* were tried, but their summer growing habit is not compatible with our conditions and they seem to have been lost.

Both *Agapanthus* and *Tulbaghia* species of the *Agapantheae* tribe have been tried with disappointing results. None of the three *Tulbaghia* species tried will flower without water even in full shade. *A. longispathus* and *A. Weilligii* bloom in partly or largely shaded spots without summer water. Other *Agapanthus* species are established, but they are very slow growing under our conditions. They need special sites of a type that will be discussed in connection with *Crinum* and they may need summer water for several years to establish them more quickly.

Many *Hemerocallis* have been planted near the house where they may benefit from run-off from the lawn. A number of evergreen and early blooming varieties have been planted in the grasslands or in partly shaded spots. They have achieved a good deal of growth during the

rainy months and have given bloom, but their performance has been very inferior to typical garden results. They clearly need more moisture. *Ixiolirion ledebourii* and *I. pallasii* have done well here and the flowers are very attractive.

The *Zephyrantheae* tribe provides *Sternbergia lutea*, one of the most important plants of the grasslands. The bright yellow flowers of many hundreds of bulbs in the fall are an important part of the garden's fall display. The bulbs grow anywhere in the grasslands. *Rhodophiala bifida* and *R. spathacea* grow well also. *R. chilensis* appears to be more difficult and only rarely blooms. *Sprekelia formosissima* and its variety *superba* persists under our conditions, but rarely blooms. It goes dormant during the summer and starts growth after the fall rains. Thanks to the kindness of Dr. Thad Howard, a large variety of rain-lilies (*Zephyrantes* and *Habranthus*) have been planted along our lawn. Each heavy watering of the lawn is followed subsequently by a show of flowers during July through September. A few have been planted where they receive only natural rainfall. Their growth has been much less vigorous, but an unusual heavy rain in May brought forth some blooms and blooming more frequently follows heavy fall rains if they come early. *Sternbergia fischeriana* has not yet been tested in the grasslands, but a test planting near the house gave lovely bloom this spring.

Amaryllis, the favorite amaryllid of most readers, is poorly adapted to our garden. One single bulb is planted where it can receive some run-off from the lawn. It persists, but has never bloomed. However, the other genus of the Amaryllideae tribe, *Lycoris*, plays an important role in the garden. A number of these species grow in the grasslands and their fall color is an important addition to the garden. *L. squamigera* has been planted in a variety of locations and persists, but it has never bloomed here. *L. sprengeri* and *L. incarnata* grow and bloom well in the grasslands. *L. sanguinea* has apparently been lost; it may be too tender. *L. radiata* needs shade, probably for frost protection as well as conservation of moisture, to bloom. *L. albiflora* and its variety *carnea* have bloomed well with at least 50% shade. Fifteen *L. aurea* (might be *L. traubii*) have sent up leaves every fall for four years, but they have suffered from frost during the winter and one scape has been obtained in four years.

Narcissus unquestionably dominates the spring garden for almost three months. We have more than 200 varieties and many thousands of bulbs planted throughout the grasslands. The varieties have been carefully chosen to be sun-proof, which has eliminated many large cups and most small cups. Our location appears to be ideally suited for *Narcissus* as representatives of all ten divisions are growing well here. The very late blooming varieties such as the poeticus hybrids, for example, must have considerable shade. Many of the forms of *N. bulbocodium* and other species do well here. The *Narcissus* plantings are divided into two distinct sections which are separated by our house and generally a gap of 20 to 30 feet. Quite a number of years ago, before we had learned to recognize the presence of bulb flies, both the large and small narcissus bulb flies were introduced into the southern

Narcissus section in a batch of bulbs obtained from a local nursery. Although the infestation spread throughout the southern section, it is striking that neither narcissus bulb fly has been observed in bulbs from the northern section. The flies apparently do not travel far. Fortunately, the winds are from the west and never from the south during the time that the flies are on the wing. With the plentiful supply of *Narcissus* in the garden, no evidence has yet been found of attack of other amaryllids except for *Leucojum*. 5% dieldrin dusted around the base of the leaves in March has greatly reduced the infestation. A dusting followed by a spraying of the leaves in April should practically eliminate the flies. If the next owner were to apply the double treatment and follow it with a lifting of the bulbs in August to eliminate any remaining grubs, the infestation could be eliminated permanently. Except to check for fly infestation, the bulbs are left undisturbed. The shoulder of the bulb is covered with 6 to 9 inches of soil to slow down formation of offsets. The bulbs are planted in clumps of one or two dozen with the clumps randomly distributed in the grasslands.

Haemanthus coccineus is well suited to our conditions and never fails to bloom in late August and September. All that it demands is the shelter of some shrub to protect it from the winter sky or ample grass growth around its large leaves to offer frost protection. *H. carneus* has persisted without blooming but the leaves have always been small. It is in 75% shade. *H. catherinae* has been grown as a watered plant, but with no bloom to date. *H. albiflos* goes dormant during the summer and leaves start after the fall rains. Growth has not been vigorous and there has been no bloom.

The *Crineae* tribe provides the very important *Brunsvigia* and *Nerine*. The Californian natives provide ample color in the period November-June in normal years and it is the fall period that needs the most support. Fall color has been provided primarily by *Sternbergia*, *Lycoris*, *Brunsvigia*, *Nerine*, and the fall *Crocus*. The various *Brunsvigia* hybrids do very well in the open grasslands except for frost damage to the leaves during some cold winters. The clones 'Durban', and 'Windhoek' of *Brunsvigia* x *parkeri* (Zwanenburg group), and clones of *B. x parkeri* English group, seemed to be the most tender, but the damage is greatly reduced if the grass still overtops the new leaves in late January or if a shrub provides shelter from the winter sky. Several hundred bulbs are planted throughout the grasslands and all available varieties have been tried. Many bulbs have not bloomed yet, but the number of scapes increases every fall and the fall display may some day rival the spring *Narcissus* display.

The *Nerine* must be carefully protected from frost. *N. Corusca major* is very badly damaged in mid-winter if its leaves are not covered by grass or shielded by shrubs. Otherwise its orange scarlet flowers are quite reliable. Some of the *N. Bowdenii* forms put out fall leaves and then go dormant in December whether protected from frost or not. *N. Bowdenii* clone 'Pink Triumph' is particularly valuable for its large blooms on tall scapes up to New Year's Day, but its leaves show frost damage where fully exposed to the night sky. The form 'Pink Beauty'

is similar to 'Pink Triumph'. 'Magnifice' (or 'Magnifica') is an attractive earlier blooming variety. *N. flexuosa alba* does well, but the flower was small and not especially attractive. *N. undulata*, on the other hand, has a small flower but a clump of scapes with pale pink waved tepalsegs is very attractive. A number of other *Nerine* have been tried, but none compared with the best of those mentioned above. Care must be taken not to plant the *Nerine*, especially 'Magnifice', in too shady a spot or trouble is encountered with mealy bug. If shelter from the night sky is desired, the south side of a shrub is preferable.

In the early years of development of the garden plantings were restricted to those plants that had a good chance of succeeding. In recent years less favorable plants such as *Agapanthus*, *Hemerocallis*, *Hymenocallis*, and *Crinum* have been tried. These plants would considerably extend the season of color in the garden and they were worth some effort. The problem was to find a site where they could find sufficient underground water for their late growing season. At first we reasoned that sub-surface drainage would follow surface drainage and that the lower parts of the garden would have sub-surface water later in the season than the higher parts. However, it turned out that the sub-surface drainage did not generally parallel surface drainage. By noting where grass stayed green later in the season and by probing to test the sub-surface moisture content, it was possible to map out those parts of the garden where sub-surface moisture was available late in the season. The planting procedure was to dig as deeply as possible and to lighten the sub-soil with sand and vermiculite. It appears that it may be necessary to water for two summers before the plants are well enough established to carry on without care. As noted above, some *Agapanthus* and *Hemerocallis* have been established; it is too soon to say how generally successful the procedure will be. It has worked well for *Crinum yemense* and *C. 'Ellen Bosanquet'* but both are tender and must be sheltered from the winter night sky. Even with protection, they lose most of their leaves in January, but they still bloom without fail every year. We have about nine or ten other *Crinum* species and hybrids being grown as watered plants which were to have been moved to unwatered sites. *C. bulbispermum* seems to be the most hardy. The others all suffer considerable frost damage even with protection. *C. moorei* is planted north of the house where it receives sun only during the six months that the sun is highest in the sky. Even this small amount of sun appears to be too much during July and August hot spells and it must be watered. It has bloomed the last two years. The X *Crinodonna* is much more like *Crinum* in regard to water requirements. It has not yet been established in an unwatered site.

Leucojum aestivum and *L. vernum* grow well if partially shaded. We have not yet found the proper conditions for *L. autumnale*. *Galanthus* is an important contributor to the garden. *G. nivalis* and *G. plicatus* and their many forms grow best on north slopes or in considerable shade. *G. elwesii* takes much hotter and drier locations. *G. byzantinus* and *G. caucasicus* also seem more drought resistant.