

*Plants for Landscape Design
HORT 608 Fall 2011*



Plant Hardiness (Adaptability)

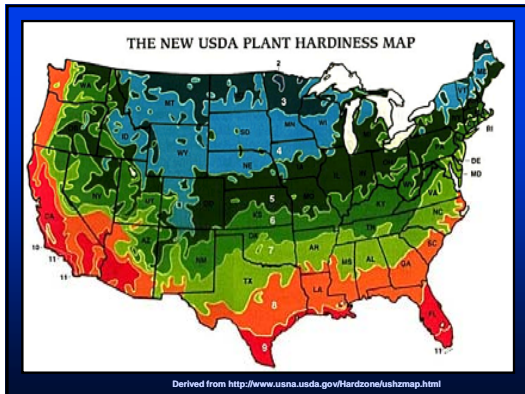
Reading Assignments

Please read pages 36 - 53 and color plates sections I-3 - I-5 in *Landscape Plants For Texas And Environs, Third Edition* as background for this lecture

What Is Plant Hardiness?

Plant Hardiness = ability of a given genotype to survive, grow, and fulfill its intended use in the landscape in a given geographic location

- Involves many interactions among genotype, environment, cultural practices, and intended use



Cold Temperatures

- A key factor for perennial plants, little meaning for summer annuals
- USDA Hardiness Zone Map
 - Based on average annual minimum low temperature
 - Says nothing about;
 - 100 or 1000 year low temperature
 - Duration or frequency of low temperatures
 - Fluctuations from low to growing temperatures
 - Fall acclimation / spring deacclimation conditions
 - Variation between measurement & planting sites

Cold Temperatures

Latitude versus altitude

- Temperature varies inversely with altitude & latitude
- Implications with global climate change

Maritime and Lake Effects

- Moderate seasonal fluctuations
- Depends on size, prevailing winds, and currents

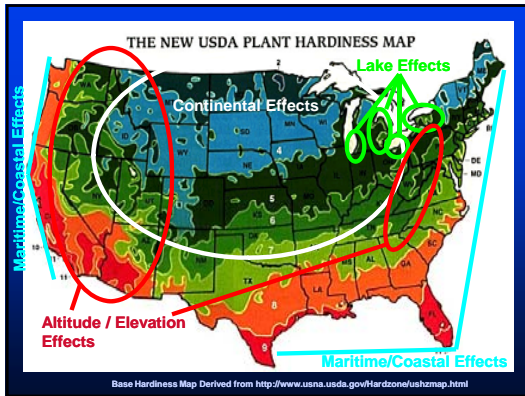
Continental Effects

- Accentuate seasonal fluctuations


Topographical Variations

- Diversion of prevailing winds
- Trapping of air masses in depressions



Mean Annual Number of Freeze Days in Texas (temperatures drop below 32 F at some time during the day)




Drought



- Year-Round Deficits**
 - Desert & semi-arid regions
- Seasonal Deficits**
 - Summer, winter, cold / drought interactions
- Soil moisture versus atmospheric humidity**
 - Significant water demand even at high RH
 - Interactions among wind, RH, and soil moisture





Excess Moisture






Flooding

- Anoxia / hypoxia is problem, not excess H₂O
- Poor surface drainage = temporary flooding
- Monsoon rains
- Permanently wet soils
 - Swamps, bogs, etc.
 - Seasonal wetlands
 - Poor internal soil drainage a major limitation




Heat

- Daily maximum temperatures**
- High night temperatures**
 - Major limitation in southern USA
 - Respiration is more temperature dependent than photosynthesis
 - Some genotypes essentially starve with long term high night temperatures
- Reflected heat**
- High root zone temperatures**
 - Special concern in above ground planters

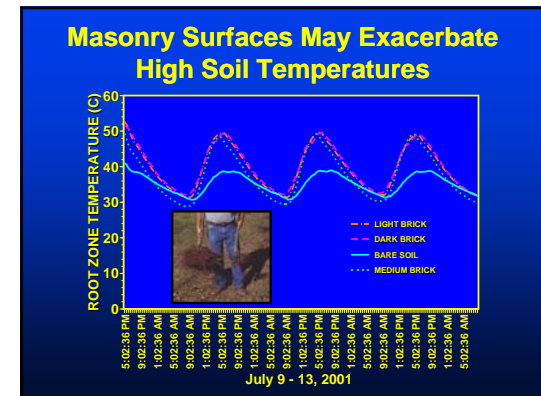




Elevated Soil Temperatures

- Major challenges in some settings
- Often combined with reflected heat and high night temperature conditions




Major league reflected heat, elevated night temperatures



Salt, Pollution & Misc. Soil Factors

- Seashore conditions
 - Soil salts &/or salt spray
- Smog / air pollutants
- Saline or alkaline soils
- Quality of irrigation water
 - Method of application
- Soil fertility
 - Interactions with various physiological processes
- Soil compaction




Soil And Foliar Salt Exposure

- High levels of soil salts arise from:
 - Use of subsoils containing high salts
 - Irrigation with salty water
 - Excess fertilizer applications
 - Drift or runoff from salted roads, parking lots, &/or pedestrian walkways
 - Coastal salt spray or salt intrusion

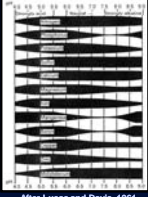


Urban / Suburban Soil Challenges

- High pH is a frequent challenge
 - Massive quantities of structures with calcium carbonate
 - Soil fertility & pH intimately intertwined




Mn chlorosis on *Acer rubrum*




After Lucas and Davis, 1961

Low Soil Oxygen

Y S# Pwy<Sf#k #PSS #z "wifw} {#S#(<-wHyS# x jfw<Sf



Construction damage!



Compaction mediated dieback on *Catalpa speciosa*

Drainage lines must exit at lower elevation



Bathtub effect!

Other Urban Soil Challenges

- Lack of soil structure
- Limited root zone
- High bulk density soils
- Poor fertility subsoil
- Imbedded foreign objects
- Low mycorrhizal inoculum



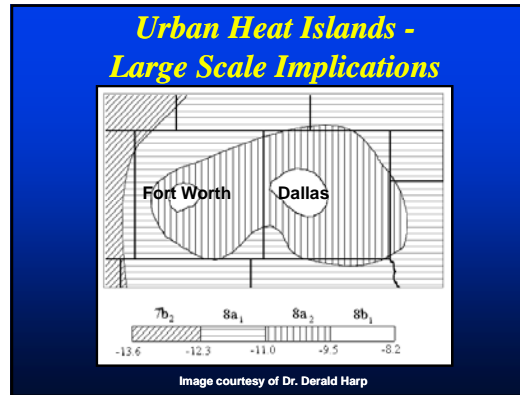


Any season

Formal setting

Informal setting

An alternative solution to urban soil problems is to use containers of various sizes



Micro Climates

- Small scale lake, river, stream effects
- Shelter by buildings and other plants
- Exposure to prevailing wind
- Reflected heat
- Restricted root zones
- Road-side salts and pollution
- Air drainage patterns
- Buried water, sewer, & steam lines
- Heated discharge water
- High traffic areas (Daughter's/son's window?)

Microsite Implications Of Urban Heat Islands

Image courtesy of Dr. Derald Harp

Disease, Pest, and Environmental Interactions

Unfavorable environment predisposes plants to diseases and pest infestations

Diseases and pest infestations increase susceptibility to environmental stresses

Poor cultural practices

- Poor pruning practices
- Girdling root development
- Improper staking
- Improper fertilization
- Insufficient or excessive irrigation regimes
- Excessive mulch applications

Image courtesy of Mr. Mark Crawford

Supplementary Reading Assignment

Please read the section entitled "Texas Regional Conditions" on pages 54 - 57 and color plate sections I-1 - I-2 in *Landscape Plants For Texas And Environs, Third Edition*.

Questions / Comments?

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