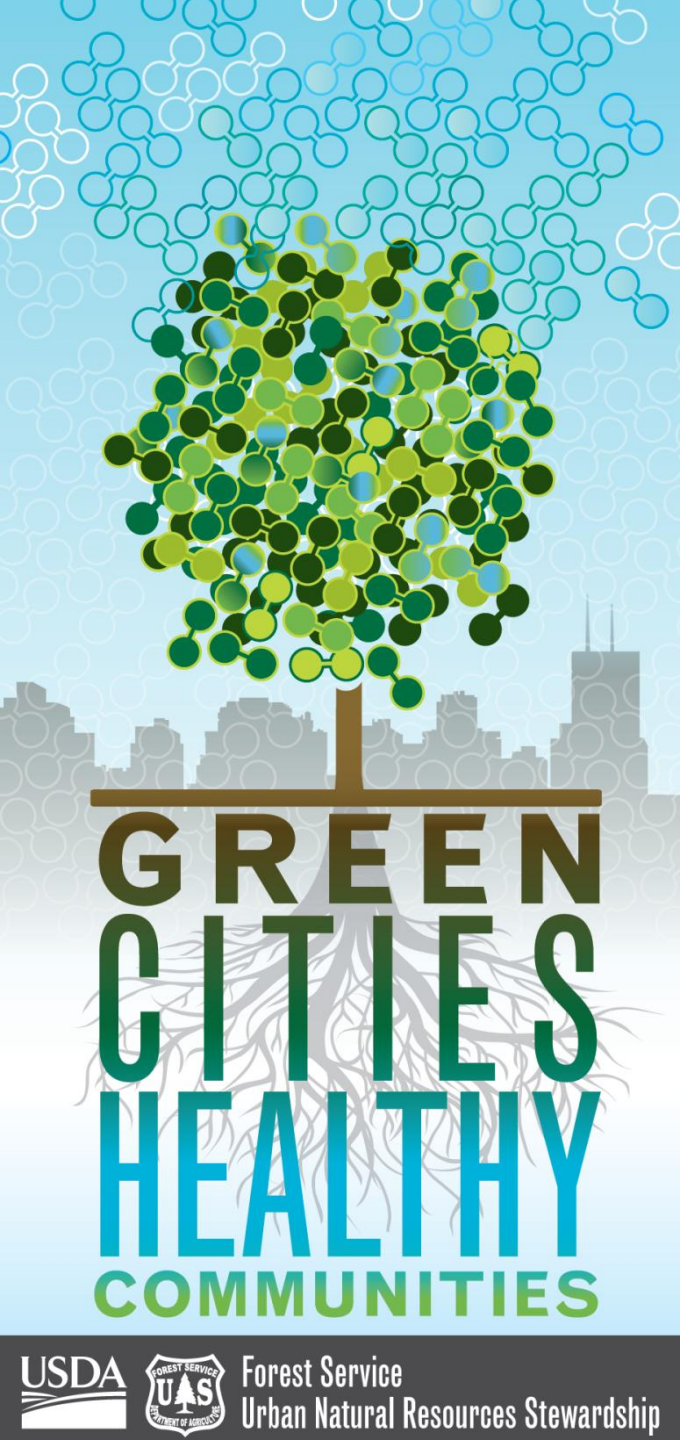

USDA Forest Service

URBAN FOREST CONNECTIONS

webinar series

Second Wednesdays | 1:00 – 2:15 pm ET

www.fs.fed.us/research/urban-webinars

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Adapting Landscape Plants, Policies, and Management to a Water-Limited Future

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Keeping Urban Trees Alive Now and into the Water-Limited Future

Dr. Heidi Kratsch

University of Nevada Cooperative Extension

What I will cover…

- Impact of drought on trees
- How to grow drought-resilient trees
- Most effective irrigation strategies for trees

We're killing our urban trees

Tree's response to drought

- Stomata close and photosynthesis slows.
- Death of root hairs and feeder roots
- Wilting, scorch, and defoliation
- Dieback of shoots
- Slowed overall growth
- Heavier than normal seed production
- Gradual death

Turf-dominated landscape

Average annual water use = **72,875 gallons**

- 4,850 square feet
- 15% hardscape
- 45% turf
- 15% shrubs
- 21% perennial beds
- 5% ground cover plants
- 12 trees
- Irrigated by pop-up sprinklers

Rosenberg et al., 2010, Value Landscape Engineering: Identifying costs, water use, labor, and impacts to support landscape choice, Journal of the American Water Resources Association

Woodland-style landscape

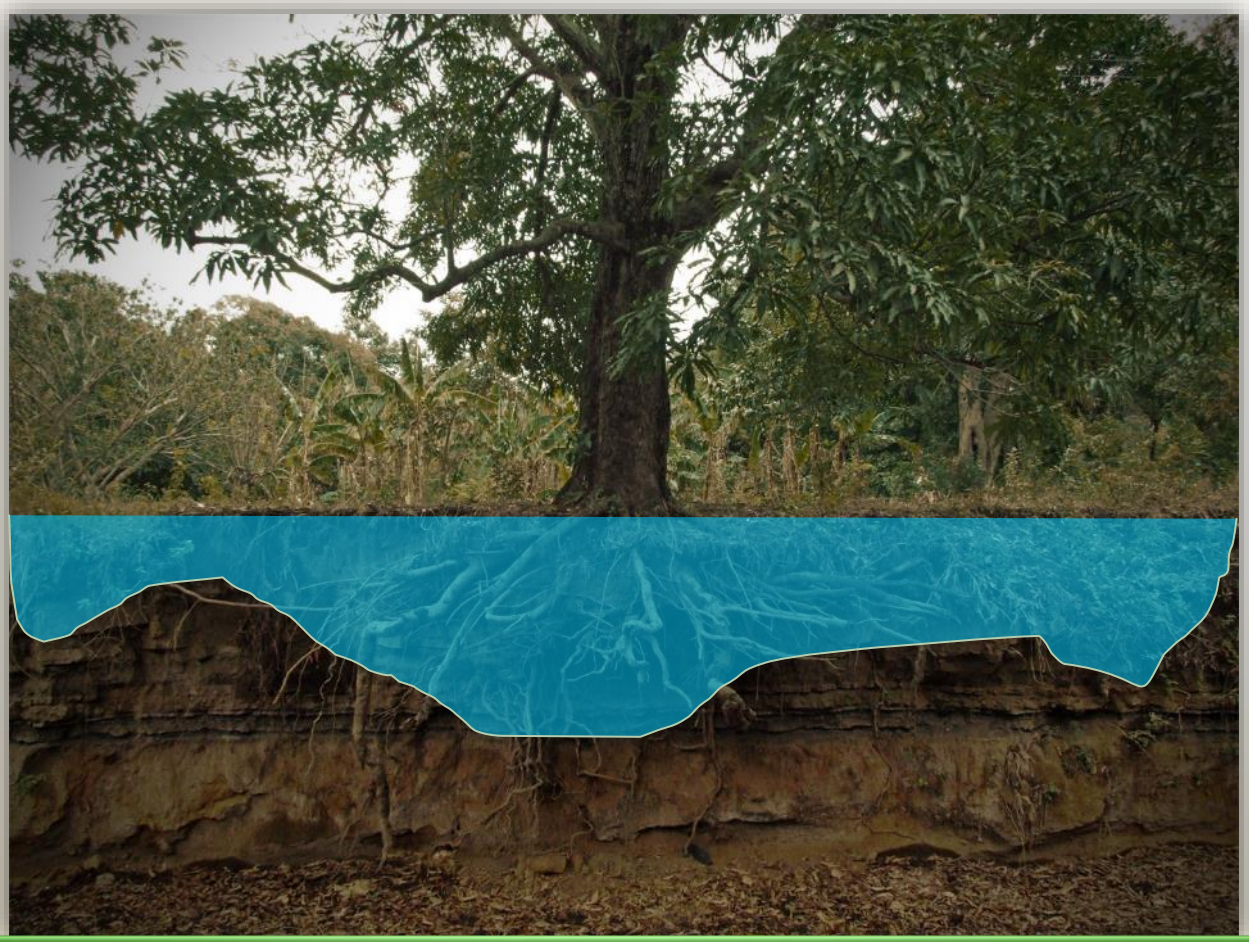
Average annual water use = **22,610 gallons**

- 4,870 square feet
- 20% hardscape
- 0% turf
- 60% shrub beds
- 20% perennial beds
- 0% ground cover plants
- 18 trees
- Irrigated entirely by drip

Trees are the most valuable asset in our urban landscapes

What would a drought-resilient tree look like?

Root system is deep and wide



Need to wet 60% to 75% of the tree root zone

Irrigation depth determines tree rooting depth

Trees have deeper roots than other landscape plants

Watering depth for different plants:
Tree roots 18 to 24 inches
Shrub roots 12 to 18 inches
Herbaceous plant roots 6 to 12 inches
Turfgrass roots 6 to 8 inches

Trees further from the lawn are most susceptible to drought

Two aspects to irrigation scheduling

- **<u>Duration:</u>**

  How much water to apply…

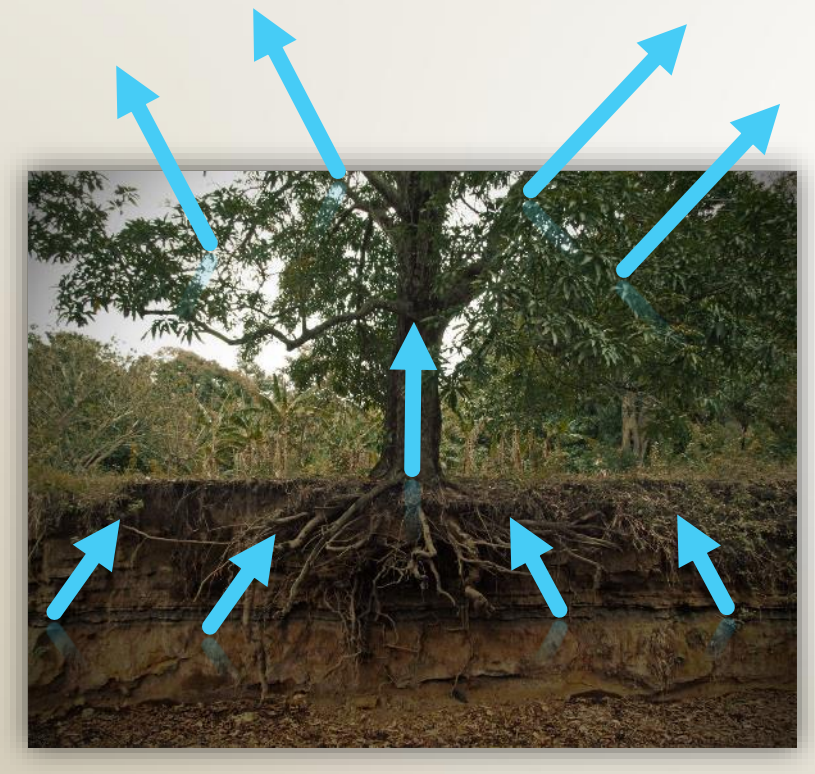
- **<u>Frequency:</u>**

  How often to apply it.

Micro-irrigation (Drip)

- Slow application
- Measured in GPH rather than GPM
- Less loss to evaporation
- Reduces runoff and leaching
- System efficiency of 80% to 90% (sprinklers < 75%)

How trees lose water: transpiration



- Transpiration starts at the leaves.
- Capillary action pulls water from below.
- Soil moisture is depleted.
- Hot, dry air increases transpiration.
- Wind blowing across leaves increases transpiration.

The goal of irrigation is to replace water lost from the soil due to evapo-transpiration

Calculate estimated daily water use for mature trees

Gallons per plant =

0.623 x plant area x plant factor x reference evapotranspiration (ETo) per day ÷ irrigation system efficiency

Based on ASCE guidelines and modified for practical use

Water trees deeply and less frequently

GALLONS OF WATER PER WEEK										
Plant water use	Plant canopy diameter in feet									
	1	2	3	4	5	6	8	10	12	14
Tree										
medium						29	52	81	116	158
low						21	42	64	92	126
Shrub										
medium		9	7	12.5	20	29	43			
low		3	5.5	10	17	21	35			
Perennial										
medium	1.5	4	10							
low	1	3	5							

Information valid for western Nevada and other similar climates during summer

Example: How long should I water?

Size	Drip Emitters	Microspray Emitters
Large trees (canopy 14+ feet)	20 2-gph emitters for 4 hours once a week	Eight 20-gph emitters for 1 hour once a week
Medium trees (canopy 10-12 feet)	14 2-gph emitters for 3 to 4 hours once a week	Six 14-gph emitters for 1 to 1.5 hours once a week
Small trees/large shrubs (canopy 6-8 feet)	10 2-gph emitters for 1.5 to 2.5 hours once a week	Five 11-gph emitters for 0.5 to 1 hour once a week

Based on gallons of water needed per tree

Micro-spray emitters

- External emitters connected to the lateral distribution line using spaghetti tubing
- Fewer heads needed to cover large areas.
- Visible to easily check for damage.

When trees are young…

- Wet as much of the root ball as possible.
- Irrigation line should not be up against the trunk.
- Emitters should be placed within and **beyond the spread** of the root ball to encourage root growth into native soil.

Roots don’t seek water – they follow water

Result of inadequate early water distribution

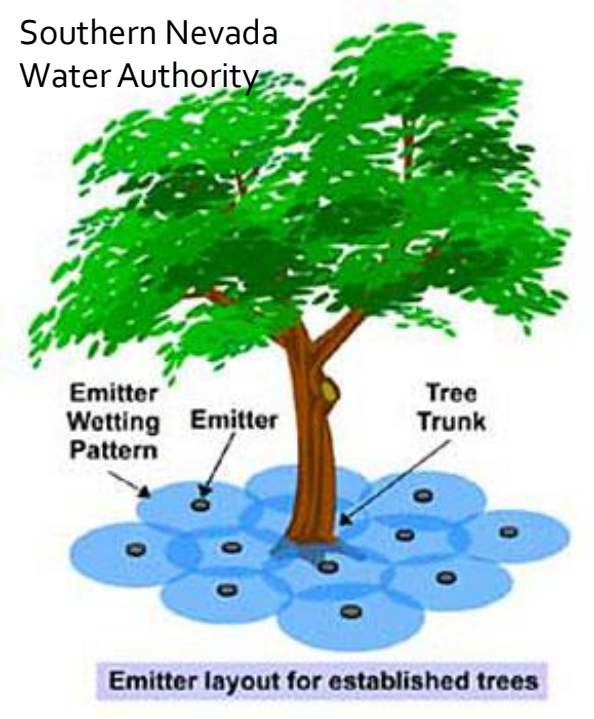
Roots won’t spread into dry soil

Where are the roots again?

One emitter on an established white pine is obviously not enough

Emitter arrangement for established trees

Southern Nevada Water Authority



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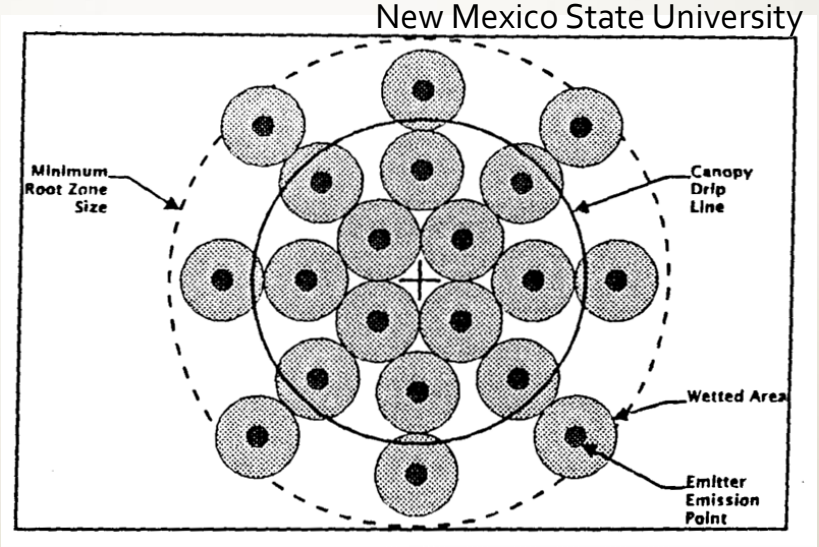

The depth and distribution of water application will determine the architecture of the root system

Remember where the roots are

Summary of effective irrigation strategies in arid climates

- Irrigate trees separate from turfgrass (hydrozone)
- Use drip irrigation to provide a long, slow soaking to at least 18 to 24 inches deep
- Cover as much of the lateral root zone as possible with irrigation emitters

Questions?

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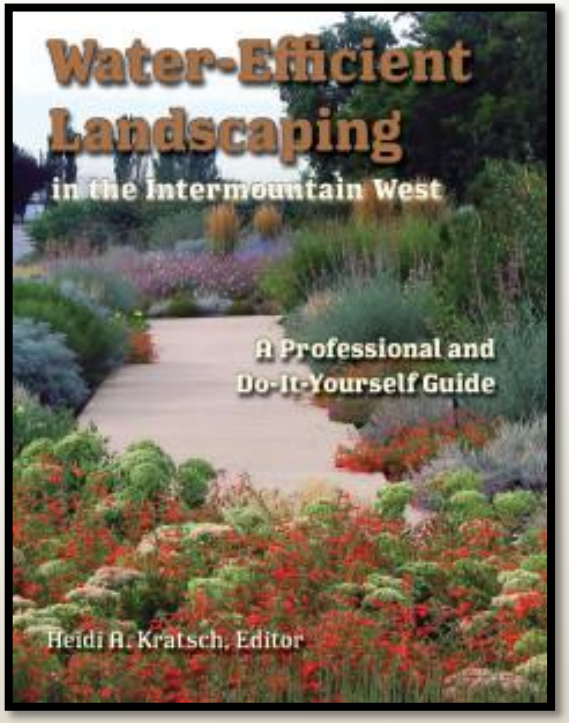

http://www.heidikratsch.com/water-efficient-landscaping/