

the  
PLANT PRESS

*Anemone tuberosa*



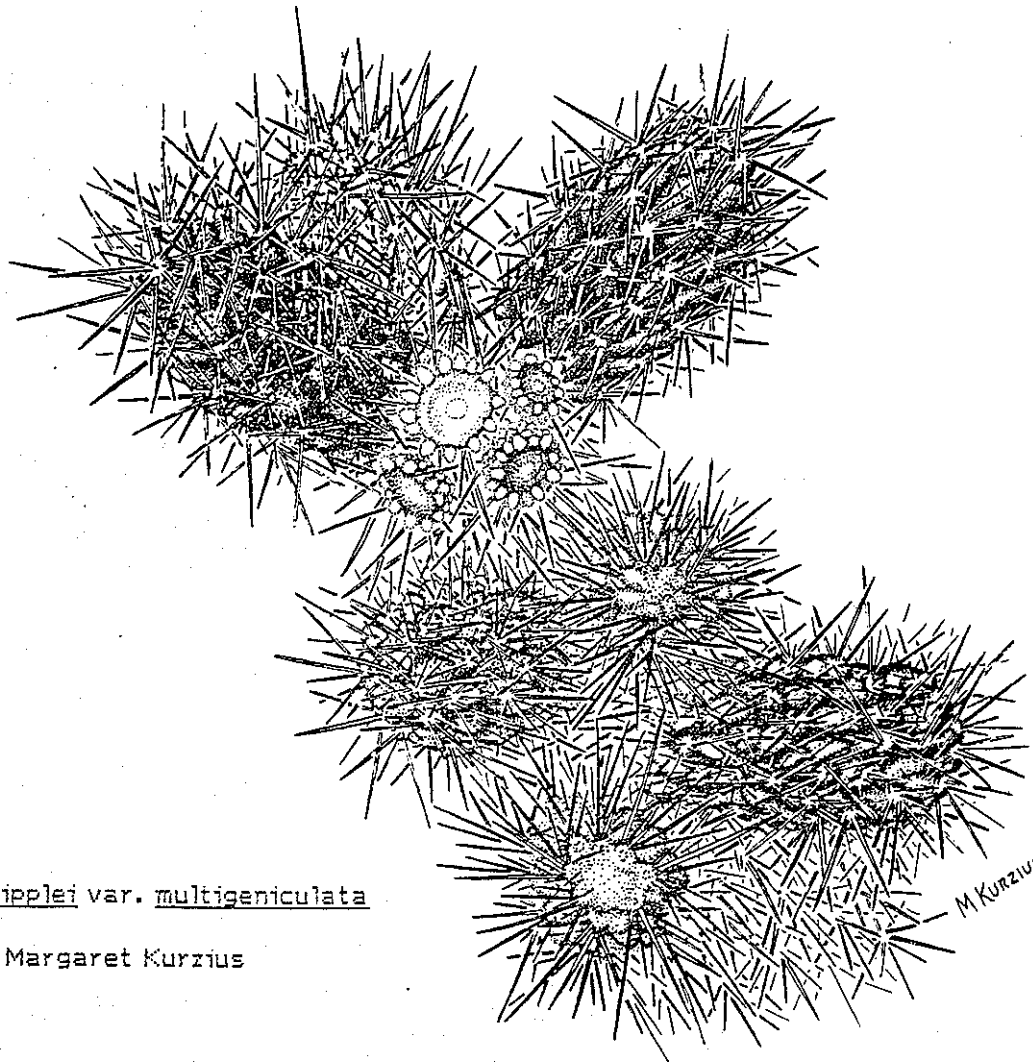
drawing by Lucretia B. Hamilton  
courtesy of University of Arizona  
Herbarium

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Opuntia whipplei var. multigeniculata

drawing by Margaret Kurzius

M Kurzius

## GROUNDCOVERS FOR DESERT LANDSCAPES

by Greg Starr

Groundcovers are sorely neglected in desert landscaping for several reasons. First, the variety of groundcovers offered by most nurseries is limited, as few new groundcover plants are being collected and tested for landscape potential. Another reason for their scarcity in desert landscapes is, undoubtedly, due to the fact that ground cover plants are extremely rare in the deserts of the world. However, there are new groundcovers being tested that look promising for desert landscaping, and these are our topic this time.

As defined here, groundcovers are plants that when grouped together can cover large areas of ground in a residential landscape. In general, groundcover plants have a greater spread than height. We will not be limited by the categories of walk-on versus non-walk-on in this discussion.

Groundcovers serve many functions in desert landscaping. They stabilize the soil, absorb solar radiation, reduce the reflectance of heat and glare, and diminish runoff of rainfall and irrigation water. In selecting appropriate groundcovers for specific situations, keep in mind the exposure, the area you intend to cover, the amount of water you want to use, and other plants in your landscape. If the plant is to cover an area of a particular size or shape, you may have to figure out a way to contain it. Also, the groundcover selected should compliment the other trees and shrubs growing around it.

The groundcover plants described below are listed alphabetically. Most if not all of these should be available through local nurseries.

### Acacia redolens (Prostrate Acacia)

An Australian acacia that is worthy of attention. Individual plants grow up to two or three feet high and eight to 12 feet across, although more prostrate forms are being selected for cultivation now. These plants are fast-growing and quite drought tolerant. Tiny yellow puffball flowers appear in late winter or early spring. They

don't make an overwhelming display, but the dash of color provided is attractive. A. redolens is perfectly hardy down to temperatures between 16 and 19 degrees F.

### Dalea greggii (Prostrate Indigo Bush)

This Chihuahuan Desert native is one of the most promising new groundcover plants under cultivation. In its natural habitat, D. greggii will not spread more than two feet, but under cultivation with supplemental water, it can spread eight to ten feet across. It roots as it grows, and may spread indefinitely with sufficient moisture. Pruning causes it to mound up on itself, giving it a soft, flowing appearance. With supplemental water, prostrate indigo bush can be used as a bankcover (as can prostrate acacia). Dalea also looks good cascading out over the sides of raised planters. The pearly silver foliage is probably the most attractive aspect of this species. Small purple flowers appear almost any time of year, with the best show usually in the spring.

### Melampodium leucanthum (Blackfoot Daisy)

A wide-ranging plant found in Arizona, northeastern Sonora, Chihuahua, Texas, and Kansas, blackfoot daisy grows about two feet in height and two to three feet across. It is a short-lived perennial that can reseed itself, but it should probably be replanted as it dies out. Yellow and white flowers produce a lovely show from late spring to early fall and occasionally bloom during warm winters. Pruning, which should be done to remove the old flowers, can increase the blooming period. Blackfoot daisy is perfectly hardy, but requires supplemental water during the summer. This is a good species to mass plant in partial or filtered shade.

Oenothera berlandieri  
(Mexican Primrose)

Mexican primrose has been cultivated as a groundcover plant for a long time. It is a hardy, vigorous plant that spreads by rhizomes and can become invasive. Showy pink and white flowers make a nice display in spring, summer, and fall. For best appearance, the plants should be pruned after flowering. This is a fast-growing groundcover for full sun or partial shade.

Oenothera caespitosa

This perennial grows four to 12 inches high and makes an excellent patio plant. Mass plants for a dense stand. Large, showy, white flowers that open at night appear in the spring. This species takes full sun with supplemental water, but will also perform well in filtered shade.

Oenothera drummondii  
(Baja Primrose)

This is a recent introduction to the nursery trade. These are fast growing plants that have been shown to outcompete other groundcovers. Good for shady spots, they have aboveground runners that root in moist soil. Blooming on warm spring nights, the flowers are large and yellow. Plants may need occasional pruning to generate new growth.

Pentzia incana  
(Karoo Bush)

Pentzia comes from the Karroo region of southern Africa and appears to be reseeding itself where it was planted near Safford. Grows about one foot tall and two to three feet across, bearing tiny yellow flowers from spring to fall (or sometimes year-'round). Mass plant in full sun or filtered shade.

Stachys coccinea  
(Betony)

This plant is a native of shady canyons in parts of Arizona, Texas, and central Mexico. Red flowers appear in the spring, summer, and fall. Prune in the winter to remove old flower stalks. Mass plants in shadier spots for an effective color display. Requires supplemental water in the warmer months.

Verbena ciliata

A small subshrub adaptable to a groundcover function if mass planted, but may need replacing after a few years. Dense clusters of dark purple flowers occur almost year-'round. For Verbena to look its best, some supplemental water is required. Grows one to two feet tall and two to three feet wide. Plant in full sun or filtered shade.

Verbena tenuisecta

This is a native of South America that is becoming naturalized in Arizona. Looks best from spring through fall, but is sensitive to frost and may die back in winter. If it does get frozen, treat it as a perennial and prune it. This species of Verbena grows from six to ten inches tall and spreads two to three feet or more if it roots in moist soil. Plant in full sun and use for seasonal color, rather than as a main groundcover (unless you don't mind a bare area in cold winters).

Zauschneria californica  
(Hummingbird Trumpet Bush)

This low perennial spreads by rhizomes and may become invasive. It prefers shadier spots around the landscape, and needs some supplemental water in summer. Zauschneria blooms most profusely in the fall. The red, trumpet-shaped flowers attract hummingbirds, as the common name implies. Zauschneria looks good in a raised planter, in contained areas, or in an informal desert landscape.

These are some of the most common and best performing groundcovers for planting in an arid environment. They can be found in many local nurseries. Each has its own advantages and disadvantages, but almost any landscape can be treated by the use of one or more of the species described above.

## DESERT PLANT STRATEGIES

Desert plants are often categorized into one of three generalized "strategies" for coping with drought: avoidance, resistance, and endurance. Short-lived annuals, drought-deciduous shrubs (such as wolfberry, bursage), and suffrutescent perennials whose active life cycles are restricted to times when water stress is minimal are considered drought-avoiders. Succulent species (cacti, yuccas, agaves) and perennials with deep roots reaching a level of permanent moisture--plants that can maintain a positive water balance through extended periods of drought--are classified as drought-resisters. According to this classification, the only true drought-endurers or xerophytes (from the Greek, xeros = dry + phyton = plant) are evergreen shrubs (such as creosotebush, sagebrush, and jojoba) that photosynthesize year-'round despite extremely low tissue moisture contents.

Unfortunately for those seeking a simplified understanding of plant adaptations, these strategic classes are ambiguous. The adaptational "strategies" of desert plants are complex and diverse, and although relatively few species have been intensively studied, few generalizations appear to be true.

A complicating factor in discussing desert plant adaptations is that there is no clear distinction between adaptation to drought and the effects of drought on plants. Almost all plant species subjected to water stress exhibit characteristic modifications. Plants that are drought-stressed grow smaller leaves that have denser venation and thicker cuticles. They also show an increase in the proportion of root growth to shoot growth. These characteristics are typical of many desert plants.

A number of desert shrubs have leaf morphologies that change with water availability. With optimum moisture, the leaves of Encelia farinosa (brittle-bush), Ambrosia dumosa (white bursage), and Jatropha spp. are larger, have fewer stomata (pores) per unit area, and are less hairy. With increasing drought, these shrubs produce leaves that are reduced

in size, number, and photosynthetic capacity, and that have denser pubescence.

Pubescence is frequently considered an adaptive feature of plants in arid environments, but the evidence for this is equivocal. In several studies of leaf pubescence in plants along environmental gradients of increasing aridity, there was no significant correlation between hairiness and aridity. The degree of pubescence changed seasonally in some communities along the gradients, but not necessarily in response to increasing aridity. Several researchers have experimented with shaving the hairs of leaves to determine the function of plant pubescence, but again, the results were inconclusive. One hypothesis suggests that hairs cause an increase in thickness of the boundary layer across the leaf surface, thereby decreasing the loss of water (transpiration) from the leaf. In some species this appears to be the case, but not in others. There is some indication that plant hairs increase the reflectance of incoming solar radiation, thus reducing the heat load on the plants and their need to transpire to stay cool. (Another effect of this would be a decrease in photosynthesis.) But exceptions to this have been demonstrated: the hairs on some plants actually increase the absorption of solar energy, thus increasing the heat load.

Some major physiological adaptations to drought include variations in the process of photosynthesis and increased ability to withstand low tissue water content. Photosynthetic adaptations have evolved that are more water economical than the "standard", Calvin cycle method. These adaptations (called CAM--Crassulacean Acid Metabolism-- and C<sub>4</sub>-dicarboxylic acid photosynthesis) are not restricted to desert plants. But, their greatest occurrence is in warm, arid environments, and a greater amount of solar energy is required to power these alternative photosynthetic pathways. Many cactus and other succulent plant species use CAM photosynthesis; a number of summer annual herbs and annual and perennial grasses

use C<sub>4</sub> photosynthesis. A number of desert plants (including creosotebush, brittle-bush, and jojoba) have been shown to be able to maintain positive rates of photosynthesis even with extremely low tissue water contents. Small cells and thick cell walls, as well as biochemical changes, probably help these plants endure extreme drought.

There appear to be many different strategies for coping with drought. Those plants investigated thus far seem to use a combination of techniques that optimize water use and increase drought-resistance and endurance. Even those species thought to avoid drought by restricting their active life cycle to times of relative wetness often have physiologic and/or morphological adaptations that enhance their ability to survive in desert environments.

by Margaret Kurzius

#### NOTES FROM THE PRESIDENT:

On behalf of the membership of the Society we welcome the new chapters of Yuma and Flagstaff to our growing membership in 1982. We appreciate the hard work of those who helped organize these new chapters and believe that their affiliation marks a significant step forward in truly becoming the Arizona Native Plant Society. Our best wishes to Yuma and Flagstaff for a long and rewarding association with the Society!

We are happy to report also that a new chapter is being formed to serve the Pinal communities. If you live in Casa Grande, Coolidge, Florence, Apache Junction, Stanfield, or another community of Pinal County, we invite you to affiliate with this chapter. The first meeting will be held Saturday, February 19, at 10:00 AM. This meeting will be held at the Student Union on the Signal Peak campus of Central Arizona College in Casa Grande. (Please use the visitors' parking lot.) Professor William Kinnison will be our host, and in the early afternoon Bill will give a walking tour of the outstanding and varied collection of arid plants on the Central Arizona College campus.

Late last year many members of the Society took an active position in urging BLM to protect an endangered population of Mammillaria thornberi near the Arizona Sonora Desert Museum by not transferring certain lands to the State for the CAP or other possible development. This is an example of how the Society can have a voice in the formulation of public and private policy which impacts the environment and the preservation of the diverse flora of Arizona.

The annual meeting of the general membership of the Society will be held on Saturday, April 2, 1983 at the Boyce Thompson Southwestern Arboretum in Superior. The program for the meeting promises to be exciting: the arboretum will present an Arid Land Plant Fair. Some of our members will be participating in this first arid land plant exposition for Arizona. We will send you details later about our annual meeting along with a ballot for choosing new directors of the Society for 1983-1985. Meanwhile we hope that you will reserve April 2 for this special occasion!

It is our sincere hope that each of you will renew your annual membership in the Society for 1983. When you receive your renewal letter you will note that the dues have been increased. Because of the higher operating costs of the Society and the expanded activities and programs of the chapters, the Directors found it necessary to increase the annual membership dues for the new year. This is the first increase in dues since the Society was founded in 1976, and we believe that we can maintain this increased level for at least two to three years. We are confident also that the increase will enable the Society to offer a better program to you and all members as well as to make all Arizonans more aware of the beauty of our native flora and the ever-increasing need to use water-saving plants in our desert environment.

A happy and prosperous new year to all of you!

Tim Clark

UPCOMING EVENTS: 1983 SPRING PROGRAMS

Tucson Chapter

MONTHLY MEETINGS

March 9: BOTANICAL LECTURE OF THE YEAR. Florence Nishida (mycologist) will discuss mushrooms of the Southwest. University of Arizona, Biological Sciences East Room 100, 7:00 pm.

April 13: "Historical Biogeography of the Chihuahuan Desert", by Tom VanDevender.

May 11: "Urban Uses of Historical Plants in Southwestern Gardens", by Walt Rogers. POTLUCK DINNER precedes this talk at 6:00 pm.

All meetings will take place at 7:30 pm at the Porter Gardens, 2150 N. Alvernon Way, except where noted. For further information, contact Greg Starr, 624-0222.

FIELD TRIPS AND SPECIAL EVENTS

February 19: Field trip to The Haunted Bookshop, 7211 N Northern Av. (near Ina and Oracle). Tour of about 5 acres of exceptional desert landscaping. Leader: Ken Cole.

February 19-27: Annual Cactus Show at The Desert Botanical Garden, Phoenix

March 12: Field Trip to Saguaro National Monument East.

March 13: Flower and Garden Fair. Reid Park, Tucson. Tucson Chapter will have booth. (Volunteers are requested to operate booth; contact Greg Starr, if interested.)

March 26-27: Annual Plant Sale at The Desert Botanical Garden, Phoenix.

April 2-3: Boyce Thompson Arboretum Spring Fair. Tucson Chapter will have booth displaying the process of pressing and mounting plants. Volunteers are requested.

For further information on Tucson Chapter field trips, contact Jane Evans, 623-9485.

BEGINNER-INTERMEDIATE TAXONOMY CLASS is being planned for this spring in Tucson. Class will meet 1 night/week for 8 weeks, and will cost \$25. Contact Don LoBiondo at 299-6351 (evenings), if interested.

Phoenix Chapter

MONTHLY MEETINGS

March 14: "Australian Plants for the Landscape", by George Hull.

April 11: "Poisonous and Medicinal Plants of Arizona", by Wendy Hodgson.

May 9: "Tissue Culture of Desert Plants", by Ralph Backhaus.

June 13: "Native Plants Workshop: Fibers, Foods, and Other Uses of Native Plants", by Ruth Greenhouse.

All meetings are held at 7:30 pm at the Desert Botanical Garden. These are held on the second Monday of every month unless otherwise stated.

FIELD TRIPS AND SPECIAL EVENTS

February 19: Field trip to Plant Materials Center, Tucson.

March 20: Field trip to Arnett Canyon near Superior.

April 16: Field trip to Central Arizona College to see drought-tolerant plants used in landscaping.

April 23-24: Arid Lands Plant Fair (3rd Annual), held at Paradise Valley Mall.

May 21: Field trip to Four Peaks in the Mazatzal Mountains.

June 17-19: Ramsey Canyon Weekend at Mile Hi in the Huachucas.

June 19: Day trip to Canelo Hills Cienega.

July 23-24: Canyon Creek Overnighter on the Mogollon Rim.

August 19-21: Sycamore Canyon Weekend (Santa Cruz County).

Further information on the above events can be obtained by calling Marc Mittleman (265-0670) or Peg Gallagher (894-0994).

#### Yuma Chapter

#### MONTHLY MEETINGS

February 14: "Evolution of Agaves", Tony Burgess will discuss his research on agaves of Arizona and so. California.

March 14: "Plants and Birds of Southeastern Arizona", by Charles McMoran.

#### FIELD TRIPS AND HIKES

February 12-13: Field trip to Anza-Borrego State Park in California. Leader: Tony Burgess.

March 12-13: Local wildflower hike in Yuma area, led by Chuck McMoran.

Regular monthly meetings are held at 7:30 pm in the Yuma County Extension Service conference room, 1047 Fourth Ave., unless otherwise indicated. Phone 783-8338 for further information.

#### Flagstaff Chapter

#### MONTHLY MEETINGS

March 1: Sources of seed and information on native plants for landscaping, and short presentation on how to plant and care for native grasses.

April 5: Program to be announced.

Monthly meetings are held at the Adult Center on the first Tuesday of the month.

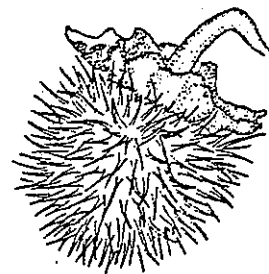
#### FIELD TRIPS AND SPECIAL EVENTS

March 5: Cross country skiing at the Transition Zone Arboretum. (Alternate plan, if no snow: outing to Wupatki National Monument.) Meet at 8:00 am at the Adult Center.

March 19: Revegetation along the pipeline on Museum of Northern Arizona grounds using native grass seeds. Meet at 9:00 am at museum.

April 16: Wildflower outing to Verde Valley or Kingman area.

For further information on activities of the Flagstaff Chapter, contact Bill Condit (774-0412) or Susan Husband (774-7294).



Fruit of  
Datura meteloides  
(Sacred Datura)  
drawing by Margaret Kurzius



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