

Gardening in Clay Soils

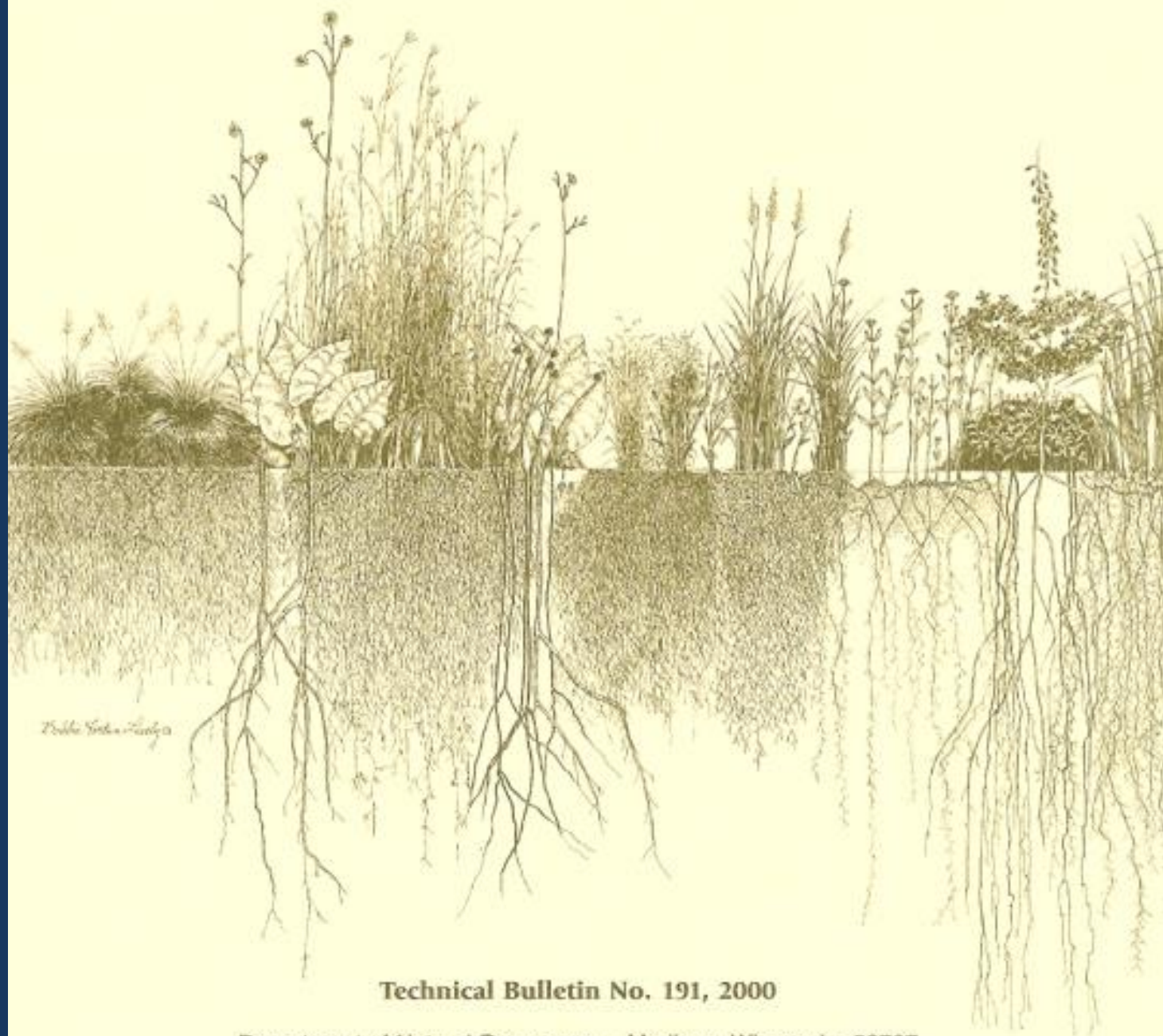
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Tonight's Plan

1. Clay Soils 101
2. Strategies for gardening in clay

We Can Thank The Glaciers (and runoff) For Our Clay

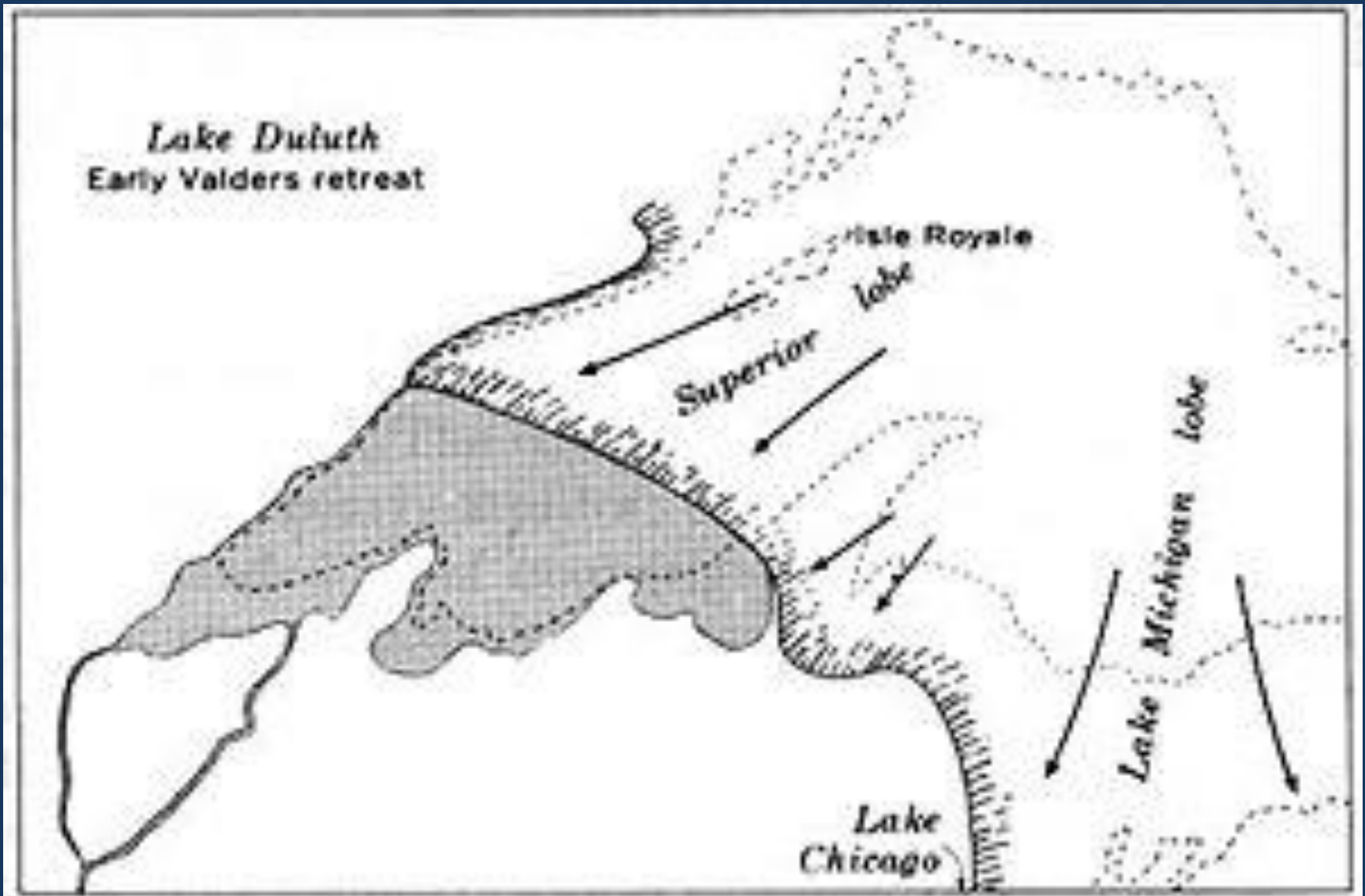
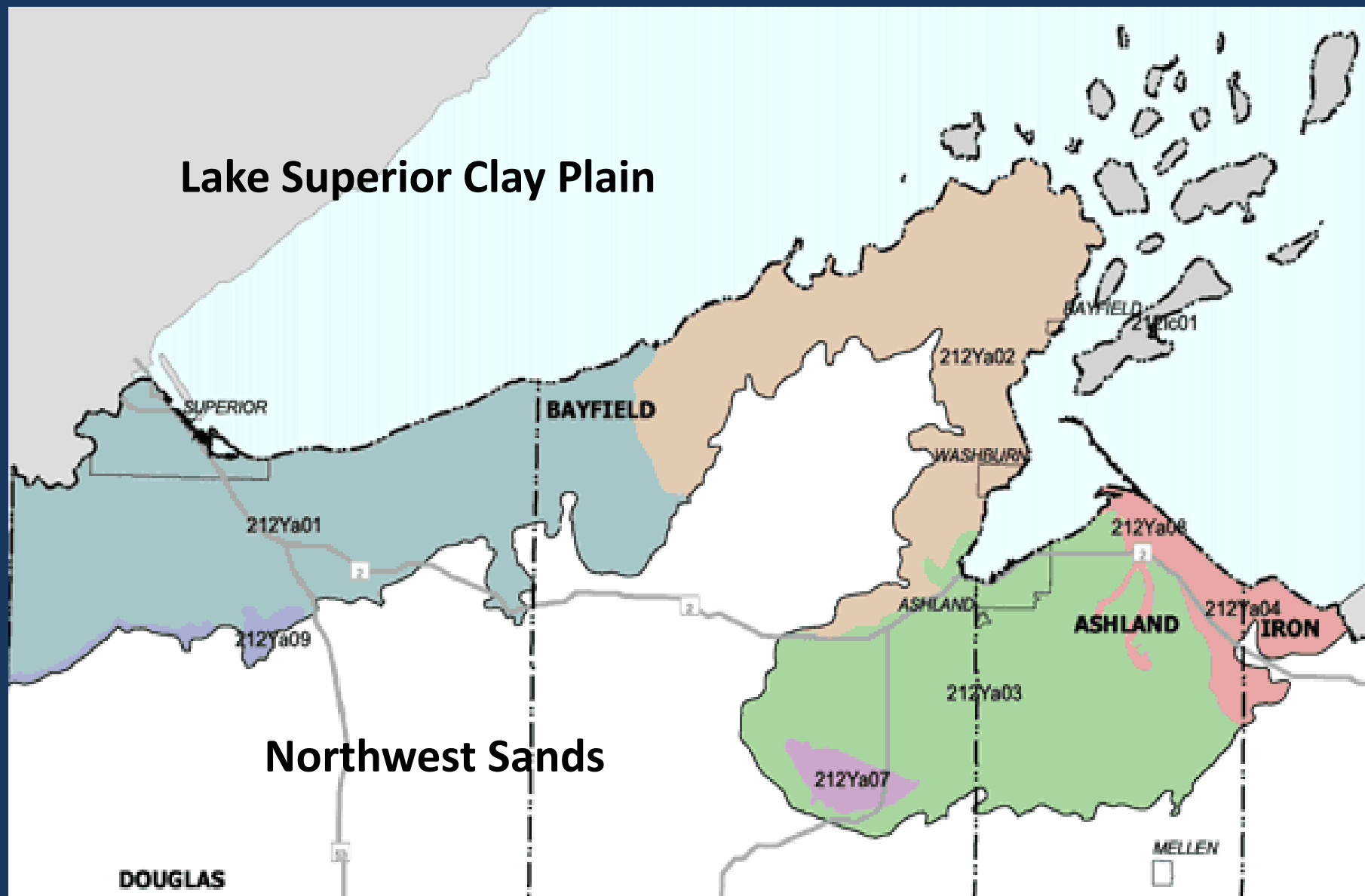




Photo Credit: Bob Gros

Ecological Landtypes



Soil Maps

websoilsurvey.nrcs.usda.gov



580B Sanborg-Badriver Complex

Description of Badriver

Setting

Landform: Till plains

Landform position (two-dimensional): Footslope

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Clayey till

Typical profile

A - 0 to 3 inches: clay loam

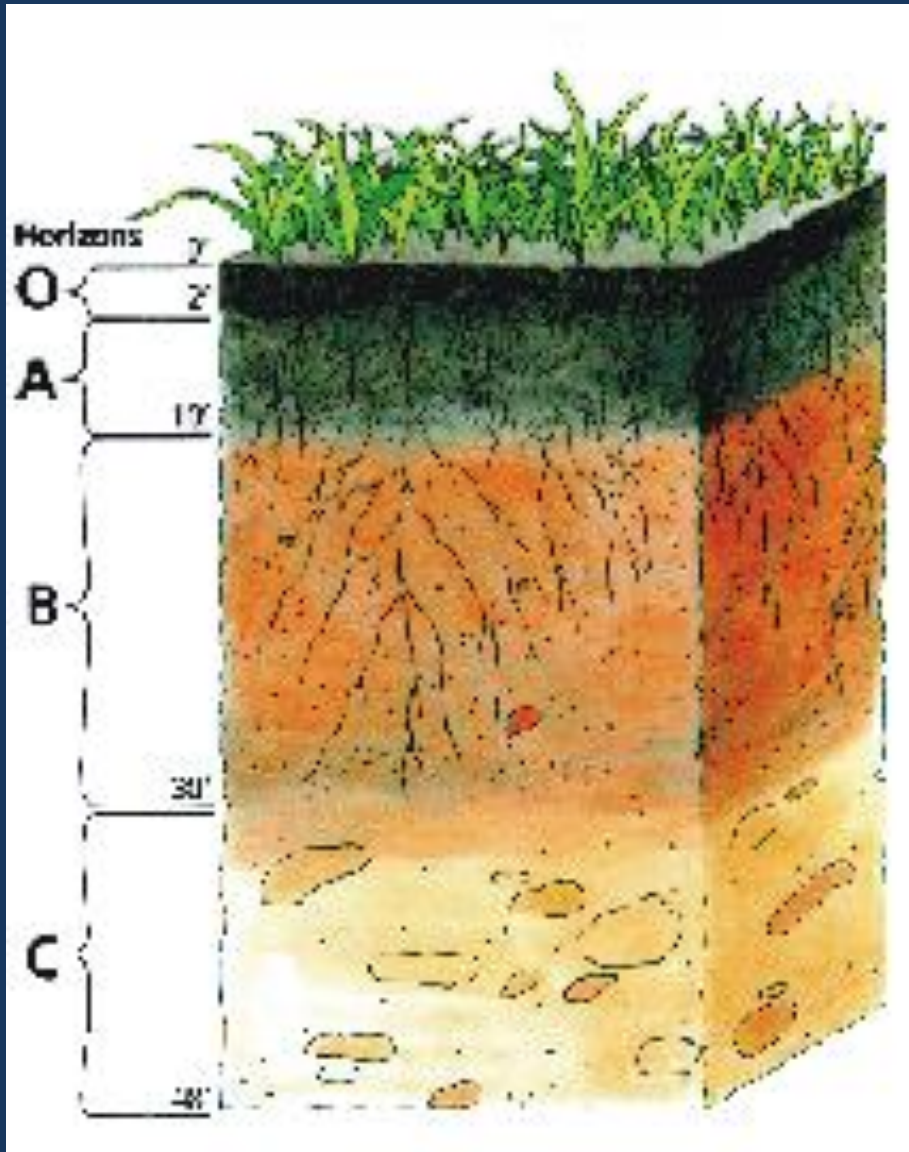
E/B - 3 to 10 inches: clay loam

B/E - 10 to 24 inches: clay

Btk - 24 to 53 inches: clay

C - 53 to 60 inches: clay loam

Dig a Hole to Learn More!





Clay Loam

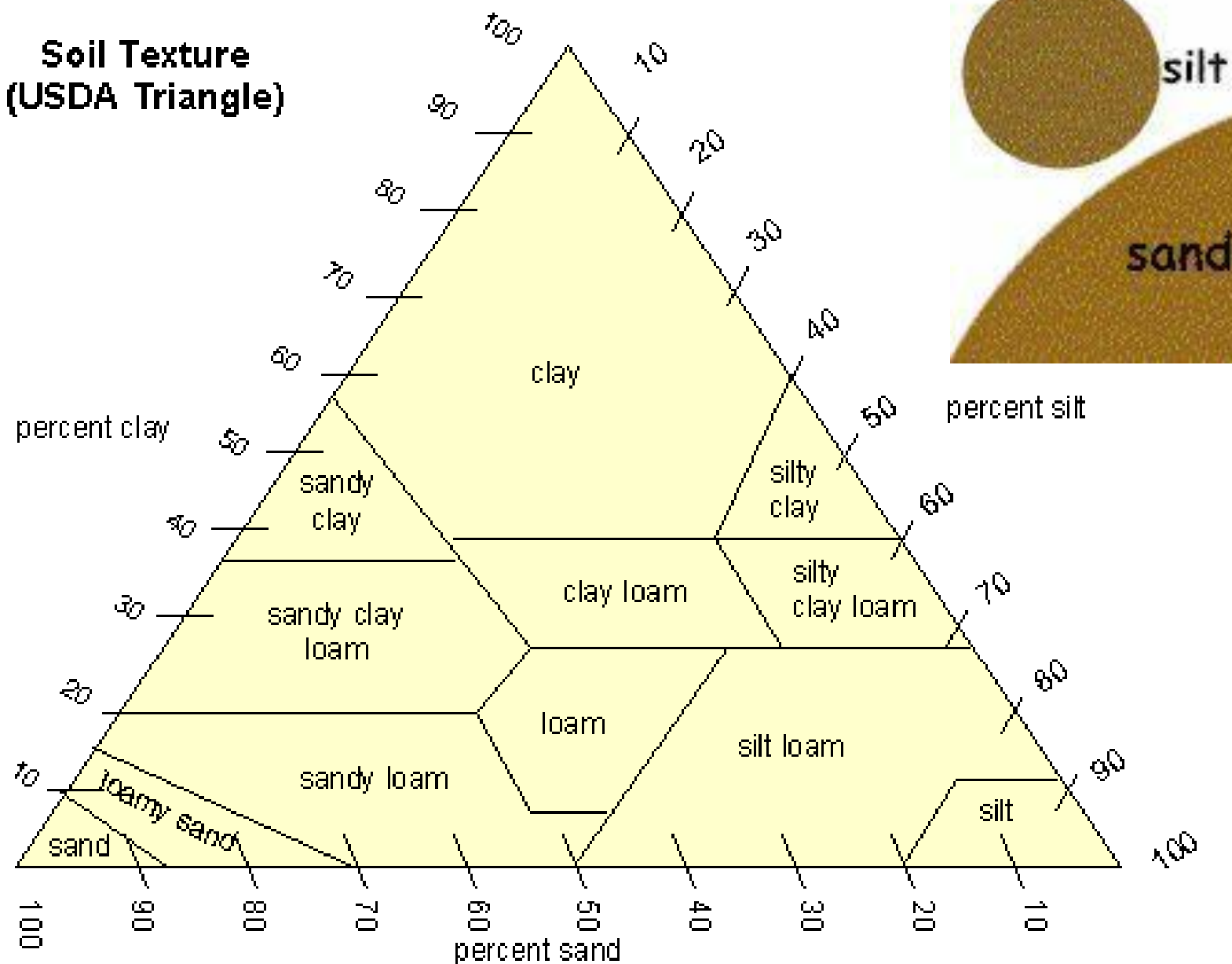


Clay



Find A New Farm

Soil Texture (USDA Triangle)



Soil Tilth

A term for the state of aggregation of the soil

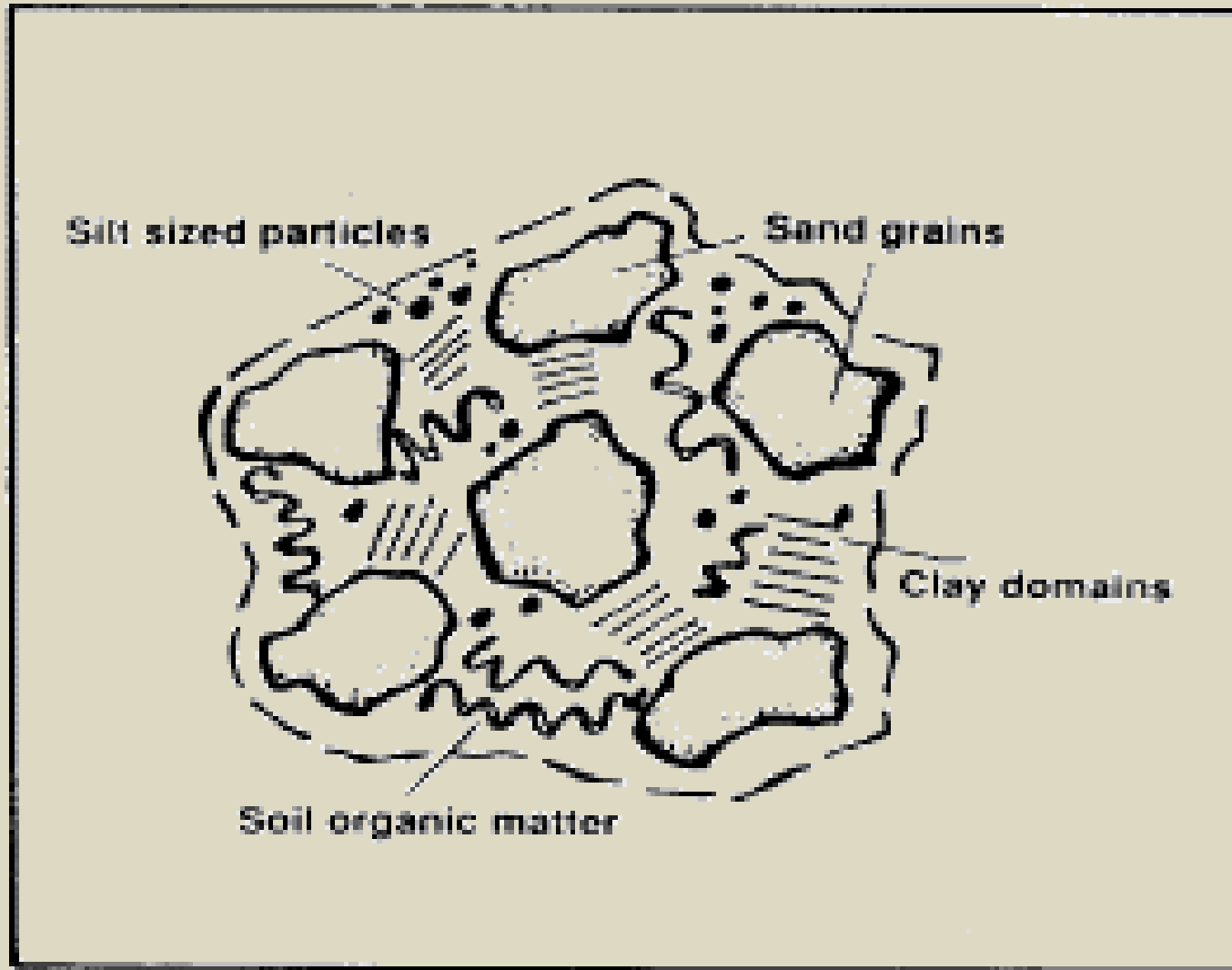
Good soil tilth means good soil health

**Tilth is a
function of
time.**

**Tillage
destroys
tilth.**



The Soil Aggregate (Our Best Friend)



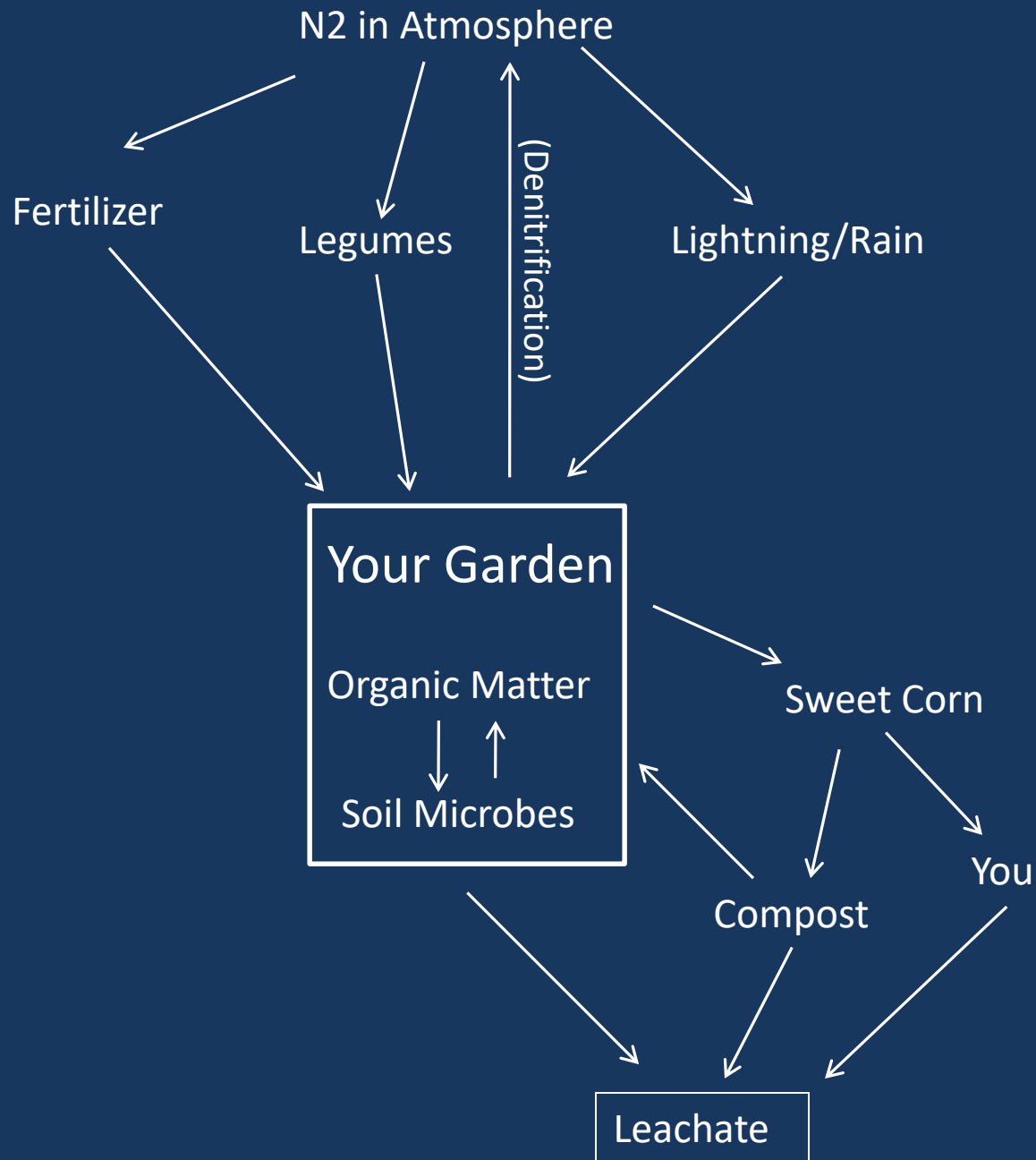
Soil Tilth/Structure

- Porosity (how fast water drains)
- Nutrient holding capacity (surface area)
- Soil temperature
- Air penetration (aeration)
- Bulk density (permeability)
- Water holding capacity

What Affects Soil Tilth?

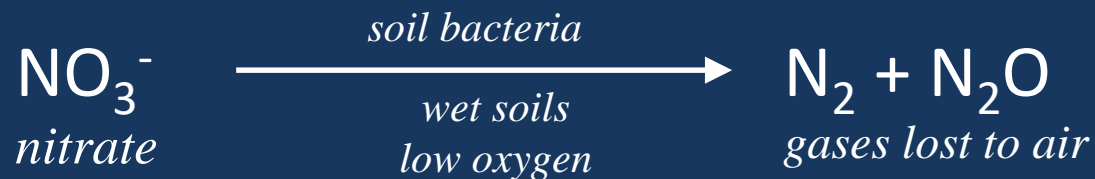
- Mix of clay, sand, silt
- Tillage
- Compaction
- Organic Matter
- Soil Biology

Nutrients in Clay Soils



Nitrogen Reactions

- Biological fixation (symbiotic)
- Chemical fixation
- Mineralization (ammonification)
- Nitrification
- Immobilization
- Denitrification



(Soil Temp. > 50 degrees F)

Phosphorus (P)

- Soils usually contain large amounts of organic and inorganic P.
- But, most soil P is “fixed” and unavailable to plants.
- Available-P (from fertilizer, manure, etc.) is quickly converted to water-insoluble (fixed) forms when added to soil.
- Very little P leaching (0.1lbs/acre)
- Mineralization converts organic to inorganic (available) available forms

Potassium (K)

- Unavailable soil K contained in mica, feldspars, and some clay minerals
- Slowly available K held by other clay minerals
 - Storehouse of K
 - Released over time
 - Low amounts in sandy and organic soils
- Readily available K is dissolved in soil water or held on soil particles
- Leaching losses of K on sands and organic soils

pH

- pH is a measure of acid or H^+ ions
- $pH < 7$ is acid or “sour”
- $pH > 7$ is basic or “sweet”
- pH affects surface chemistry which affects nutrient availability
- Each plant has a preferred range (usually between 6.2-6.8)
- Test your soil and add a liming agent if necessary

LIME WORKS IN TWO WAYS

1. CALCIUM DISPLACES H^+ FROM SOIL PARTICLES
2. CARBONATE AND H^+ FORM CARBONIC ACID WHICH DISSOCIATES INTO WATER AND CO_2



Pros and Cons of Clay Soils

Pros

- Holds water
- Deep reservoir of nutrients
- Good nutrient cycling
- Enormous potential
- Usually no cutworms or grubs

Cons

- Holds water
- Warms slowly
- Narrow operating windows
- Rhizomatous weeds
- Crusting

Quackgrass



Soil Management Strategies

Strategy 1: Give Up and Build A Greenhouse



Strategy 2: Build Raised Beds With Imported Soils



Northland College Compost



\$65/yd or \$0.35/lb, Call Todd Rothe at 715-6821268

Manure





Strategy 4: Rotate With Cover Crops



Chickling Vetch (AC Greenfix)

Cover Crop Species

- Spring Plantings
 - Oats and peas, red clover
- Summer Plantings
 - Chickling vetch, oats and peas, buckwheat
- Fall Plantings
 - Winter rye grain
 - Annual rye grass

Strategy 5: Double Dig to Break Up Compaction



Strategy 6: Use Peat Moss/Sand To Avoid Crusting



Strategy 7: Use Plastic To Manage Operating Windows



Strategy 8: Mulch to Reduce Crusting and Splashing



Shrubs For Clay

- Willow
- Dogwood
- Ninebark
- Hawthorne
- Aronia
- Elderberry
- Lilac
- Nannyberry (viburnum)
- Currants

Veggies For Clay

- Generally, nothing
- With decent prep, everything

Managing Soil is a Matter of Priorities

- Tilt (structure, aggregation, bulk density)
- Organic matter
- pH
- Nitrogen
- Potassium
- Phosphorus
- Micronutrient deficiencies
- Microbiology

Where should you spend your time and money?