Planning Your Landscape; Microclimates, Seasons, Sites and Soils

Larry A. Sagers
Horticulture Specialist
Utah State University

Funding Assistance From
A
Bureau Of Reclamation Grant

Analyzing the Landscape Site

Preparation for the Design Process

Successful landscapes always consider the site features and the surrounding area.

Preparation for the Design Process

- Note site characteristics including:
  - Water and Air Drainage
  - Slope of the land
  - Soil conditions
  - Existing vegetation
  - Existing structures
  - Climate

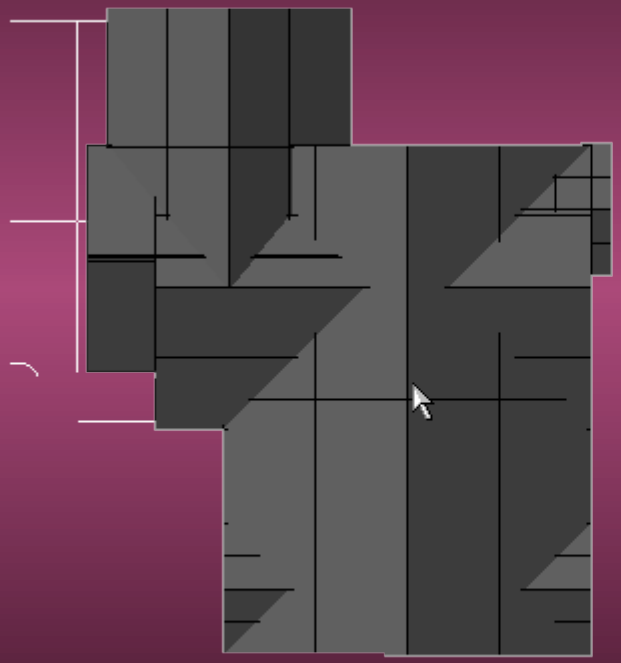
Preparation for the Design Process

- The base plan is the first drawing in a landscape design and is the drawing of the house on the lot.

Preparation for the Design Process

- The plan view is a view from above looking down as opposed to a drawing of the front of the house known as a elevation view

Home on Site

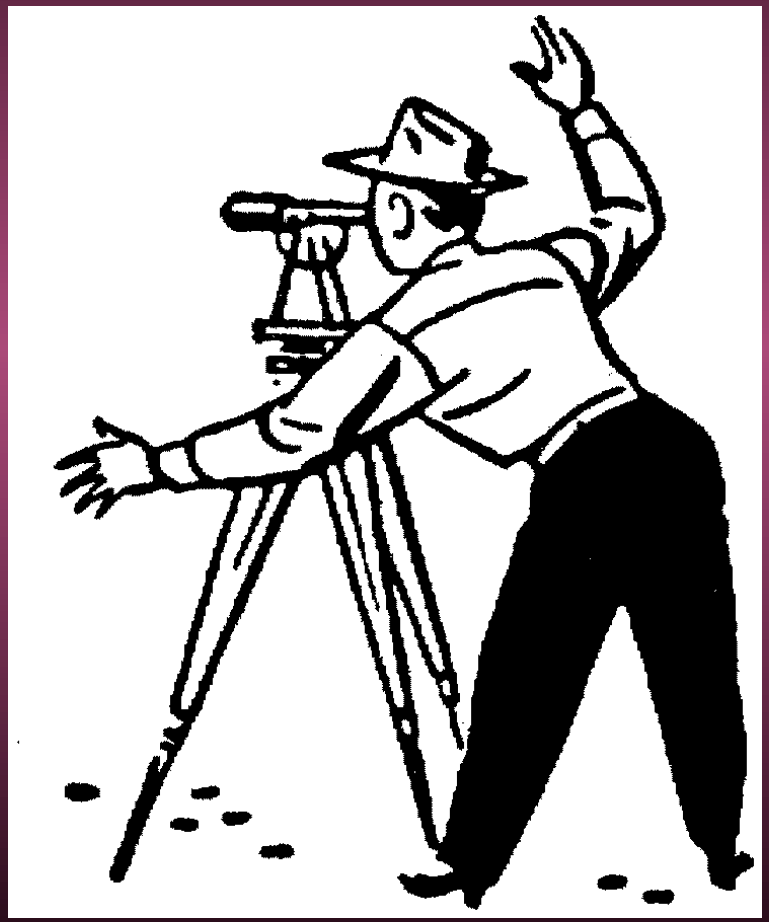


Front View of Home

Preparation for the Design Process

- Features included on a base plan in addition to the house are:
  - Driveways
  - Patios
  - Walks
  - Fences

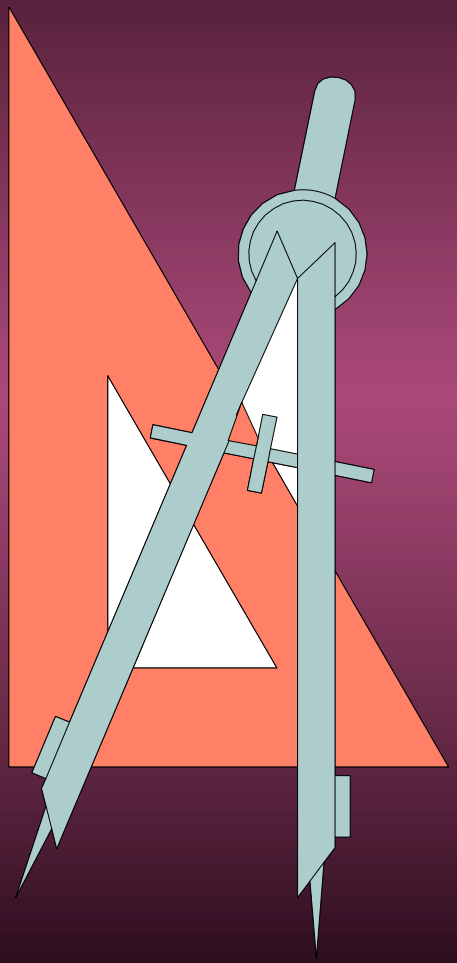
Preparation for the Design Process



- The plat or survey is a legal document indicating the exact locations of physical structures and the exact dimensions of the property

The Design Process

- Designs may be produce with the simplest equipment or top of the line computer technology.



The Design Process

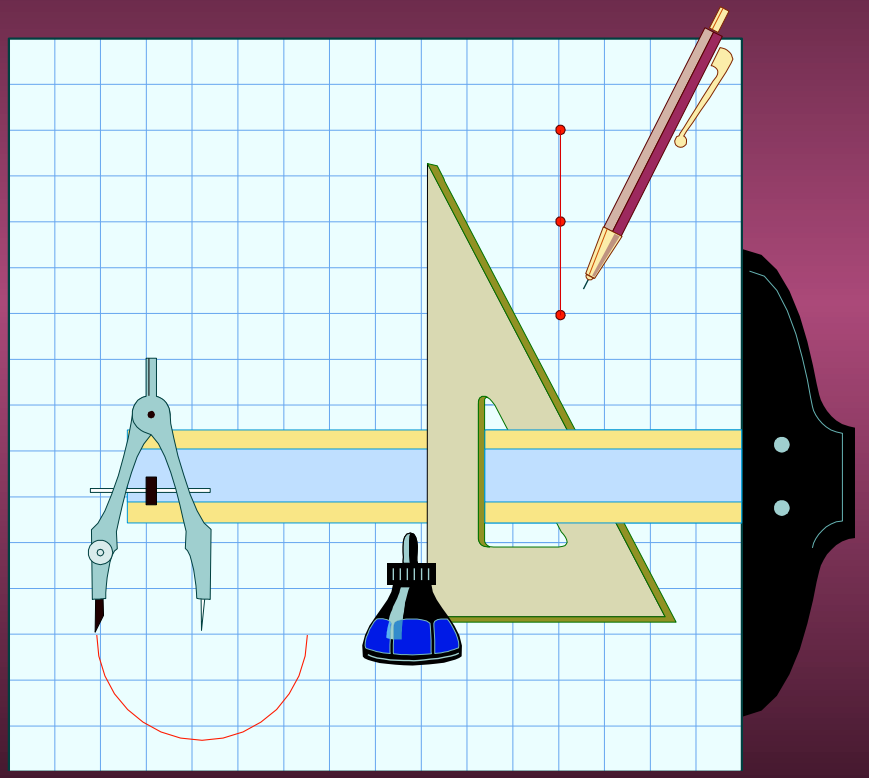
- Computer assisted design (CAD) refers to the use of computer hardware and software to produce drawings.

The Design Process

- **Drawing the Plan:**
  - Drafting equipment need not be expensive.
  - You can draw plans by hand.

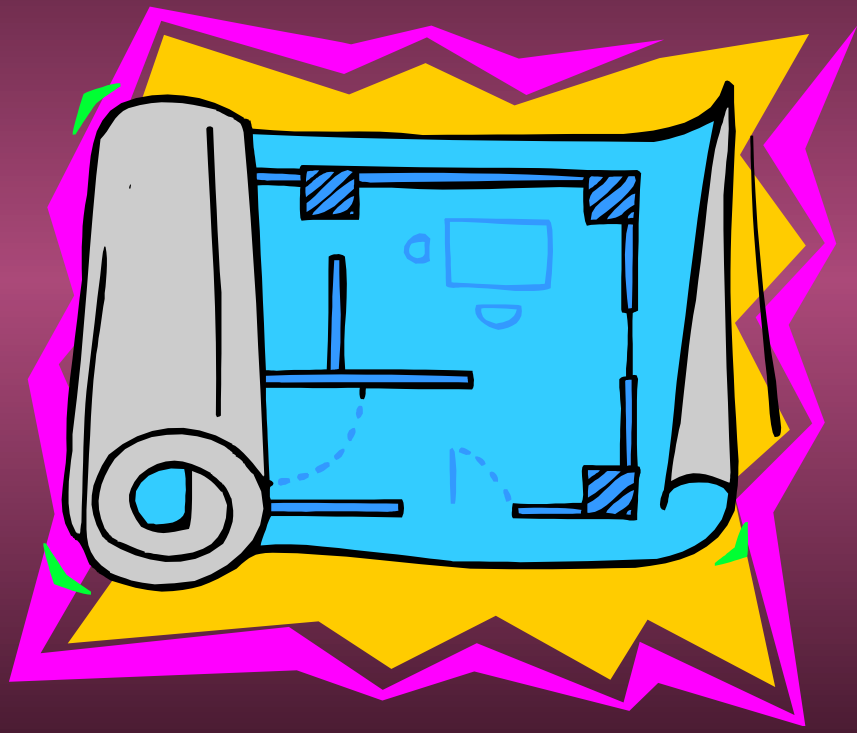
The Design Process

- When drawing a plan you may use:
  - Drawing board
  - T- Square
  - Drawing paper
  - Drafting Tape
  - Drawing pencils
  - Triangles
  - Eraser and erasure shield
  - Scale



Site Analysis

- The site analysis plan is a piece of paper with an accurate sketch of the house and lot on which observations are recorded.



Site Analysis

- Features noted on a site analysis plan are:
  - Orientation of the House
  - The Lay of the Land
  - Soil
  - Existing Vegetation
  - Natural Features
  - Climate
  - Views

Site Analysis

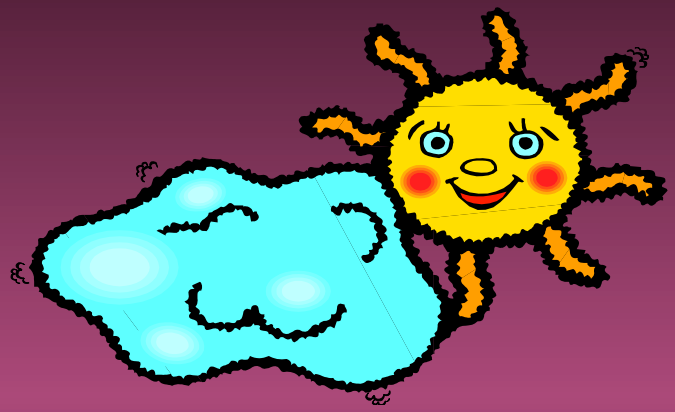
- Orientation of the House
  - Need to know your directions N,S, E, W
  - Locating the activity areas of the land.
  - Need to know how much shade an area gets
  - Need to know how much wind exposure the area gets.

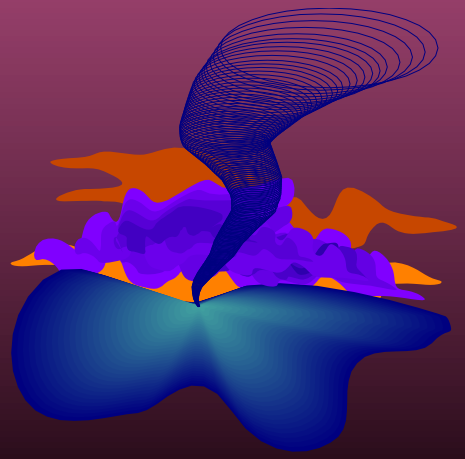
Site Analysis

Study and make notes on the site analysis plan views. Remember to preserve the desirable views looking toward the house and away from the house.

Site Analysis

- Climate and Microclimates
  - How much shade or shade an area gets
  - How much wind the area gets.





Check The Slope Or Grade For Drainage Issues

The Lay Of The Land Including The Hills, Valleys, And Flat Areas

Site Analysis

- Soil:
  - Check the soil texture which is the proportion of different sized particles in the soil like sand, silt, and clay.
  - Check the soil structure which is the arrangement of the soil aggregates
  - Topsoil is the soil found near the surface and is a critical plant growth factor

Site Analysis

Existing Vegetation:

- Check existing vegetation in the site.
- Native plants are those that are indigenous to the area and not introduce by people
- Native is different than natural

Site Analysis

- Natural Features
  - Rocks
  - Existing plants
  - Water
  - Topography

Site Analysis

Climate is broken down into two categories:

Macroclimate

Microclimate

Site Analysis

- Climate
  - Macroclimate concerns the temperature , precipitation, humidity and wind over the large areas or region
  - Microclimate is the temperature, precipitation, sun exposure, humidity and wind on the landscape site.

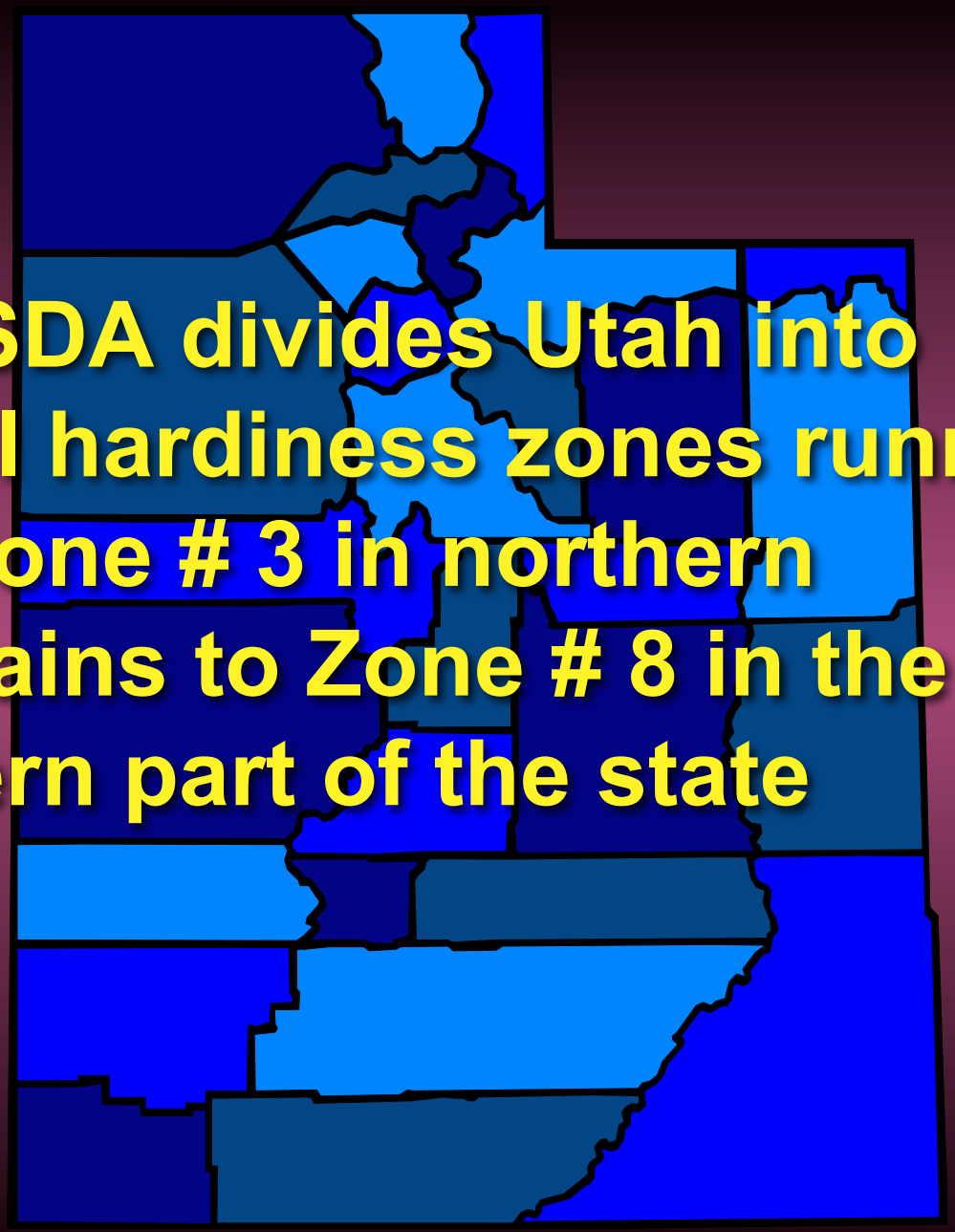
Utah growing conditions make it difficult to grow many landscape plants

The number one criteria when selecting any landscape plants is to place it where it grow

If you ignore plant adaptability, they are never going to perform well.

Does it grow in my climate?

The USDA divides Utah into several hardiness zones running from Zone # 3 in northern mountains to Zone # 8 in the southern part of the state



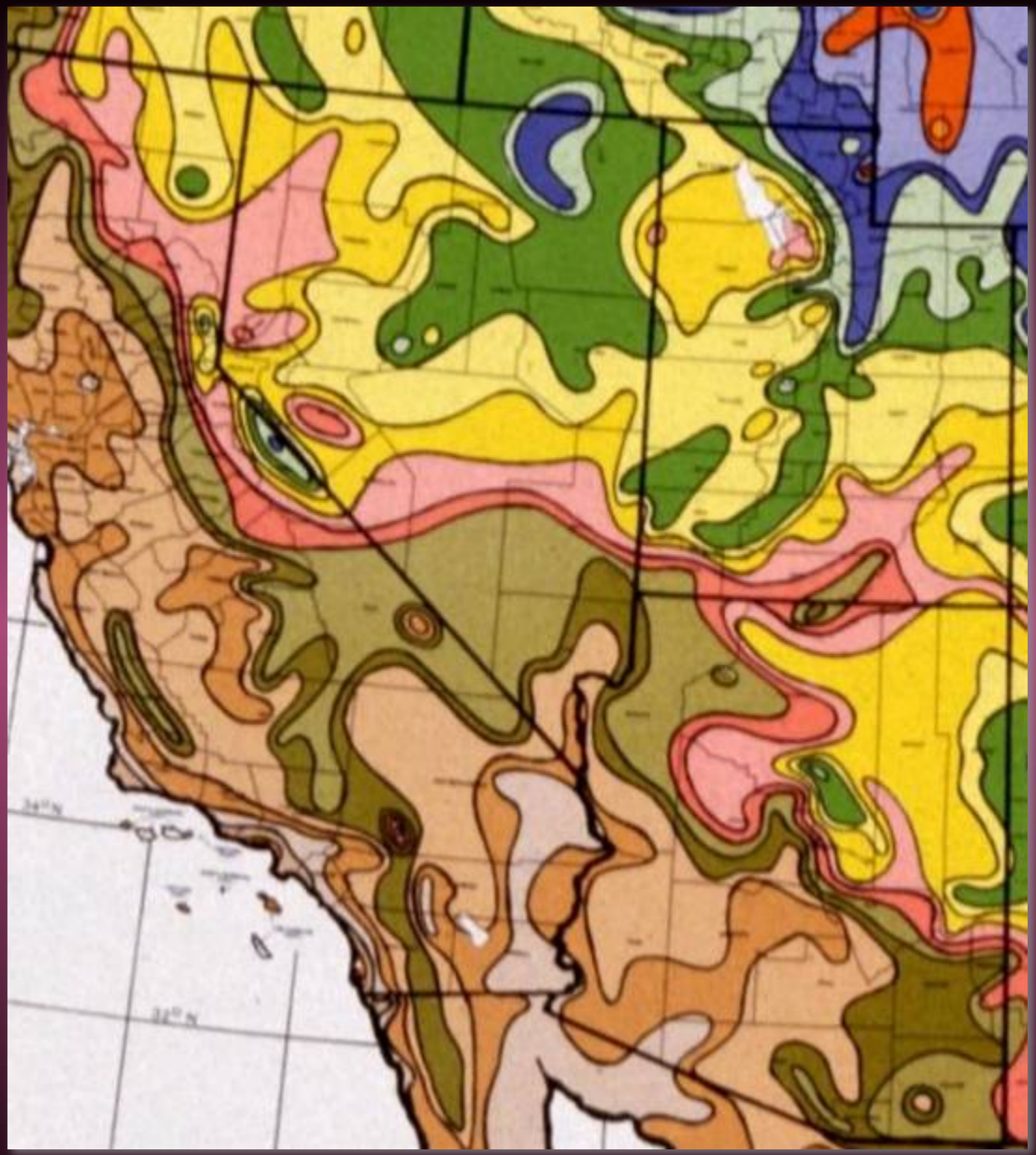
Selecting Landscape Plants

Find out what plant hardiness zone you live in

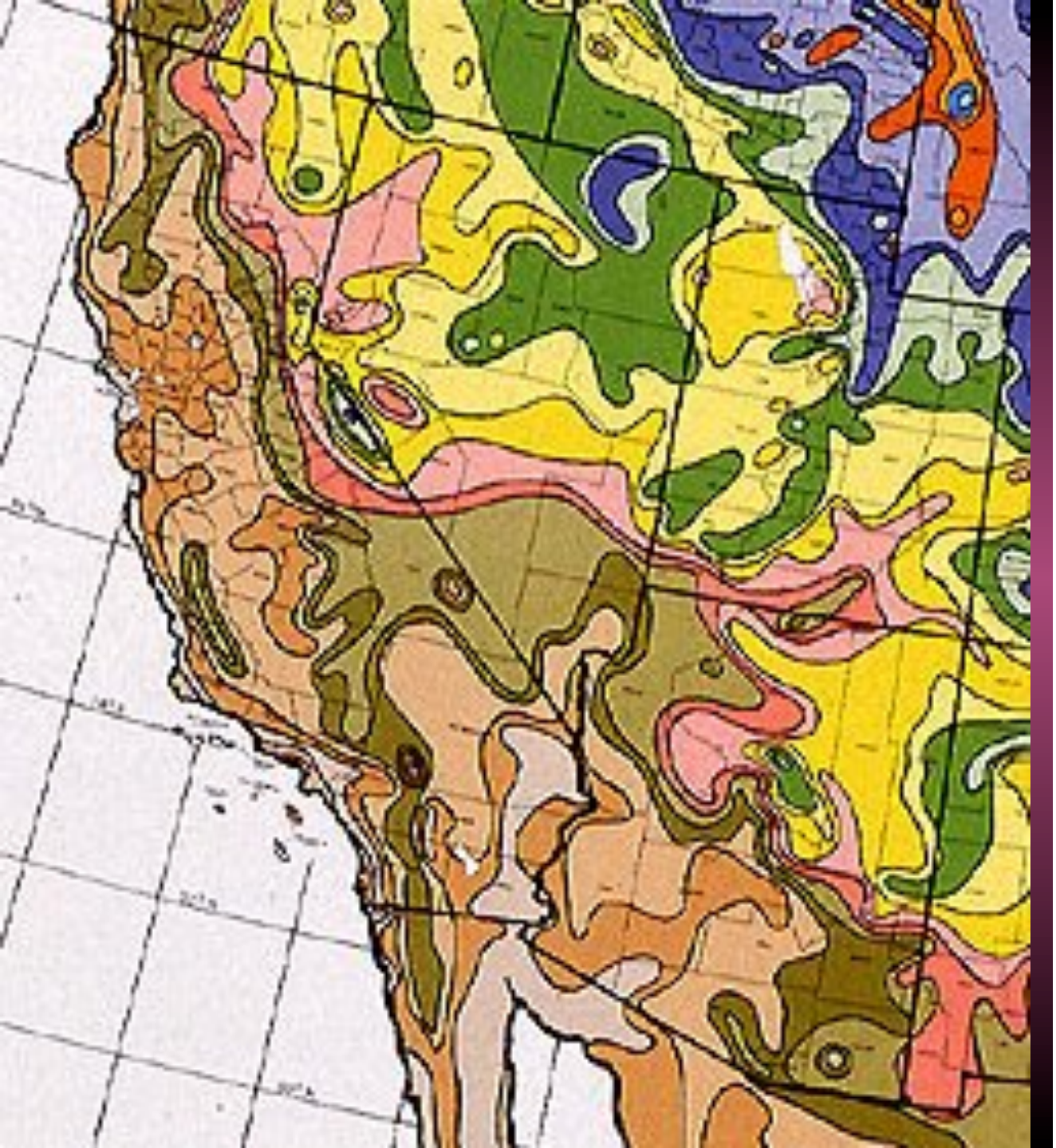
http://www.usna.usda.gov/Hardzone/ushzmap.html

Most plant books have a copy of the zone map in them

Zones 2-10 in the map have been subdivided into light- and dark-colored sections (a and b) that represent 5 F (2.8 C) differences within the 10 F (5.6 C) zone. The light color of each zone represents the colder section; the dark color, the warmer section.



Zone 11 represents areas where the average annual minimum temperature is above 40 F. The map shows 20 latitude and longitude lines. Areas above an arbitrary elevation are traditionally considered unsuitable for habitation and do not bear zone designations.



Average Annual Minimum Temperature

Temperature (F)	Zone
Below -50	1
-45 to -50	2a
-40 to -45	2b
-35 to -40	3a
-30 to -35	3b
-25 to -30	4a
-20 to -25	4b
-15 to -20	5a
-10 to -15	5b
-5 to -10	6a
0 to -5	6b
5 to 0	7a
10 to 5	7b
15 to 10	8a
20 to 15	8b
25 to 20	9a
30 to 25	9b
35 to 30	10a
40 to 35	10b
40 +	11

There are also island zones that, because of elevation differences, are warmer or cooler than the surrounding areas and are given a different zone designation.

Many large urban areas carry a warmer zone designation than the surrounding countryside. The map contains as much detail as possible, considering the vast amount of data on which it is based and its size.

Average Annual Minimum Temperature

ZONE	Temperature
1	Below -50 F
2a	-50 to -45 F
2b	-45 to -40 F
3a	-40 to -35 F
3b	-35 to -30 F
4a	-30 to -25 F
4b	-25 to -20 F
5a	-20 to -15 F
5b	-15 to -10 F
6a	-10 to -5 F
6b	- 5 to 0 F
7a	0 to 5 F
7b	5 to 10 F
8a	10 to 15 F
8b	15 to 20 F
9a	20 to 25 F
9b	25 to 30 F
10a	30 to 35 F
10b	35 to 40 F
11	Above 40 F

Frost Free Days

Zone	Last Frost Date	First Frost Date	Number of frost free days
1	June 15	July 15	30
2	May 15	August 15	90
3	May 15	September 15	120
4	May 10	September 15	125
5	April 30	October 15	165
6	April 15	October 15	180
7	April 15	October 15	180
8	March 10	November 15	245
9	February 15	December 15	265
10	January 20	December 20	335
11	Frost Free		365

Selecting Landscape Plants

The average annual frost-free days and minimum winter temperatures determine zones

Selecting Landscape Plants

Most of Utah falls within zones 4B to 5B. Zones are important when selecting plants from catalogs or nurseries

Selecting Landscape Plants

Landscape plants will grow in their zone as well as two or three zones lower. For example, if you live in zone 5, you can grow plants with 3,4 and lower numbers with little problem

Selecting Landscape Plants

Attempts at higher zone number plants require significant winter protection

Selecting Landscape Plants

Winter temperatures are not the only consideration in choosing perennials. Summer temperatures also influence plant growth and survival

Selecting Landscape Plants

A Plant Heat-Zone Map, similar to the Plant Hardiness Zone Map, divides the U.S. into 12 heat zones based on the average number of days per year above 86 degrees F

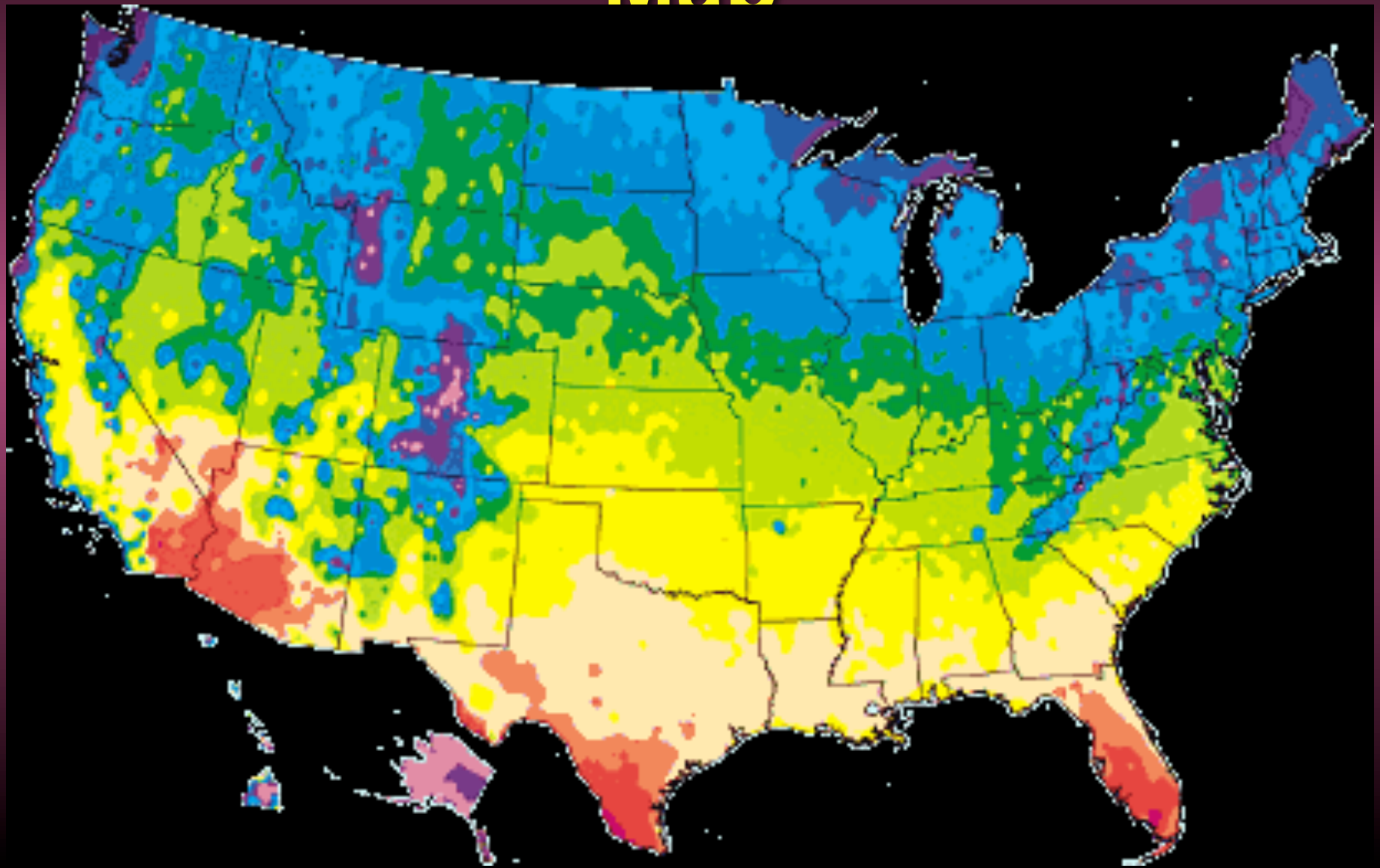
Selecting Landscape Plants

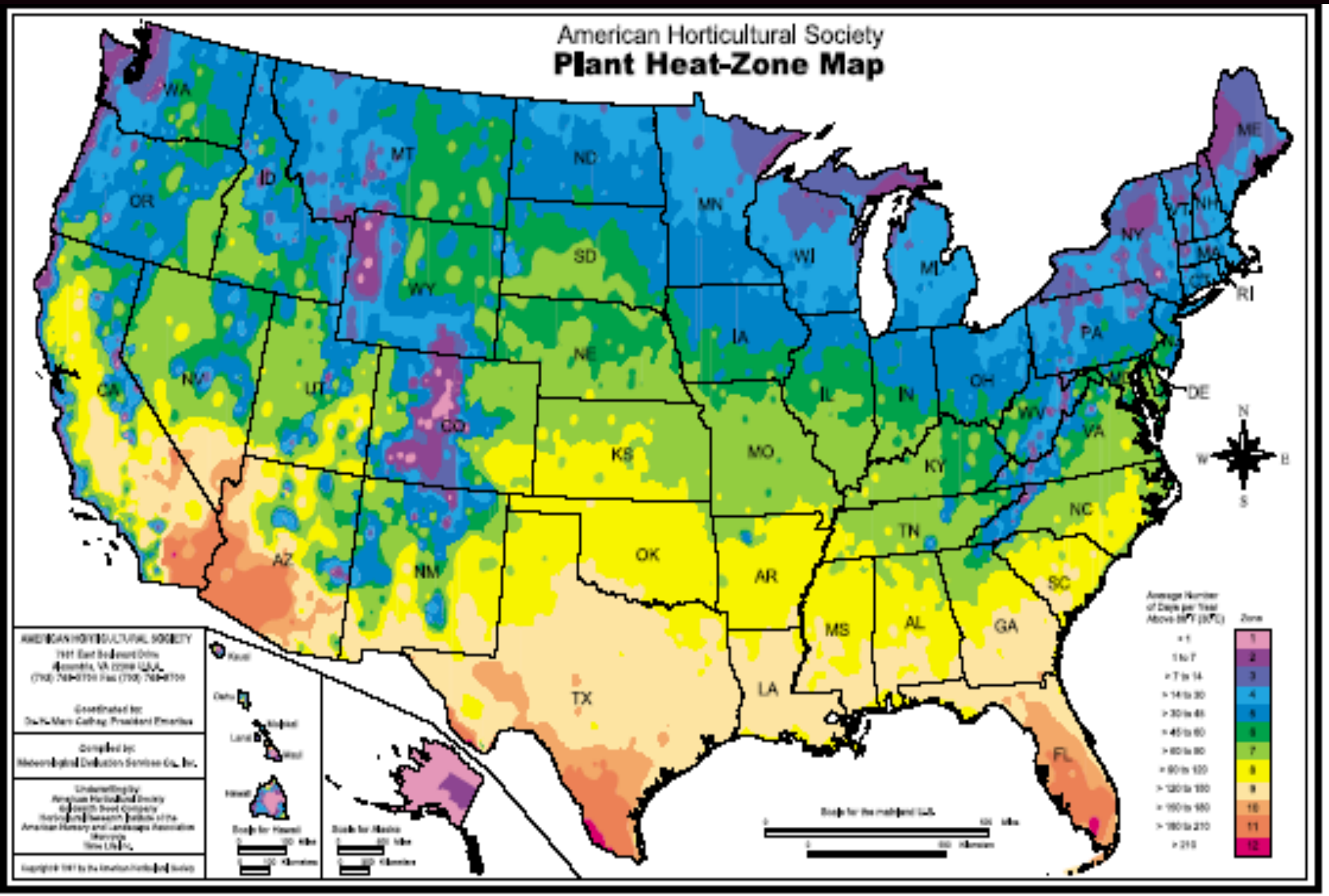
Utah is divided into four heat zones:

The map is available online at

http://www.ahs.org/publications/heat_zone_map.htm

AHS Heat Hardiness Zone Map




American Horticultural Society
Plant Heat-Zone Map
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
MD
DE
NJ
CT
RI
MA
VT
NH
ME
N
S
E
W
Average Number of Days per Year Above 86°F (30°C)
Zone
< 1
1 to 7
> 7 to 14
> 14 to 30
> 30 to 45
> 45 to 60
> 60 to 90
> 90 to 120
> 120 to 150
> 150 to 180
> 180 to 210
> 210
1
2
3
4
5
6
7
8
9
10
11
12
AMERICAN HORTICULTURAL SOCIETY
7931 East Boulevard Drive
Alexandria, VA 22308 U.S.A.
(703) 768-5700 Fax (703) 768-8700
Coordinated by:
Dr. H. Marc Cathey, President Emeritus
Compiled by:
Meteorological Evaluation Services Co., Inc.
Underwritten by:
American Horticultural Society
Burpee Seed Company
Horticultural Research Institute of the
American Nursery and Landscape Association
Sponsors
Time Life Inc.
Copyright © 1997 by the American Horticultural Society
Kauai
Oahu
Molokai
Lanai
Maui
Hawaii
Scale for Hawaii
Scale for Alaska
Scale for the mainland U.S.A.
miles
kilometers

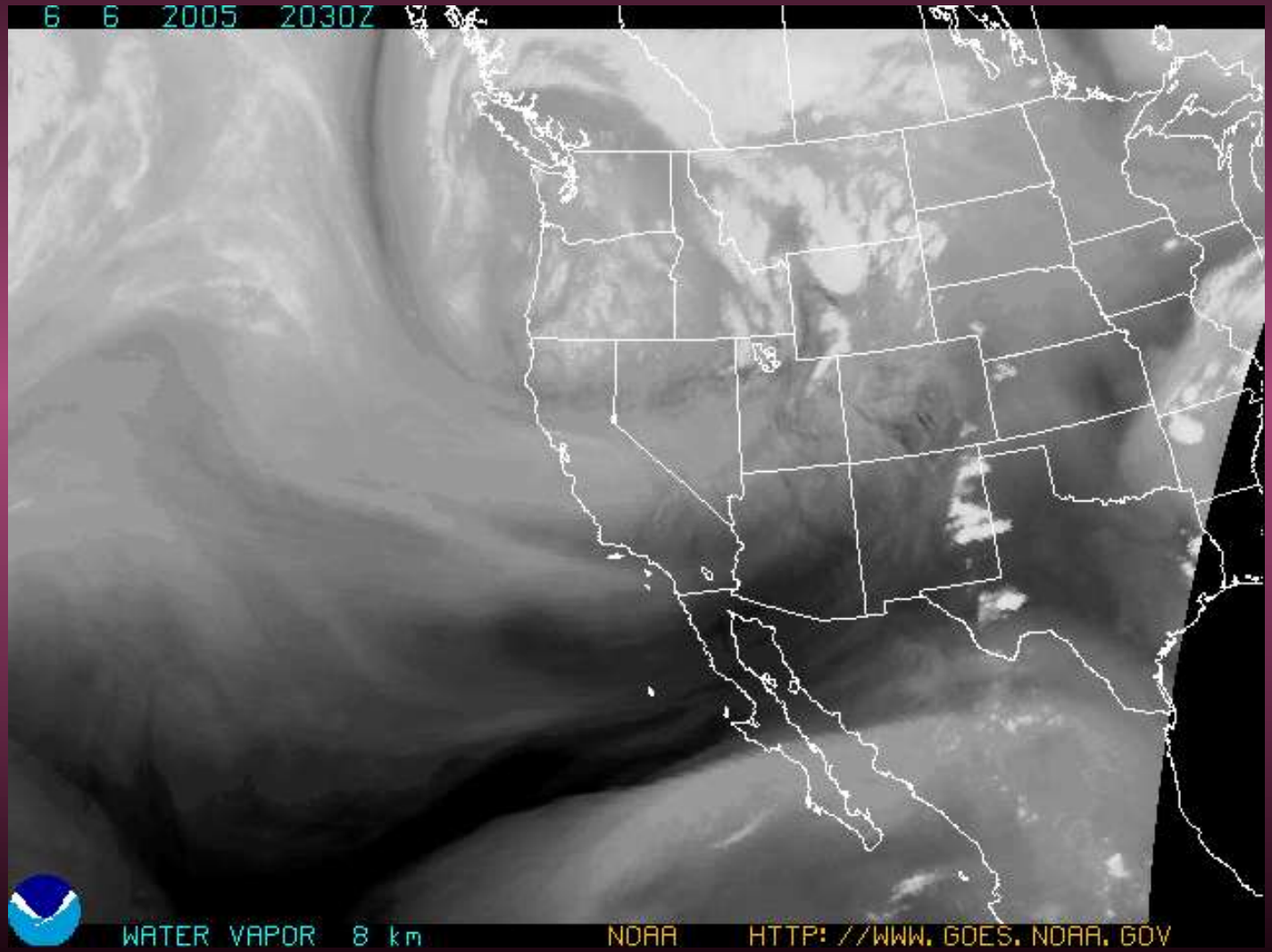

Using Microclimates

Localized Data

http://climate.usu.edu/

Freeze Dates

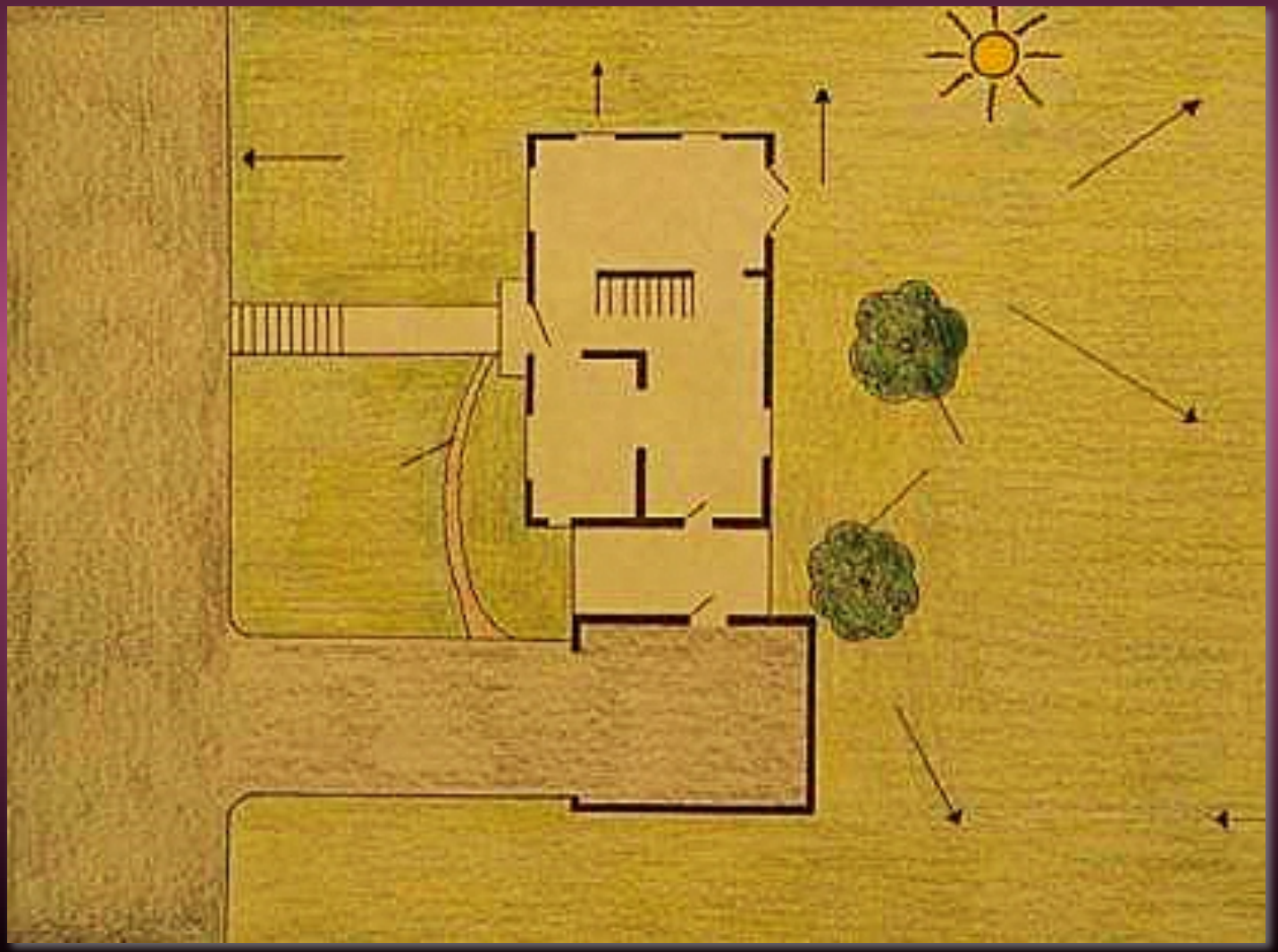
Macro Areas



Your Town

Your Neighborhood

Your Lot



Microclimates

Selecting Landscape Plants

Microclimates areas support plants that are technically planted outside of their hardiness zone

Selecting Landscape Plants

Exception to plant hardiness zone rules recognizes microclimates exist and are particular to various sites

Selecting Landscape Plants

In hardiness zone 5, there may be areas unique to a particular property that could support zone 6 or 7 plant material

Selecting Landscape Plants

Another aspect of growing landscape plants is mulch.

Selecting Landscape Plants

Soil only gets so cold so protecting the soil means protecting the plants.

Selecting Landscape Plants

Mulches are often misunderstood. They are to prevent extremes in soil temperatures.

Selecting Landscape Plants

Apply mulches after the soil freezes in the fall. They do not prevent freezing but keep the plants frozen so they do not go through frost heaving.

Selecting Landscape Plants

Look for specific microclimates that apply to the plants you select.

Selecting Landscape Plants

These areas are usually located where there is some protection during the colder parts of the year

Selecting Landscape Plants

Areas protected by buildings, fences, hedges, or other structures or land features can often be one or two planting zones different than other parts of the yard

Selecting Landscape Plants

Because these areas are so unique and individualized, they are often found only after working and observing your flowerbed for several seasons

Sun Tolerant

Shade Tolerant

Drought Tolerant

Bog Tolerant

Cold Tolerant

Cold Sensitive

Seasons

Plan before you plant to allow each plant its greatest potential

1. Saves time
2. Saves money
3. Saves heartache
4. Less is more

Plan by seasons

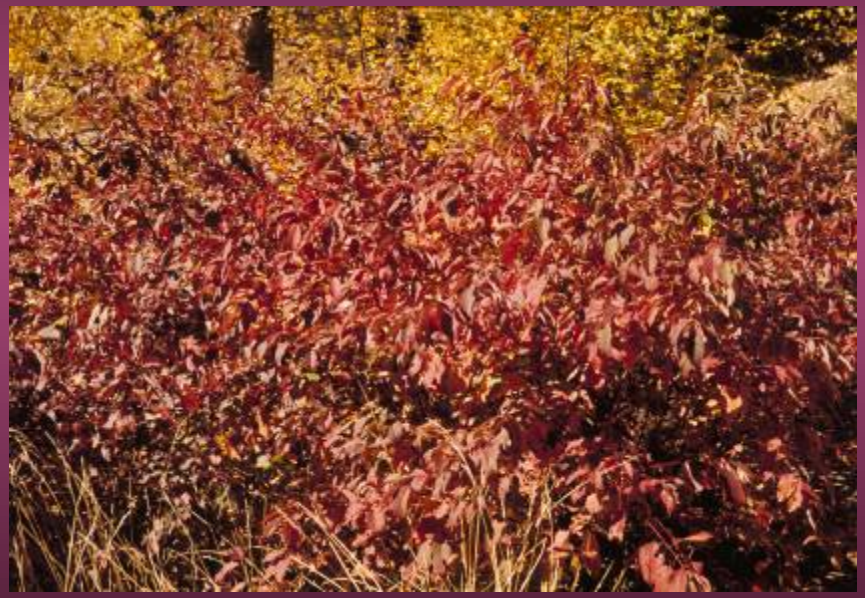
1. Spring
2. Summer
3. Autumn
4. Winter

Spring Season

Summer Season

Autumn Season

Autumn Season



Winter Season

Winter Season

Many Perennials Normally Bloom For A Short Time

Orchestrating A Long Bloom Season Takes Planning

Selecting the Best Perennials

Utah Landscape Soils

Managing Landscape Soils

Good Landscapes Are Not Natural, They are Created

They Always Start With The Right Soil

Where Are You Planting Your Landscape?

Is This My Soil?

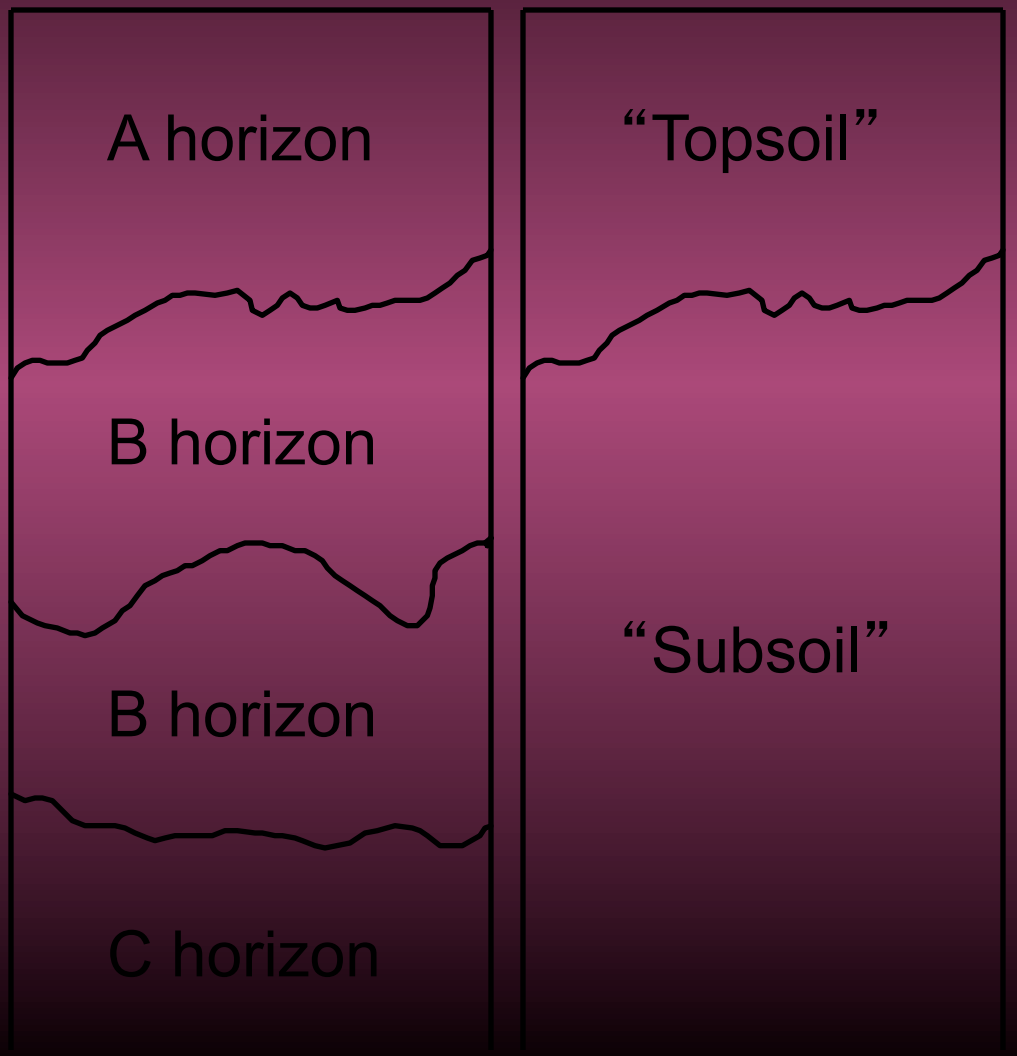
Is This My Soil?

What is topsoil?

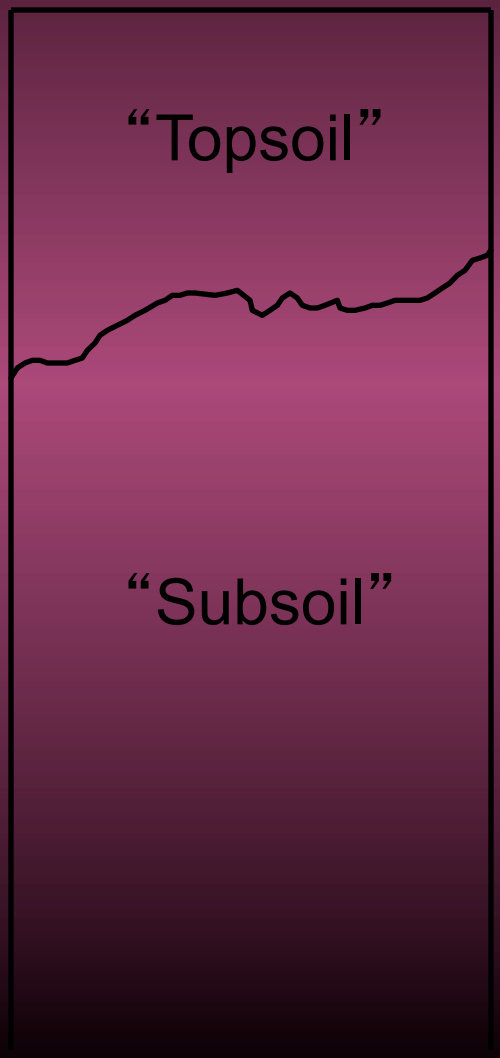
The “stuff” on top?

“I can’t describe it, but I know it when I see it”

A soil profile (Weber County)



Topsoil-subsoil characteristics



-high organic matter
-low salts
-high nutrients

-low organic matter
-high clay and/
or lime
-high salts
-high pH

Cache County forest soils

Litter layer - O horizon

A horizon (“topsoil”)

B or E horizons

Forest vs. landscape soils

Forest litter layers and mulches

Litter layers	Mulches
insulate	insulate
nutrient source	nutrient source
reduce competition	reduce weeds
water conservation	water conserv.
aeration	aeration
other?	other?

The main points:

- Topsoil is available in *limited supply*
- In most cases, subsoil is not a satisfactory replacement for true topsoil
- Seek out true topsoils for landscapes

“An ounce of prevention is worth a pound of cure”

Topsoil quality guidelines

- Key chemical and physical properties:
  - soluble salts
  - pH
  - texture
  - organic matter
  - Sodium Adsorption Ratio (SAR)


Soil Salinity

Soil salinity = soluble salts in soil

- Salts inhibit plant growth
- Salts cause “chemical drought” - equivalent to induced water stress
- Visual diagnosis: salt crusting/salt burn
- Soil test diagnosis:
  - Electrical conductivity (EC) is the measure of soil salinity.
    - EC > 2 deciSiemens/meter is a saline soil for horticulture uses
    - EC > 4 deciSiemens/meter is saline for ag.

Sources of salts

- Residual salts in new development areas
- Irrigation waters
  - natural sources?
  - water softeners?
- Deicing salts (road throw and sidewalk)
- Over-application of fertilizers and/or manures and composts

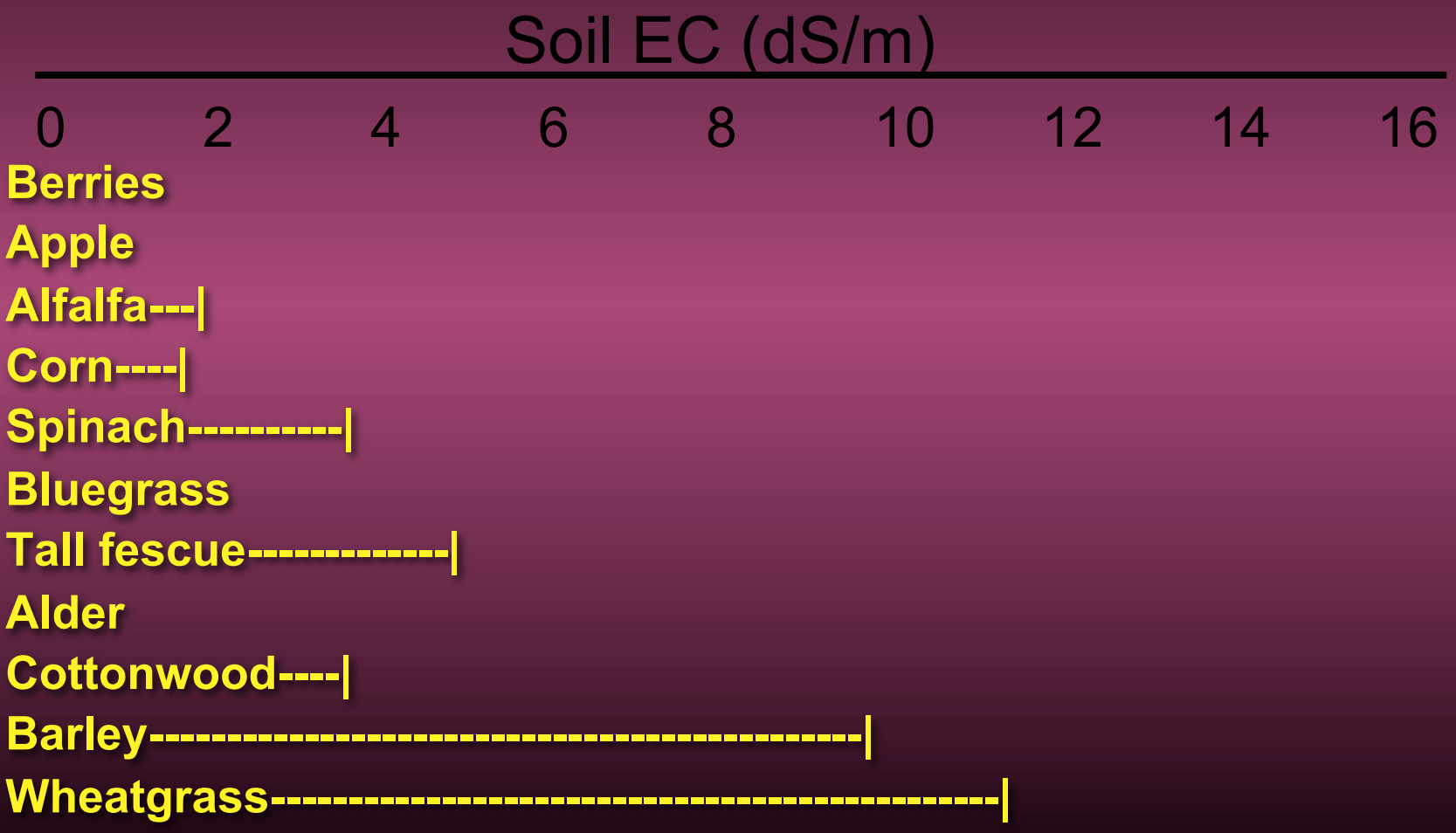
Solutions to Salt Problems

- Control the source
  - History, water, fertilizer, manure runoff, other?
- Select salt tolerant vegetation
  - Salt prone areas
  - Salt prone landscapes
- Clean up the problem
  - Remove salts by leaching with water

Soil Salts

Salt Induced Drought

Salinity and plant adaptation



Leaching Salts With Water

- Ensure that soil has good internal drainage. Water must move through the soil to carry salts out
  - Add organic matter
  - Deep tillage/ripping
- Apply water over 1-2 days
  - 6 inches of water to cut EC by 50%
  - 12 inches of water to cut EC by 80%
  - 24 inches of water to cut EC by 90%

Soluble Salts

- Electrical conductivity of the solution extracted from soil
- Guidelines:
  - Ideal: < 2 dS/m or mmho/cm
  - Acceptable: < 4 dS/m or mmho/cm
  - Unacceptable: > 4 dS/m or mmho/cm

Tree Tolerance to Soil Salinity

- ?
- Very few studies on tolerance to soil salinity
- Most studies on tolerance to salinity on foliage (salt spray)
- “Ideal: topsoils are okay for most trees

Treatment of salinity problem

- Select tolerant species and varieties

Treatment of salinity problem

- Increase drainage through soil

Treatment of salinity problem

- Leach soil with clean water to wash salts lower into profile, or out of profile

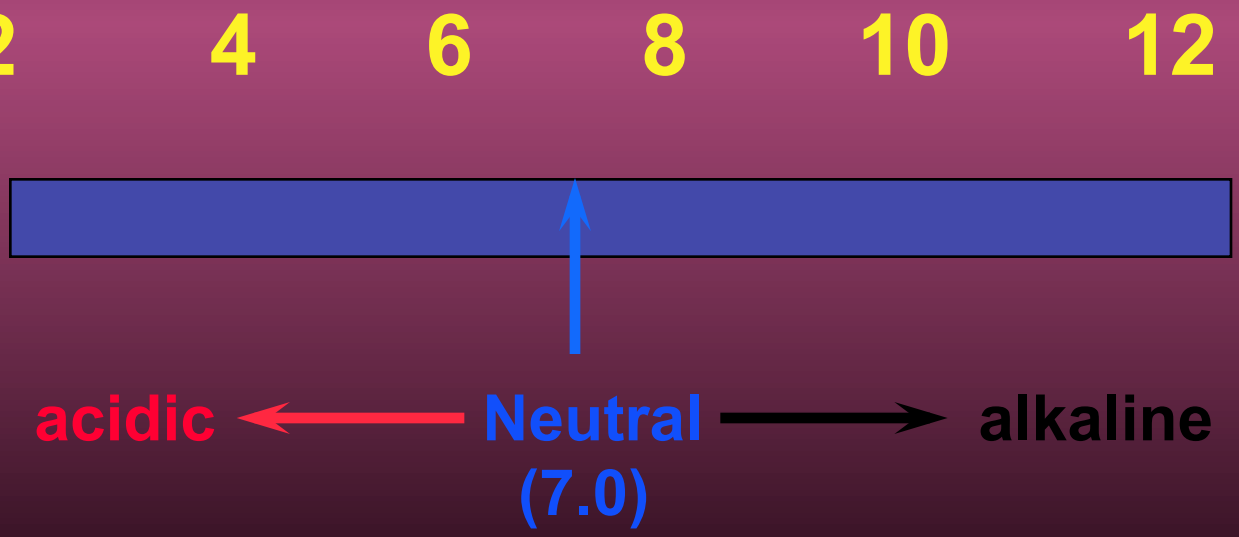
Salt Damage

Salt Damage

Soil pH

Soil pH

- Soil pH: the degree of acidity or alkalinity of soil
- The pH scale:



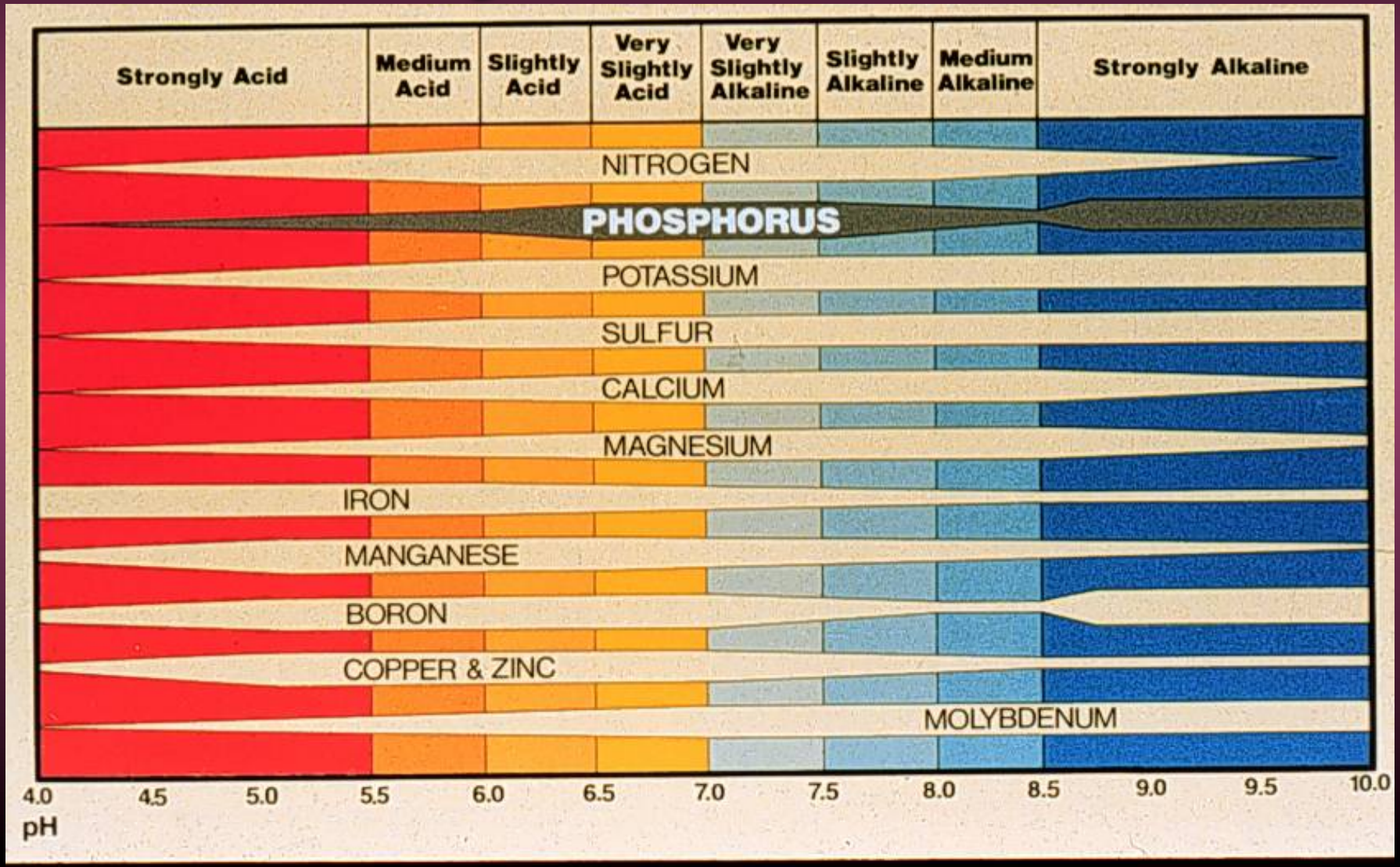
pH (alkalinity)

- The degree of acidity or alkalinity (basic nature) of soil
- Guidelines:
  - Ideal: between 5.5 and 7.5
  - Acceptable: between 5.0 and 8.2
  - Unacceptable: below 5.0 or above 8.2

Acidic Loving Azaleas, Rhododendron, Magnolias

Alkaline Loving Juniper, Russian Olive, Salt Cedar And Halogeton

Soil pH and nutrient availability



Treatment of high pH problem

- Select tolerant species and varieties
- Try amending soil with acidic organic matter or elemental sulfur
- Good luck

No Practical Way to Change Soil Once Landscape Trees are Planted

Major pH problem: iron chlorosis

Manganese Deficiency

Zinc Deficiency

Soil texture

Soil texture

- The percentage (by weight) of sand-, silt-, and clay-sized particles in soil
- Guidelines:
  - Acceptable percentages:
    - less than 30% clay, and
    - less than 70% sand, and
    - less than 70% silt

Soil texture classes

- Class guidelines:
  - Ideal: loam, silt loam
  - Acceptable: sandy clay loam, sandy loam, clay loam and silty clay loam
  - Unacceptable: clay, sandy clay, silty clay, silt, sand, loamy sand

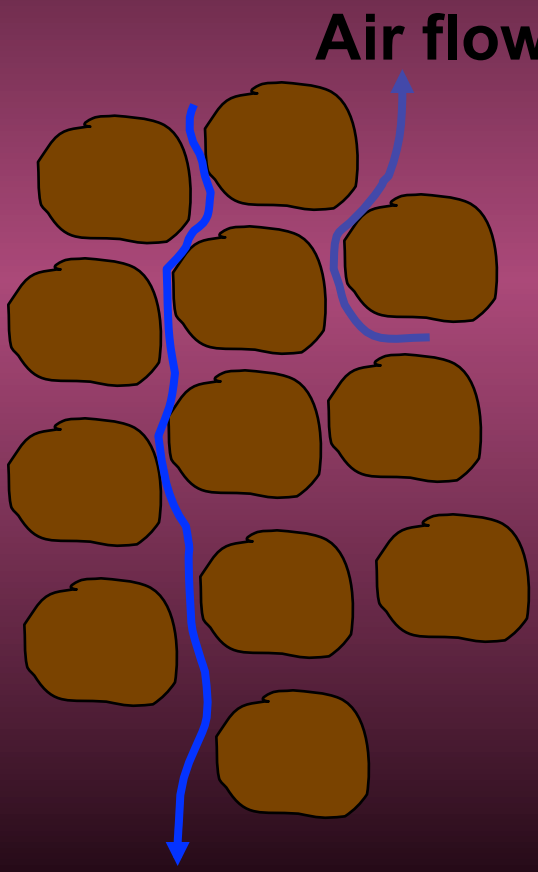
Soil texture

- The relative proportion (percent) of sand, silt and clay in soil
- Refers to individual or primary soil particles left after structure is removed

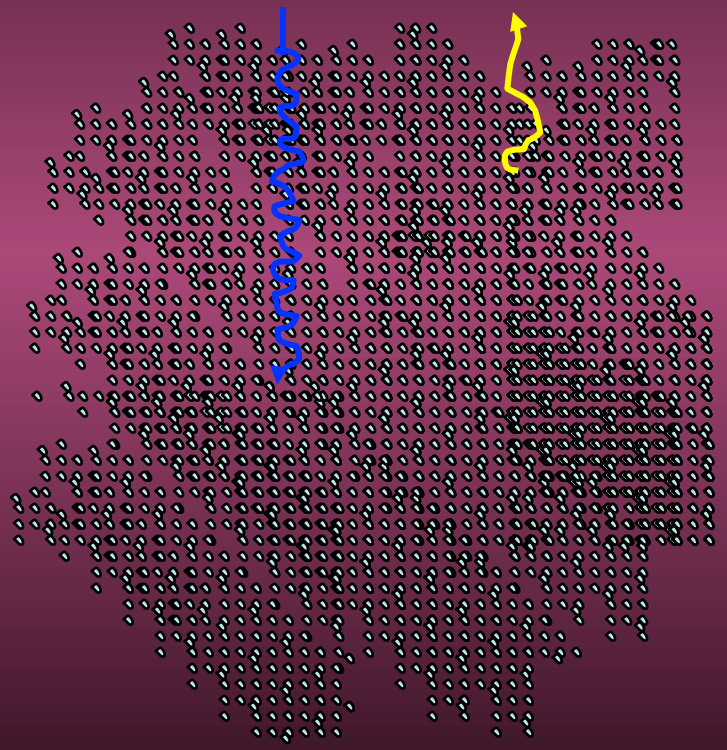
The mineral particles: sand, silt, and clay

The effect of particle size

Sand particles

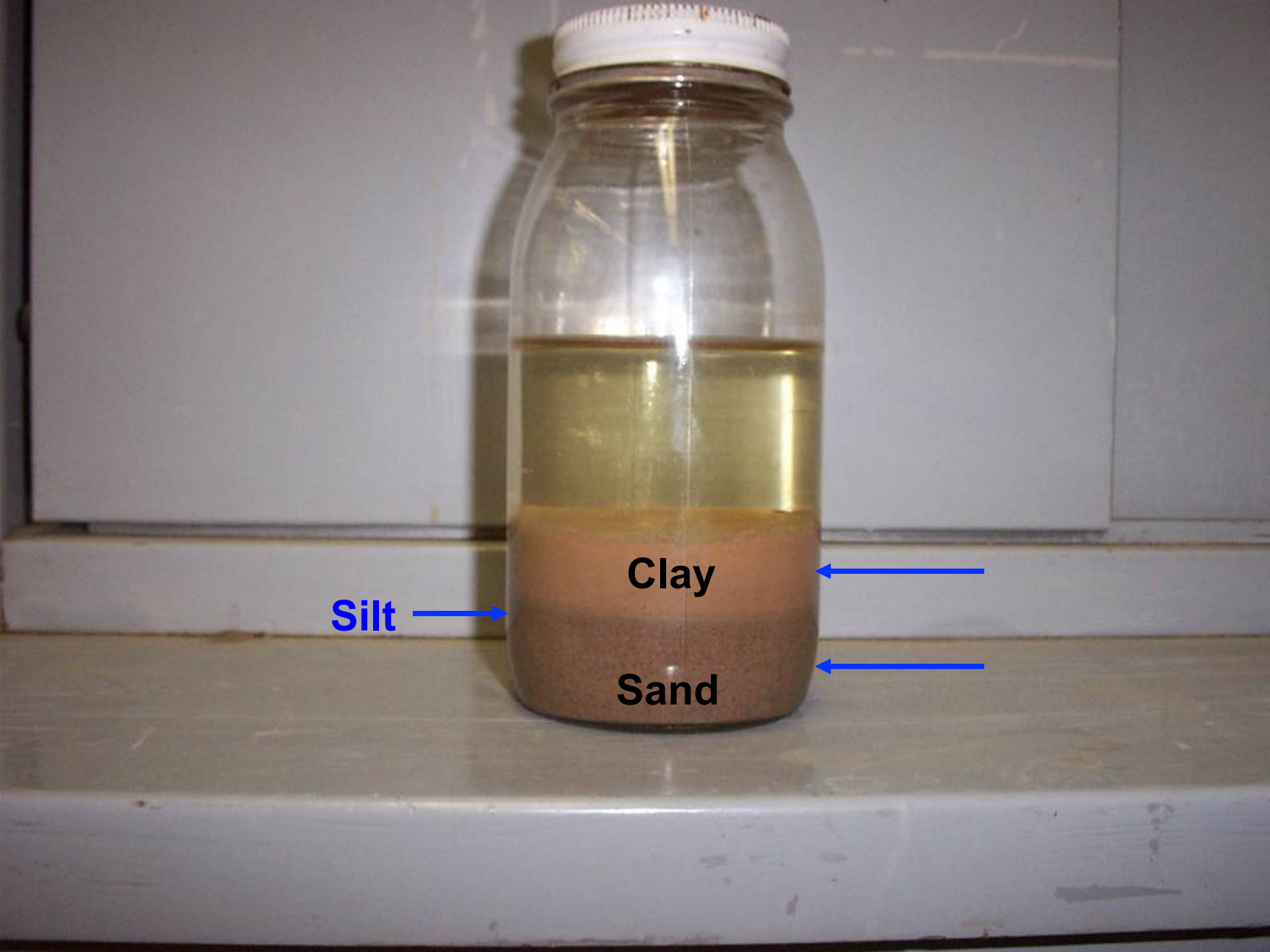


Clay particles



Determining soil texture

- By feel
- Soil test
- Using the jar method
  - Fill a 1 quart jar ¼ full of soil
  - Fill the jar up to ¾ full of water
  - Shake very well to suspend soil
  - Place on a flat surface and allow soil to settle


Clay
Silt
Sand

Qualitative indicators of topsoil quality

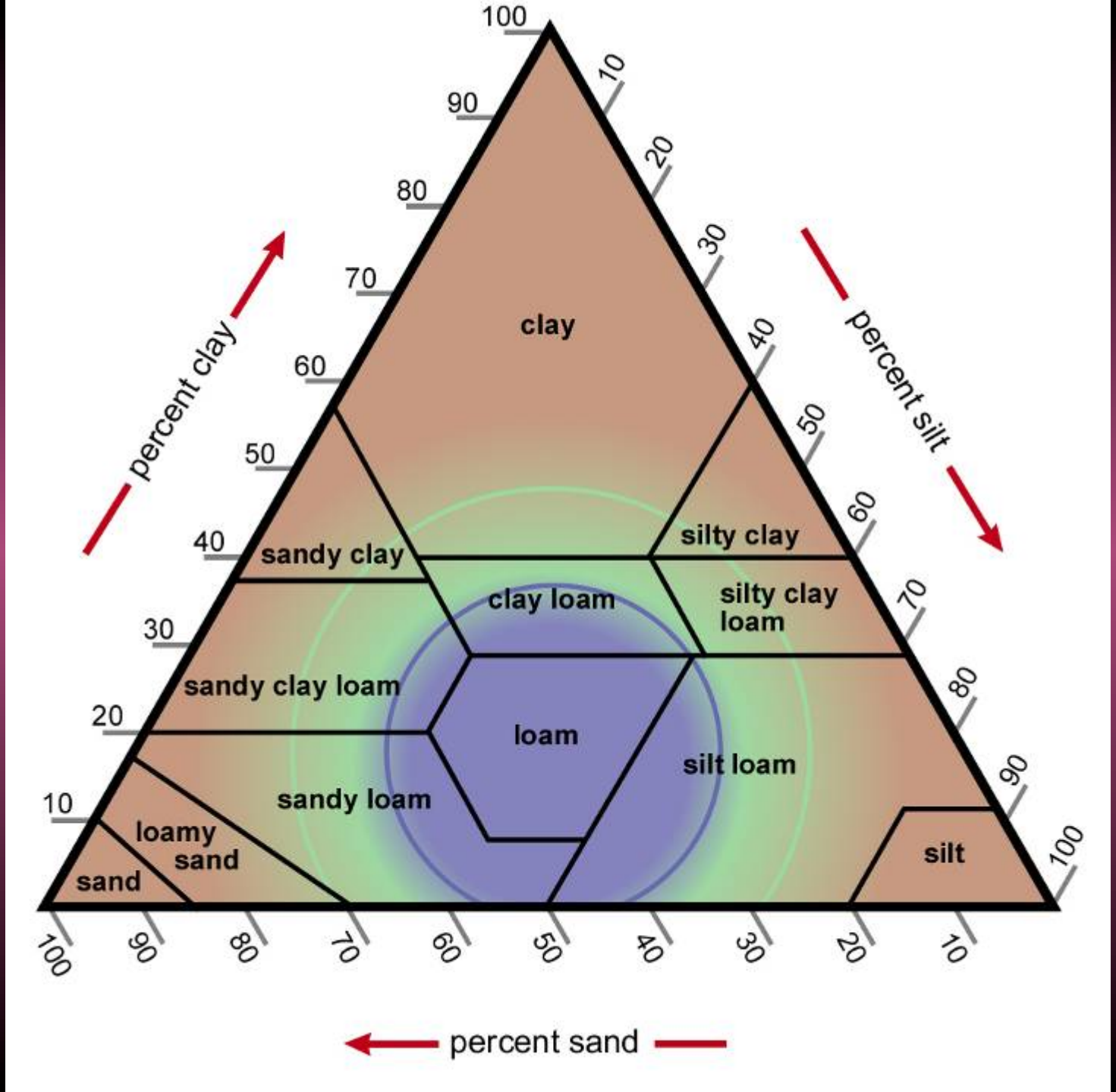
- Visual appearance
- Feel when wet and dry

Visual appearance

- Do you see salt crystals on the surface?
  - high salinity problem
- Is soil white or light in color?
  - low organic matter
  - high lime
  - high salt

Feel

- Wet:
  - sticky? too much clay
  - gritty? too much sand
  - generally, does it feel right?
- Dry:
  - too hard to crush? low organic matter or high clay


100
90
80
70
60
50
40
30
20
10
percent clay
percent silt
percent sand
clay
sandy clay
silty clay
clay loam
silty clay loam
sandy clay loam
loam
silt loam
sandy loam
loamy sand
sand
silt

Treatment of texture problem

- Select species tolerant of:
  - drought if soil is coarse (“sandy”)
  - poor drainage if soil is fine (“clayey” or “silty”
- Few treatments for wrong soil texture
  - add large quantities of organic matter

Organic Matter

Organic matter

- The percent organic matter in a soil (by weight)
- Guidelines:
  - Ideal: greater than or equal to 2%
  - Acceptable: greater than or equal to 0.5%
  - Unacceptable: less than 0.5%

The effect of organic matter

Silty clay texture class

0% organic matter

5% organic matter

Correcting low organic matter

- Add high quality organic matter
  - composts
  - sawdust
  - wood chips
  - bark
  - rice hulls
  - grain straw

The Best Amendment for Trees is What They Drop

Soil Depth

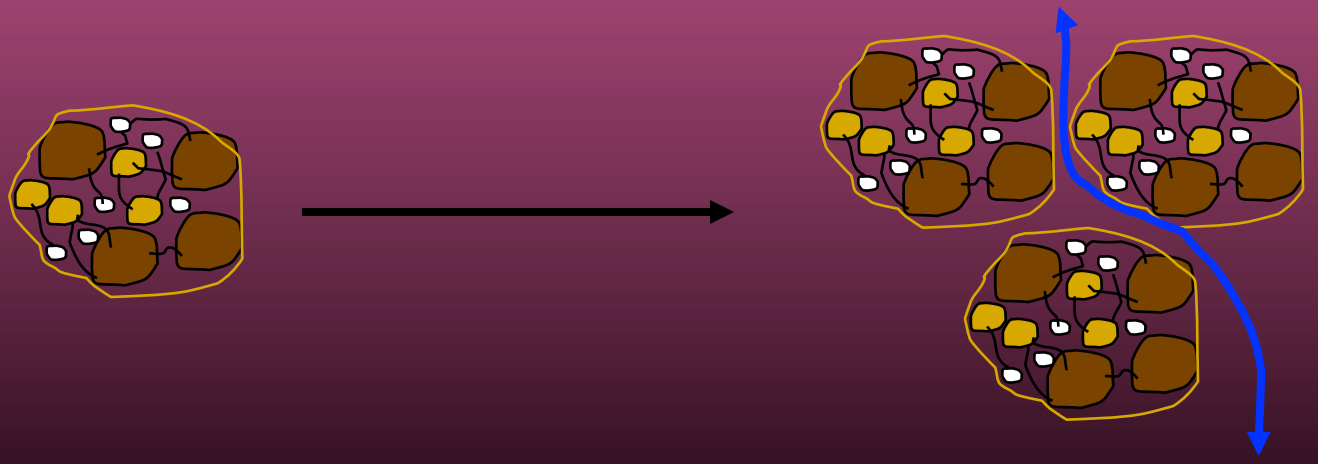
Oregon forest soil profiles

Soil Structure

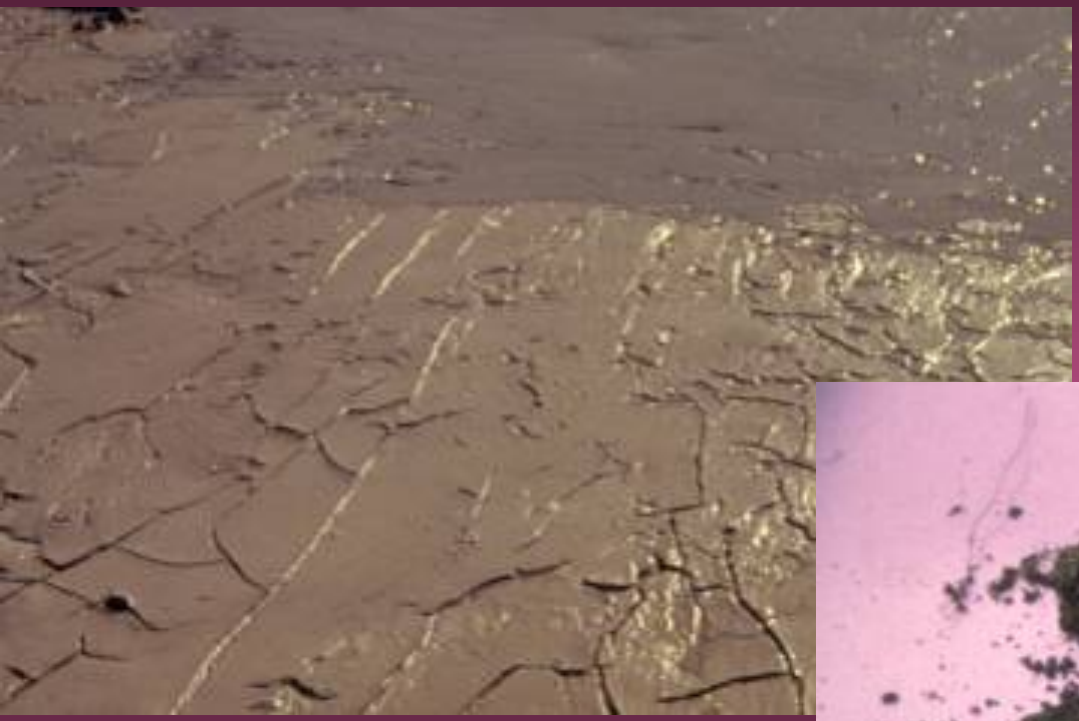
Soil Structure is One of the Few Aspects of Your Soil Condition You Can Change

Soil structure

- The combination of sand, silt and clay (with organic matter) into secondary particles called *aggregates*



Structured or not?



Amending soils with organic matter

- improves drainage of high clay soils
- improves sandy soil water-holding capacity
- reduces compaction
- provides nutrients to plants
- improves soil “tilth” (ease of tillage, working with a soil)
- lowers soil pH

How much should I add?

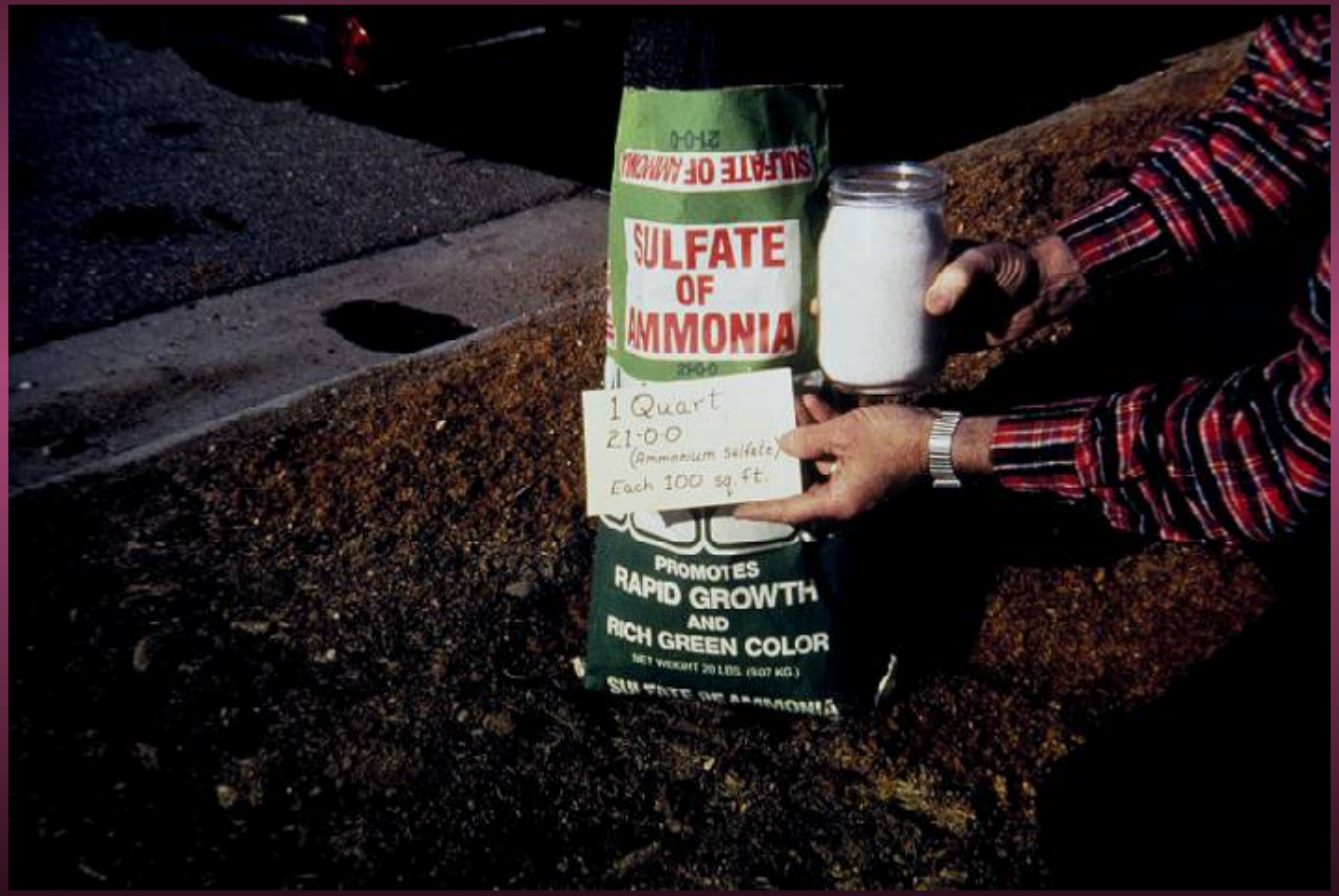
- How much is already there?
  - Native Utah soils ~ 0.25 to 2.0%
  - Ideal soils 5-10%
- Are you satisfied with the current condition of your soil?
- Don't Learn to live with it!
- Add organic matter to maintain soil conditions

Ways to add/preserve organic matter

- Grow plants
  - plants put organic matter back into soil with roots and leaf litter
- Mulch around trees - organisms will incorporate the organic matter for you
- Add extra organic matter to the entire area, not just the planting hole

Sources of organic matter

- Wood residues
  - chips/sawdust/bark materials persist but need extra nitrogen to prevent tie-up (1 lb of nitrogen per 100 lbs of material)


SULFATE OF AMMONIA
21-0-0
SULFATE
OF
AMMONIA
21-0-0
1 Quart
21-0-0
(Ammonium Sulfate)
Each 100 sq. ft.
PROMOTES
RAPID GROWTH
AND
RICH GREEN COLOR

Sources of organic matter

- Grass or leafy green residues
  - can't go wrong with these

Sources of organic matter

- Composts and animal manure
  - good sources of organic matter and nutrients
  - watch for salts and weed seeds
  - Biosolids

Add Leaves

How much OM should I add

- Single application
  - 1 (one) inch per year for normal applications in annual areas
  - 2-3 inches of low salt material if you are in dire need of organic matter (a new site needs significant improvement)
- 1 inch of material = 3 cubic yards spread over a 1000 square foot area

Soil Compaction Impacts

Compaction Problems for Landscapes

Compaction Problems

- Causes of soil compaction
- The impact on landscapes
- The root of the problem
- Prevention
- Treatment

Causes of soil compaction

Causes of compaction

- Soil Compression by:
  - vehicle traffic
  - foot traffic
  - water (sprinklers)
- Passive vibration forces (street, mass transit traffic, construction equipment)

The Impact on Landscapes

The impact on Landscapes

- Vegetation declines
  - Visual impacts
  - Economic impacts
- Water runoff and erosion - urban nonpoint source pollution

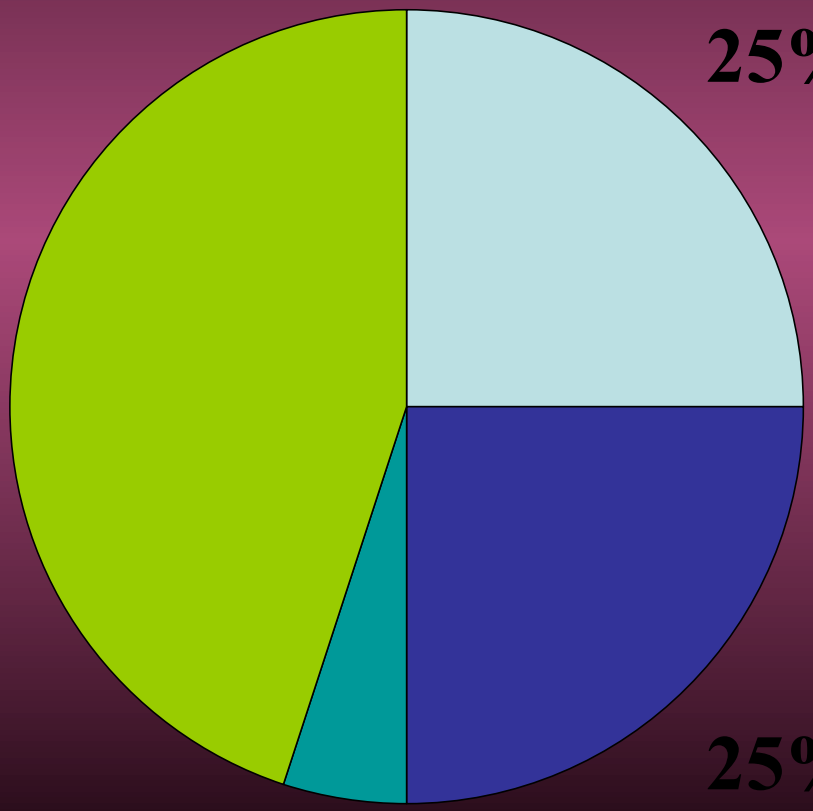
Common problem in high use areas and most home landscapes

The root of the problem

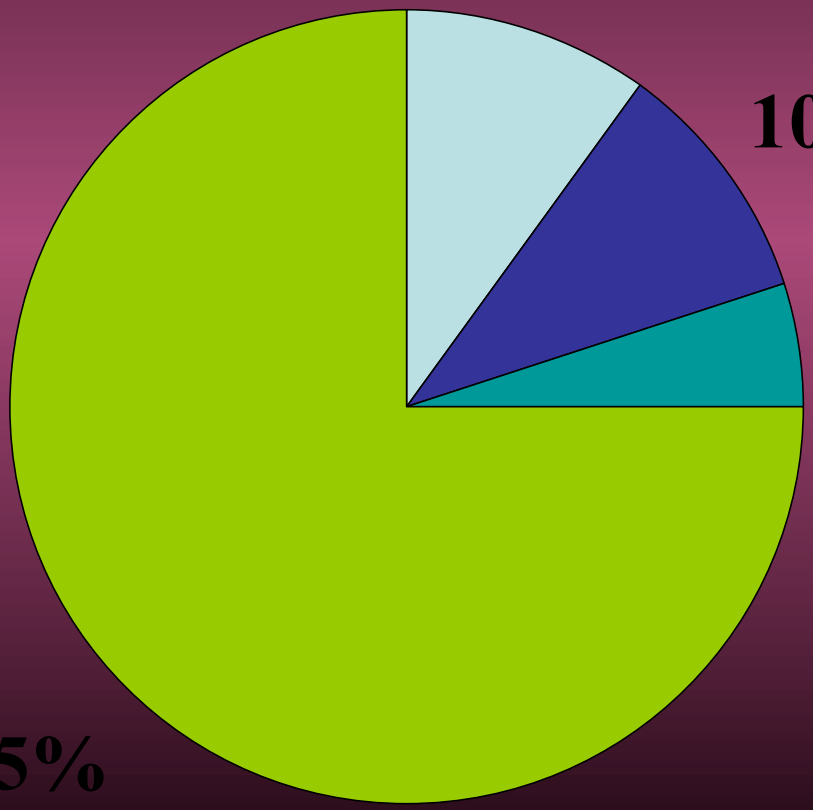
The root of the problem

- Reduced aeration
  - plant smothered by lack of oxygen to the roots
- Reduced water-holding capacity of soils
  - water stress
- Physical impedance to root growth

The ideal soil (% by volume)



The compacted soil



How much is too much?

- Plant growth is severely restricted when air space <10% of total soil volume
  - highly compacted soil
  - over watered, moderately compacted soil

Prevention

Preventing compaction

- Restricting traffic
  - Fencing
  - Sidewalks
  - Shrubs
  - Walls

Preventing compaction

- Treatments
  - Grates
  - Brick
  - Stay out of Planting Areas

Preventing compaction

- Compaction-resistant soils
  - sandy materials - sandy loam/loamy sand textures, fine sands resist compaction
  - high organic matter induces the formation of soil structure

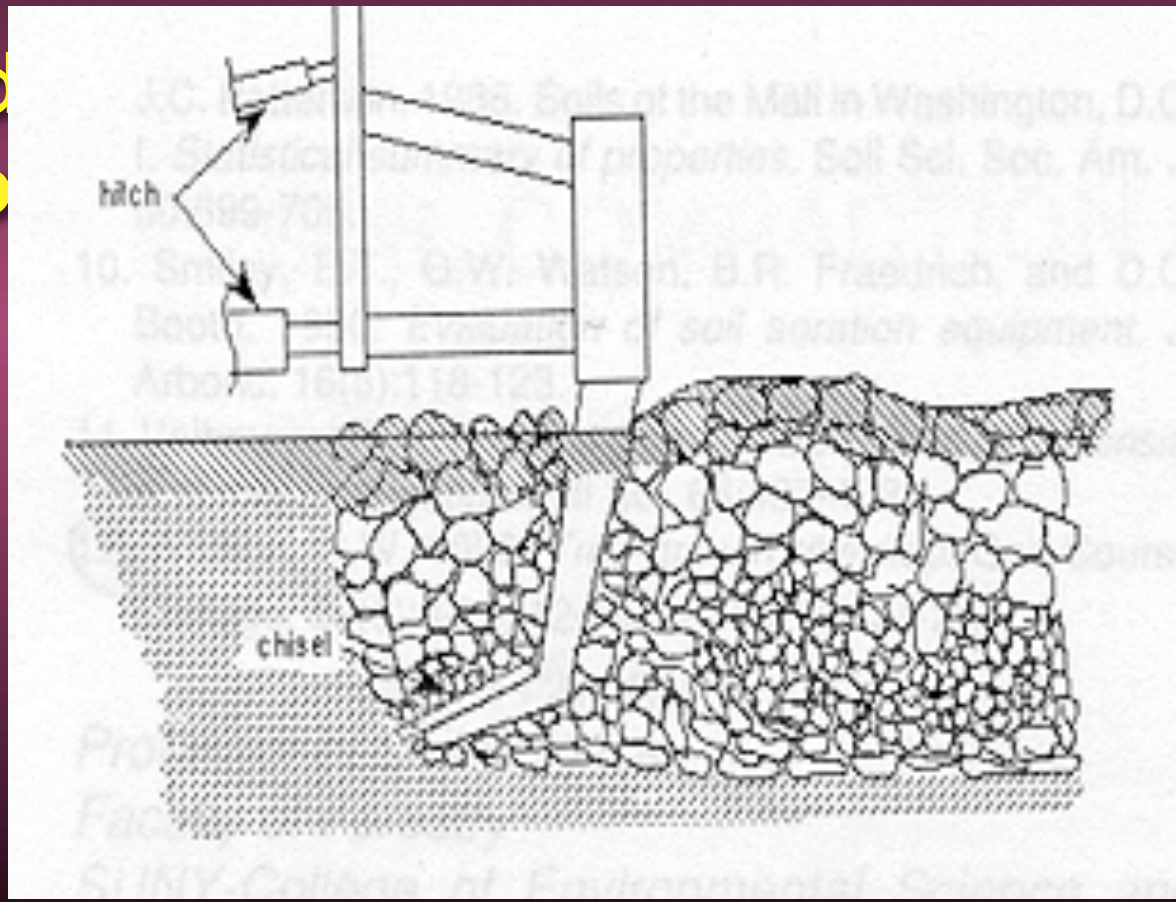
Treating compaction

Treating compaction

- Dynamite? - early 1940s technique
- Add organic matter
- Ripping - deep compaction
- Roto-tilling - shallow compaction
- Aeration/aerating - shallow compaction
  - hollow tine implements are best

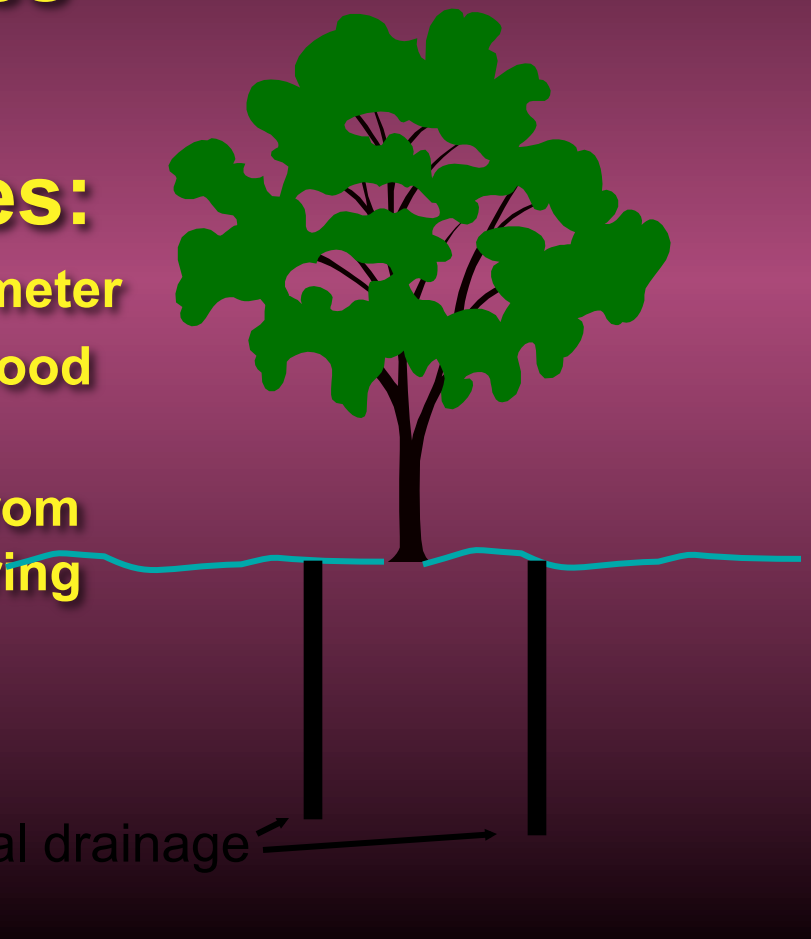
Deep ripping or subsoiling

- Recommended for construction sites before establishing landscape



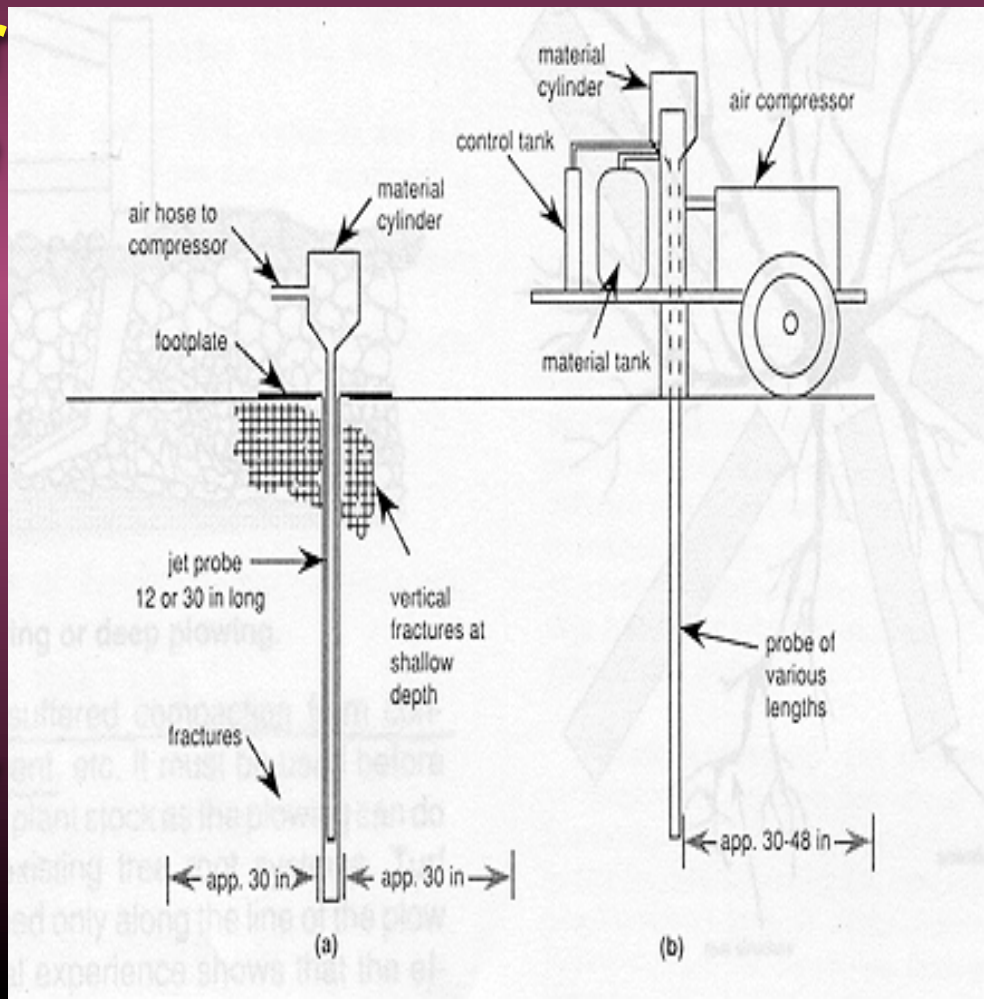
Mulching

- Surface mulch for trees and trails
- Vertical mulch for trees:
  - Vertical holes 3-4 inches in diameter
  - Backfill with coarse gravel or wood chips
  - Provides outlet for water flow from root zone; improves deep watering and aeration



Jetting

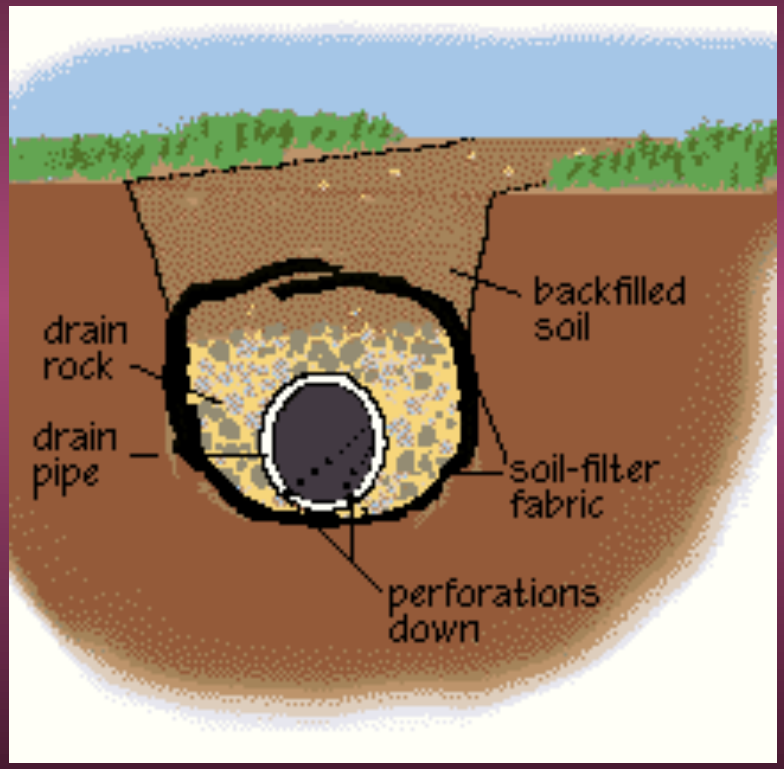
- Injecting water or air under high pressure to fracture soil
  - Hydrojet injects water
  - Terrajet injects air
- Mixed results with these units, but may be only option for deep compaction



Soil drainage

Poor drainage problem

- Add organic matter
- Consider installing a subsurface drainage system (tile drain)
- Consider drainage ditches
- Compaction?
- Consider raised beds
- Precise water management



Poor Drainage = Dead Plants

Poor Drainage = Dead Plants

Poor Drainage = Dead Plants

Excessive drainage problem

- Very sandy or rocky soil
- Add extra organic matter
- Precise water management

Precise water management

Tree on left not irrigated, tree on right adequate irrigation for 7 years

The “Average” Utah Soil

Soil trends and variation in Utah

Let's begin with a quote

- There is more soil variability along a mile transect in Utah than there is across the entire state of Iowa

  -(paraphrased) author unknown

Utah soils are variable

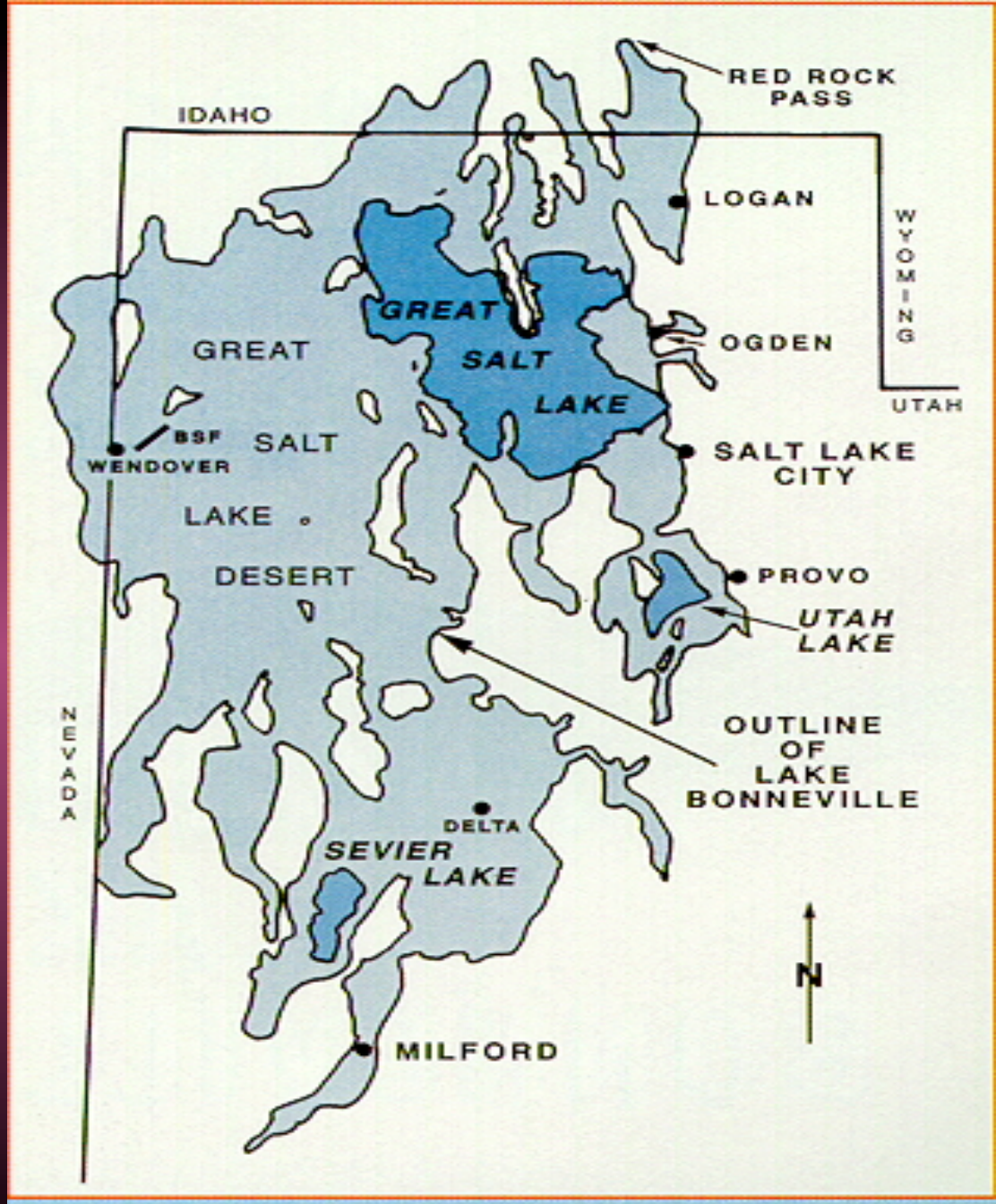
- Texture
- pH
- Salinity (soluble salt levels)
- Organic matter contents
- Nutrient levels
- Other – structure/compaction, foreign materials…

Why is there so much variability?

- History, geology, and geomorphology
  - Ancient Lake Bonneville
  - Complex geologic features (mountains, basins…)
- Climate
  - Arid climate = lack of vegetation (low organic matter levels) and low leaching (salt accumulations)

Ancient Lake Bonneville

- Existed 32,000 to 14,000 years ago
- Covered 20,000 square miles of Utah, NV, ID



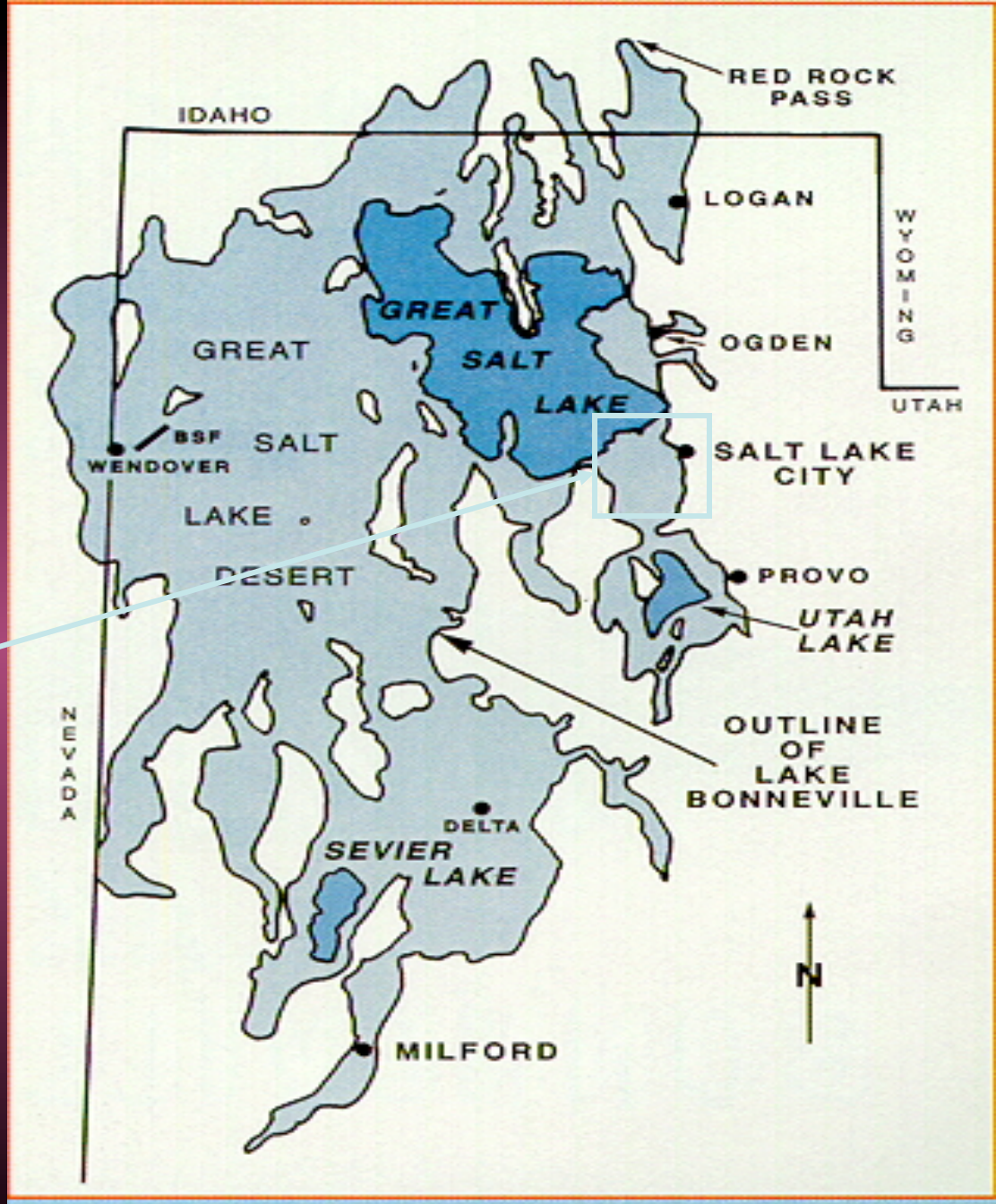
Outline of ancient Lake Bonneville and associated modern features. (BSF = Bonneville Salt Flats).

Lake Bonneville influence

- Lacustrine (lake) sediments are typically fine textured soils high in silt and clay
- Fine-textured soils cover the majority of the areas covered by Lake Bonneville
- Coarse-textured soils are found in stream/river outwash plains and at the foot of mountain slopes (bench areas) where coarse materials were

Recall Lake Bonneville

- Focus on Davis County
- USDA Soil Survey map



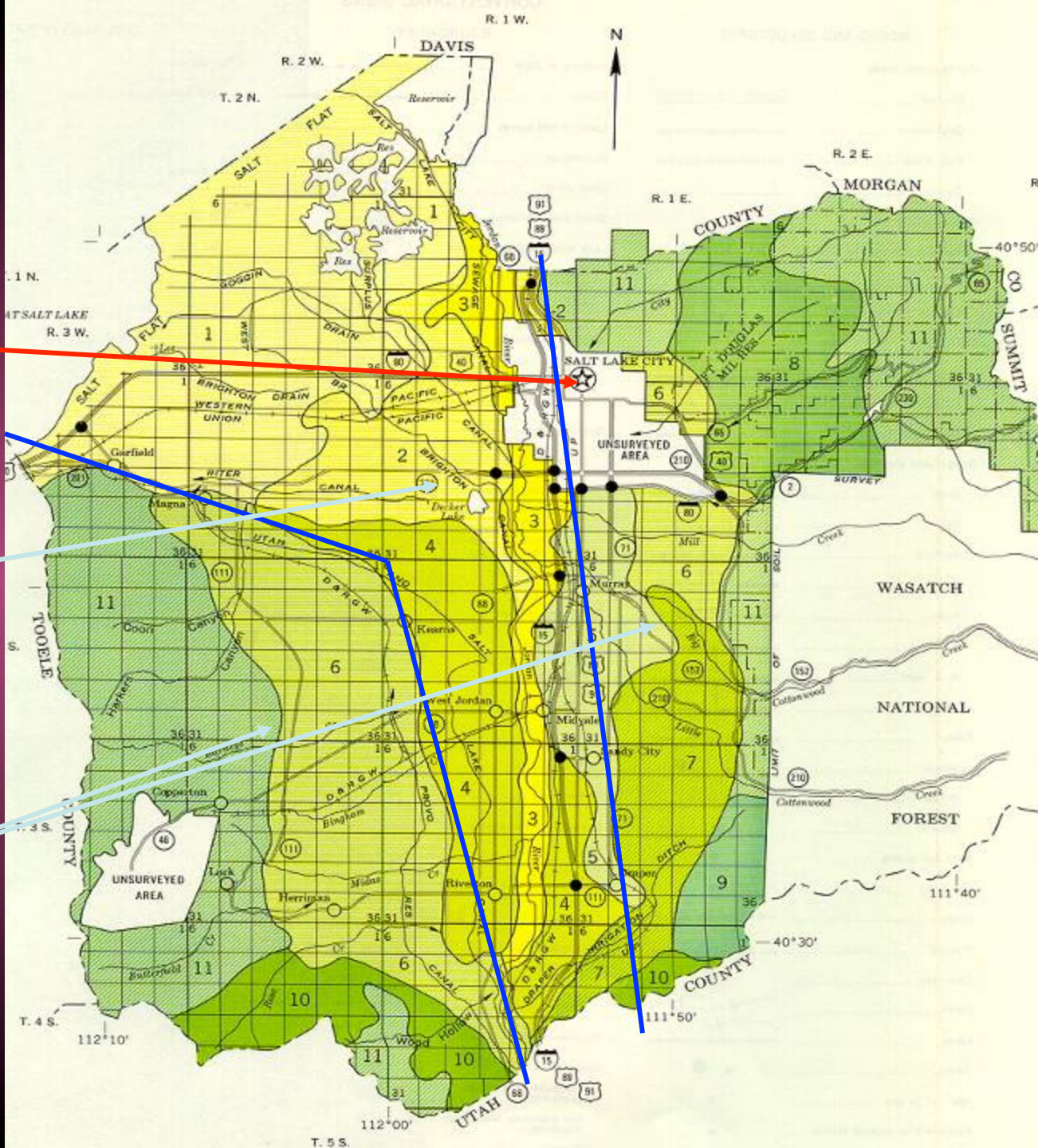
Outline of ancient Lake Bonneville and associated modern features. (BSF = Bonneville Salt Flats).

Salt Lake County Soil Survey

Salt Lake City

Poorly drained (fine-textured) soils

Well-drained (coarse-textured) soils



The influence of an arid climate

- Thousands of years of low rainfall means:
  - low native plant growth (low soil organic matter levels)
  - inadequate leaching of soluble salts (saline soils)
  - lime accumulation (calcareous soils)
  - alkaline (high pH soils)
  - sodic (sodium-dominated soils)

Summary: Utah soils today

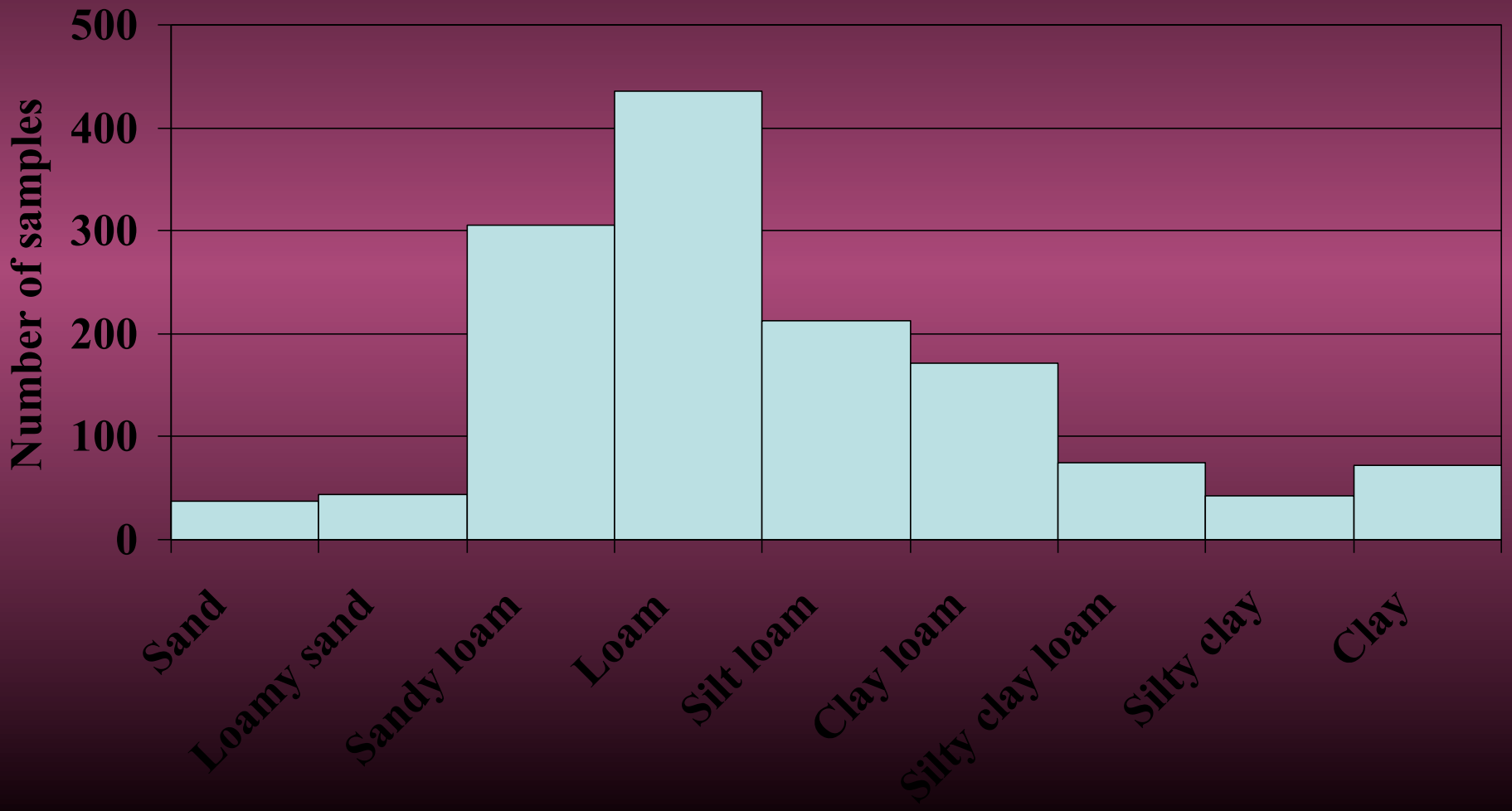
- The product of a long history of soil genesis
- Complex landforms and geology = complex soil patterns
- Some soils still influenced by Great Salt Lake and other saline water sources (water tables, etc.)
- Difficult to generalize about Utah soils

Trends in Utah Soils

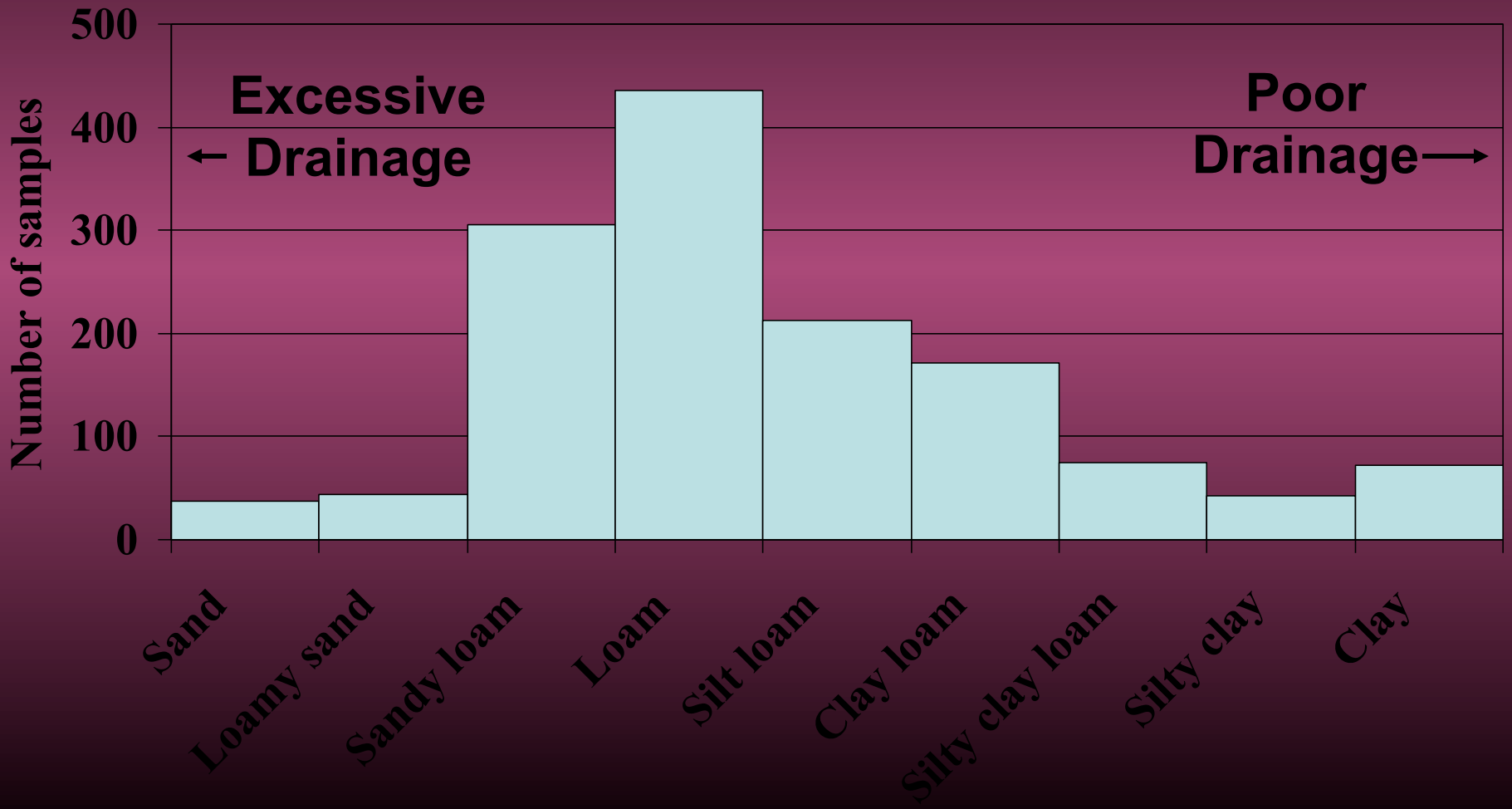
Utah State University data

- Analytical Laboratory data from 1999 (Dr. Jan Kotuby-Amacher)
- Taken from 1697 samples submitted to the lab
- “Frequency distribution” plots for texture, salinity, and pH (as examples) – parameters that are difficult to change

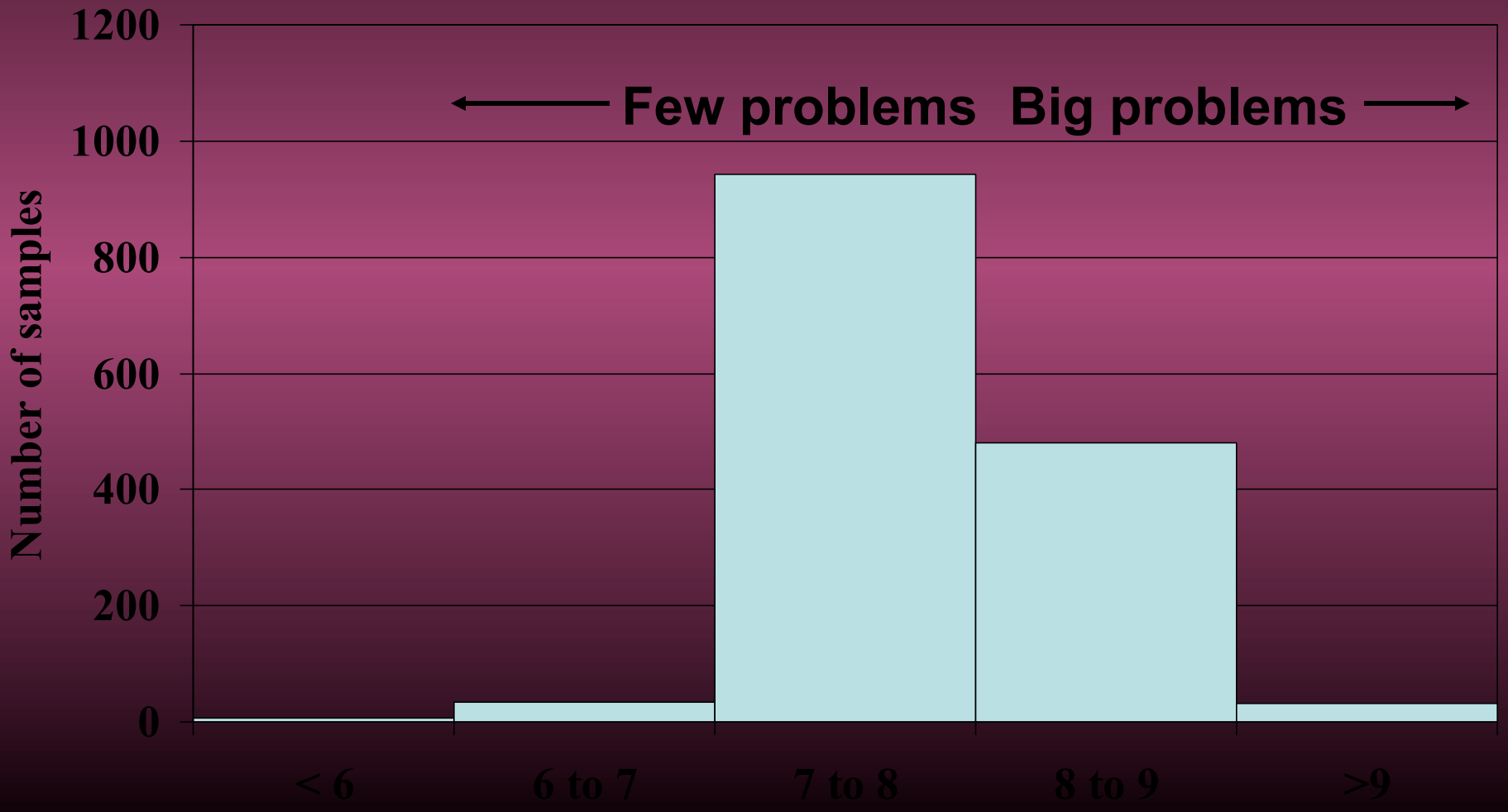
A frequency distribution



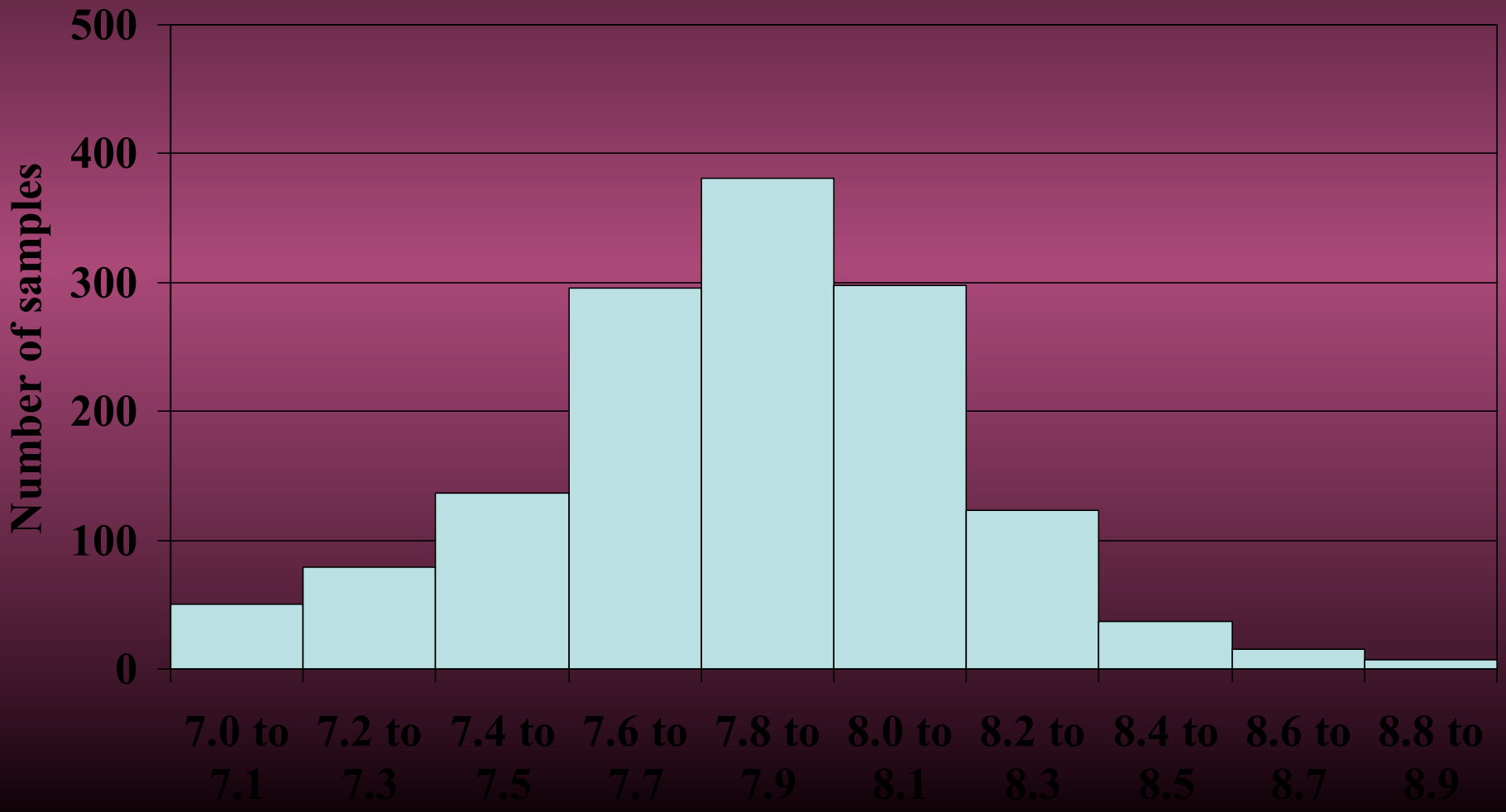
Soil texture



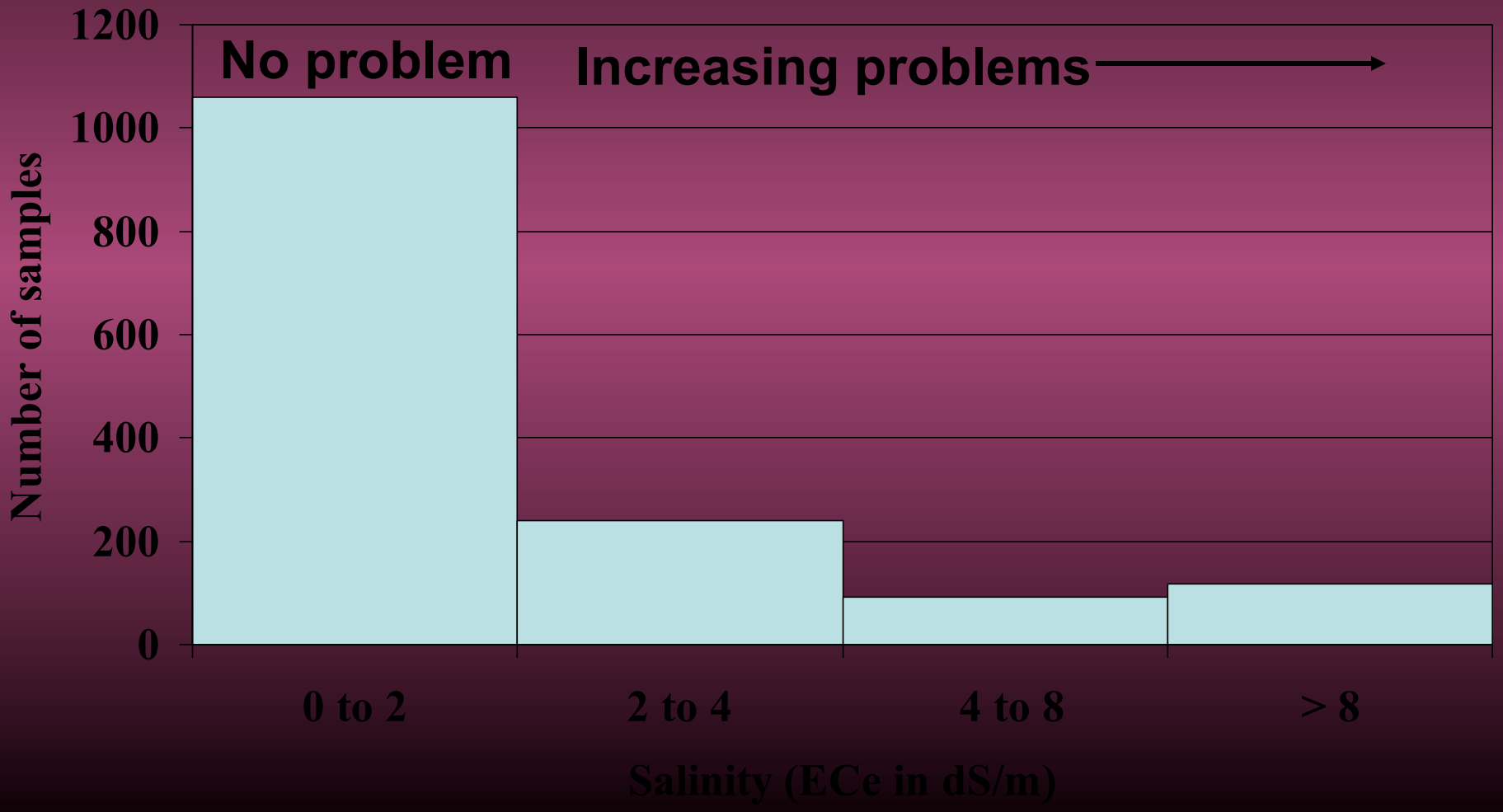
Soil pH


1200
1000
800
600
400
200
0
Number of samples
Few problems
Big problems
< 6
6 to 7
7 to 8
8 to 9
>9

Soil pH refined



Soil salinity (ECe)



Other parameters

- Nutrients, organic matter, etc. are also variable
- However, these are easier to influence over shorter time scales (fertilizer and soil amendment additions can alter soil nutrient and organic matter levels in days)

The “average” Utah soil?

- Intermediate texture class (sandy loam, loam, or silt loam)
- Alkaline (pH = 7.8 to 8.0)
- Non-saline (EC < 2 dS/m)

A word about averages

- Averages are okay as long as you remember that the soil at any given location may differ from the average
- The range in soil properties may be more important than the average
  - The frequency distributions given earlier tell us Utah soils are highly variable

What do you do?

- Soil testing is essential if you know little or nothing about the properties of the soil on a site – it's cheap information and insurance
- Rely on previous experience with a site
- Look up general properties in the USDA Soil Survey

The USDA Soil Surveys

- Available at:
  - local libraries
  - local county Extension offices
  - local NRCS offices

SOIL SURVEY OF

Salt Lake Area, Utah

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Utah Agricultural Experiment Station

Issued April 1974


The End


For More Information Contact Your
Local Utah State University
Extension Office


Check Them Out At
http://extension.usu.edu/