

Soil Amendments

Amendment	Benefits / Cautions
Compost – Plant material	Improves soil and provides a low concentration of nutrients for plant growth. Helps sandy soils retain water, helps clay soils drain better, “Feeds” soil microorganisms that produce humus and improves soil structure. Should be used with fertilizer for optimum plant growth.
Wood sawdust, shavings, or ground bark	Nitrogen should always be added with these amendments. Add ammonium sulfate, blood meal, or cottonseed meal to provide extra nitrogen. Do not use chemically treated wood or sawdust in the garden.
Manure (cow/poultry)	Use only when well-aged or commercially composted. Ammonia gas from fresh manure can damage plants. Good for high bacteria count; bad because of high salt content. May contain weed seeds unless heat composted. Check on school district policy for use of composted animal manure. Fresh and passive/cold composted manure can contain harmful bacteria (i.e. e-Coli and salmonella). Use commercially composted manure, wear gloves and wash hands after use.
Peat moss (sphagnum)	When added to a moderately alkaline soil will make it more acidic (lower the pH). Loosens and aerates soil. Works more rapidly than other amendments. Will last up to five years in soil. High nutrient and water-holding capacity.
Sand	Not a practical amendment for to improve drainage and aeration of clay soil. A very large ratio of sand to clay would be needed. It is expensive and difficult to mix uniformly. Adding a small amount to clay will only increase density and may create “concrete”.
Soil Sulfur	Makes soil more acidic. Process occurs slowly and takes up to a year. Mix small amounts into soil (1-3# for 100 sq ft area). Heavy application can damage plants.
Gypsum (Calcium Sulfate)	Used to reclaim soils that contain excess sodium. Does not change soil pH. Mix into soil and water thoroughly several times.

Vermiculite	A light weight, fluffy mineral product created by heating a silicate mineral to a high temperature. Used in potting soil. Holds several times its weight in water and allows room for roots to grow.
Perlite	A light weight, white, porous mineral product created by heating volcanic obsidian to a high temperature. Used in potting mixes to provides aeration and drainage.

Plant Macronutrients

Nutrient / Application	Function	Symptoms of Deficiency	Symptoms of Excess
<p>Nitrogen (N) San Diego California soils contain little and inorganic forms are rapidly depleted. It deteriorates rapidly. Mix into soil before planting or apply to surface and water in. Replenish regularly. Nitrate form is very mobile in soil.</p>	<p>Important for many growth and development processes. A constituent of proteins, enzymes, and chlorophyll (needed for photosynthesis).</p> <p>Stimulates early growth and root formation; promotes seed, fruit, and flower formation.</p>	<p>Slow growth, stunting, and yellow-green color; more pronounced in older tissue; tips and margins turn brown; premature death</p> <p>Slow growth, stunting, and purplish color on foliage or dark green color; dying leaf tips; delayed maturity; poor fruit or seed development.</p>	<p>Excessive vegetative growth, dark green color, excessive transpiration, reduced yield; delayed maturity; few fruits. Excess can interfere with micronutrient absorption; may mimic Zinc (Zn) deficiency.</p>
<p>Potassium (K)</p> <p>Does not move far in soil. Remains near source of application. Mix into soil if needed before planting. Apply around the root zone of established plants. Adequate in most San Diego California soils.</p>	<p>Proper growth of fruits and flowers, ensuring good size, color and quantity.</p>	<p>Slow growth; leaf tip and marginal burn (starts on more mature leaves); weak stalks; small fruit and shriveled seeds.</p>	<p>Light green foliage; tendency for Calcium and Magnesium deficiency symptoms to appear.</p>
<p>Calcium (Ca)</p>	<p>Essential part of cell wall structure, must be present for formation of new cells. Adequate in most San Diego soils.</p>	<p>Reduced terminal growth of shoots (buds) and roots, resulting in plant death.</p>	<p>Interferes with micronutrient availability.</p>
<p>Magnesium (Mg)</p>	<p>Essential for photosynthesis. Adequate in most California soils</p>	<p>Leaves curl upward along margins; marginal yellowing with green</p> <p>“Christmas tree” pattern along mid-ribs of leaves.</p>	<p>Interferes with Calcium uptake</p>

Sulfur (S)	Responsible for characteristic odors of plants such as garlic and onion	Reduced growth, delayed maturity. Light green to yellowish foliage on leaves; small spindly plants.	Not known.
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Plant Micronutrients

Nutrient	Function	Symptoms of Deficiency	Symptoms of Excess
Iron (Fe)	Required for formation of chlorophyll in plant cells. Plants may not be able to absorb enough in alkaline or water logged soil	Yellow-green color, but veins remain green; twig dieback; reduced growth, and death in severe cases.	Mimics phosphorus, manganese deficiency
Manganese (Mn)	Assists iron in chlorophyll formation and serves as activator for enzymes in growth process.	Yellow-green color of young leaves, but no sharp distinction between veins and interveinal areas as with iron.	Mimics iron deficiency; loss of foliage color, bronzing of leaf margins, necrotic areas.
Zinc (Zn)	Important plant growth regulator; essential in root and plant growth. Micronutrient most often deficient in San Diego crops. Plants may not be able to absorb enough in alkaline soil	Yellow-green color, but veins remain green; decrease in stem length; rosetting of terminal leaves; reduced fruit bud formation; twig dieback after first year	Not known.

Boron	Regulates metabolism of carbohydrates in plants. Critical for new growth in plants and assists in flower pollination, fertilization, fruit set.	Death of terminal growth; thickened, curled, wilted leaves; Reduced flowering.	Rare except in inland deserts with high boron contaminated water.
Copper (Cu)	Activator of enzymes in plants.	Stunted growth; dieback of terminal shoots in trees; death of leaf tips.	Reduced growth
Chlorine (Cl)	Required for photosynthesis and root growth.	Very rare; wilting followed by yellow-green color; leaf bronzing.	Poor growth; marginal leaf necrosis.
Molybdenum (Mo)	Required by plants for the utilization of nitrogen. Plants cannot transform nitrate nitrogen into amino acids without molybdenum.	Stunting; reduced yield; lack of vigor; marginal scorching; cupping, rolling of leaves.	Not known.
Nickel (Ni)	Needed to complete the life cycle of the plant and viable seed.	Leaf tip necrosis	Induces iron and zinc deficiency. Interveinal yellowing of foliage.

Commonly Used **Organic and Natural or Organic Fertilizers:**

- Compost – A soil amendment with a low concentration of nutrients. partially decomposed plant material, Made with equal volumes of green plant material and naturally brown plant material. Greens are fresh, moist materials such as grass cuttings, green leaves, and fruit and vegetable scraps (avoid meats, fats, and grease and animal manure). Brown materials are dry materials such as wood chips, dried leaves, dried grass, straw, and woody prunings.

- Manure (farm animal excrement – poultry, cow, goat, horse) – Use only commercially produced, and heat composted, or processed manure. Has a high salt content.
- Bloodmeal - ~~1200 to 1400A~~ A dried blood product. A good source of nitrogen (12-13%N) with some P&K, ~~Phosphorus, 1.5~~ Contains higher percentages of nitrogen
 - Cottonseed meal 6-2-1
 - Alfalfa meal 2-0-2
 - Feather meal 12-0-0
- Bonemeal - ~~1100~~ Contains about 20% calcium A ground bone product. A good source of Phosphorus (12-14%P with a little nitrogen).
- Green sand – 0-0-5
- Fish emulsion – Liquid fish waste product. A good source of Nitrogen (5%N with some P & K) (5-1-1). ~~311 to 522 Releases most of its nitrogen quickly. It can be sprayed onto leaves for a fast-acting nutrient boost.~~
- Fish meal – ~~533~~ A dried ground fish product. A good source of Nitrogen (8-10%N and Phosphorous 6%P) ~~Contains both immediately available nitrogen and a slow release form that supplements the soil for up to 2 months.~~
- Seaweed extract – A liquid kelp product. ~~10-52-5~~ Usually made from kelp, Provides trace elements. ~~and natural growth hormones.~~ Use liquid kelp as a foliar spray. Kelp meal is a **more** concentrated form high in potassium and boron.
- Compost tea – Add 2 or 3 shovels full of compost into a burlap or woven mesh bag. Tie the bag securely and submerge it into a large bucket or barrel of water. Let it steep for 1 week then remove the bag. Dilute the remaining liquid until it is the color of weak tea if you plan to spray or sprinkle it directly on **plants** perennials, or use it full strength to drench the ground around the base of the plants.
- Worm compost (**castings**) ~~or worm~~ and “tea” - Applying a layer of earthworm castings **around plants** in February or March can add nutrients and microorganisms ~~as well as~~ **and may** repel insect pests. Make a tea to spray on leaves or pour over plant roots.

Place 1 quart earthworm castings in a bucket and cover with 3 quarts of water. Stir mixture and let stand for 24 hours. Stir again, allow mixture to settle 5 minutes, and scoop the tea into a sprayer. Apply earthworm spray in the early morning under and over plant leaves. Stir up leftover tea and pour both water and sludge over roots of plants.
- ~~Commercial~~ Blended organic fertilizers- Contain 2 or more different materials which provide N, P and K. Nutrient content varies by product.