

Deficiency symptoms

Iron (Fe)

Symptoms: Intervenal yellowing in new tissues (chlorosis). Blades lose color; necrosis is minimal.

Treatment: 1-2 lbs./acre of iron sulfate; foliar sprays.

Manganese (Mn)

Symptoms: Yellowing or striping between veins along with stunting, curling or spotted leaves. Leaves are very limp.

Treatment: 1-2 lbs./acre of manganese sulfate.

Zinc (Zn)

Symptoms: Dark, thin leaves turning progressively white; yellowing and bronzing of stunted leaves; witches brooms, reduced growth.

Treatment: 0.4-0.8 lbs./acre of zinc sulfate.

Copper (Cu)

Symptoms: Bluish discoloration at the tips of youngest leaves.

Treatment: 0.3-0.5 lbs./acre copper sulfate.

Boron (B)

Symptoms: Growing points develop chlorotic streaks; leaves are stubby and rosette-like in appearance.

Treatment: 0.1-0.3 lbs./acre of boron.

Molybdenum (Mo)

Symptoms: Wilting, stumping and cupping of broad leaves.

Treatment: 0.1 lb./acre of molybdenum. Lime applications improve availability.

Source: "The Turf Managers' Handbook" by Daniel & Freeborg, 1989

Proper size, proportions, of root balls

■ To reduce transplanting shock and assure that adequate feeding roots are moved with trees purchased from nurseries, the American Association of Nurserymen has established standards for height/diameter relationships and root ball sizes. General rule of thumb for approximating minimum root ball diameter is one foot for each one inch of caliper, according to the AAN.

Please note that caliper is tree trunk diameter, measured at six inches above the ground for trees with a diameter of four inches or less and 12 inches above the

1. Soil testing
2. Tissue testing
3. Plant symptoms

Of those three methods of detection, Davidson says observation of plant symptoms is most reliable.

"There's no really good calibration for soil testing," believes Davidson, "and most state labs are reluctant to make micronutrient recommendations based on soil tests. If private labs (make recommendations), I would question their data base."

Davidson says tissue analyses can be helpful, but they must be done regularly to determine a pattern of deficiency.

"Plant performance," advises Davidson, "will be your best source of information as to whether or not micro- or macronutrients are deficient."

Visual clues to micronutrient deficiency include:

- Lack of vigor; gradual slowing of growth rate.
- Poor response to nitrogen (especially important when you know there are no diseases or pests present).
- Turf adjacent to the affected area is healthy.
- Are symptoms occurring on young or old leaves? According to the "Turf

The Micronutrient Danger Zone (parts per million)

Iron : 120 ppm

Copper : 12 ppm

Manganese : 80 ppm

Boron : 8 ppm

Zinc : 50 ppm

Molybdenum : 2

Source: Dr. Dave Davidson, Cornell University

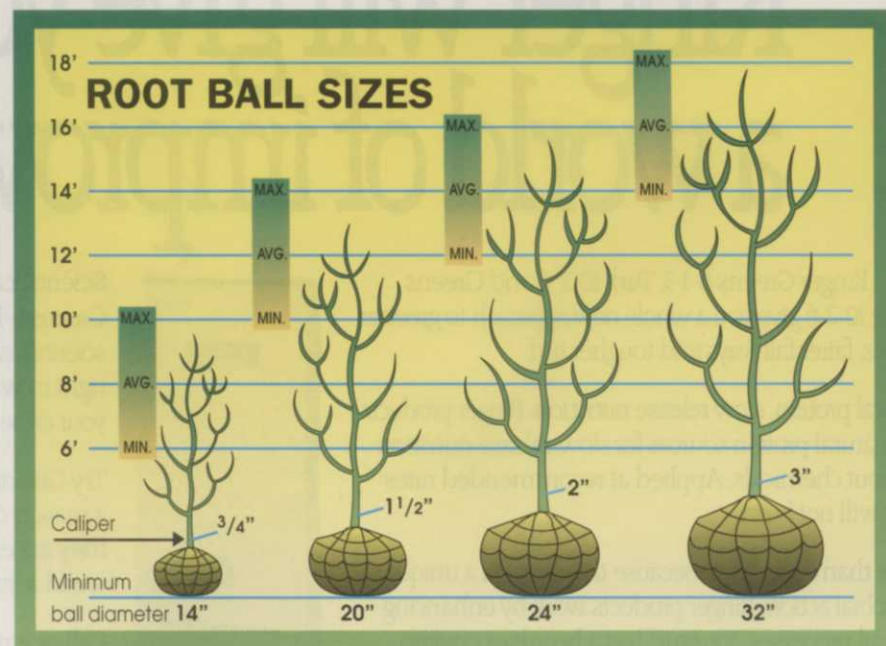
Managers' Handbook," for example, iron deficiency will cause new tissue to develop interveinal yellowing.

- Is the symptom occurring interveinally, uniformly, or is it blotchy?
- Is the plant dying? Watch leaf tips and margins.

Factors influencing nutrient availability include:

- The soil (texture; mineralogy; fertility; amount of oxygen present).
- Management (fertilizers; pesticides; irrigation; water quality).
- The plant (species and variety; root function).

Davidson predicts the green industry will soon see more sophisticated "quick tests" for turf diagnosis.



ground on larger planting stock. The diameter of larger trees, expressed as "diameter breast height" (DBH), is measured approximately 4-1/2 feet above ground level.

This chart, courtesy of "Tree City USA Bulletin" of the National Arbor Day

Foundation, illustrates the AAN standards for most deciduous shade trees.

A more complete range of sizes may be found in "American Standard for Nursery Stock," available for \$10. Send check or money order to: AAN, 1250 I St., NW, Suite 500, Washington, DC 20005.