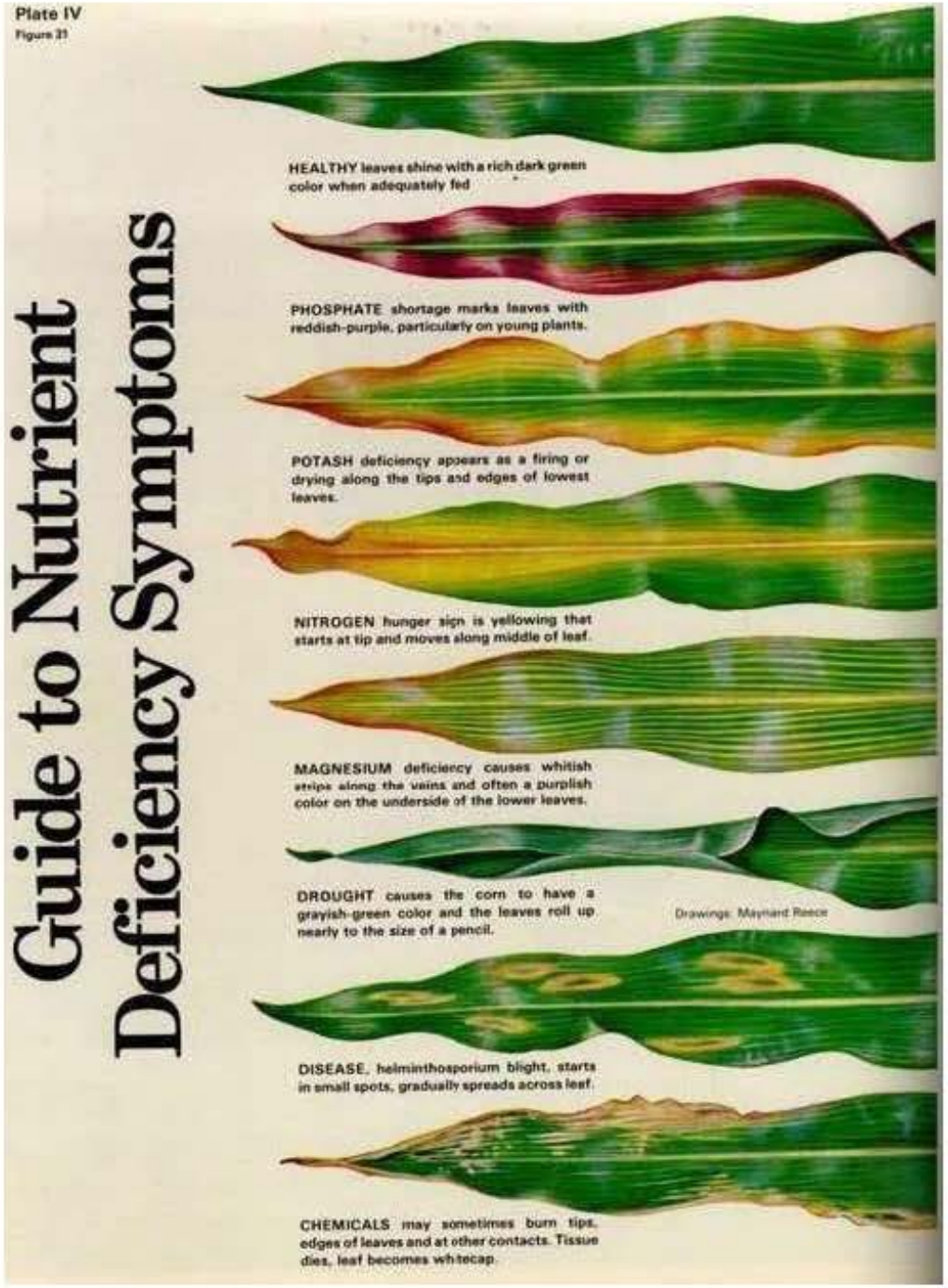


Healthy: Leaves shine with a rich dark green color when adequately fed.

Phosphate: Shortage marks leaves with reddish-purple, particularly on young plants.

Potash: deficiency appears as a firing or drying along the tips and edges of lowest leaves.

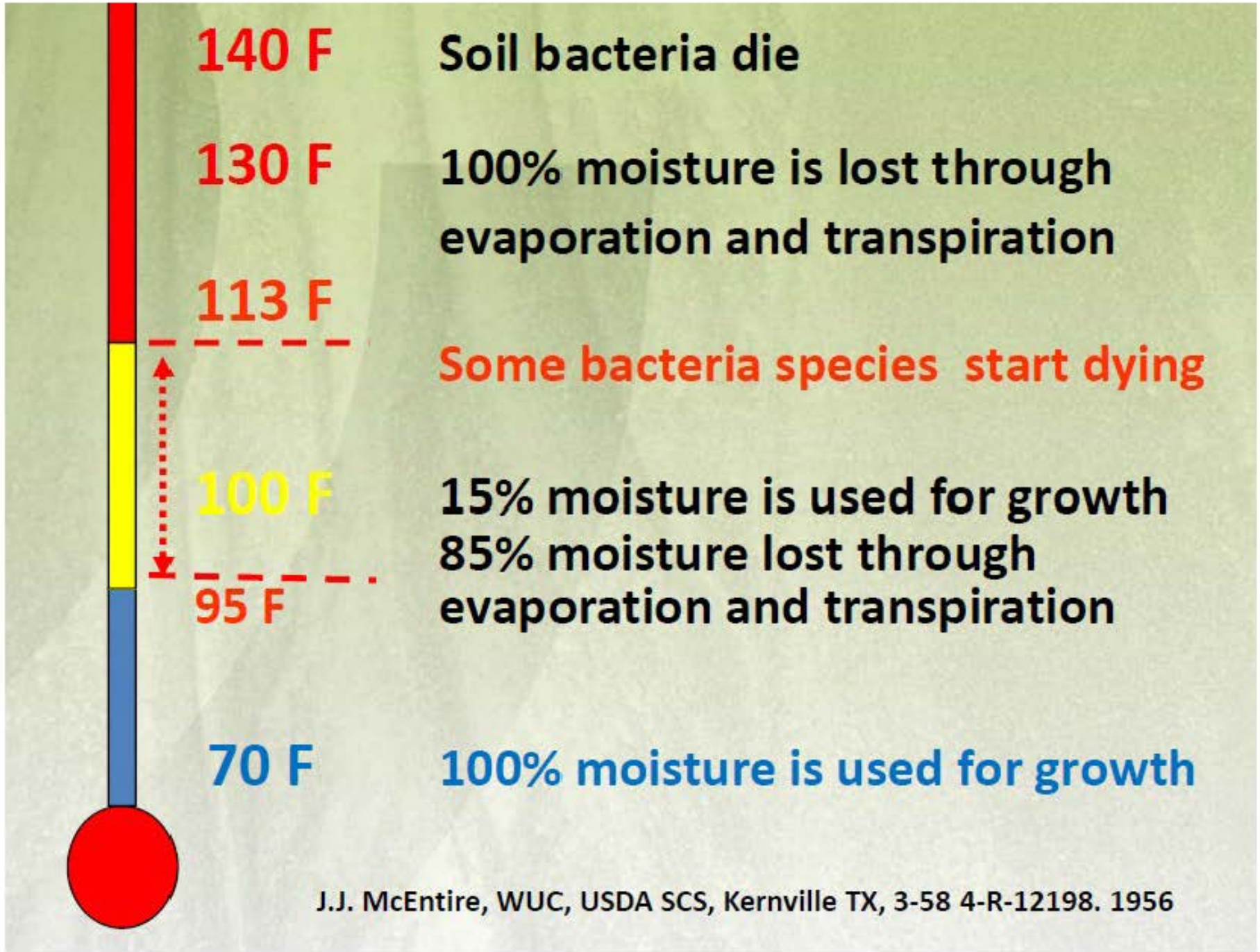
Nitrogen: hunger sign is yellowing that starts at the tip and moves along middle of leaf.

Magnesium: deficiency causes whitish strips along the veins and often a purplish color on the undersides of the lower leaves.

Drought: causes the corn to have a grayish-green color and the leaves roll up nearly to the size of a pencil.

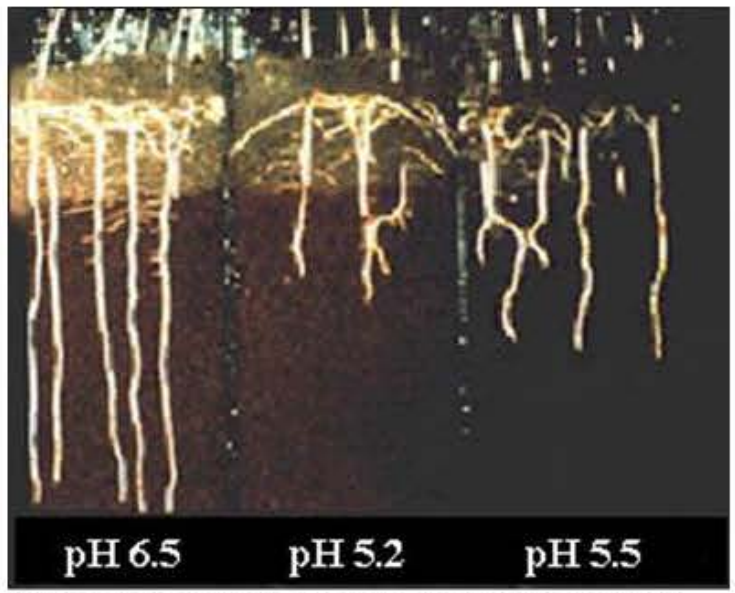
Disease: heminthospoium blight, starts in small spots, gradually spreads across leaf.

Chemicals: may sometimes burn tips, edges of leaves and at other contacts. Tissue dies, becomes whitecap.

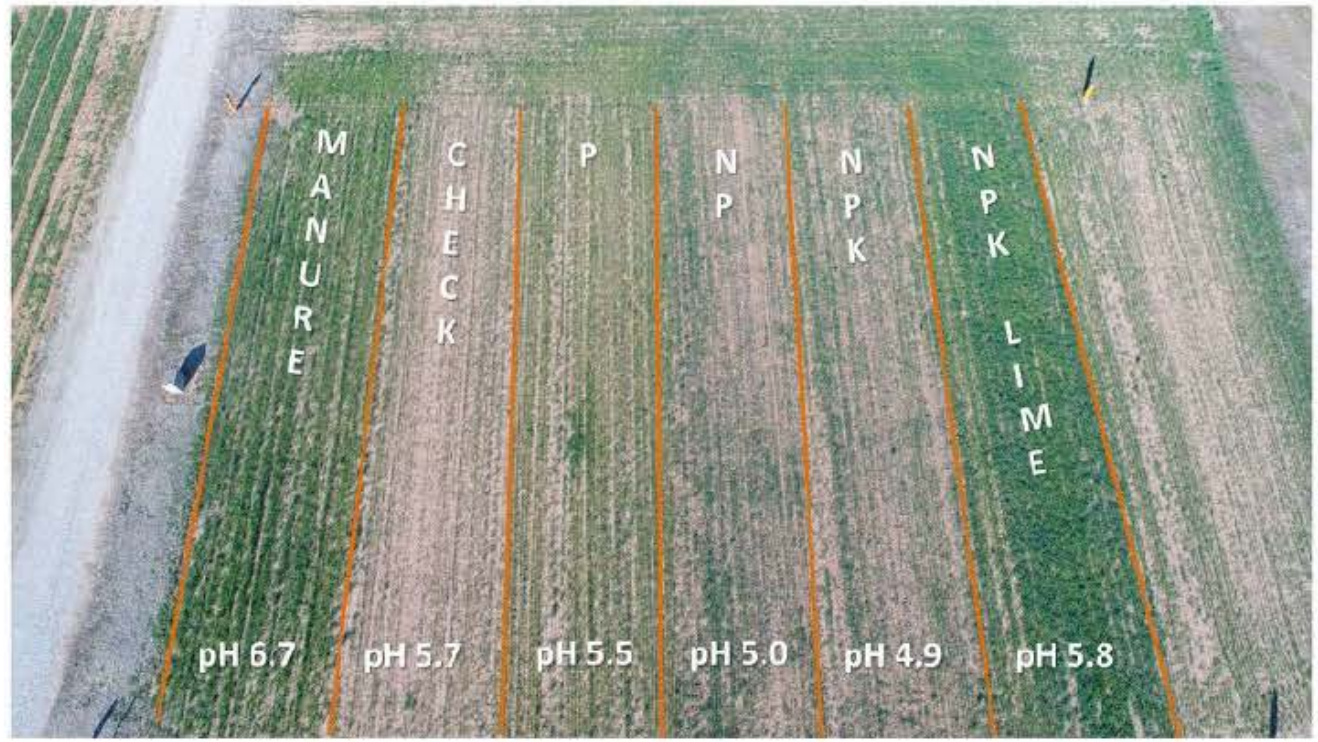

140 F
Soil bacteria die
130 F
100% moisture is lost through evaporation and transpiration
113 F
Some bacteria species start dying
100 F
15% moisture is used for growth
85% moisture lost through evaporation and transpiration
95 F
70 F
100% moisture is used for growth
J.J. McEntire, WUC, USDA SCS, Kernville TX, 3-58 4-R-12198. 1956

Magruder Plots 3.16.18

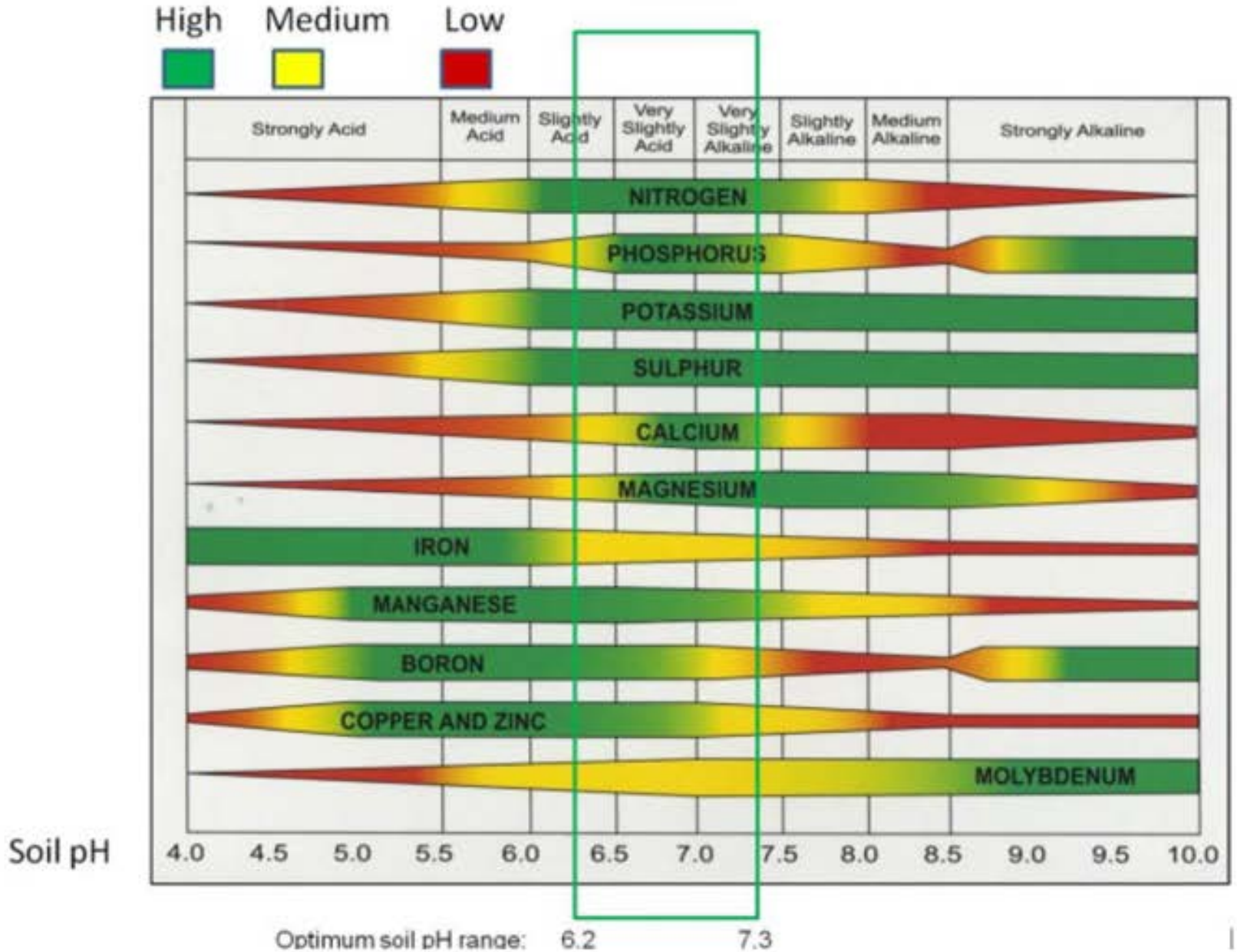
Stillwater Oklahoma

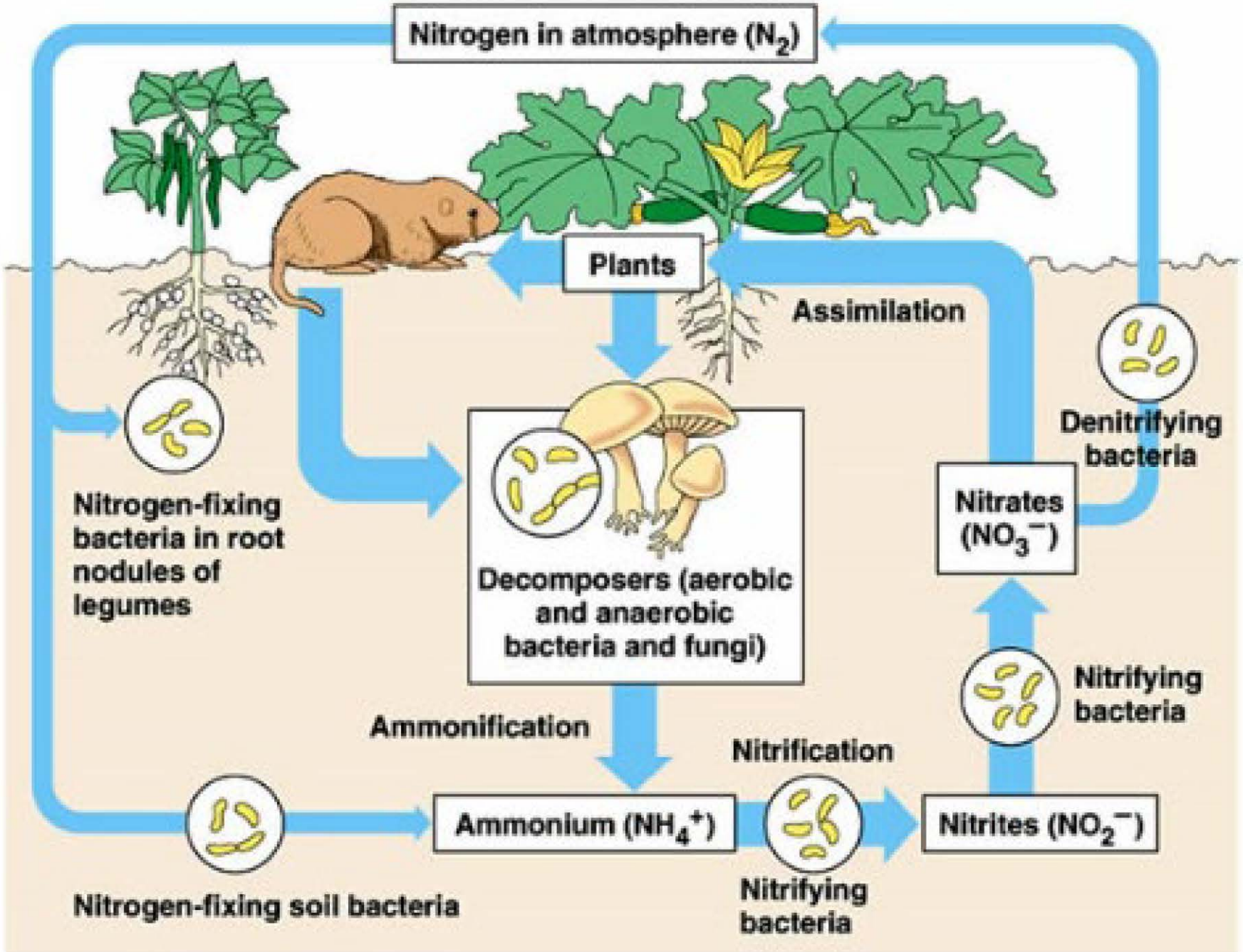


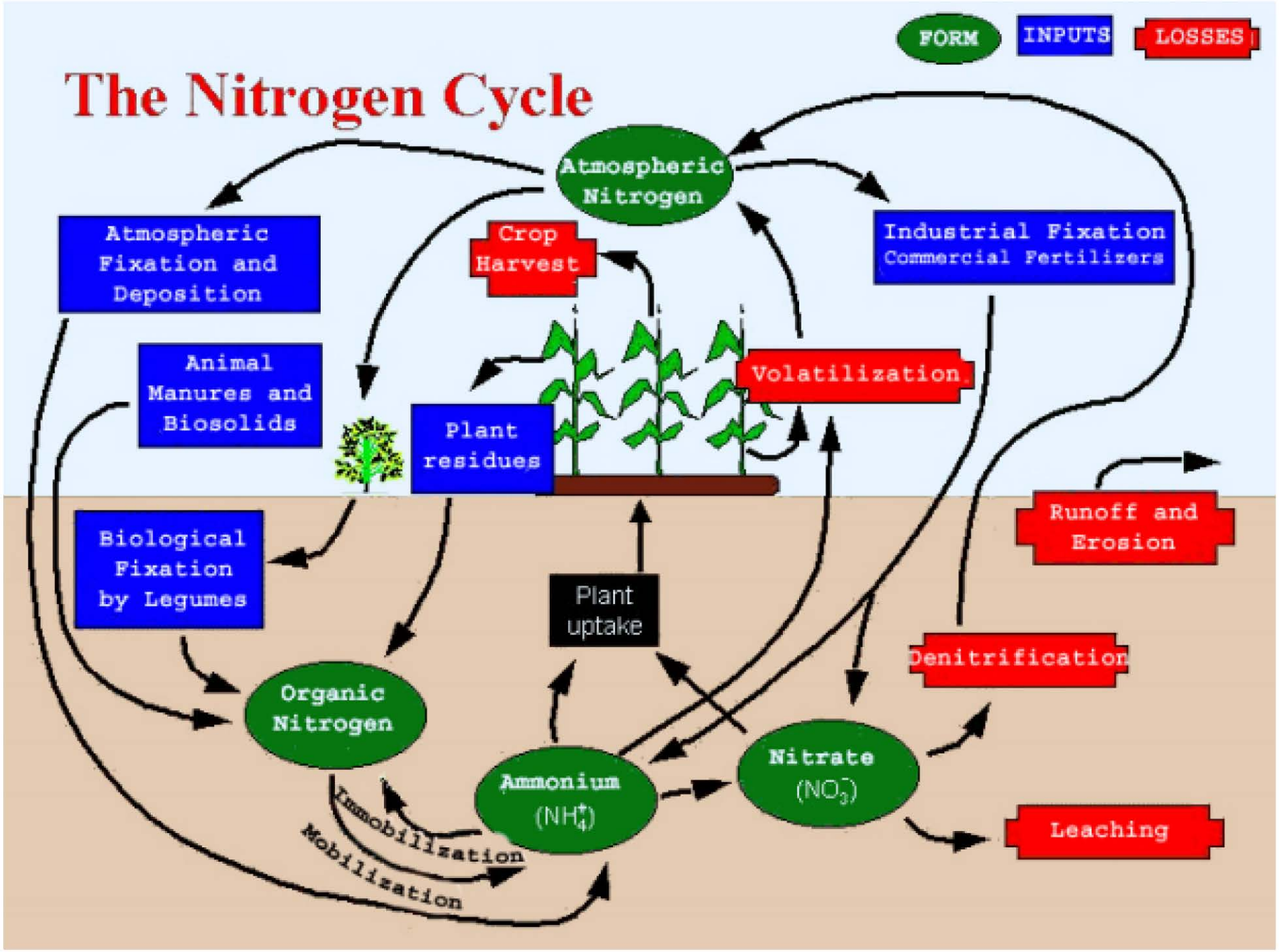
COTTON ROOT GROWTH RESTRICTION DUE TO ACID SUB-SOIL AND ALUMINUM TOXICITY



How soil pH affects availability of plant nutrients




Nitrogen in atmosphere (N_2)
Plants
Assimilation
Denitrifying bacteria
Nitrogen-fixing bacteria in root nodules of legumes
Decomposers (aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrifying bacteria
Nitrogen-fixing soil bacteria


FORM
INPUTS
LOSSES
The Nitrogen Cycle
Atmospheric Nitrogen
Atmospheric Fixation and Deposition
Crop Harvest
Industrial Fixation Commercial Fertilizers
Animal Manures and Biosolids
Volatilization
Plant residues
Runoff and Erosion
Biological Fixation by Legumes
Plant uptake
Denitrification
Organic Nitrogen
Ammonium (NH_4^+)
Nitrate (NO_3^-)
Immobilization
Mobilization
Leaching

Plants and grass need nutrients:

N -Nitrogen

Good for:
- Growth
- Color
- Density
- Chlorophyll formation

Deficiency symptoms:
- Pale color, yellowing
- Stunted growth

P -Phosphorus

Good for:
- Growth of new roots & shoots
- Seedling root growth
- Seedling plant vigor

Deficiency symptoms:
- Rarely seen
- Yellowing or purple cast to leaves

K Potassium

Good for:
- Overall plant health
- Stress resistance
- Cold hardiness
- Disease resistance

Deficiency symptoms:
- Rarely visible
- Pale color or no symptoms

Fe -Iron

Good for:
- Chlorophyll formation

Deficiency symptoms:
- Yellowing

Simple PLANT DEFICIENCY Guide

Calcium
New leaves misshapen or stunted. Existing leaves remain green.

Iron
Young leaves are yellow and white with green veins. Mature leaves are normal.

NEW GROWTH

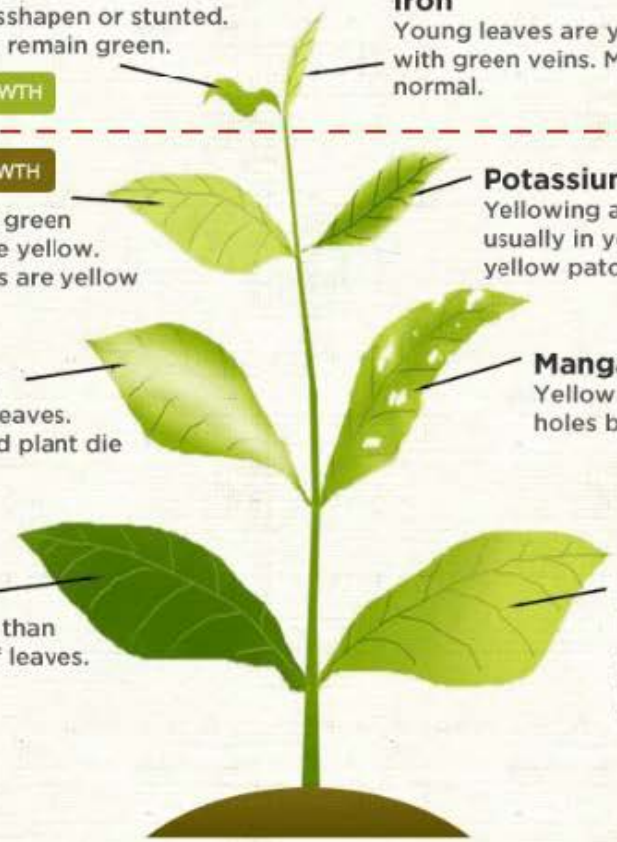
OLD GROWTH

Nitrogen
Upper leaves are light green where lower leaves are yellow. Bottom or older leaves are yellow and shrivelled.

Potassium
Yellowing at the tips and edges, usually in younger leaves. Dead or yellow patches develop on leaves.

Carbon Dioxide
White deposits on leaves. Stunted growth, and plant die back.

Manganese
Yellow spots and or elongated holes between veins.



Phosphate
Leaves are darker than normal and loss of leaves.

Magnesium
Lower leaves turn yellow from outside going in, veins remain green.

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Deficiency Chart of Micronutrients

Boron: Discoloration of leaf buds. Breaking and dropping of buds

Sulphur: Leaves light green. Veins pale green. No spots.

Manganese: Leaves pale in color. Veins and venules dark green and reticulated

Zinc: Leaves pale, narrow and short Veins dark green. Dark spots on leaves and edges.

Magnesium: Paleness from leaf edges. No spots Edges have cup shaped folds. Leaves die and drop in extreme deficiency.

Phosphorus: Plant short and dark green. In extreme deficiencies turn brown or black. Bronze colour under the leaf.

Calcium: Plant dark green. Tender leaves pale. Drying starts from the tips. Eventually leaf bunds die.

Iron: Leaves pale. No spots. Major veins green.

Copper: Pale pink between the veins. Wilt and drop.

Molybdenum: Leaves light green/ lemon yellow/ornge. Spots on whole leaf except veins. Sticky secretions from under the leaf.

Potassium: Small spots on the tips, edges of pale leaves. Spots turn rusty. Folds at tips.

Nitrogen: Stunted growth. Extremely pale color. Upright leaves with light green/yellowish.Appear burnt in extreme deficiency.

THE COLOUR REPRESENTED ARE INDICATIVE.
THEY MAY VARY FROM PLANT TO PLANT