

GROWING WINTER-HARDY CACTI AND OTHER SUCCULENTS OUTDOORS IN WESTERN COLORADO

Don I. Campbell - November 2004 (Revised April 2012)



Xeriphytic plants are adapted to dry arid conditions. Some have adapted to cold climates and are able to survive freezing temperatures. Many are classified as succulents. Succulents are defined as any drought-resistant (xeriphyte) plant able to store water in its stem, leaves, or roots. Cacti, sedums, sempervivums, ice plants, and agaves are examples of plants that store water in their leaves, stems and roots. Sagebrush, rabbit brush, native grasses and yucca are examples of non-succulent drought resistant xeriphytic plants. They do not store water but have root systems and other survival strategies that allow them to survive on very limited water supplies.

There is no universal agreement about which plants are considered succulent. The degree of fleshiness and where it occurs gives clues to a particular plants succulence and cultural requirements. Succulent plants occur throughout much of the world. Cacti, however, are native only to the Western Hemisphere. A distinguishing characteristic of cacti are the areoles which produce spines and flowers. All cacti are succulents but not all succulents are cacti.

CULTURAL REQUIREMENTS

Growing many cacti and other succulents outdoors in our area is relatively simple IF you select the right plants and IF you can satisfy the plants basic needs for soil, drainage, moisture, minerals, light, and protection from pests.

DRAINAGE - The most important consideration is drainage. Do not allow water to collect around the base of plants. Cacti are more sensitive than most other hardy succulents. If, after a rain, you find standing water in your garden which does not either sink in or drain off quickly, you may want to raise the plants or rework the soil to improve drainage. Another solution may be to add soil around the base of the plant to help drain off excess moisture. Other ways to improve drainage include raised beds, mounding the soil and building terraces or slopes.

SOIL - Most cacti and other succulents tolerate poor soil. The soil must, however, be porous, permeable and quick draining. Many clay-based soils require modification. Most plants will thrive in a soil mixture consisting of approximately 50% existing garden soil, 10% organic material such as compost or peat moss, 25% coarse sand and 15% pea gravel. Many non-cacti succulents will do even better with the addition of more organic matter.

There are about as many soil formulas as gardeners. Some use pure sand or a sand and small gravel mixture. Beware of adding only small amounts of sand to heavy clay

soils...it can harden like concrete. With heavy clay, you need a lot of coarse sand, gravel and organic matter.

Most cacti and other succulents appreciate a “rock garden” environment. You can mix sand, gravel and small stones into the soil. Larger stones (small boulders) can be included on the surface. A top dressing of coarse sand or fine gravel is desirable. It is decorative and inhibits weed growth. It also reduces mud splatter on plants, wind blown soil and erosion on sloping beds. Soil conditions are modified because the dressing acts as a mulch to keep in moisture and maintain a more even soil temperature.

LIGHT - Most winter-hardy cacti and other succulents require at least 4-6 hours of direct sun or very strong indirect light for proper growth and flowering. Some plants prefer to be in a lightly shaded setting. Plants may survive but will not thrive without proper light. Most cacti, once established in the garden, can tolerate more direct sun, higher temperatures, and drier conditions than many other hardy succulents. Temporary shading may be required for new plants, transplants and seedlings. Take advantage of reflected light from walls and rocks to insure adequate light in shady situations. Beware of too much reflected sunlight in bright situations such as on the south side of buildings, etc.



WATER - It is a myth that cacti and other succulents will thrive on little or no rainfall. Many cacti want up to 10-12 inches of water per year for good growth and flowering. Many non-cacti succulents will appreciate even a bit more water. Supplemental water should be applied only during the growing season, when the soil has dried and rain is not in the short-range forecast. The Grand Valley might need up to 2-4 inches of supplemental moisture in an average year.

Supplemental watering is generally needed only during the June-August period and should be stopped by late August to early September during a normal year. Plants in an established garden can survive several weeks of extreme summer drought and temperature without supplemental water.

Before adding supplemental water there are several considerations: the porosity and moisture content of the soil, the present temperature and humidity, the interval since the last moisture, the weather forecast, how well plants are established and the season of the year. Watch your plants. They can tell you much about their water needs. Shrinkage and limpness during the growing season probably indicates a need for additional moisture. Plants should generally be plump and erect during the summer.

In the fall many winter-hardy plants begin losing moisture in anticipation of freezing temperatures. This results in shrinkage, color change, and a wilted appearance. Any supplemental water at this time is likely to result in damage or death of the plant.

FERTILIZER - Most cacti and other succulents will benefit from mild applications of fertilizer. Use a balanced fertilizer and apply only during the early to mid part of the growing season. Many prefer to use water soluble fertilizer applied with a garden hose sprayer. You

may combine fertilizer application with supplemental water from late May to early July. Some people prefer to add nutrients and humus via applications of compost or leaf mold. Others prefer broadcast applications of powdered or granular fertilizers. Too much fertilizer encourages overly lush, soft growth which invites winter damage.

CULTIVATION - Most cacti and many other succulents have extensive and very shallow root systems. Avoid any soil disturbance which may damage the shallow roots. Once established, cactus roots may be no more than a couple of inches deep and extend out several feet from even small plants.

LANDSCAPING WITH CACTI AND SUCCULENTS

There are many opportunities for including cacti and other succulents in the home landscape. Beds can specifically emphasize cacti and other succulents. Rock gardens can benefit from the addition of cacti and other succulents. Xeriscape gardeners appreciate the many unique forms, colors, textures and shapes represented by various species of cacti and succulents. The flowers are outstanding.



LOCATION - Most xeriscape gardeners have to “play the hand they were dealt” when it comes to locating the garden. Following are some locational factors to consider when selecting a site and preparing a cactus and succulent garden.

Orientation (aspect) of the garden is a primary consideration. Orientation is likely to affect the amount and quality of sun and light available for the plants. Aspect also affects the amount of heat and light available both in the summer and winter seasons. Reflected light and heat from buildings and fences may affect plant survival.

Water is another factor. The xeriscape garden needs to be located where it will not receive too much water from lawn sprinklers, roof down spouts, and drainage runoff from adjacent properties. The feasibility and ease of applying supplemental water when needed is another consideration.

Slope affects the amount of light and heat reaching the plants. Steep south facing slopes have much higher light intensities and temperatures. Shallow north facing slopes ensure a milder micro climate that may be more favorable to some plants. Slope also influences moisture levels. A steep slope allows water to quickly drain off, encourages erosion, and may require more frequent watering. Flat or uneven garden sites may allow excess moisture to remain around the base of plants.

Accessibility, traffic patterns and viewability are other factors to consider. The garden should ideally be located outside of major traffic patterns used by children, pets, wildlife, etc. Many plants are easily damaged by people, pets or wildlife. In addition, unwary people and pets can receive some painfully pointed reminders if they get too friendly with a mature cholla bush, agave rosette or, prickly pear clump. If possible, a location should be selected that enhances the viewability of the overall garden as well as individual plants.

Large trees and shrubs in the vicinity of the cactus and succulent garden can have serious consequences by creating too much shade. Roots from adjacent landscaping can cause underground problems in the garden. There should be some kind of buffering between plantings requiring vastly different amounts of water, light, etc. Certain locations may be more favorable for some plants than others. Plan the garden accordingly.

PLANT GROWTH FORM (size & shape) - Mature, winter-hardy cacti range from golf ball size miniatures to 6-foot tall shrubs. Prickly pear cacti can spread up to 6 feet wide and be very aggressive. Tall chollas can grow rapidly, smaller ball and clumping cacti grow very slowly.

Most non-cacti succulents are low and slow growing but may spread into fairly large clumps several feet across. Some ice plants and sedums will spread rapidly and can quickly take over a sizable area in the garden. Mature agaves and yuccas may grow to be 2 to 4 feet in diameter and several feet tall. Pruning, sometimes severe, is needed to maintain some plants within reasonable bounds. Prolific seed producers may enhance or infest the garden with numerous seedlings.

Cacti and other succulents have shallow, spreading, fibrous root systems. A few have tuberous or tap root systems. Care must be taken to give them proper growing room. A few words about spines. Cacti have spines (a few prickly pears appear “spineless”). Opuntias (prickly pears and chollas) have barbed spines and glochids that are difficult to remove from skin, gloves or clothing. Some “barrel” cacti have hooked spines that tend to grab people and clothing. The spines of most other cacti are “relatively harmless”. Agaves and yuccas have “spikes” on their leaves which can stab unwary gardeners. Spiny plants tend to collect plant litter such as dead tree leaves.

OBTAINING PLANTS



Established plants are normally obtained from nurseries or mail order catalogs. Nursery plants usually come in pots, ready to plant in your garden. Mail order plants usually come bare rooted, and can be planted directly in garden if conditions are not too severe. Some prefer to reestablish bare-rooted stock in pots prior to planting in the garden. Place new plants outdoors after the last frost. Provide temporary shade. Don't plant them too deep, better to err on the shallow side.

Another source of plants may be from private land. You must obtain permission from the landowner before removing plants from

private lands. "Wilding permits" may be purchased from some BLM Area Offices. Removing plants from other public lands such as State or National Parks is prohibited. During transplanting avoid root damage. Clean soil from roots and cut off any damaged roots. Freshly dug bare-rooted plants should dry in a shady area for at least 2-3 days prior to planting in either the garden or pots. Many use a fungicide on transplants, especially if root damage has occurred. The best time to transplant is during late spring to early summer. It is desirable to provide temporary shade following transplanting.

PROPAGATION

Cuttings and growing from seed are the two ways to propagate plants for your winter-hardy garden.

CUTTINGS AND OFFSETS - Taking cuttings and offsets from established plants is a simple and effective way of propagating many cacti and other succulents. This approach works especially well for the Opuntia group of cacti, Sempervivums, Sedums, and ice plants. Cuttings can also be taken from clumping ball cacti such as Echinocereus and Escobaria.



Opuntias (prickly pear and cholla) - Take cuttings during active growth periods (May-July). Make cuts at the joints. Allow cuttings to callus in a shady place for at least 4-5 days before planting. A rooting/fungicide compound may be applied to the cutting prior to planting but this is not usually necessary. Cuttings can be planted directly in the garden. Some prefer to plant the cuttings in plastic pots using coarse (concrete) sand as the rooting medium. Keep cuttings lightly shaded, warm and water lightly about once per week until roots are formed. Plants can then be moved to the garden. Cuttings should be planted only deep enough to support the cutting.

Clumping ball cacti - Carefully remove individual heads or stems from an established plant with a sharp knife. Cut close to main stem or base of plant. Allow cuts to callus (similar to Opuntias) for a week or two. Treat the cutting with rooting/fungicide compound. Plant in coarse sand/soil mixture only deep enough to support the cutting. Water about weekly. Allow sand to mostly dry between waterings. Once roots have established themselves in the pot, the plant can be safely transferred to the garden.

Spreading non-cacti succulents (sedums, ice plants, etc.) - Take 2-4 inch tip cuttings during active growth period. These cuttings can be planted directly in the garden. Many prefer to dip cuttings in rooting/fungicide compound and get them established in small plastic pots prior to planting in garden. Rooting medium can be coarse sand or a combination of garden soil, sand and organic matter. Keep cuttings lightly shaded and warm. Water when medium approaches dryness.



Offsetting Succulents (Sempervivums) - Separate offset(s) from main clump using a small trowel, knife or fingers and plant directly into pots or your garden. Treat similar to spreading succulents (see above).

SEED - Growing plants from seed can be both challenging and satisfying. Some species are easy to propagate from seed while others are extremely difficult for most amateurs. There are several seed sources. Seeds can be collected

locally from plants in habitat or other gardeners. Be sure the fruits and seeds are mature. Commercial catalogs offer many types of seeds. National Plant Society seed exchange programs are another source of correctly identified seeds. There are many possibilities for the growing medium. Most seed starter mixes will work well (Ready-Earth) or you can mix your own using; 50% coarse sand (cement sand), 30% sandy loam garden soil, and 20% grit (pumice, perlite, etc.)

Fill pots or trays with soil mix and press level with a small board. Soak pots in fungicide solution, completely wetting the soil. Spread seeds evenly on top of soil. Tap pots and gently press seeds into the soil with a flat board. Add thin layer (1/16-1/8 inch) of coarse sand or sandblasting grit. Beware of fine sands which are likely to "crust over" and inhibit germination.

Indoor germination requires the use of germination chambers made from plastic pots covered with clear plastic or commercial plastic germination trays with clear plastic covers. Zip-Loc bags enclosing a single small pot also work well. Keep seeds warm (day/night fluctuation is appropriate) and moist but not soggy wet. Add shade cloth, window screening or thin white cloth if seed trays are in a lot of direct sun. Remove the plastic cover soon after most seeds have germinated. During the first year keep soil at least slightly moist. Gradually acclimate seedlings to the reality of dry air, direct sun, etc.

During outdoor germination (late winter) cover pots and trays with white cloth and/or window screening. Place outdoors in a bright spot without direct sun. Protect from wind. Allow pots & seeds to go through normal freeze/thaw cycles. Water periodically but allow soil to be wet and then dry on 2-3 week cycles. As spring progresses and seeds germinate, containers can be moved to a warmer, brighter location and kept moist, not wet.

After germination, seedlings can usually remain in original pots for the first year regardless of crowding. Separate seedlings into individual pots after about a year. Fertilize seedlings about monthly during growing season with a weak solution. Transplant seedlings into the garden after the 2nd or 3rd year or when they reach 3/4-1 inch in diameter.

PESTS

There are very few insect or disease problems associated with hardy cacti and succulents. Gardeners should periodically inspect their plants to ensure any pests or

problems are promptly discovered and treated. Cochineal (mealy bugs) on prickly pear cacti and yucca weevils are Insects that can be treated with Imidacloprid, Cygon, Orthene, or Malathion.

Rot, usually from too much moisture, is the main disease problem. Plants suspected of root and/or base rot should be removed to a shady dry area and the diseased portions removed. The remaining disease-free part of the plant can then be handled as if propagating from cuttings. Diseased plants or plant parts should be promptly removed from the garden area. Benalate, Captan, and Maneb are effective fungicides. Grafting, using disease-free plant cuttings may save a sickly plant.

Hail can cause severe plant damage as can dogs, cats, squirrels, deer, sparrows, and even children. Plants with hail or animal damage should be pruned and treated with fungicide.

Pre-emergent weedicides may be applied although periodic hand weeding is usually effective. Prudent use of Roundup is an effective way to remove grasses and other weeds from among cacti. Roundup is likely to kill any succulent plant that does not have a hard waxy skin. Beware of spines when doing hand weeding.

SEASONAL OBSERVATIONS AND SUGGESTIONS

SPRING - The flowering season begins in late March. Plants begin taking on moisture and plumping-up. This is the time to carefully clean winter debris from around plants and remove any winter damaged plant parts. There is normally little need to apply supplemental moisture during the spring. Fertilizer could be applied at the first application of supplemental water. Prune Opuntias and any other plants getting out of hand following the bloom period. This is a good time for transplanting, taking cuttings and setting out new plants.

SUMMER - Many plants will be putting on new growth and finishing blooming. Some cacti will be maturing their fruits and beginning a mid-summer dormancy period. Supplemental water is likely to be needed. Pruning can be done during this season along with taking propagation cuttings. Transplanting and putting out new plants can be done if proper precautions against over stressing the plants are observed. Delicate plants may need special care to protect them from sun, heat, drought, and hail. Some plants may experience a late-summer growth period. This is the time to reduce water and begin hardening plants for winter. Seed can be collected as the fruits mature.

FALL - Fall is the season to harden plants for winter. Eliminate all supplemental water and do not fertilize. Collect seed, prune, tidy up and generally prepare for winter. This is a fascinating season to watch many plants begin the shrink and shrivel process associated with winter "hibernation." Many plants will change color with the onset of cold weather.

WINTER - Shrinkage continues and drastic color changes in some plants become apparent. Plants may shrink below ground level or frost may heave them up. Sun and wind burn may adversely affect some plants. Snow cover can help prevent frost damage.

**SELECTED WINTER-HARDY CACTI & OTHER SUCCULENTS
FOR WESTERN COLORADO LANDSCAPES**

(Hardy to at least USDA Winter Temperature Zones 5 & 6)

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CACTI

ECHINOCEREUS (Hedgehog Cacti)

fendleri	(Fendler's Hedgehog)-	viridiflorus	(Green-flowered Torch)
engelmannii	(Engelmann's Hedgehog)	triglochidiatus	(Claret cup)
reichenbachii	(Purple Candle)	coccineus	(Red-flowered Hedgehog)

ESCOBARIA (Pincushion Cacti)

leei	(Lee's Dwarf Snowball)	orcuttii	(Snowball Beehive)
sneedii	(Sneed's Escobaria)	vivipara	(Spiny Star)
missouriensis	(Missouri Pincushion)		

MAMMILLARIA (Nipple Cacti)

wrightii	(Nipple Cactus)		
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OPUNTIA (Prickly Pear Cacti)

basilaris	(Beavertail Cactus)	phaeacantha	(Purple-fruited Prickly Pear)
compressa	(Low Prickly Pear)	polyacantha	(Starvation Cactus)
erinacea	(Porcupine Prickly Pear)	humifusa	(Eastern Prickly Pear)
fragilis	(Brittle Cactus)		

CYLINDROPUNTIA (Cholla Cacti)

clavata	(Dagger Cholla)	kleiniae	(Pencil Cholla)
whipple	(Silver or Rat-tail Cholla)	imbricata	(Cane Cholla)
leptocaulis	(Desert Christmas Cactus)		

PEDIOCACTUS (Ball Cacti)

simpsonii	(Mountain Ball Cactus)		
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SCLEROCACTUS (Fishhook Cacti)

parviflorus	(Devil Claw)	whipplei	(Devil Claw)
glaucus	(Uinta Basin Hookless Cactus)		

OTHER SUCCULENTS

AGAVE (century plant)

parryi
utahensis

CHASMATOPHYLLUM

musculinum

HESPERALOE

parviflora

OROSTACHYS

spinosa

RUSCHIA

hamata

SEMPERVIVUM

All species are hardy

YUCCA

- baccata
- harrimaniae

ALOINOPSIS

spathulata

DELOSPERMA

cooperi
nubigenum

LEWISIA

cotyledon

ROSULARIA

Several species are hardy

SEDUM

Many species are hardy

TITANOPSIS

calcareae

SOME PLANT SOURCES - MAIL ORDER

Cactus Patch
RD 2 Box 159
Radium, KA 67550-9111

Midwest Cactus Sales
Box 163
New Melle, MO 63365

A High Country Garden
2904 Rufina Street
Santa Fe, NM 87505

Plantasia Cactus Gardens
867 Filer Avenue W
Twin Falls, ID 83301

Alplains
32315 Pine Crest Court
Kiowa, CO 80117

Desert Nursery
1301 South Copper
Deming, NM 88030

Christa's Cactus
529 West Pima
Coolidge, AZ 85228

Strong's Alpine Succulents
P.O. Box 50115
Parks, AZ 86018

Intermountain Cactus
1478 N. 750 East
Kaysville, UT 84037

Mesa Garden
P.O. Box 72
Bellevue, NM 87002-0072

Dennis Hoidal Succulent Plants
16244 Kwei St.
Forest Lake, MN 55025

Squaw Mtn. Gardens
P.O. Box 946
Estacada, OR 97023

Miles To Go
P.O. Box 6
Cortaro, AZ 85652

Agua Fria Nursery
1409 Agua Fria St.
Santa Fe, NM 87505

Plants of the Southwest
3095 Agua Fria St.
Santa Fe, NM 87505

ON-LINE LINK TO MANY CACTUS & SUCCULENT RELATED ITEMS

The Cactus and Succulent Plant Mall: <http://www.cactus-mall.com/>
The Chinle Cactus & Succulent Society website: <http://www.chinlecactusclub.org>

SOME PLANT SOURCES - RETAIL

Chelsea Nursery
3347 G Road
Clifton, CO

Valley Grown Nursery
680 24 1/2 Rd.
Grand Junction, CO

Bookcliff Gardens
755 26 Road
Grand Junction, CO

Meadowlark Garden
2259 Broadway
Grand Junction, CO

Paulino's Garden Center
6280 North Broadway
Denver, CO

High Desert Gardens
2971 S. Hwy 191
Moab, UT

Bureau of Land Management
(Sells permits for collecting "wildings")
2815 H Road, Grand Junction, CO

Colorado Cactus and Succulent Society
Annual Show and Sale at the
Denver Botanic Gardens (in late March)

SELECTED REFERENCES

1. Audubon Society Pocket Guides, Familiar Cacti (1993). Published by Alfred A. Knopf, Inc.
2. Benson, Lyman, The Cacti of Arizona (1981). University of Arizona Press Tucson, AZ.
3. Brethauer, Bruce, Cactus in the Snow (2000). Columbus, OH
4. Colorado Cactus & Succulent Society, Growing Cacti & Succulents (1996). Published in Denver, CO by the Colorado Cactus & Succulent Society.
5. Earle, W. Hubert, Cacti of the Southwest (1963). Rancho Arroyo Book Distributor, 6737 N. 20th St., Phoenix, AZ.
6. Huntington Botanical Garden, Dry Climate Gardening with Succulents (1995). Pantheon Books, Knopf Publishing Group, New York.
7. Kelaidis, Gwen, Hardy Succulents. Story Publishing
8. North American Rock Garden Society, A Rock Garden Handbook for Beginners. (1999)
9. Sierer, David, Where the Hardy Cactus Grow (1999). The Amateurs' Digest.
10. Spain, John N., Growing Winter Hardy Cacti in Cold/Wet Climate Conditions (1994). Elizabeth Harmon, 75 Middlebury Rd., Watertown CT 06795.
11. Weniger, Del, Cacti of Texas and Neighboring States (1988). University of Texas Press Austin. (excellent color photographs).
12. High Country Gardens Catalog, Santa Fe, NM