Water Management is Vital

- Irrigate for the 1st three years
- Irrigate during droughts
- Manage water quantity & quality
- Consider tree species
- Consider soil type & condition

Establishment

- When a tree is established, many roots will have grown a distance equal to approximately 3 times the distance from the trunk to the branch tips (Gilman 1988; Watson and Himelick 1982). During the establishment period, shoots and trunk grow slower than they did before transplanting. When their growth rates become more or less consistent from one year to the next, the tree is considered established.

Irrigation for establishment (Zone 8)
2 gallons and 6 months per caliper inch

Container size	Gallons of Water	Schedule	Months to Establish
#45 (24”)	6	Daily for 2 weeks. Every other day for 3 months Weekly until established	12-24
#65 (30”)	7	Same	12-24
#100 (42”)	9	Same	24-36
#200 (48”)	11	Same	24-36

encourages growth	limits growth	little or no effect
loose soil	compacted soil	peat or organic matter added to backfill soil
proper irrigation management	little or no irrigation	root stimulant products
mulch 8' or more around planting hole	grass and weeds close to trunk	fertilizing at planting
root flare slightly above soil surface	planting too deep	adding spores of mycorrhizae*
leaving top of tree intact	pruning at planting	water absorbing gels
*can enhance growth on seedlings under certain circumstances		

Water & Soil Relationship

Water & Soil Relationship

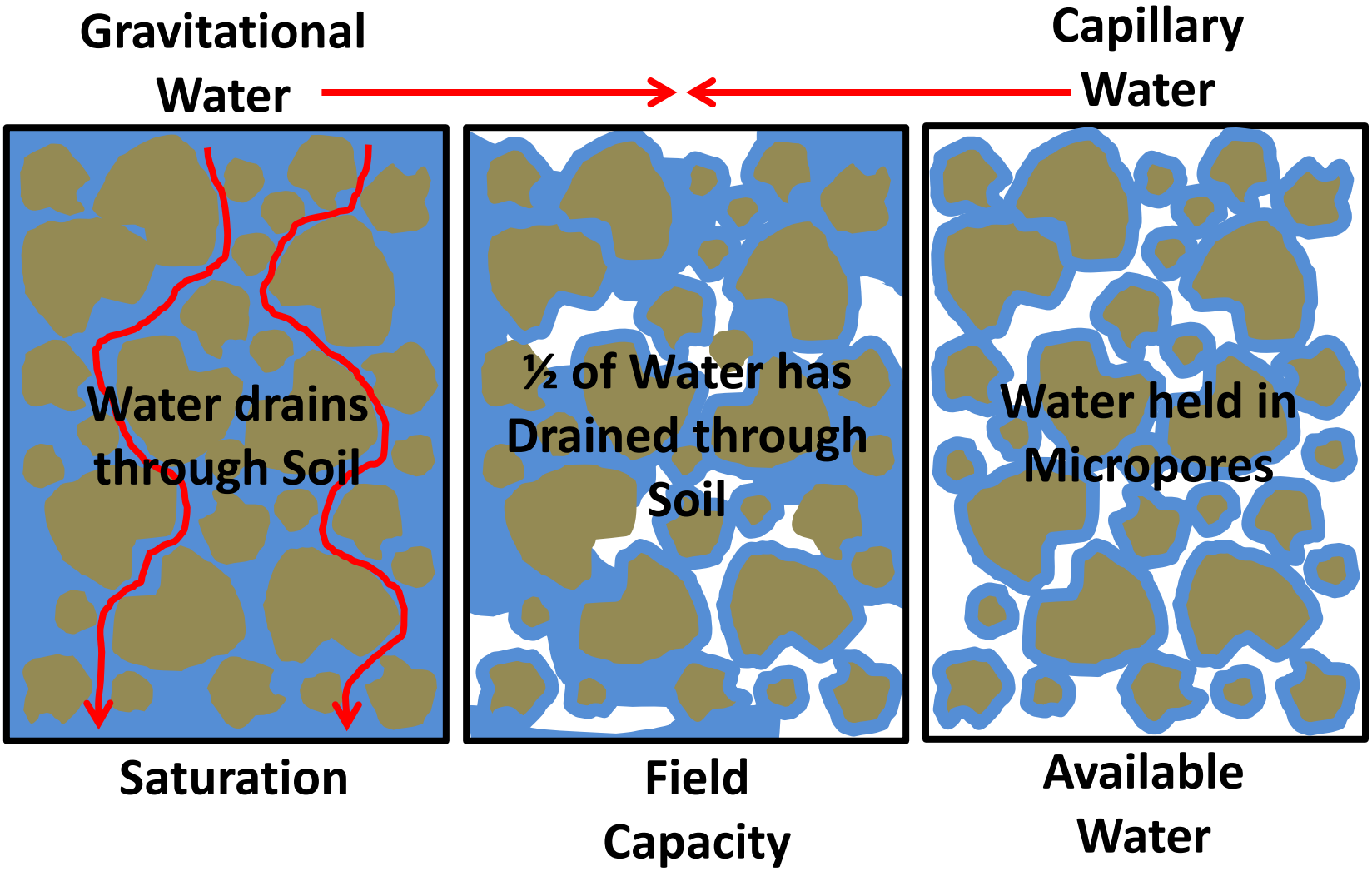
3 Types of Soil Water:

Gravitational Water	Capillary Water	Hygroscopic Water

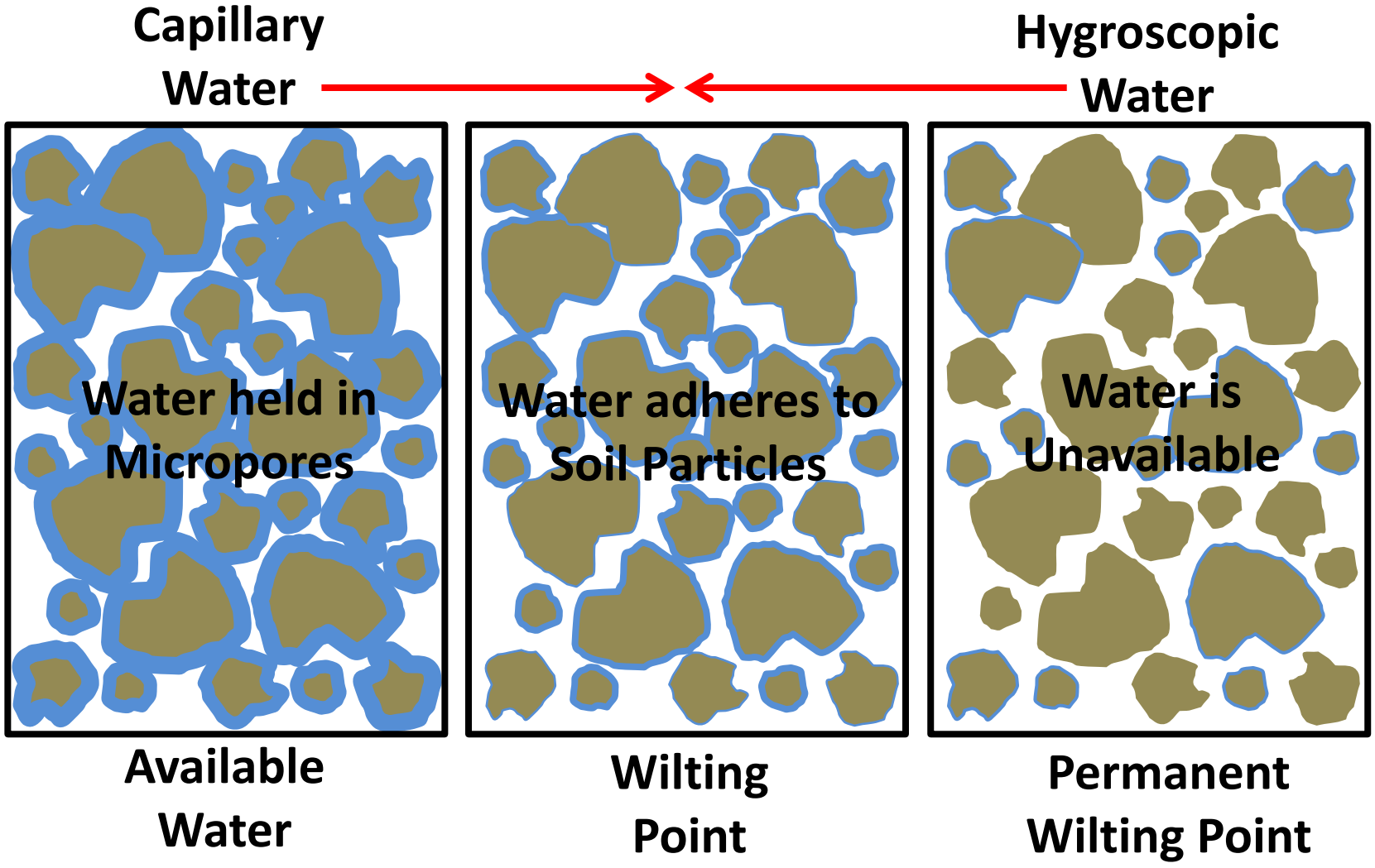
5 Soil Moisture Conditions:

Saturation	Field Capacity	Available Water	Wilting Point	Permanent Wilting Point

Water & Soil Relationship



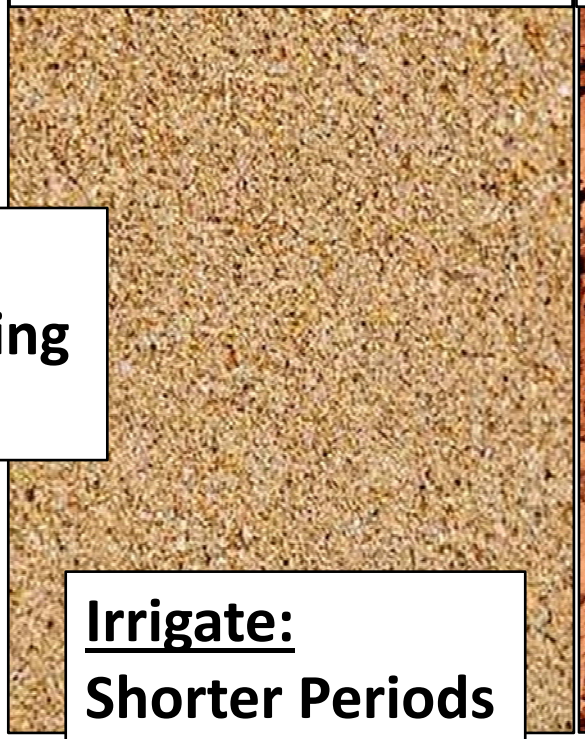
Water & Soil Relationship



Water Holding Capacity

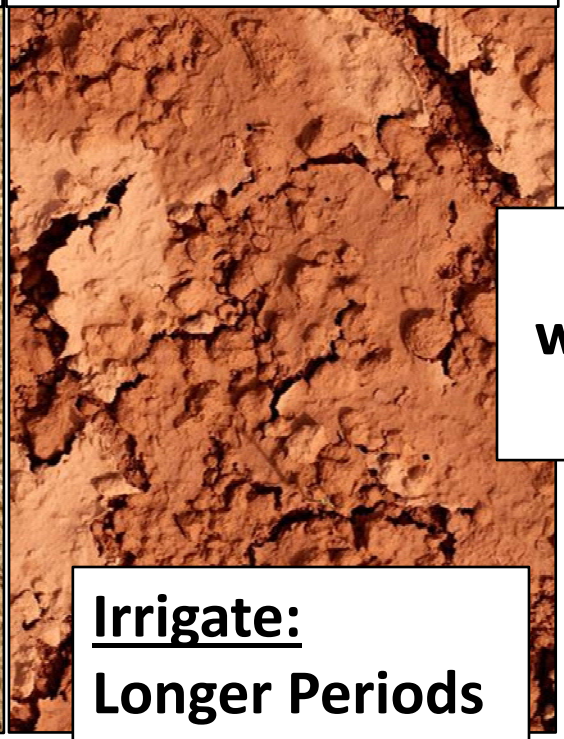
Amount of water held by soil after drainage occurs
Varies with soil texture

Course textured Soils (Sand)



Irrigate:
Shorter Periods
More frequent

Fine textured Soils (Clay)

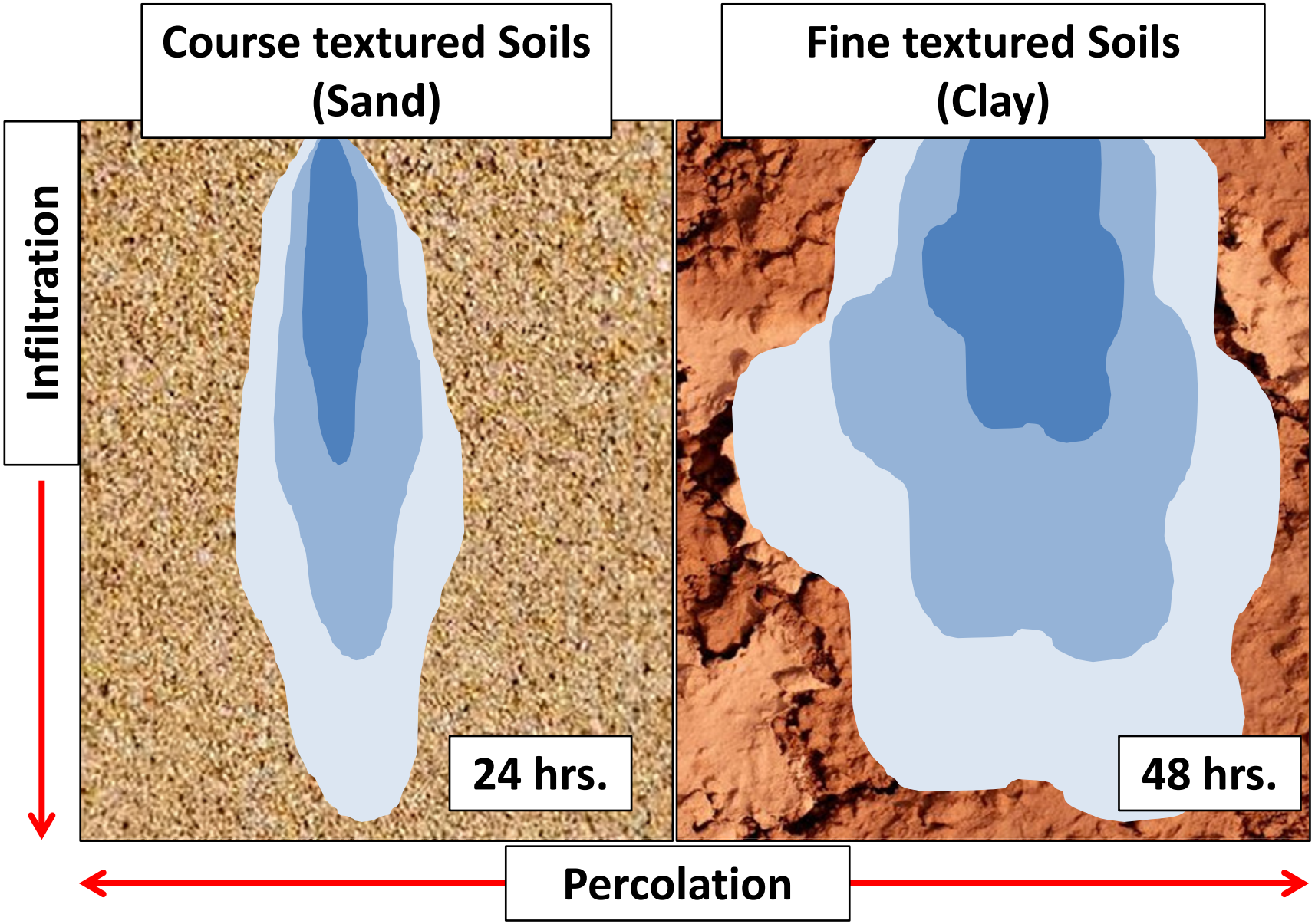


Irrigate:
Longer Periods
Less frequent

Lower water-holding Capacity

Higher water-holding Capacity

Water Movement in Soil



GENERAL SOIL AREAS

EAST TEXAS TIMBERLANDS
Uplands--Light-colored, acid, sandy loams and sands, some red soils.
Bottomlands--Light-brown to dark-gray, acid, sandy loams, clay loams, and some clays.

COAST MARSH
Light- and dark-colored, acid sands, sandy loams, and clays.

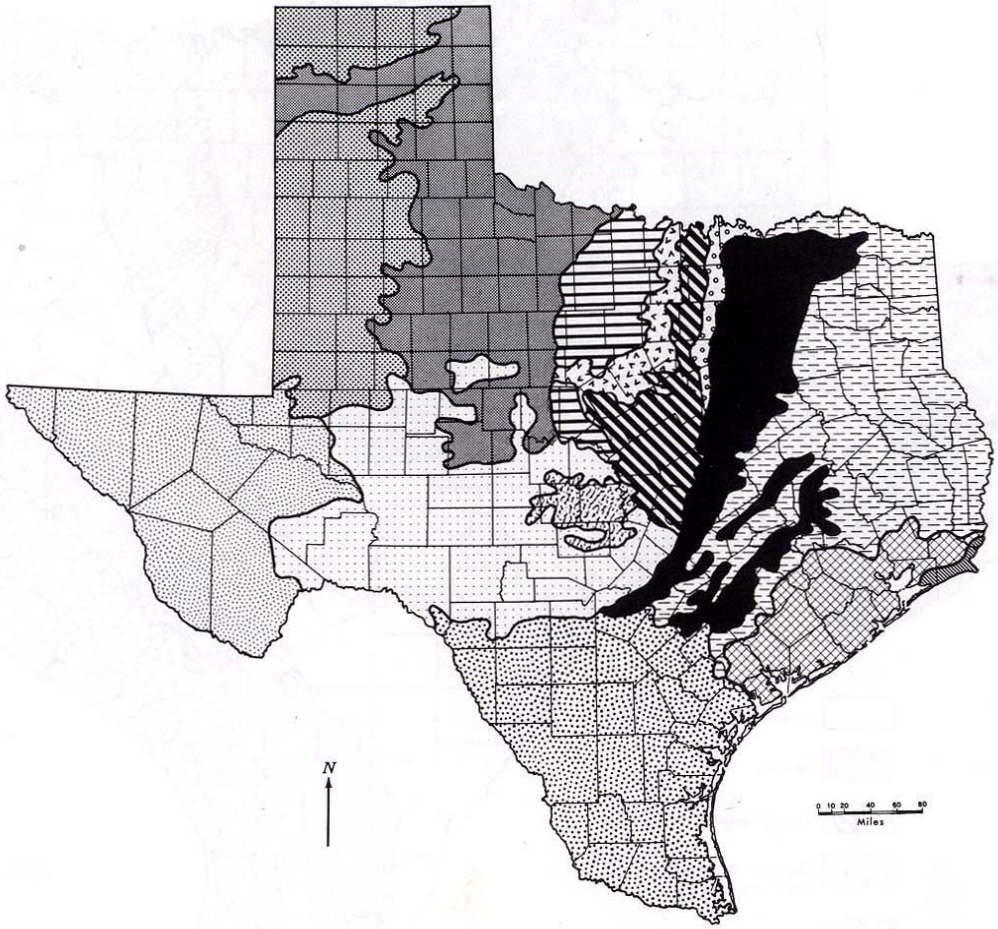
COAST PRAIRIE
Uplands--Dark-colored, neutral to slightly acid clay loams and clays, with some lighter colored sandy loams; acid soils mostly east of Trinity River.
Bottomlands--Reddish-brown to dark-gray, calcareous clay loams and clays.

BLACKLAND PRAIRIE
Uplands--Dark-colored calcareous clays. Some grayish-brown, acid sandy loams and clay loams along eastern edge of the major prairie and interspersed in the minor prairies.
Bottomlands--Dark-gray to reddish-brown calcareous clay loams and clays.

EAST CROSS TIMBERS
Light-colored, acid loamy sands and sandy loams.

GRAND PRAIRIE
Uplands--Dark-colored, deep-to-shallow and stony calcareous clays over limestone.
Bottomlands--Reddish-brown to dark-gray clay loams and clays.

WEST CROSS TIMBERS
Light-colored, slightly acid sandy loams, loamy sands, and sands.



NORTH CENTRAL PRAIRIES
Reddish-brown to grayish-brown, neutral to slightly acid sandy loams and clay loams, with some areas of stony soils.

CENTRAL BASIN
Reddish-brown to brown, neutral to slightly acid gravelly and stony sandy loams.

RIO GRANDE PLAIN
Uplands--Dark calcareous to neutral clays and clay loams. Reddish-brown, neutral to slightly acid sandy loams. Grayish-brown, neutral sandy loams and clay loams; some saline soils near coast.
Bottomlands--Brown to dark-gray, calcareous clay loams and clays; some saline soils.

EDWARDS PLATEAU
Dark, calcareous stony clays and some clay loams.

ROLLING PLAINS
Dark-brown to reddish-brown, neutral to slightly calcareous sandy loams, clay loams, and clays.

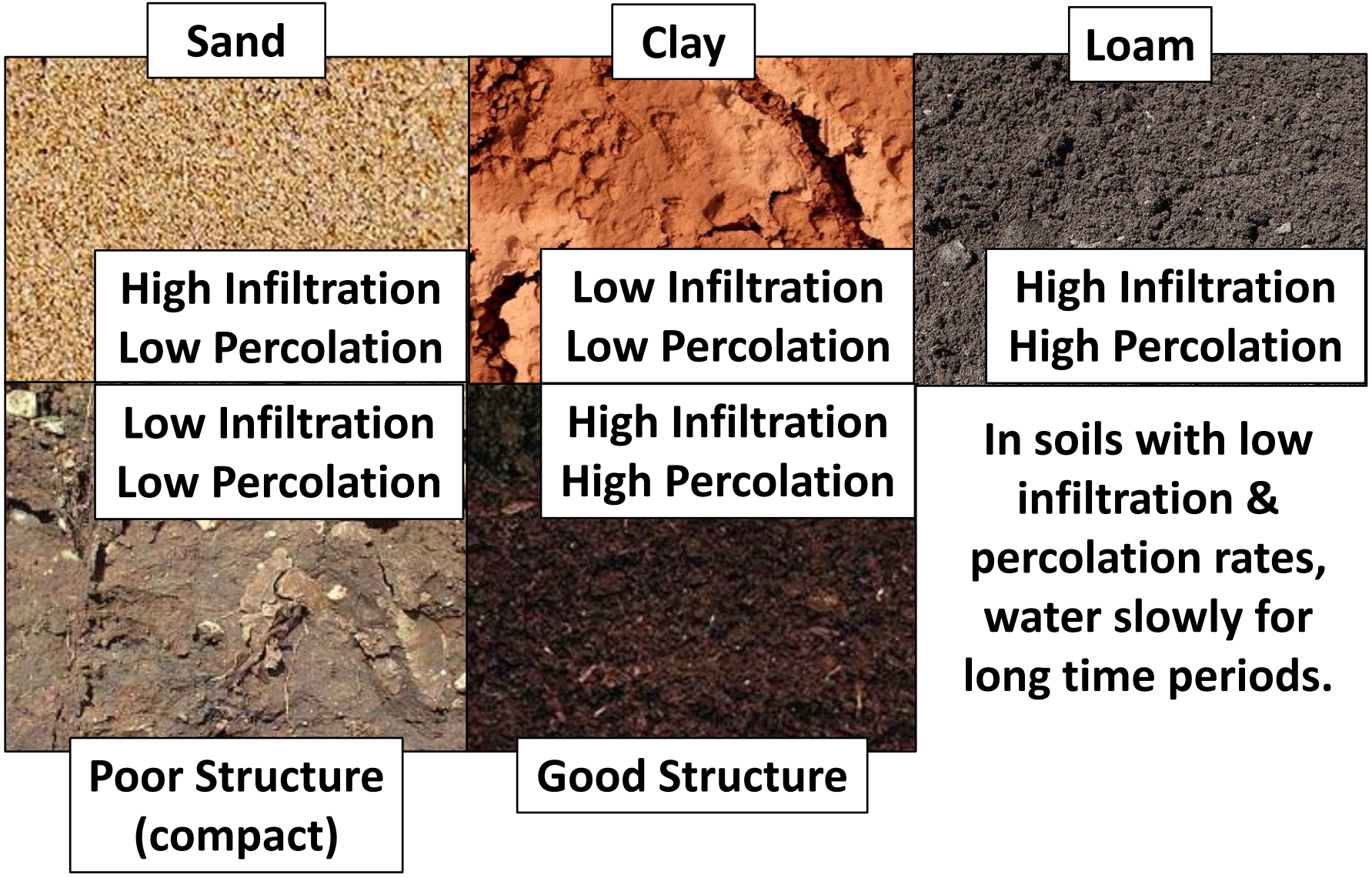
HIGH PLAINS
Dark-brown to reddish-brown neutral sands, sandy loams, and clay loams; some very shallow calcareous clay loams.

TRANS-PECOS
Uplands--Light reddish-brown to brown sands; clay loams, and clays, mostly calcareous, some saline; and rough stony lands.
Bottomlands--Dark grayish-brown to reddish-brown calcareous clay loams, and clays, some saline.

Source: Texas Agricultural Experiment Station, *Types of Farming in Texas*, Bulletin 964, 1960.

Infiltration & Percolation Rates

Affected by Soil Texture & Structure



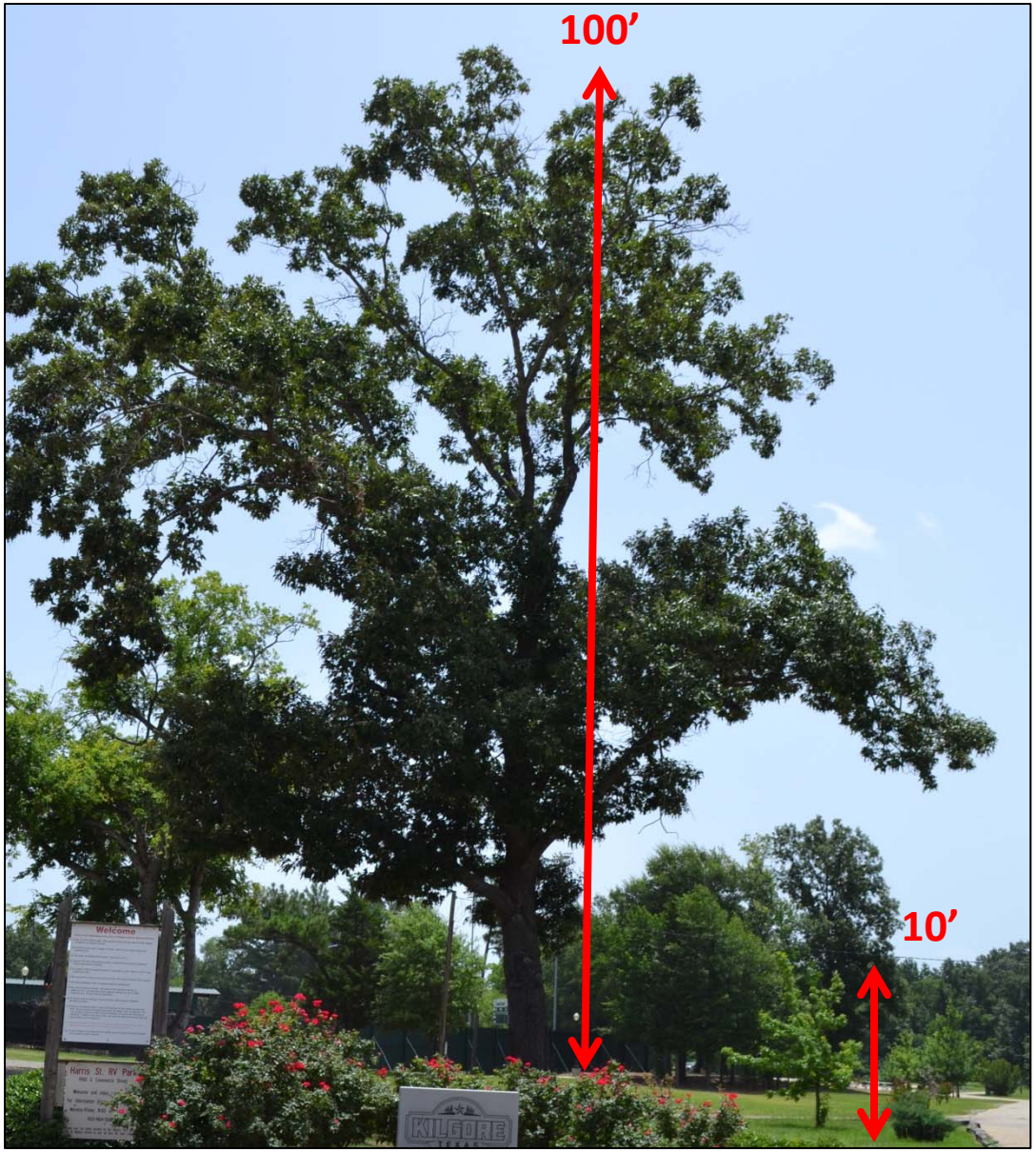
In soils with low infiltration & percolation rates, water slowly for long time periods.

Water & Trees

Tree Water Use

Depends on:

- Species
- Size
- Soil Conditions
- Air Temperature
- Humidity
- Sun exposure
- Wind Movement



Transpiration

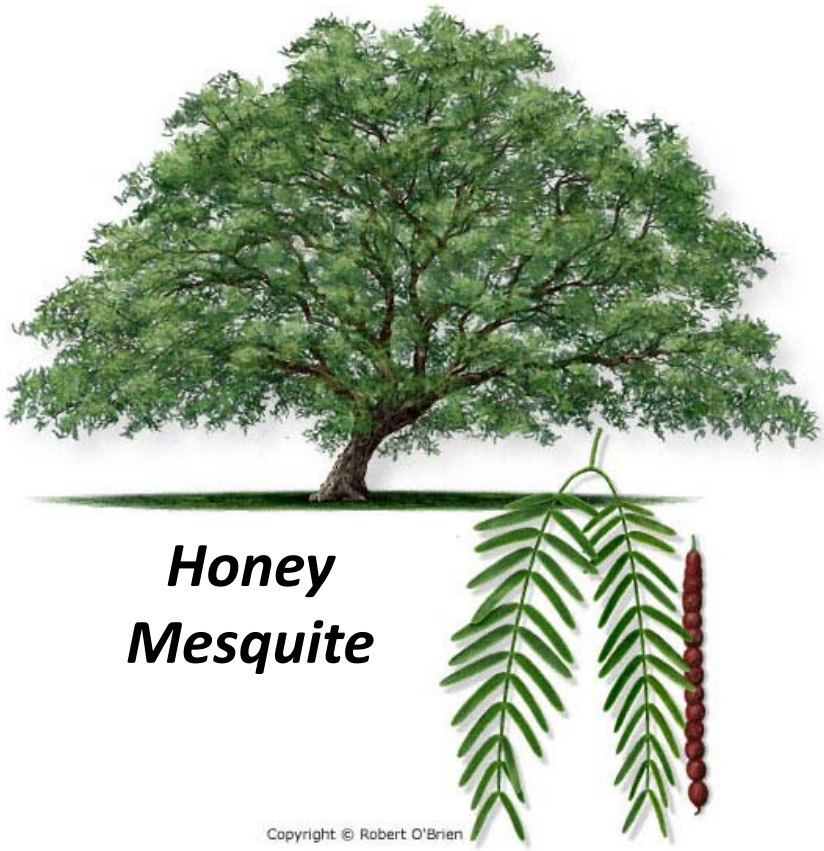
Water vapor loss through the stomata of leaves.

Transpiration is controlled by stomatal opening & closing.

When transpiration exceeds water uptake, leaves wilt, & eventually trees dies.

Drought Adaptations

Extensive Root Systems

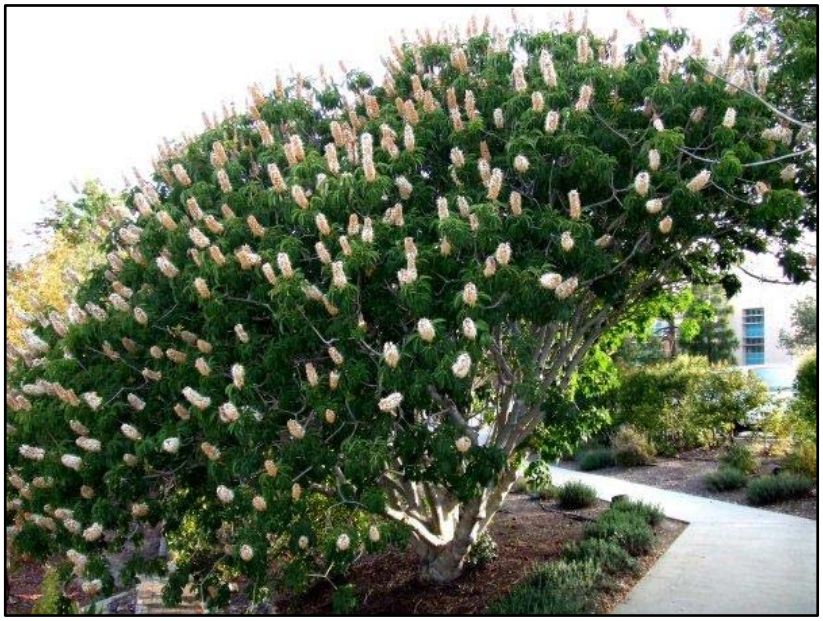


Honey Mesquite

Root Depth: up to 15’

Root Length: up to 50’

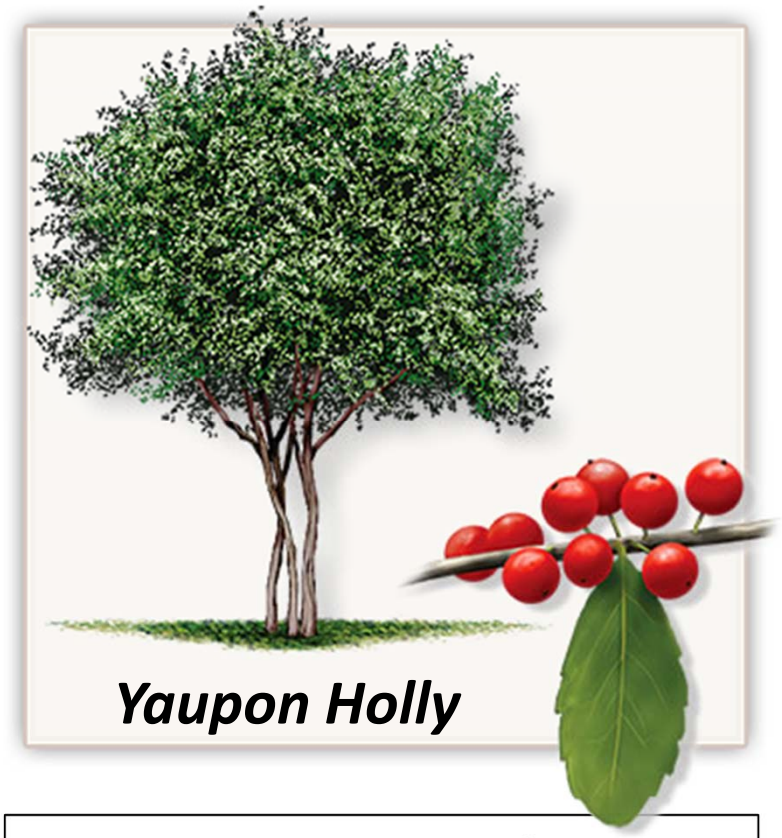
Leaf Shedding/ Early Dormancy



California buckeye

Drought Adaptations

Waxy Leaves



Yaupon Holly

Protective coating limits moisture loss to the air

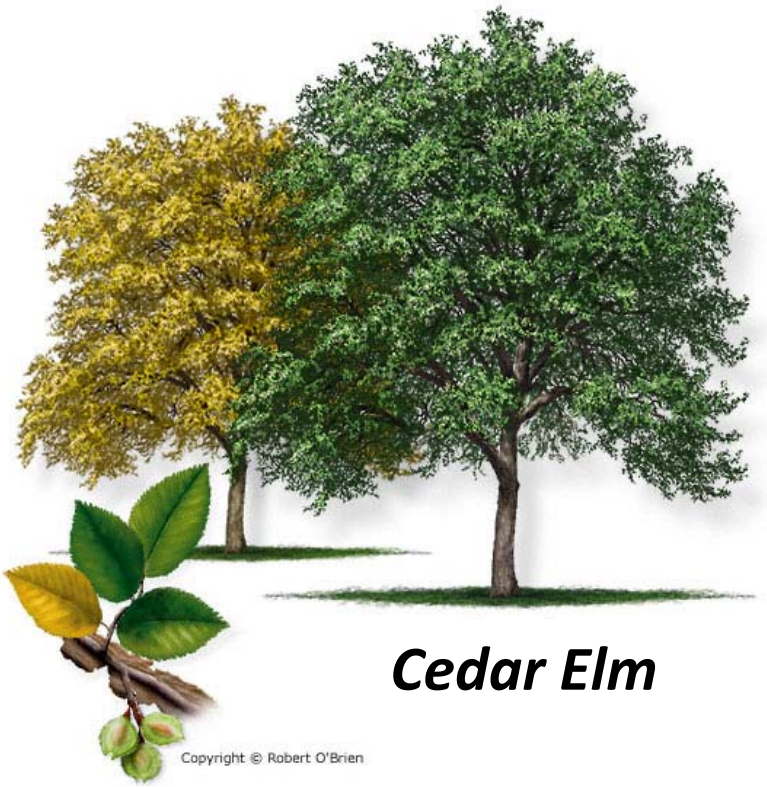
Pubescent Leaves

Gum Bully

Hairs trap an insulating layer of moist air near leaf surface

Drought Adaptations

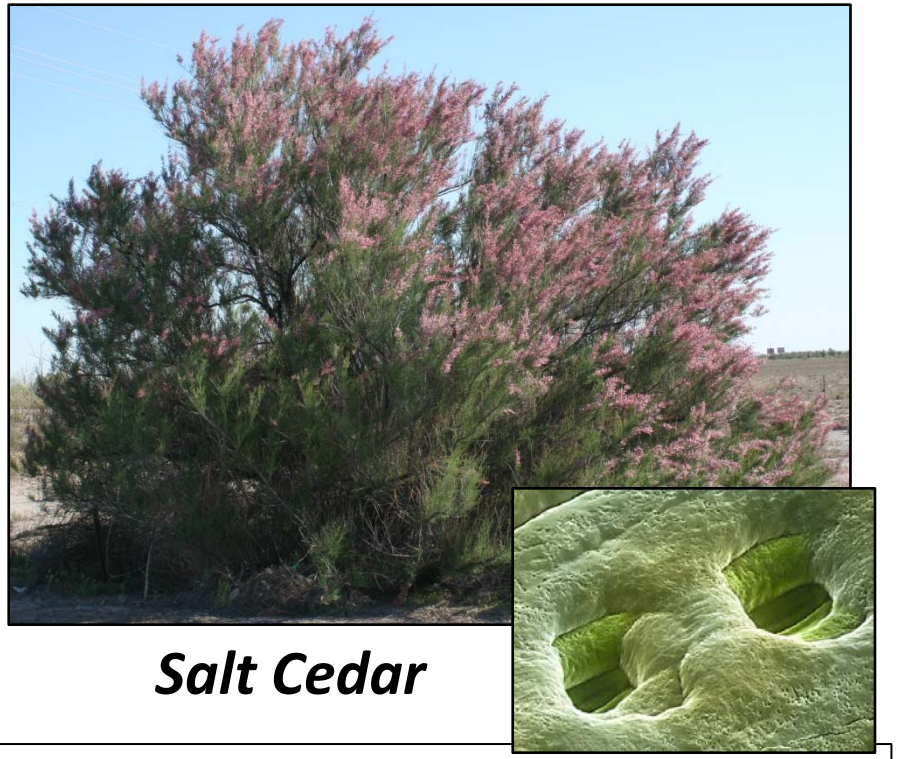
Small Leaves



Cedar Elm

Less leaf surface area to transpire

Sunken Stomata

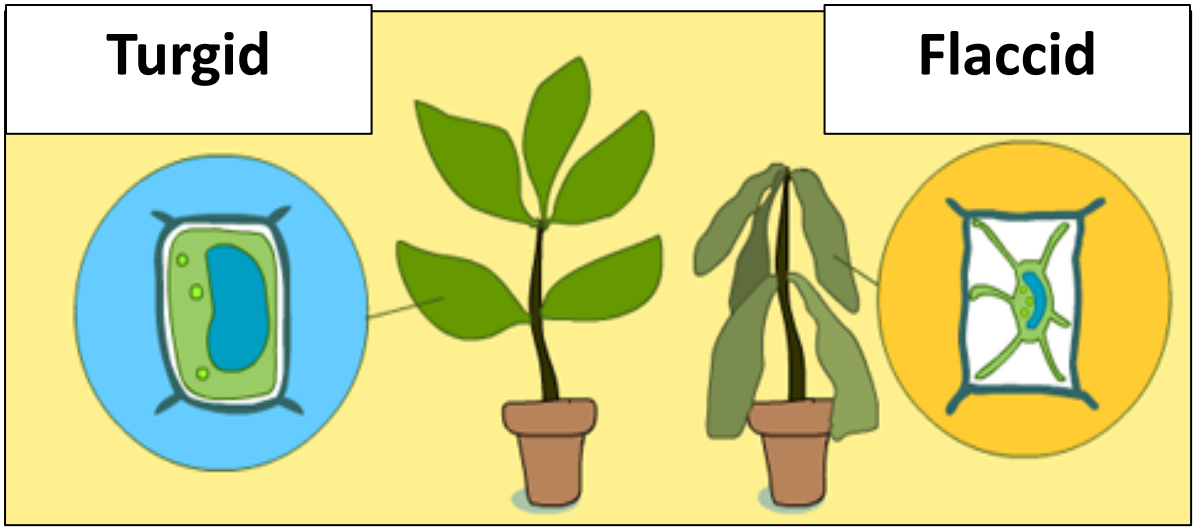


Salt Cedar

Water escaping during transpiration may remain in the depression & be reabsorbed by the leaf

Drought Stress Symptoms

- Afternoon wilting
- Leaf browning
- Leaf scorch
- Leaf curling



Drought Stress Increasers

Limited Soil Volume