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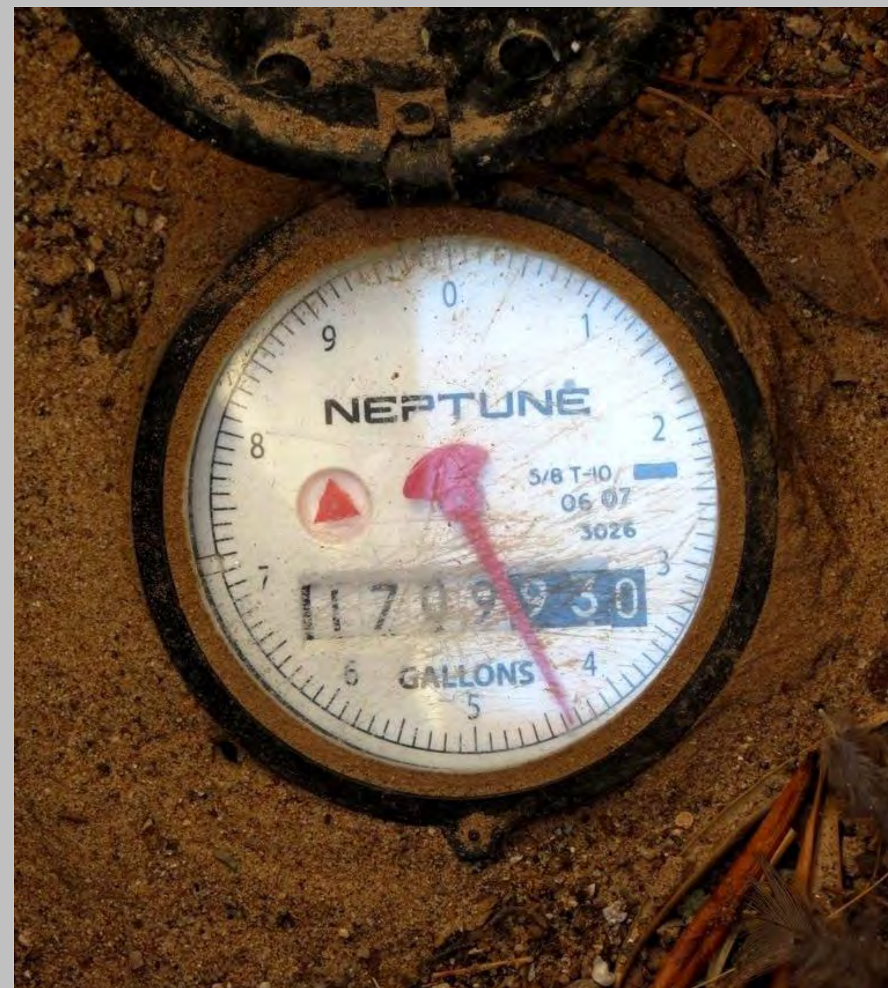
IRRIGATION

Irrigation Basics

Determining Irrigation Requirements

Parts, Materials, Timers and Controllers



Presentation Objective

Through this presentation, show the participants ways to conserve water without sacrificing plant life by applying uniformity to their irrigation usage and controlling the application and timing of their irrigation.

Presentation Objective Benefits

How to determine plant irrigation needs

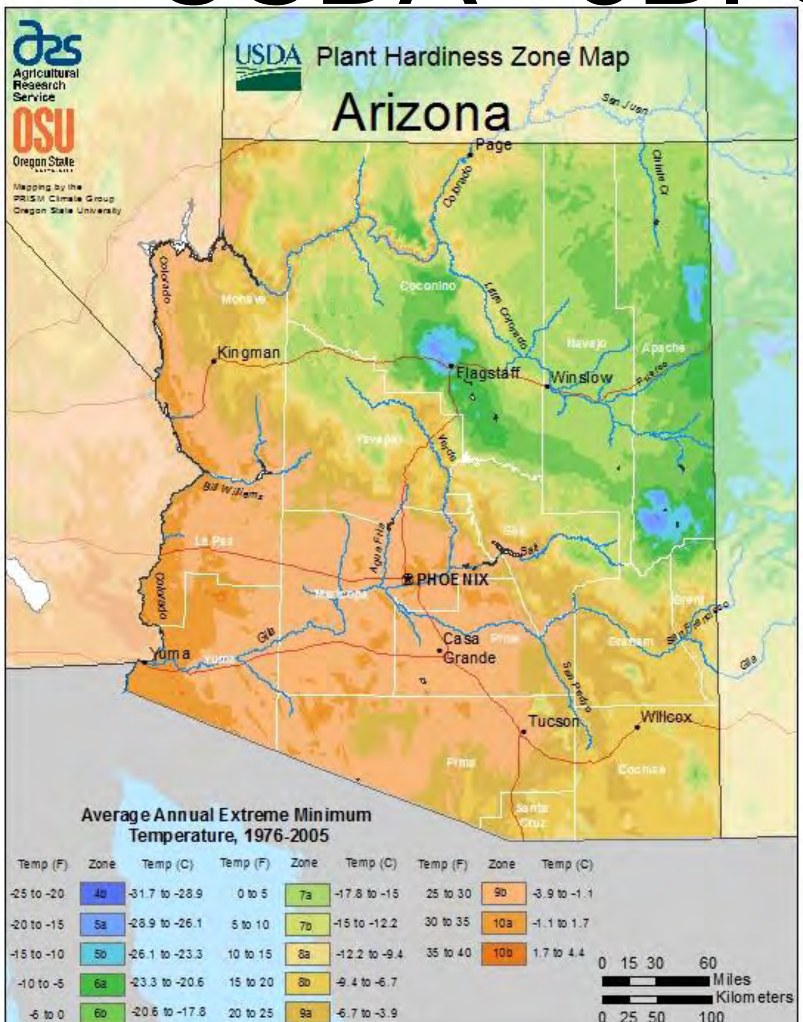
How to determine plant irrigation schedules

How to properly assemble PVC piping for irrigation use

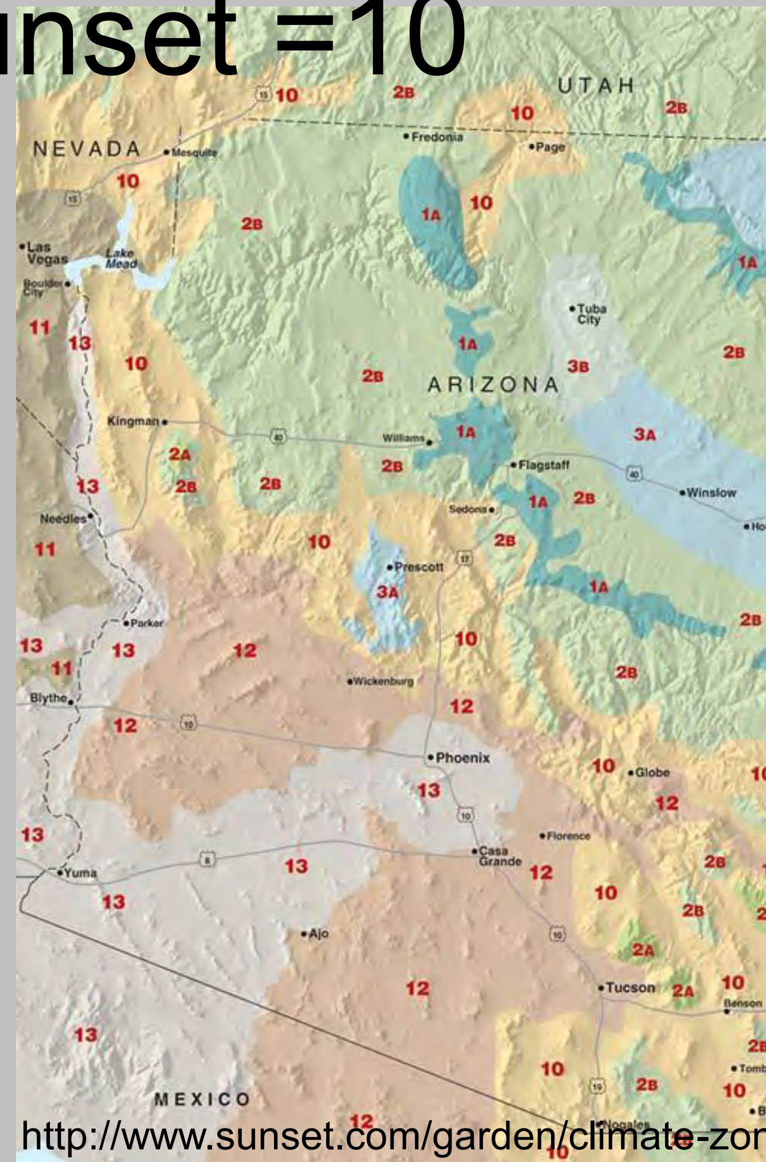
Presentation Goals for the Participants?

What are We @ Kingman?

USDA =8B. Sunset =10



http://planthardiness.ars.usda.gov/PHZMWeb/



http://www.sunset.com/garden/climate-zones/

Kingman, Prescott, Globe, Sedona – Zone 2 and 3

Casa Grande, Tucson, Wickenburg – Zone 4

Bullhead City, Lake Havasu City, Yuma, Phoenix – Zone 5

Arizona Plant Climate Zones

http://ag.arizona.edu/pubs/garden/az1169/

Planting Zones Kingman

USDA zone Hardiness Zone 8B. (15°F to 20°F)

Sunset Climate Zone 10; High desert. Kingman, Arizona. Kingman proper average winter minimums range from 32°F down to 23°F. Some extreme lower temperatures range down to 15 degrees.

Average rainfall 10 inches.
Average High Temp; 74°F. Average low temp 48°F

IRRIGATION BASICS

Determining Irrigation Requirements

Before selecting your irrigation system the plant needs, soil type, and plant types should be known.

Readily available water is the portion of the available water which is relatively easy for a plant to use. Even though all of the available water can be used by the plant, the closer the soil is to the wilting point, the harder it is for the plant to use the water. Plant stress and yield loss are possible after the readily available water has been depleted

Plant Requirements

For the homeowner, we have all heard or read about plant water requirements. Often expressed in terms of "Regular Watering, Drought Tolerant, Moderate Water, Low Water, and Very Low Water."

These terms are often displayed on the plant's information tag along with terms of "Direct Sun, Some Shade, Morning Sun, and Shade.

Most of the plants are grown, and the tags are printed, someplace other than Mohave County. (most likely in cooler climates such as those in California.)

Do Plants Perspire?

Well, actually plants "Transpire" from the plant leaves, and the soil moisture evaporates with changes in climate conditions. These two activities when combined are called

"Evapotranspiration" or "ET"

“Evapotranspiration” or “ET”

What does this have to do with irrigation? Wind, sunlight, high temperatures, low temperatures all influence Evapotranspiration, and relates to the amount of irrigation per cycle and the frequency of irrigation the plant will need throughout the year.

High temperatures, high winds or a combination of those can cause the plant to exceed its capability to Transpire, causing plant stress, plant decline and plant death. This is especially true if the plants rooting system has difficulty with the uptake of water and nutrients.

Mulches

Mulches are beneficial for reducing irrigation losses due to evaporation and helps to protect the plants roots from the summer heat and the winter cold. Mulch also can reduce weed growth.

What kind? Use an organic mulch for fruit trees, and edible plants not rock or rubber. Rock mulch are natural and a good fit for desert type plants.

Mulches

How much? Use about 4 plus inches of non rock type mulches. Spread the mulch under the tree and outside of the tree drip line. The roots extend out past the drip line as should the mulch. Keep the mulch away from the trunk. Use some sort of screen device or guard to help position the mulch away from the trunk.

POTENTIAL ROOT ZONE DEPTH

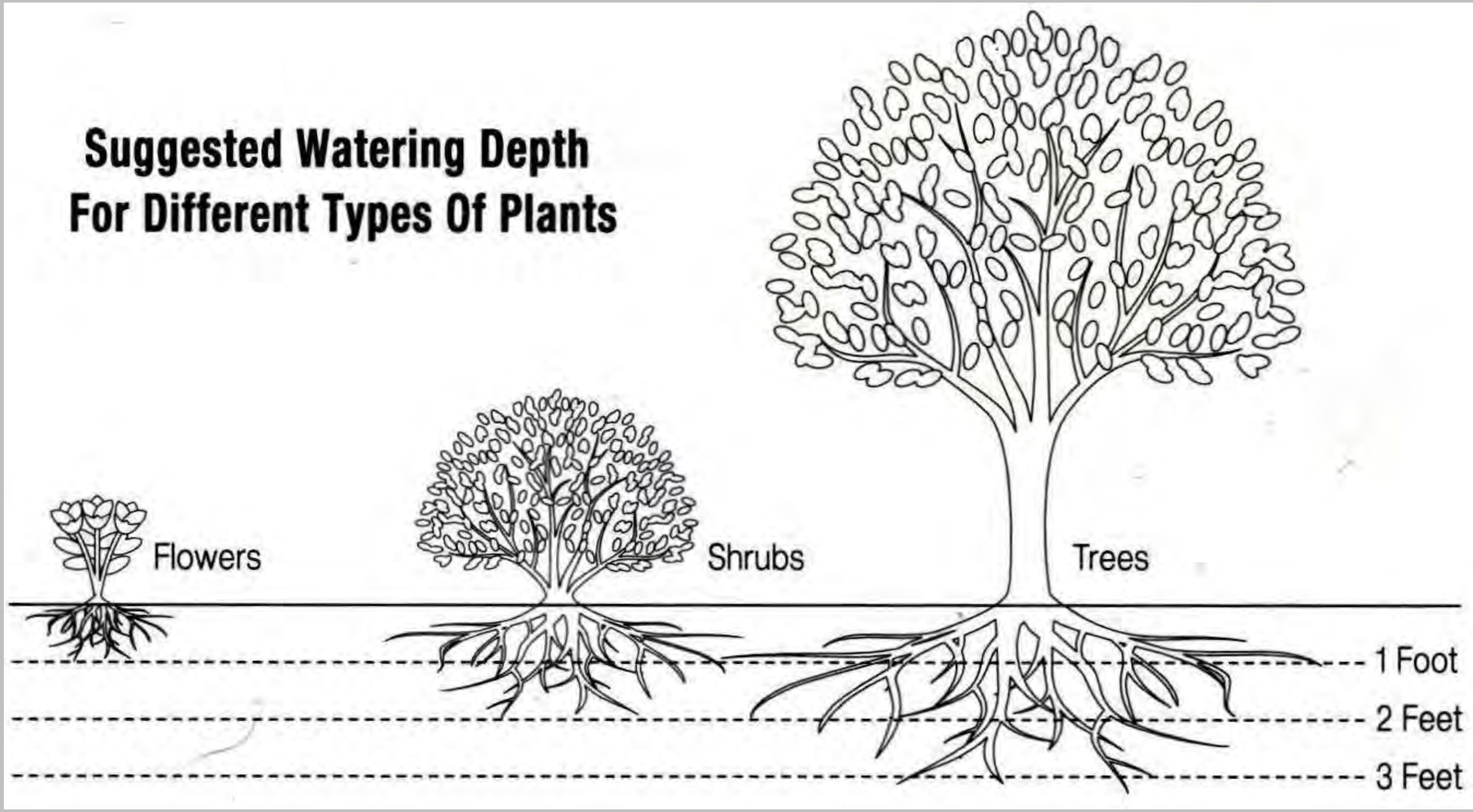
•**Turf**	**6 inches to 12 inches**
•**Shrubs**	**12 inches to 18 inches**
•**Trees**	**18 inches to 36 inches**

What is 1 Inch of Water

One inch of water for one square foot is equal to about 0.623 gallons for 144 square inches

To add enough water to soak the soil to a depth of at least 12 inches, it takes approximately .65 to 1.3 gallons of water for each square foot or 65 to 130 gallons for 100 square feet of garden area.

Root Zones



Suggested Watering Depth
For Different Types Of Plants
Flowers
Shrubs
Trees
1 Foot
2 Feet
3 Feet

You have a tree basin of 10 feet in diameter, (Area = 3.1416 x r2) =78.54 sq feet
(5 x 5 x 3.1416 = 78.54)

Your tree basin for one inch of water will take approximately 48.93 gallons for one inch of water

One inch of water for one square foot is equal to about 0.623 gallons for 144 square inches

To add enough water to soak the soil to a depth of at least 12 inches, it takes approximately .65 to 1.3 gallons of water for each square foot

or

65 to 130 gallons for 100 square feet of garden area.

WATER MOVEMENT IN THE SOIL

The soil type will determine the pattern of irrigation. This is especially true with drip irrigation. The water pattern for sandy soil is narrow and deeper as compared to the broader and shallower wetting pattern of clay soil.

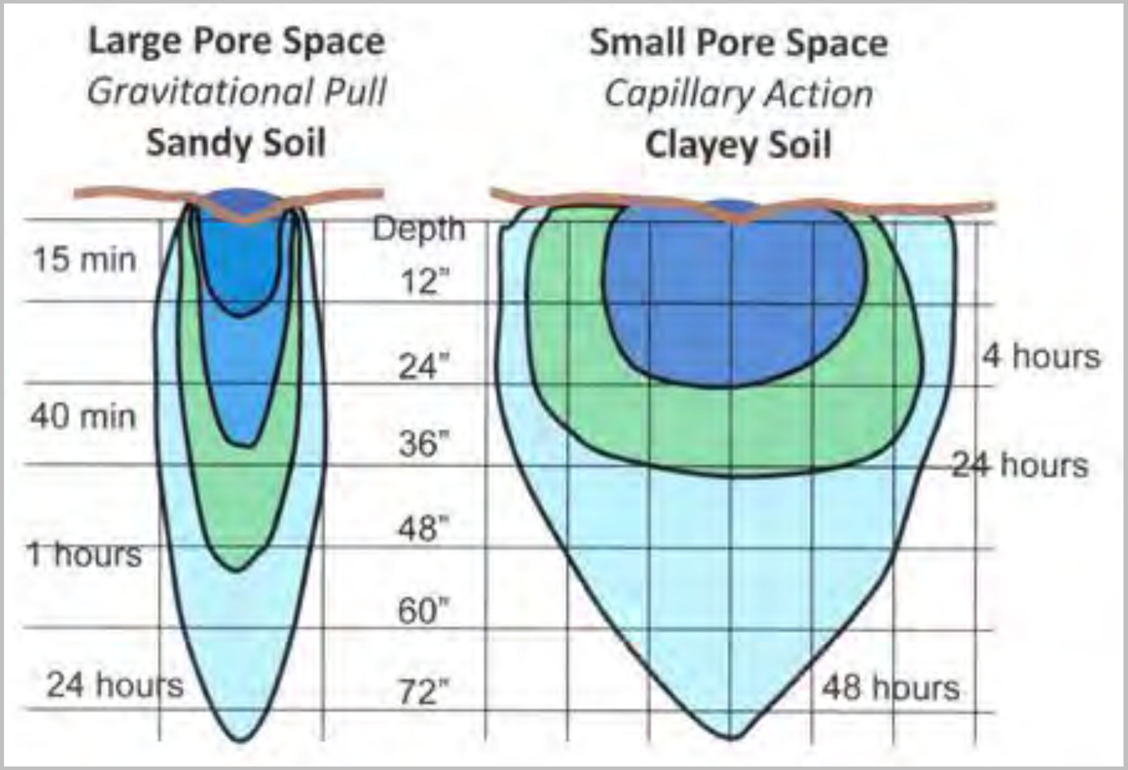


Image courtesy of Colorado State University
http://www.cmg.colostate.edu/gardennotes/images/213-7.jpg

WATER MOVEMENT IN THE SOIL

The amount of water needed is influenced by soil type, climate exposure and the plants water requirements. Soils vary greatly in their rate of percolation (clay type soil very slow, loam type soil medium and sandy soils very fast). Knowing your soil type, including if a layer of cliché is present below your plant materials is necessary to determine your irrigation scheduling.

Remember, clay type soil particles are close together and the water spreads laterally. Sandy type soils particles are further apart and the water flows downwards until saturation.

What to Irrigate With?

A reliable irrigation system would be one of automation

Using a garden hose for the water supply and your memory as a timer does not work well in the Desert.

Above Ground Drip and Flood
or
Below Ground Sub Surface

For this presentation we will be talking about

Above Ground Drip Irrigation

Flood Irrigation

Sub Surface Irrigation

Drip, Flood or Sub Surface?

- **Drip has its advantages as well as disadvantages. It can deliver concise amounts of water to an exact location**

- **However, maintenance is required to keep the system functioning correctly**

- **As the plant grows, so should the drip system, adding additional emitters placed around the expanding root zone**

Drip, Flood or Sub Surface?

Basin type Flood irrigation is basic, and requires little maintenance once installed and adjusted.

Flood irrigation may use more water than drip or sub surface.

Drip, Flood or Sub Surface?

Drip systems do not require trenching, and can be covered up with mulch.

Sub Surface Irrigation requires trenching and the material to be buried below the soil surface to the anticipated root zone area.

Flood irrigation (PVC) piping also requires trenching.

Drip or Flood?

Rabbits and Coyotes love drip tubing

Drip, Flood or Sub Surface?

For a true functioning irrigation system, the system should include piping connected to a water source and a controller (timer) controlling the frequency and amount of time the system is in operation.

Plants with similar irrigation needs should be grouped together and set up into hydrozones.

Drip, Flood or Sub Surface?

Adjustable Bubblers

Sub Surface

Sub Surface tubing is buried near or at the root zone levels. Depth can vary from a few inches to several feet.

Spacing is predicated on plant types.

Spacing also varies based on plant and soil type.

Sub Surface Irrigation

Placement depends on crop type and soil make up. Sandy soils require closer placement than clay type soils. Depth can be as much as 24 inches for deep rooted plants such as fruit trees, or as shallow as 6 inches for turf grass.

Sub Surface Irrigation

When using sub surface irrigation, some of the water thru capillary action actually moves upwards, some radiates outwards and some moves downwards. How much will be determined by the type of soil and the speed of the application.

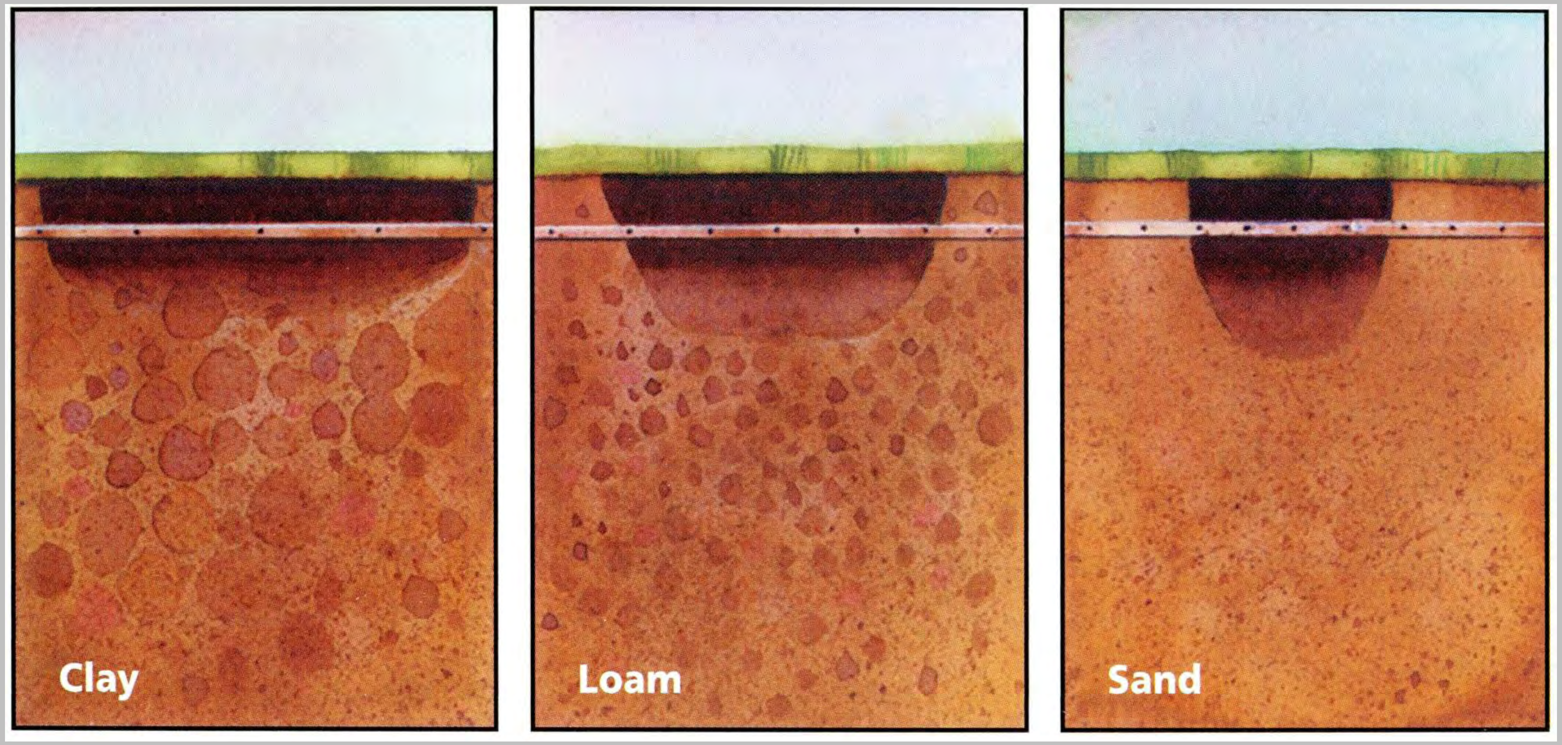


Chart courtesy of Netafim

Sub Surface Irrigation

For sub surface always use the lowest flow rate dripper possible. Netafim recommendation is
0.26 GPH for clay
0.4 GPH for loam
0.6 GPH for sand

By irrigating on a daily basis using sub surface irrigation, the roots are allowed to reach their maximum depth, and the irrigation water can move outwards to its maximum radius.

Depending on the manufacture, sub surface tubing comes in varied flow rates and emitter spacing.

Surface or Sub Surface Irrigation

Thin wall drip line or (drip tape) can be used above ground or placed sub surface. Normally it's a one time use.

Surface Irrigation

This tubing is designed for sub surface or above ground applications

Low Water Irrigation For Your Plant Needs

DRIP EMITTERS

Below are some of the basic drip emitters available for use in your project. Emitters are classified in two types, pressure compensating and non pressure compensating.

As the plant grows, so does the need for additional drip emitters. Add additional emitters to the canopy area of the plant. Use supplied charts for application suggestions

EMITTER SELECTION

It is recommended to use a minimum of two emitters for any application. Determine the amount of water the plant needs per cycle or per week. Select emitters based on at least two emitters. For larger shrubs and trees use more emitters.

With larger plants and trees, use more emitters with higher flow rates. This will allow the water to be properly delivered to the root zones of the plant

EMITTER PLACEMENT

Emitter placement should be away from the trunk area and on top of the root ball and the adjoining area of the original soil. Extra emitters should also be placed outwards to overlap the rootball and the existing soil, thus allowing for a transitional movement of the irrigation water from the rootball to the original soil.

Proper emitter placement will allow for the roots to move from the original planting container rootball, outwards thru the new adjoining soil, creating a healthier root and plant system.

Determining Irrigation Requirements

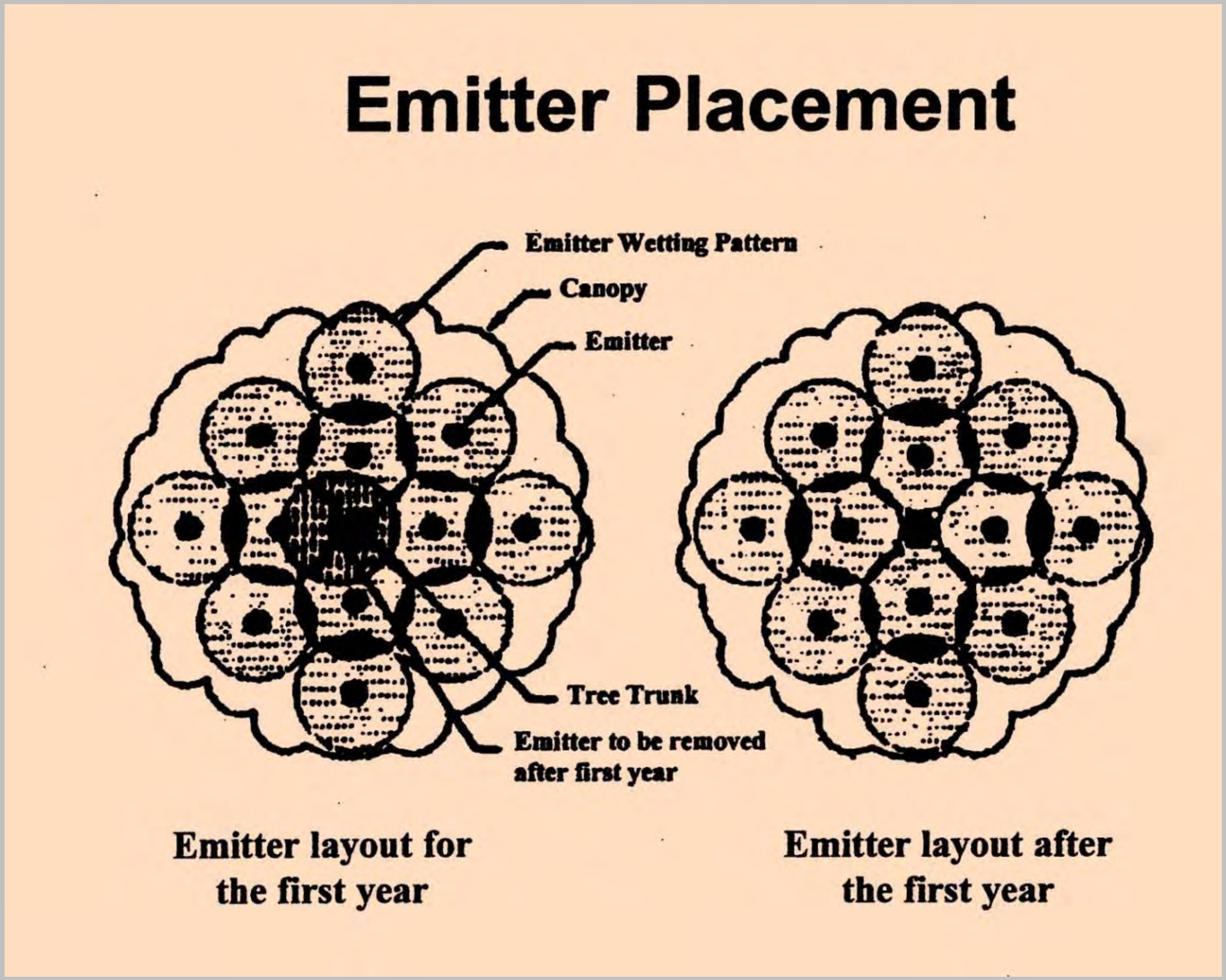
Step 1: Finding water requirement per day or month for the garden section.

Step 2: Determining how many emitters to use, or how much emitter drip line to use.

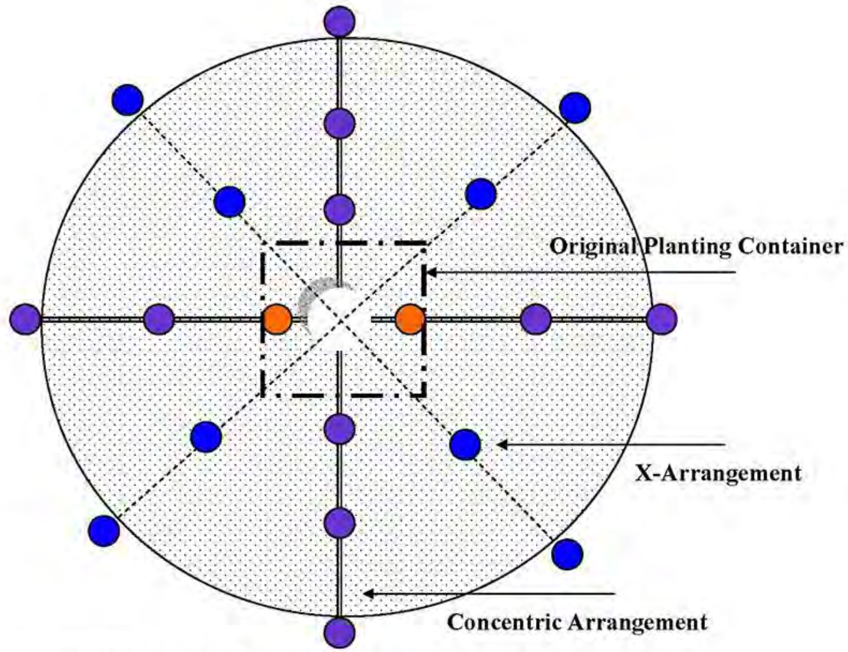
Step 3: Determining the watering days and times of your system.

With larger plants and trees, use more emitters with higher flow rates. This will allow the water to be properly delivered to the root zones of the plant

Large Plants use more water than Small Plants



Information courtesy of the “Conservation District of Southern Nevada”



Irrigation Emitter Arrangement Options

Emitter watering original rootball (plug emitter 30 to 90 days after planting)

Concentric watering pattern (3 foot spacing)

X watering pattern with additional emitters for more water demanding trees i.e.: Chilopsis linearis or Acacia smallii

Trunk of tree

Emitter Selection Chart

Emitter Selection for Shrubs

Plant Water Use		Plant Diameter in Feet	2	4	6	8	10
Low	# Emitters		1	1	3	5	7
	Emitter Rate (GPH)		0.5	1	1	1	1
Low to Mod.	# Emitters		1	2	5	4	6
	Emitter Rate (GPH)		0.5	1	1	2	2
Moderate	# Emitters		1	3	7	6	9
	Emitter Rate (GPH)		1	1	1	2	2

Emitter Selection for Trees

Plant Water Use		Plant Diameter in Feet	10	15	20	25
Low	# Emitters		7	8	14	22
	Emitter Rate (GPH)		1	2	2	2
Low to Mod.	# Emitters		6	14	25	40
	Emitter Rate (GPH)		2	2	2	2
Moderate	# Emitters		9	20	36	56
	Emitter Rate (GPH)		2	2	2	2

Emitter Selection Chart

Inline Drip Tubing Lengths (0.6 GPH) For Trees*

Plant Diameter in Feet	10	15	20	25
Plant Water Use				
Low Feet Tubing	24	54	96	150
Emitter Spacing	24”	24”	24”	24”
Low to Mod. Feet Tubing	32	72	128	200
Emitter Spacing	18”	18”	18”	18”
Moderate Feet Tubing	30	68	120	188
Emitter Spacing	12”	12”	12”	12”

* Inline drip tubing at .5 GPH emitters use 20% more tubing and inline drip tubing at .9 GPH use 33% less tubing.

Information courtesy of the “Conservation District of Southern Nevada”

Water Time in Hours

		Soil Types					
Depth	**Emitter Flow Rate**	**Sandy**	**Sandy Loam**	**Loam**	**Clay Loam**	**Silty Clay**	**Clay**
1 Foot	1 gph	1.4	2.3	3.8	5.1	10.3	7.2
Ground Cover Small shrubs	2 gph	1.1	1.9	3.1	4.2	8.5	5.9
	4 gph	0.9	1.5	2.6	3.5	7	4.8
2 Feet	1 gph	4.2	6.8	11.5	15.4	31.1	21.6
Shrubs Small Trees	2 gph	3.4	5.6	9.5	12.6	25.5	17.7
	4 gph	2.8	4.6	7.8	10.4	20.9	14.5
3 Feet	1 gph	7.9	13	22	29.3	59.1	41
Trees	2 gph	6.5	10.7	18	24.1	48.5	33.7
	4 gph	5.3	8.7	14.8	19.7	39.8	27.6

These watering times are based on the volume of soil which can be saturated from 60% available moisture content. These values are only guidelines for establishing maximum watering times

A simple Test

For the test, run a single 1 gallon per hour emitter at your test site for 30 minutes. After a 1 hour saturation period, test the area with your soil probe to determine the width and depth of your wetting pattern. After a 2 hour period, again test the soil with your probe.

Your goal is to have the water reach a depth of your plants root zone.

Example; Use the 24 inch depth for large shrubs. You might have to perform this test several times to reach your desired depth. Note the lateral movement and use this information for the emitter placement.

Another consideration for emitter selection would be the size of the root system at plant maturity.

Place the emitters so the wetting patterns slightly overlap.

Not enough emitters will cause poor root development. A single emitter in sandy soil will have a wetting pattern up to 2 feet in diameter (5 feet for clay).

Tree roots can grow more than 3 feet the first year. Misplaced emitters will cause poor development within the 1st year after planting.

In Sandy soils, the water drains downwards between the particles, and does not flow laterally (until it reaches saturation). Drip irrigation requirements differ from those of Loam or Clay type soils.

For Sandy soils emitter placement to each other would be much closer than those of other types of soils.

In sandy soils, irrigation would be more often as compared to Clay type soils. Irrigation run times would also differ. This is where testing the soil with a probe would help determine the irrigation run time.

In Sandy soils, using two ½ GPH emitters instead of a single 1GPH emitter will double the irrigation area using the same amount of water. (better root coverage)

PLANT ROOTS

ROOTS

Roots stabilize and help anchor the plant

Roots supply nutrients to the plant

Roots Win in Low Water Conditions

ROOTS (Continued)

Roots don’t seek water
Roots grow where the water is
Roots grow rapidly in desert plants
Roots grow first then the plant grows

Plants start to grow once the roots find their source of water

ROOTS (Continued)

If over irrigated, the top growth exceeds the root capabilities for anchoring the plant

If over irrigated, the top growth water requirements will eventually exceed the supply capabilities of the roots, and the plant will go into stress, and die off

ROOTS (Continued)

Photo Courtesy of Bob Morris
xtremehorticulture.blogspot.com/

Each irrigation cycle should wet the soil to root zone. Frequent and shallow irrigation promote shallow and unstable roots.

This was a 25 gallon box tree when planted. The tree died within 6 months of the plant date. Note the lack of a healthy root system. The most likely cause was at the nursery, not changing the container sizes as the tree grew in height and girth. This in turn caused encircled roots. It would have survived in the 25 gallon box since it was watered daily, however in real life, not enough roots caused the plants death. Encircled roots can also be caused by poor emitter or irrigation placements.

Note the salt build up in this landscape. Additional deep irrigation is required to drive the salts down and away from the plants root system. The use of a organic type mulch would help is this situation.

Overwatering -Underwatering

Underwatering

- Soil is dry
- Lack of growth
- Older leaves turn yellow or brown and drop off
- Leaves become wilted
- Leaves curl and become brittle, crumble to the touch
- Plant is dead

Overwatering

- Soil is saturated
- Leaves turn a lighter shade of green - turn yellow
- Leaves curl and sometimes limp
- Young shoots are wilted
- Excessive plant growth
- Plant is dead

Methods of Measuring Soil Moisture

- Soil moisture can be measured in a variety of ways.
- Touch and feel method
- Probing
- Using a soil moisture meter
- Soil sampling
- Using sophisticated probes

Large Plants use more water than Small Plants

BEFORE YOU DIG CALL 811

BEFORE YOU DIG CALL 811

Pipe and Tubing

PVC Pipe Schedule and Class

- Using PVC piping Schedule rating of pipe, the larger the pipe, the less pressures it is rated at.

- Schedule 40; 1/2″ = 600 PSI, 3/4″ = 480 PSI, 1″ = 450 PSI, 1 1/4″ = 370 PSI. (see note) **

- Using PVC Class rating of pipe, the class number represents the pressure rating of the piping. Example class 200, is a 200 psi rating, class 315 is 315 psi rating. (see note) **

** Note the pressure ratings of PVC pipe are at 73 degrees F. PVC is not intended for hot water applications. Pressure ratings start at 73oF, and drop drastically from there. There is a 62% de rating at 100oF, and a maximum usable temperature 140oF (60oC)

Schedule and Class

Fahrenheit Temperature Ratings of PVC Pipe

73 degrees F - 100%

80 degrees F – 90%

90 degrees F – 75%

100 degrees F – 62%

110 degrees F – 50%

120 degrees F – 40%

130 degrees F – 30%

140 degrees F – 22%

Determine Piping Needs

- A key component in landscaping design, is the grouping of plants with similar water requirements together. This grouping is called a "Hydrozone"
- An example; your landscape has mesquite, desert willow and other desert adapted trees. It also has texas rangers, cassias, mexican bird of paradise for shrubbery.
- Group the trees into one zone, and the shrubbery in another.
- You also have a Citrus (orange) tree. Based on the above plant materials, the Citrus should be on a zone by itself.

Determine Piping Needs

PVC (Poly-vinyl Chloride) Pipe is available in many sizes and schedules. For the Homeowners, the main supply piping for the irrigation system should be a minimum of ¾ inch diameter pipe. It is even better to use 1 inch PVC pipe for your initial connections from the meter service, and for the control valve manifolds. Using the larger diameter piping will reduce flow and pressure losses. Never use schedule 20 PVC pipe. PVC fittings are normally schedule 40

PVC Pipe schedule 40 flow rates at low pressure.

½” – – – 7 gpm
¾” – – – 11 gpm
1” – – –16 gpm
1-1/2” – 35 gpm
2” – – – 55 gpm

Flows vary due with piping pressure changes, and additions of elbows, valves, and other restrictive devices installed into the piping systems.

Credits

Elephants drinking water
William Lorenz at *http://www.ixaris.com*

Man Scratching Head Cartoon
http://blog.lib.umn.edu/meriw007/myblog/assignment-1/

Guidelines for Landscape Drip Irrigation System
http://www.amwua.org/pdfs/drip_irrigation_guide.pdf

Drip Irrigation Guide (Arizona Landscape Irrigation Guidelines Committee)
http://www.amwua.org

Wile-E-Coyote
http://media.photobucket.com/user/dragonface72/media/wile-e-coyote.jpg.

Rain Bird Sub Surface Dripline Tubing
http://www.rainbird.com/landscape/products/dripline/XFS.htm

Web Sites To Save

- Water Wise (U/A)
- http://waterwise.arizona.edu/
- Plant Disease Publication
- http://ag.arizona.edu/pubs/diseases/az1124/
- Drip Irrigation Guide (Arizona Landscape Irrigation Guidelines Committee)
- http://www.amwua.org
- Low Water Tree and Plant Guide (Mohave County MG'S)
- http://www.lhcaz.gov/brochures/publicworks/lowwatertreeandplantguide.pdf

Web Sites To Save (Kgmn)

- For Watering Trees and Shrubs
- http://ag.arizona.edu/pubs/water/az1298/
- Landscape Watering by the Numbers
- http://wateruseitwisely.com/wp-content/uploads/2013/07/Landscape-Watering-Guide.pdf
- Arizona Master Garden Manual, Irrigation
- https://ag.arizona.edu/pubs/garden/mg/irrigation/Design.html
- WUCOLS Landscape Water-Use Planning Tool http://www.waterwonk.us/
- A Guide to Estimating Irrigation Water Needs of Landscape Plantings In California
- http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf

QUESTIONS?

How to Properly Fasten PVC Piping


Oatey
#30756
FOR CPVC, PVC
PURPLE PRIMER
PARA CPVC, PVC
IMPRIMADOR PÚRPURA
LoVOC
DANGER/PELIGRO: EXTREMELY FLAMMABLE • VAPORS MAY CAUSE FLASH FIRES • MAY IRRITATE EYES AND SKIN • VAPOR HARMFUL - MAY IRRITATE RESPIRATORY TRACT AND CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION • HARMFUL OR FATAL IF SWALLOWED • READ LABEL CAREFULLY PRIOR TO USE
• EXTREMADAMENTE INFLAMABLE • LOS VAPORES PUEDEN PROVOCAR FOGONAZOS • PUEDEN IRRITAR LOS OJOS Y LA PIEL • VAPORES DAÑINOS - PUEDEN IRRITAR EL TRACTO RESPIRATORIO Y PROVOCAR DEPRESIÓN DEL SISTEMA NERVIOSO CENTRAL • DAÑINO O FATAL SI SE TRAGA • LEA LA ETIQUETA CUIDADOSAMENTE ANTES DE USARLO
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MADE IN USA HECHO EN E.U.A.
8 fl. oz. 237 mL


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PVC CEMENT
MEDIANO • TRANSPARENTE
CEMENTO PVC
DANGER:
EXTREMELY FLAMMABLE • VAPORS MAY CAUSE FLASH FIRES • MAY IRRITATE EYES AND SKIN • VAPOR HARMFUL - MAY IRRITATE RESPIRATORY TRACT AND CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION • HARMFUL OR FATAL IF SWALLOWED • READ LABEL CAREFULLY PRIOR TO USE
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Cleveland, OH 44135 800-321-9532 www.oatey.com
MADE IN USA HECHO EN E.U.A.
4 fl. oz. 118 mL

Using the PVC adhesive is a weld process not a glue process. The cleaner and adhesive temporarily melts a thin layer of the PVC and in seconds when bonded together the adhesive makes up a watertight and seamless joint.

Cut piping as square as possible

Remove internal and external burrs using sandpaper or file

Pre fit prior to using cement or primers

Always use primer then the adhesive.

The primer not only cleans the material, it also softens the material making a better bond for the adhesive. Coat both sides of the connection with the primer.

Once the connection has been test fitted, and then primed on connecting surfaces, apply the adhesive to both parts, insert and twist. Make sure to bottom out the piping into the fitting.

What can go wrong?

Presence of water during the bonding process will not allow the normal adhesive to properly bond, thus causing a weak and possible failed joint.

Too much adhesive, will actually solidify inside the piping and block the flow of your irrigation water.

What can go wrong?

Not bottoming out the piping inside of the fitting makes for a weaker joint.

Not using primer causes a weak joint.

Assembling the piping without the use of adhesive (common)

What can go wrong?

Not cleaning the piping prior to using the adhesive causes a poor connection.

HANDS ON DEMONSTRATION

IRRIGATION BASICS
The Parts and Materials

Irrigation
Parts Materials
and
Controllers

System Components

BEFORE YOU DIG CALL 811

Irrigation Timers/Controllers

Manually operated irrigations systems lack reliability. Using an electric control system removes the guesswork out of having an accurate irrigation regimen.

Irrigation Control System

Timers/Controllers/Clocks come with many options. There are indoor or outdoor, powered by batteries, by 120vt or 220vt electrical systems. They differ by number of stations, programs, and smart controls. Some timers are affixed to the station solenoid valve itself

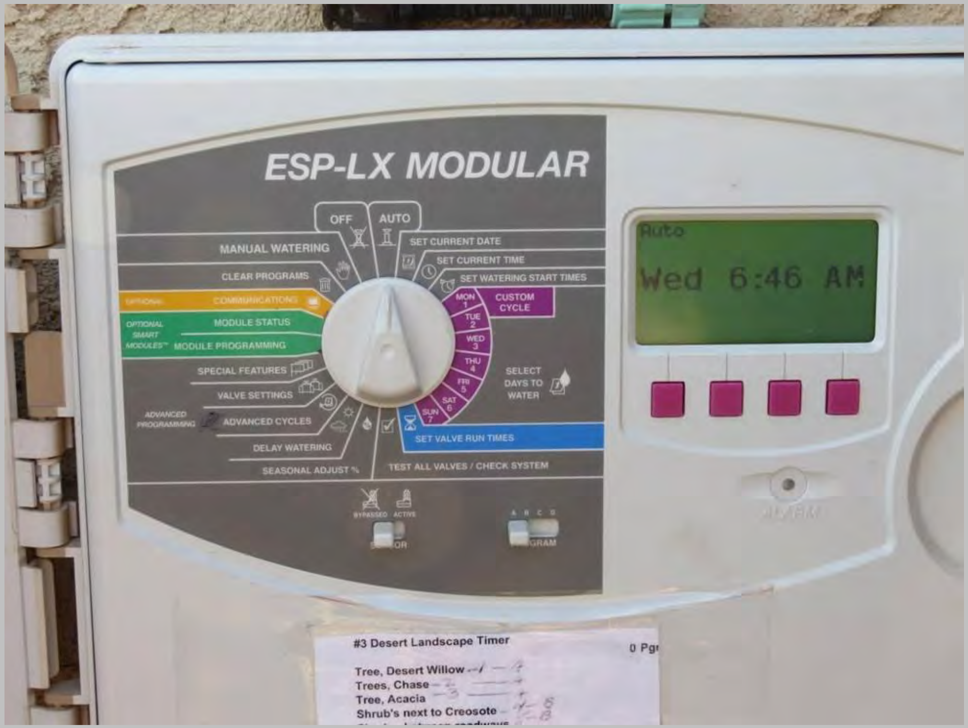
Irrigation Control System

Two general types of timers/controllers are used for irrigation.

•Closed Loop uses sensors to determine the amount and timing of irrigation applications.

•Open loop leaves it up to the user to determine the amount and timing of the irrigation.

Outdoor Irrigation Control Timer



Outdoor Irrigation Timers

Outdoor Hose Connection Timer

Outdoor Irrigation Control Timer

Outdoor Irrigation Timer

Rain Sensor

Outdoor Irrigation Control Timers

Back Flow Prevention Device

Drip Irrigation Components

What Is It?

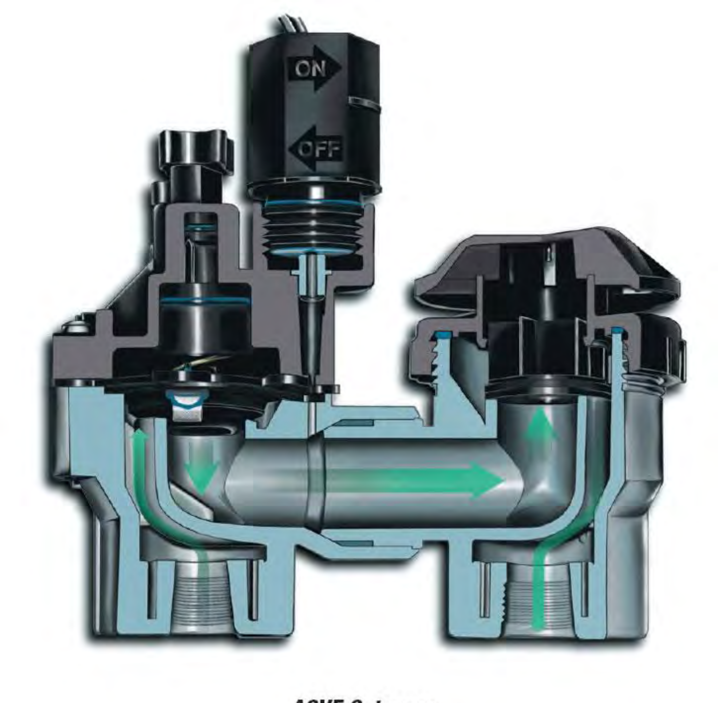
Back Flow Prevention Devices

Anti Siphon Valves

Electrically Operated

Manually Operated

Electric Solenoid Valves



ASVF Cutaway

Irrigation Components

PVC Pipe Primer and Cement

Primer used to clean and soften the joining materials

PVC Pipe Primer

PVC Cement used to Weld the PVC parts together

PVC Pipe Solvent Cement

When applying the solvent cement to the adjoining pieces, the PVC joints are literally welded together with the chemical solvent reaction.

PVC Pipe Solvent Cement

Irrigation Components

½” Pipe Adjustable Flow Rate Bubblers

Drip Irrigation Components

Poly Pipe Pressure Regulator and Filter
Note how the Filter is downstream of the regulator

Irrigation valve box, with low volume regulator and filter

Drip Irrigation Components

½" pipe to ¼ micro tubing connectors

Drip Irrigation Components

Emitter Heads, & Miscellaneous Connectors

Remember, as the plant grows, so does the need for additional drip emitters. Add additional emitters to the canopy area of the plant. Use supplied charts for application suggestions

Drip Irrigation Components

½” Poly Tubing Connectors

Dripline Tubing

Sub Surface Dripline Tubing

Sub Surface Dripline Hose

Dripline is a hose like polyvinyl tubing with drippers inserted at a predetermined spacing. Flow rates very from .2 GPH and upwards.

When using a Dripline, find the one which suits your needs, and one which contains pressure compensating (PC) drippers.

Additionally, some manufacturers offer a filtering system for each emitter, and self venting built into the drip line.

The working pressure range for most pressure compensation drip line is from 10 to 50 PSI but it should always be used with a 25 PSI pressure regulator.

Always install a flush valve at the end of the system for required system maintenance

Sub Surface Dripline Hose

Advantages to using Sub Surface Irrigation

When properly placed, irrigation is to root zone without wetting the upper soil surfaces.

Can be used to supply reclaimed water to plants without fear of human or animal contact with the irrigation product

Can be used to precisely fertilize plant roots at the root zone

Estimated Water Requirements
(Guidelines for Landscape Drip Irrigation Systems)

Desert Adapted Plants, Natives

Plant Coefficient 0.30		*Typical Water Usage - Gallons Per Day*												
		Canopy Diameter (Feet)												
		1	2	3	4	5	6	7	8	9	10	15	20	25
	Eto	Area (Square Feet)												
Months	(In./Day)	1	3	7	13	20	28	38	50	64	79	177	314	491
January	0.09	0.01	0.05	0.1	0.2	0.3	0.5	0.6	0.8	1.1	1.3	3.0	5.3	8.3
February	0.13	0.02	0.08	0.2	0.3	0.5	0.7	0.9	1.2	1.5	1.9	4.2	7.5	11.8
March	0.19	0.03	0.11	0.3	0.4	0.7	1.0	1.4	1.8	2.3	2.8	6.3	11.2	17.5
April	0.27	0.04	0.16	0.4	0.6	1.0	1.4	1.9	2.5	3.2	3.9	8.8	15.7	24.5
May	0.32	0.05	0.19	0.4	0.7	1.2	1.7	2.3	3.0	3.8	4.6	10.4	18.6	29.0
June	0.36	0.05	0.21	0.5	0.8	1.3	1.9	2.6	3.4	4.2	5.2	11.8	20.9	32.7
July	0.30	0.04	0.18	0.4	0.7	1.1	1.6	2.2	2.8	3.6	4.5	10.0	17.8	27.8
August	0.26	0.04	0.15	0.3	0.6	1.0	1.4	1.9	2.5	3.1	3.8	8.6	15.3	24.0
September	0.24	0.04	0.14	0.3	0.6	0.9	1.3	1.8	2.3	2.9	3.6	8.0	14.3	22.3
October	0.19	0.03	0.11	0.3	0.4	0.7	1.0	1.4	1.8	2.3	2.8	6.3	11.2	17.5
November	0.12	0.02	0.07	0.2	0.3	0.4	0.6	0.9	1.1	1.4	1.8	4.0	7.0	11.0
December	0.08	0.01	0.05	0.1	0.2	0.3	0.4	0.6	0.8	1.0	1.2	2.7	4.7	7.4

Examples: Bursage, Cassia, Texas Ranger, Brittle Bush, Mesquite, Palo Verde, Sweet Acacia

IMPORTANT NOTE: This table should only be used as a guide. It does not take into account rainfall, microclimates, weather extremes, and cultural requirements. It also assumes the plants are not deciduous.

***Note: Derived from monthly average evapotranspiration values from Tucson area Arizona Meteorological Network (AZMET) weather stations. Evapotranspiration derived by modified Penman method.**

Estimated Water Requirements

(Guidelines for Landscape Drip Irrigation Systems)

Fruit Trees

Plant Coefficient	0.65	Typical Water Usage - Gallons Per Day												
		Canopy Diameter (Feet)												
		1	2	3	4	5	6	7	8	9	10	15	20	25
	Eto	Area (Square Feet)												
Months	(In./Day)	1	3	7	13	20	28	38	50	64	79	177	314	491
January	0.09					0.7	1.0	1.4	1.8	2.3	2.9	6.5	11.5	18.0
February	0.13					1.0	1.5	2.0	2.6	3.3	4.1	9.2	16.4	25.6
March	0.19					1.5	2.2	3.0	3.9	4.9	6.1	13.6	24.2	37.8
April	0.27					2.1	3.1	4.2	5.4	6.9	8.5	19.1	33.9	53.0
May	0.32					2.5	3.6	4.9	6.4	8.1	10.1	22.6	40.2	62.8
June	0.36					2.8	4.1	5.6	7.3	9.2	11.3	25.5	45.4	70.9
July	0.30					2.4	3.5	4.7	6.2	7.8	9.6	21.7	38.6	60.3
August	0.26					2.1	3.0	4.1	5.3	6.7	8.3	18.7	33.2	51.9
September	0.24					1.9	2.8	3.8	5.0	6.3	7.7	17.4	31.0	48.4
October	0.19					1.5	2.2	3.0	3.9	4.9	6.1	13.6	24.2	37.8
November	0.12					1.0	1.4	1.9	2.4	3.1	3.8	8.6	15.3	23.9
December	0.08					0.6	0.9	1.3	1.6	2.1	2.6	5.8	10.3	16.0

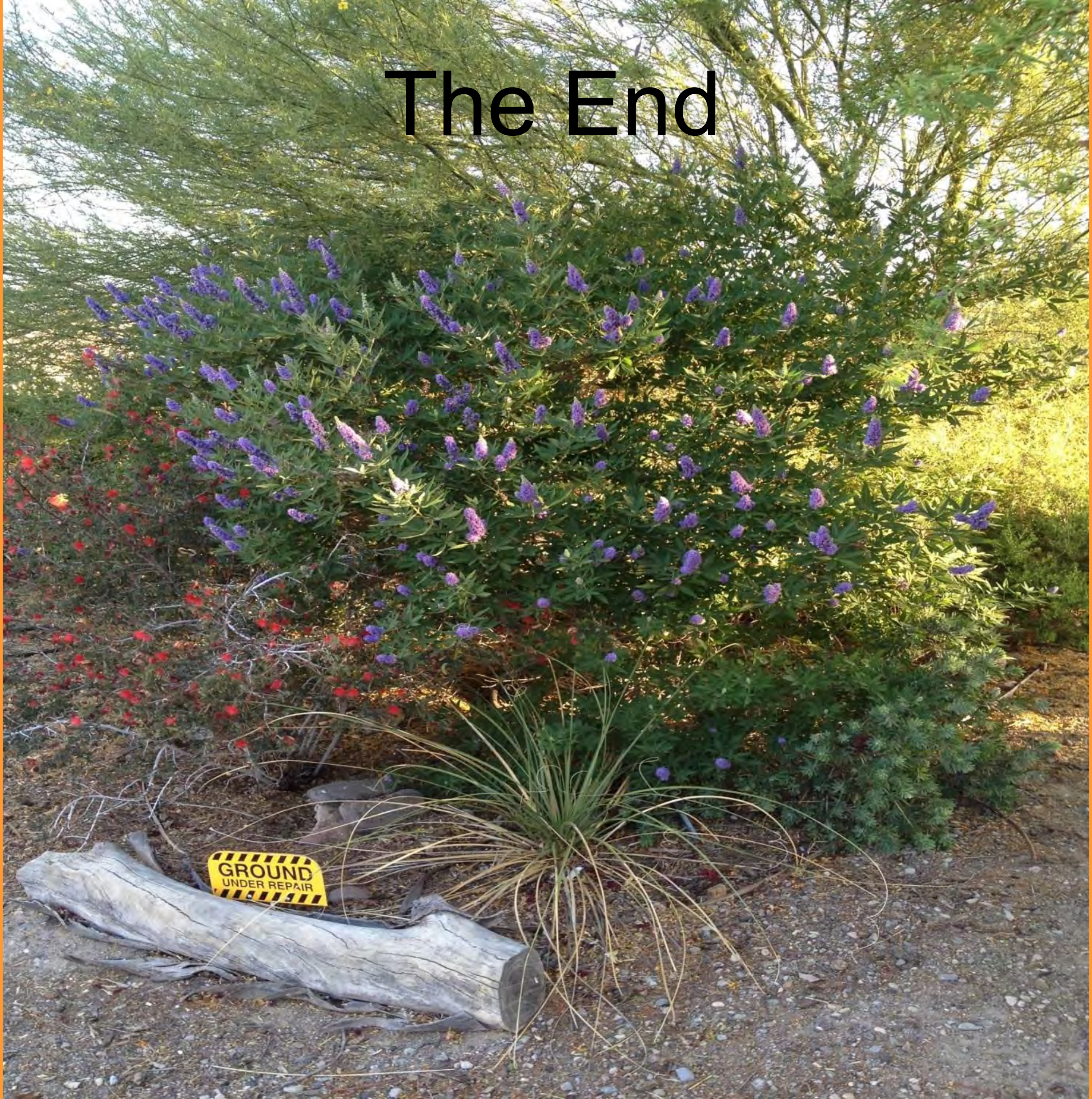
Examples: Citrus, Peach, Plum

IMPORTANT NOTE: This table should only be used as a guide. It does not take into account rainfall, microclimates, weather extremes, and cultural requirements. It also assumes the plants are not deciduous.

***Note: Derived from monthly average evapotranspiration values from Tucson area Arizona Meteorological Network (AZMET) weather stations. Evapotranspiration derived by modified Penman method.**

Improper irrigation was the cause of this root failure?

The End



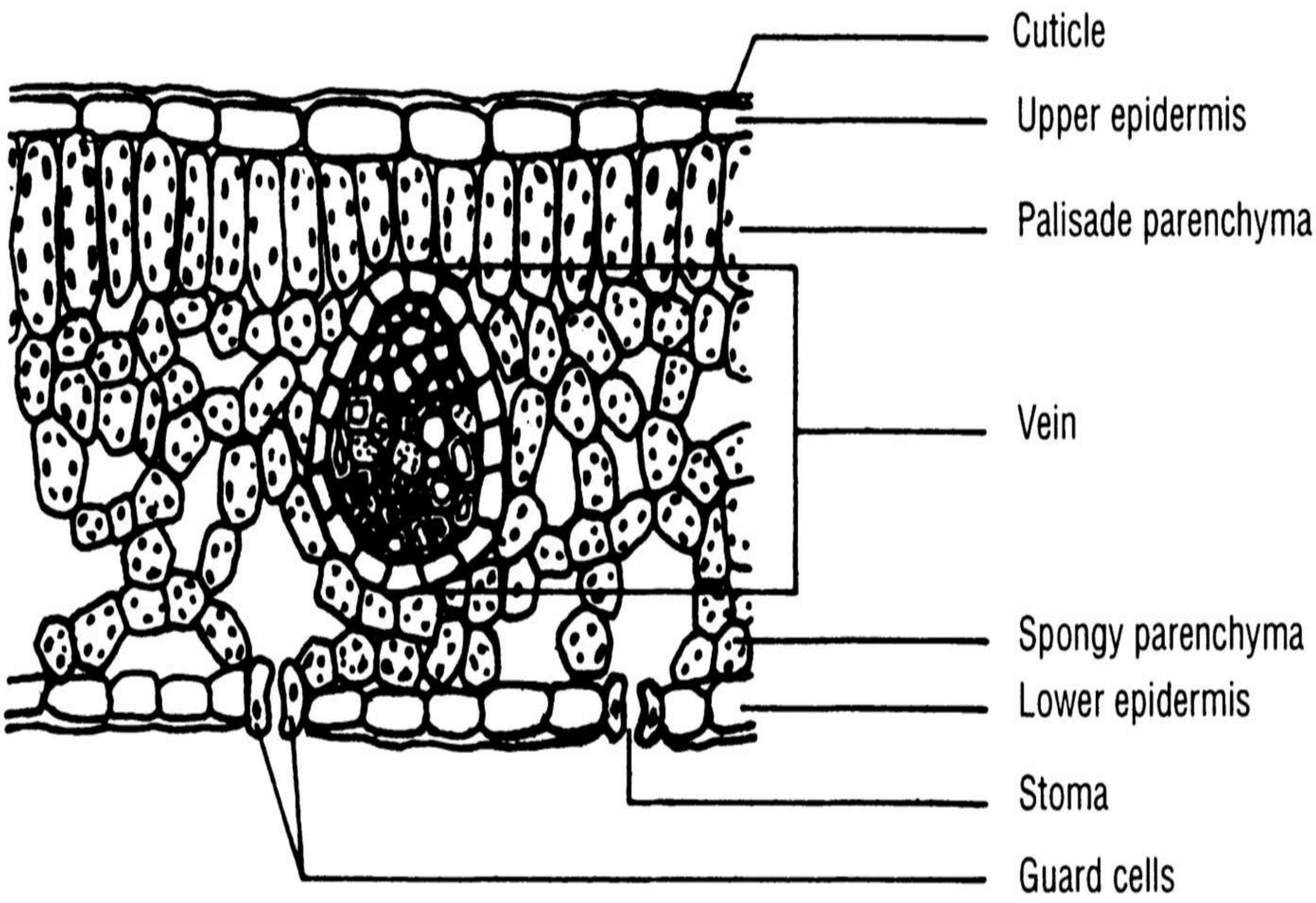
“Evapotranspiration” or “ET”

The plant leaves have transpire thru the part of the plant structure called the Stomata. The stomata (pores) are found in the epidermis of leaves, stems, and other organs, which is used to control gas exchange.

The pores are bordered by “guard cells” which are responsible for regulating the opening size of the pores. This is part of the photosynthesis and respiration process.

The stomata pores open and close in response to changing climate conditions (light intensity, wind, humidity, temperature).

STOMATA



Cuticle
Upper epidermis
Palisade parenchyma
Vein
Spongy parenchyma
Lower epidermis
Stoma
Guard cells