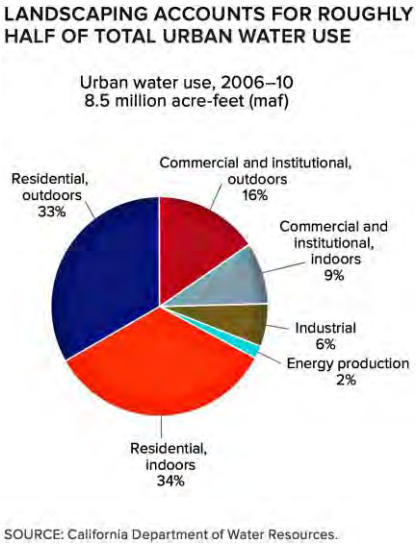
Fertilize Drought-Resistant Plants Sustainably and Effectively: Cycads, Succulents and Other Water-Wise Flora [Photos & Charts]

Maurice Levin, Jurassic Garden

Increasingly, people and businesses want to live and work sustainably. Protecting the environment, conserving resources, and creating savings – all motivate forward-thinking people. A significant way we can conserve water is to reduce outdoor use. In California, nearly 50% of urban water use is for landscapes [chart]. So, if we conserve landscape water, ***and*** retain oxygen-producing plants, we're living and acting more sustainably.



Enter drought-resistant plants[1]**.** In home gardens and commercial landscapes, drought-resistant plants, such as cycads, succulents, and other water-wise flora, are becoming popular. These plants have a distinctive beauty, adapt to many soils and conditions, need little maintenance, and consume less water and other resources. Some have rarity and architectural beauty that few other plants can claim. And, when you grow a cycad, you preserve an endangered species in your own garden.

Cycads like the Sago Palm (Cycas revoluta), and more rare Cycas, Dioon, and Encephalartos are finding their way into upscale landscapes. Succulents like Aloes, Agaves, Echeverias and Crassulas have bold colors, symmetry, and often unique appearances. Given proper care, cycads, succulents and other water-wise plants can be stunning landscape features.

When fertilizing drought-tolerant plants, it's easy to make mistakes. Cycads and succulents, may ***look*** similar to palms and other tropicals, but their fertilizing needs are different. This article discusses how to fertilize drought-resistant plants, and the nutrients necessary to grow healthy water-wise plants, while conserving water and creating a green environment.

The Western Fertilizer Handbook shows 17 Essential Elements for healthy plants in the chart to the right:

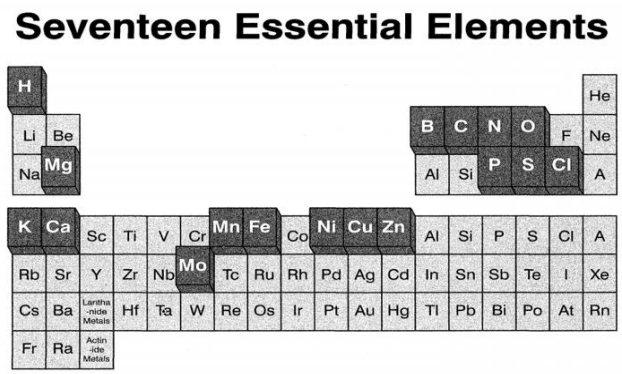


FIGURE 4–1. Periodic table of elements highlighting the 17 essential plant nutrients.

H - Hydrogen	P - Phosphorus	Fe - Iron
B - Boron	S - Sulphur	Ni - Nickel
C - Carbon	Cl - Chlorine	Cu - Copper
N - Nitrogen	K - Potassium	Zn - Zinc
O - Oxygen	Ca - Calcium	Mo - Molybdenum
Mg - Magnesium	Mn - Manganese	

Based on this information, how can we provide our plants necessary nutrients?

1. Western garden plants generally get enough hydrogen, oxygen, and carbon (dioxide) from air, water and sunlight.
2. The remaining necessary plant nutrients come from the soil, and what we add to it.
   a. Primary: Nitrogen, Phosphorous, Potassium.
   b. Secondary: Calcium, Magnesium, Sulfur.
   c. Micronutrients: Iron, Copper, Manganese, Zinc, Boron, and Molybdenum.

[1] For simplicity, I use the terms drought-resistant and drought-tolerant interchangeably. Effectively, "drought-resistant" plants handle drought with little impact, whereas "drought-tolerant" plants survive, but their appearance will be affected negatively.
[2] Western Fertilizer Handbook, Ninth Edition, Western Plant Health Association, Waveland Press, Inc. Longland, IL. 2002

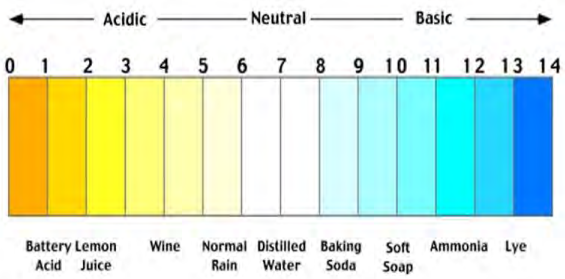
Your soil may not have enough of these elements, so you'll want to add them to your plant's "diet". For 15 years, we've tested numerous fertilizers in our nursery and clients' gardens to learn the best way to augment healthy growth. Through systematic study, as well as trial and error, we've discovered some key ways to amend soil to grow healthy drought-resistant plants.

Arid climate growers face several key challenges:

1. Alkaline soil can prevent plants from absorbing nutrients
2. Alkaline water distributed by utilities also prevent plants from absorbing nutrients
3. Drought-resistant plants may have special nutritional needs.
4. Most plans we grow are not native to "summer-dry, winter-wet" climates like ours.

Alkaline Soil and Waters: What about that sugar in your iced tea?

The pH scale measures how acidic or alkaline (basic) something is. It ranges from 1 (very acidic) to 14 (very alkaline). 7 is neutral. A one point pH increase or decrease equals a multiple of 10, so **8 pH is ten times the alkalinity of 7**. Rain water pH is slightly acidic, about 5.5-6.0. **Most garden plants prefer a 5.5 to 7 pH**. Arid regions tend to have "**basic**" (alkaline) soil, high in salts, with little organic material.

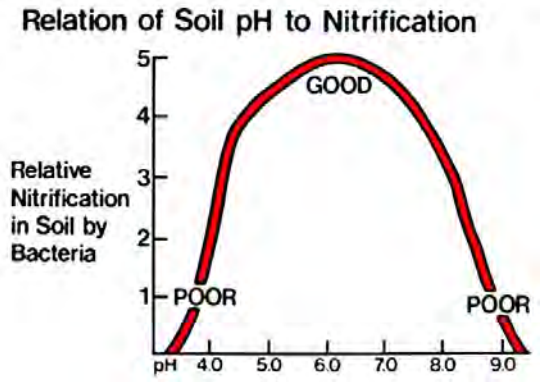


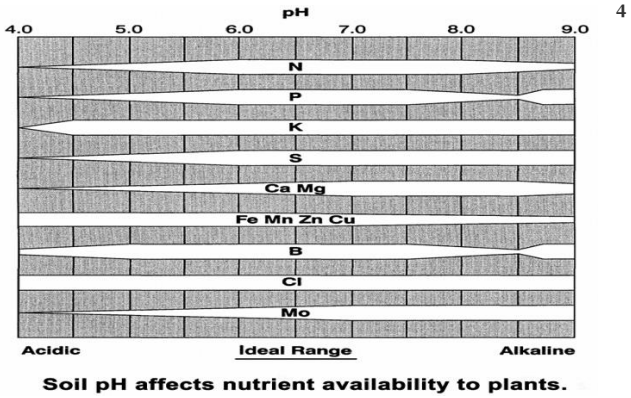
[3]

Landscape plants tend to prefer organic-rich soil content that creates a neutral pH, to grow strong, pest-resistant and healthy. Arid climate soils, without organic amendments, typically range from 7.5-8.5 pH. **This is 5 to 50 times more alkaline than 7 pH**.

Alkaline tap water predominates in the USA.
Water utilities often add ingredients to increase water alkalinity, to reduce water's corrosiveness, and prevent heavy metal leaching and water nitrification. Los Angeles tap water ranges from 8.0- 8.5 pH, [L.A. Dept. of Water and Power.]

The charts below, from the Western Fertilizer Handbook, show that ***soil alkalinity limits plants' access to nutrients*** (and fertilizer). The left chart shows "Nitrification," (how Nitrogen feeds plants), is best at 5.0-7.0 pH. Since typical Western US soil and tap water can be 8 pH, plants receive only 20% of the Nitrogen they'd have if soil pH was 7. The second graph shows how highly alkaline soil denies plants key nutrients. So, with typical soil, tap water, and typical fertilizer, it's like trying to dissolve sugar into a cup of iced tea. Your plant can't access the nutrients. So, how do we give our plants "hot tea?"





[4]
Soil pH affects nutrient availability to plants.

[3] Socratic.org
[4] Western Fertilizer Handbook, ibid.

Do Your Plants "Pump Iron?"

Iron (Fe) is another key nutrient that's less available in alkaline soils (above 8.0 pH). African cycad and succulent habitat photos show dark orange-reddish-brown, iron-rich soil. See the "Red Dirt" where these cycads in Hawaii and South Africa thrive! Growers there often scoop ground soil and add it to potting mix (photos).


Hawaii


South Africa

Organic Mulch is Key Organic mulch and compost help offset alkaline soils' organic material deficiency, and they neutralize soil alkalinity. They also feed your soil and your plants naturally. Think of how a forest floor fertilizes its plants. Organic mulch also moderates soil temperatures, lowers water loss in summer, protects plants in winter, and encourages beneficial microorganisms to help plants grow.

Your Fertilizer: Organic vs. Inorganic, Soluble vs. Insoluble

While organic mulch and compost can offset soil and water alkalinity, the right fertilizer can augment healthy growth. Organic fertilizer has several advantages over chemical fertilizer:

1. It improves soil structure and increases soil's ability to hold water and nutrients
2. It's renewable, biodegradable, sustainable, and environmentally friendly,
3. Over time, it feeds your soil as well as your plants, and
4. It releases nutrients more gradually (and healthily) than chemical fertilizers.

Chemical fertilizer, while often quickly available to plants, has significant drawbacks: It's an "artificial additive" can feed the plant, but does not feed the soil.

1. It can leach away from the plant, requiring additional applications
2. It doesn't build soil health, can deplete nutrients, and add unhealthy salts and chemical residue
3. Long-term exclusive use can negatively affect soil pH, making it more alkaline.

So, **how can you feed your soil sustainably**, to grow healthy cycads, succulents and other drought-resistant plants, and have a soluble nitrogen source that's readily available to plants? Can you do this organically, or do we have to resort to chemicals?

Here's the good news: Organic fertilizer advances make nutrients more quickly available to plants. Note the color change in this cycad one month after fertilizing.

[5]

Don't Panic, Go Organic

Ultimately if you fertilize drought-resistant plants with largely organic nutrients, you can:

1. Reduce soil and water alkalinity, short-term and long-term. Organic fertilizer feeds the soil, not just the plant, and provides for long-term plant growth.
2. Add needed iron, often absent or unavailable in soils.
3. Add organic mulch and compost for the soil's and plants' long-term health.
4. Provide a variety of nitrogen sources, organic + limited chemical, soluble + insoluble, to give plants necessary growth fuel, while also feeding your soil.

[5] Jurassic Garden, http://www.cycadpalm.com/cycad-fertilizer-succulent-fertilizer.html

When to Fertilize? How often? What time of year?

Here is another graph from the Western Fertilizer Handbook:[6]

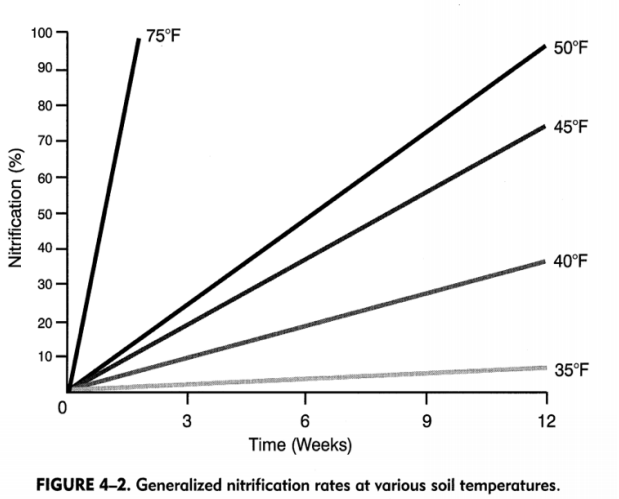
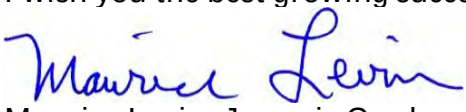


FIGURE 4–2. Generalized nitrification rates at various soil temperatures.

If you fertilize when the weather is cold, nitrogen takes much longer to reach your plants, and may dissipate by the time the soil is warm enough to feed your plant(s). Remember our "iced-tea example" above? So, wait until outside temperatures average in the 70's for a couple of weeks before you fertilize. Then, apply fertilizer again in mid-to-late summer, and perhaps once more in early-to-mid fall.

I wish you the best growing success.



Maurice Levin, Jurassic Garden
maurice@cycads.com
http://www.cycadpalm.com/contact.html
http://mauricelevin.com

P.S. Our website offers information on fertilizer we developed for drought-resistant plants.

Thank you to Glen Williams, who augmented this article, and Timothy Lindsay, who taught me many of these principles.

Sources for this article include:

North Carolina Department of Agriculture & Consumer Services
Western Fertilizer Handbook
Seattle Public Utilities
Illinois Department of Public Health
Los Angeles Dept. of Water and Power
Florida Water Resources Journal
California Dept. of Water Resources

[6] Western Fertilizer Handbook, ibid.