Functional irrigation

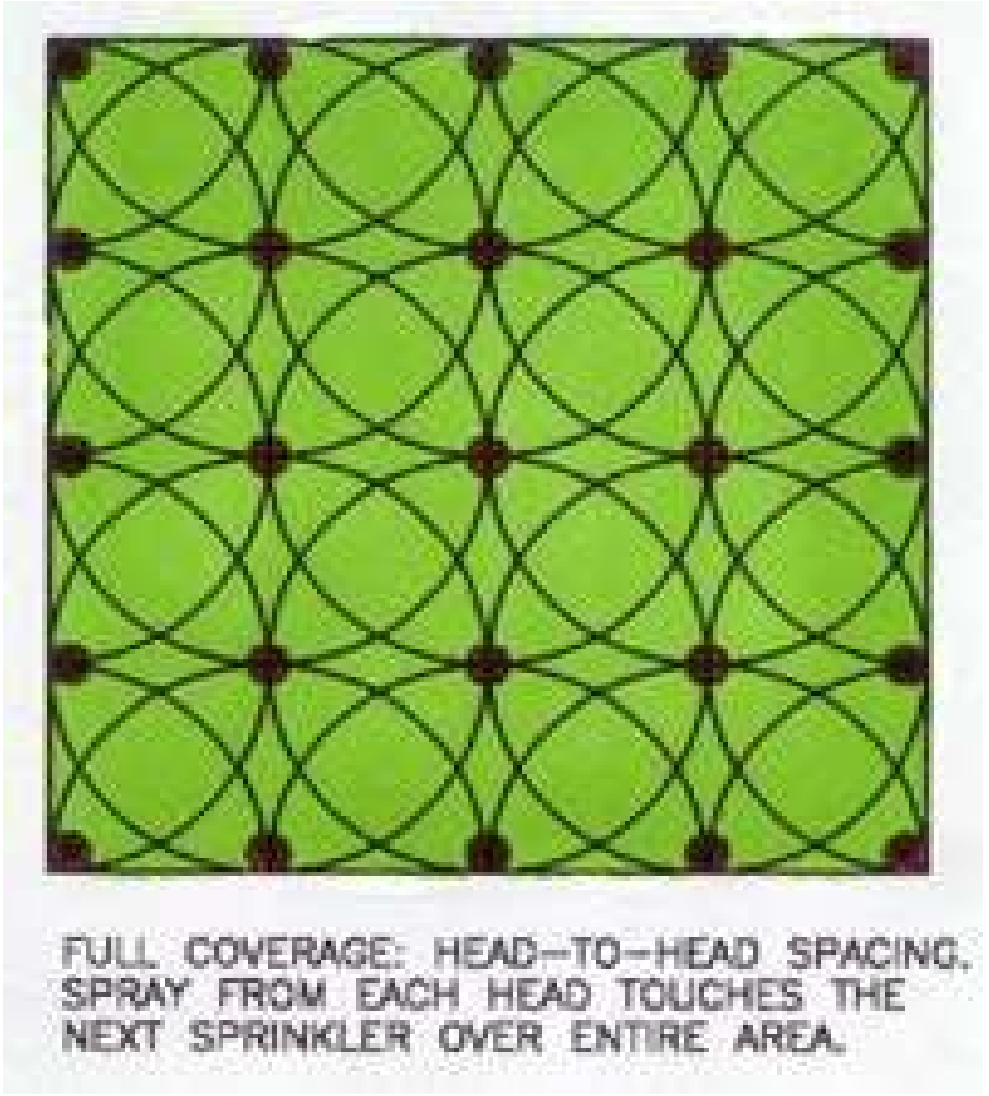
Sprinklers
Introduction to drip components
Point source or line source?
Component limits
Steps to create a design
Other considerations

Sprinklers

- Do a water audit. Place tuna cans on the ground and run a normal cycle. Check for consistency of fill in each can. Also check for runoff.
- Most newer rotator sprinklers are more efficient. Consider replacing older sprinklers to save water and get better coverage.
- If runoff is a problem, cycle that zone by running for a shorter time and stopping for 30-60min. Then repeat as many times (the same day) as needed to get the required water.
- If watering your lawn every day or two, gradually decrease frequency and increase time. This makes the roots grow deeper and the lawn more drought tolerant. Watch for runoff problems from the increased run times.
- Vary run times or frequency as the seasons warm and cool.
- Always use a pressure regulator

New style (left) and old style(right) sprinklers

Best sprinkler coverage
(more difficult to do for irregular areas)



Drip components

- Distribution tubing comes in 1/4”,1/2” and 3/4” diameters (no built in emitters)
- 1/2” tubing with built in emitters comes with 9,12,18,24, and 36” emitter spacing and various GPH ratings
- 1/4” tubing with built in emitters comes with 6 and 12” spacing and various GPH ratings
- Always use a back-flow preventer if using house water source (city water or residential well)
- Always use a pressure regulator and a Y filter
- Valves can be manual or electric

Distribution Tubing

½ and ¾ inch tubing sold in lengths of 50, 100 or 500 feet

Quarter Inch Tubing

Solid tubing for distrbution

Inline emmitter tubing

tubing with built-in emitters is available with 6 and 12-inch spacing

Locking Tubing Adapters

Half-inch tubing connectors with easier twist screw-on

Fittings for ¼” Tubing

Straight

Goof plug

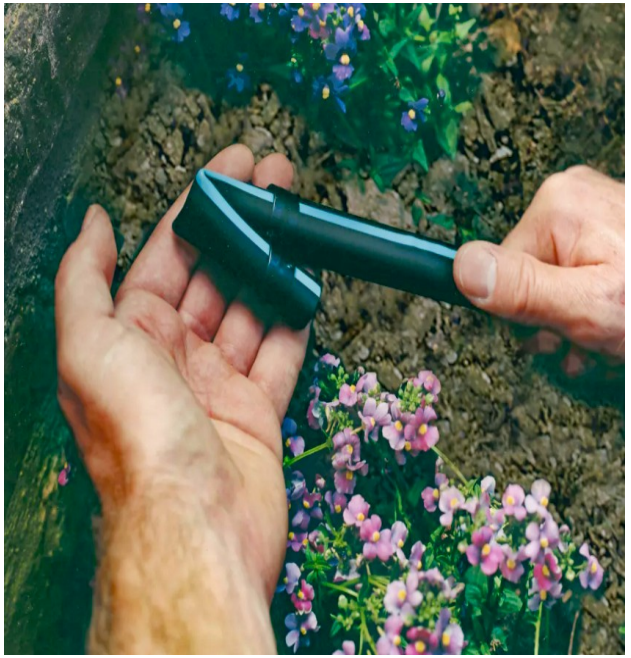
or

End cap

Elbow

Tee

End Caps



Point source emitters

0.5 GPH emitter

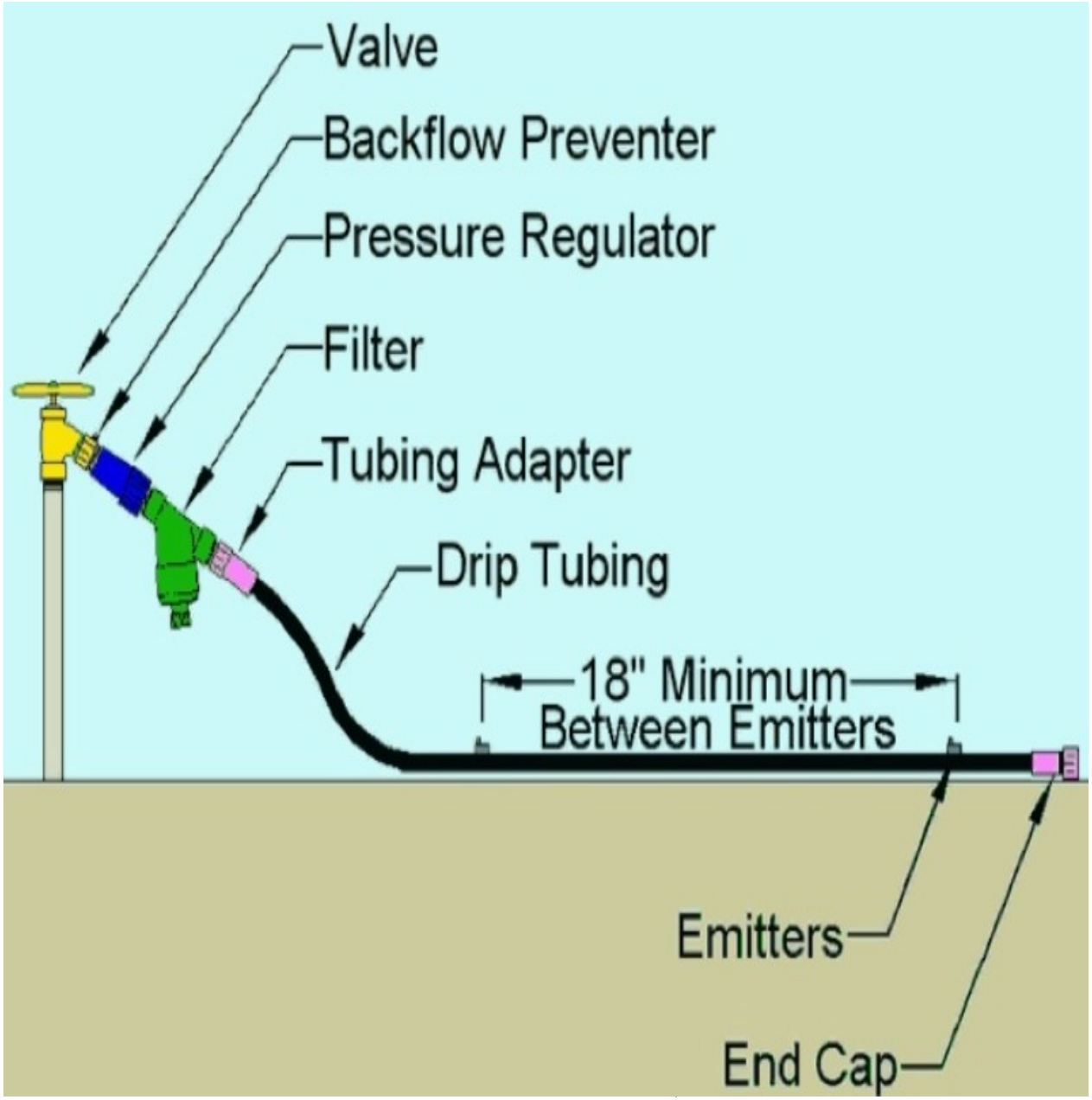
Shrubbler

4 GPH Flag emitter (Flushable)

Component limitations

- 1/4” tubing 30’ run and 30GPH
- 1/2” tubing 200’ run and 200GPH
- 3/4” tubing 480’ run and 480GPH
- You should design significantly under these limits.
- Any crimps or debris will decrease these values.
- Adding new plants or increasing the number of emitters as plants grow can cause a problem if original design was near the limit.
- Uphill lines will have lower pressure and flow

Typical setup



Backflow Preventer

Must have! Stops dangerous contamination from being drawn backward from garden to domestic water supply

Pressure regulator

Reduces water pressure to a lower pressure for drip lines. Check drip manufacturer recommendations. Some pressure reducer are pipe thread fittings.

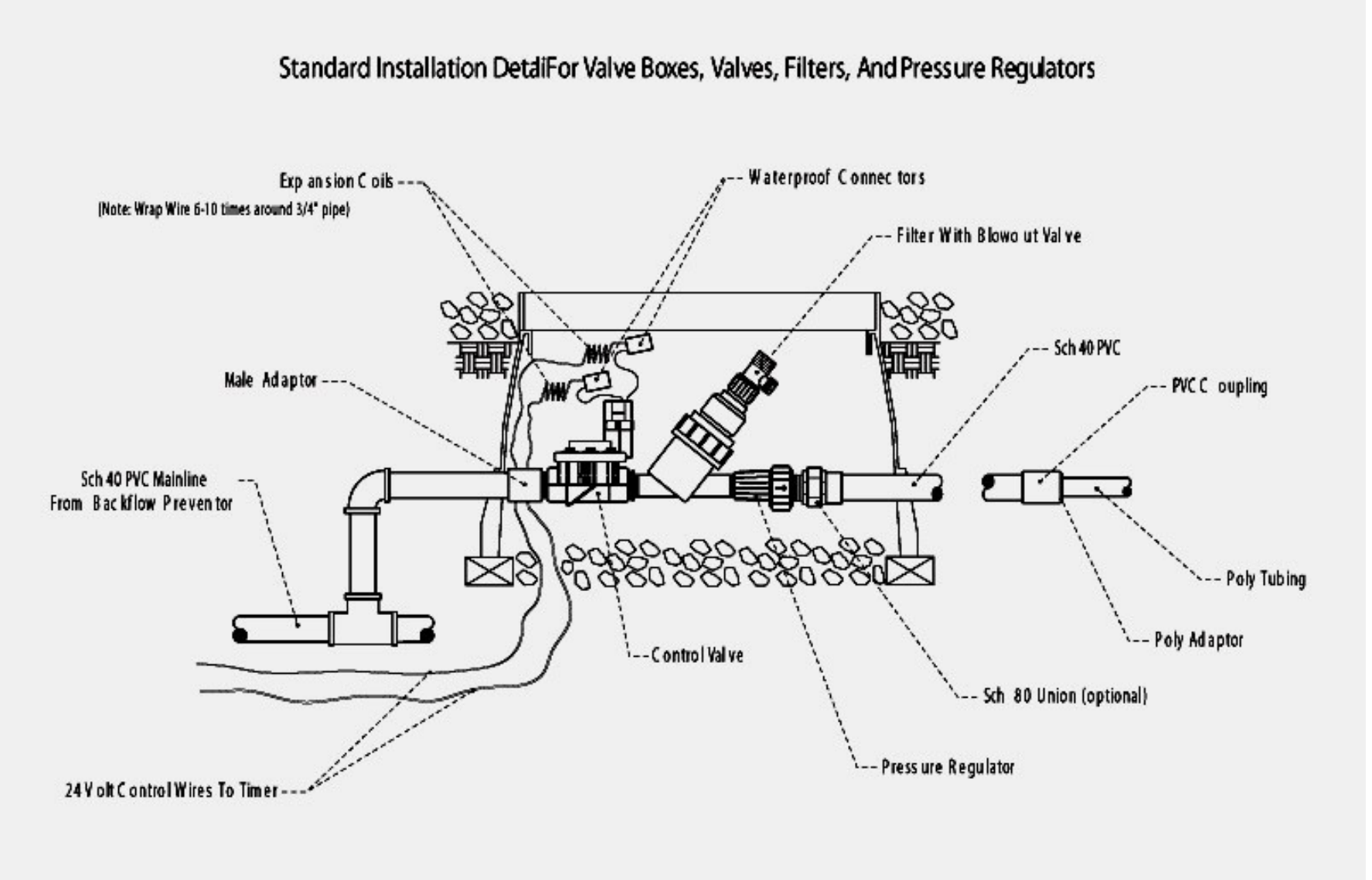
Y Filter

filter can be cleaned without disassembling entire line

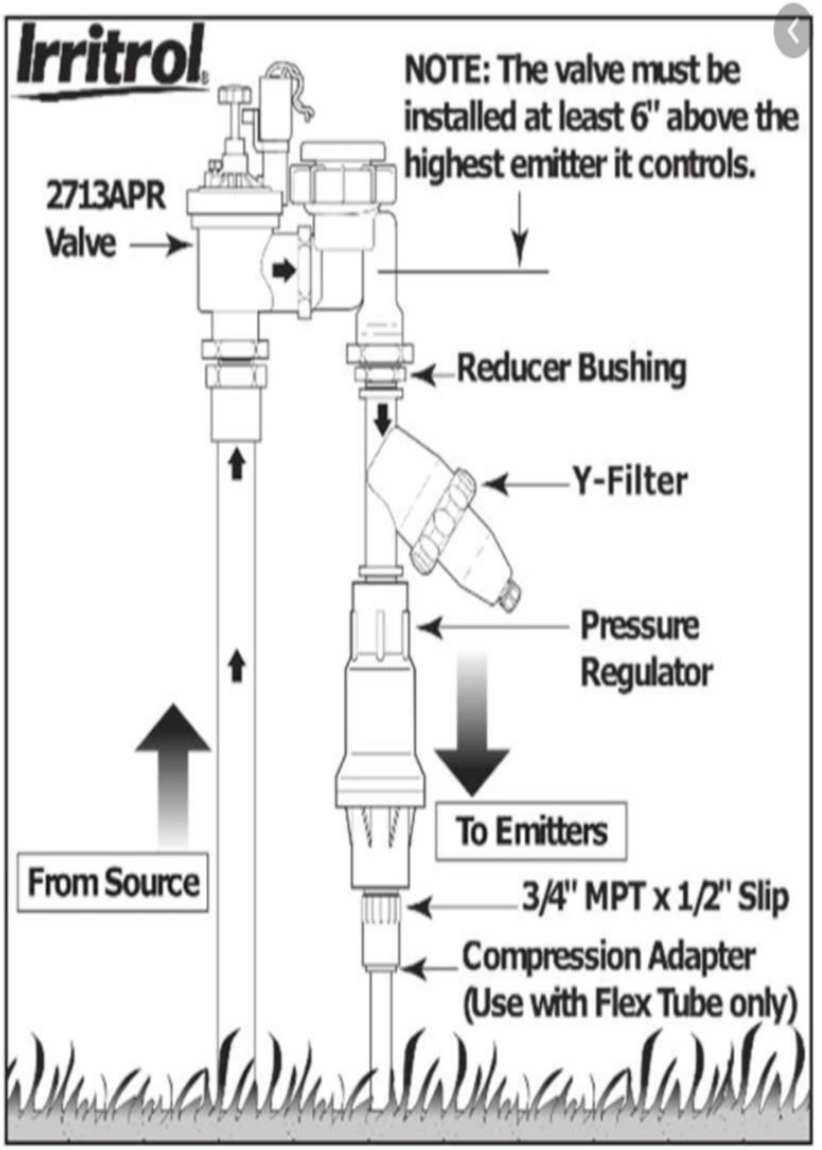
Underground valve box install

Helps prevent damage from people or pets.

Gives some protection from freezing.

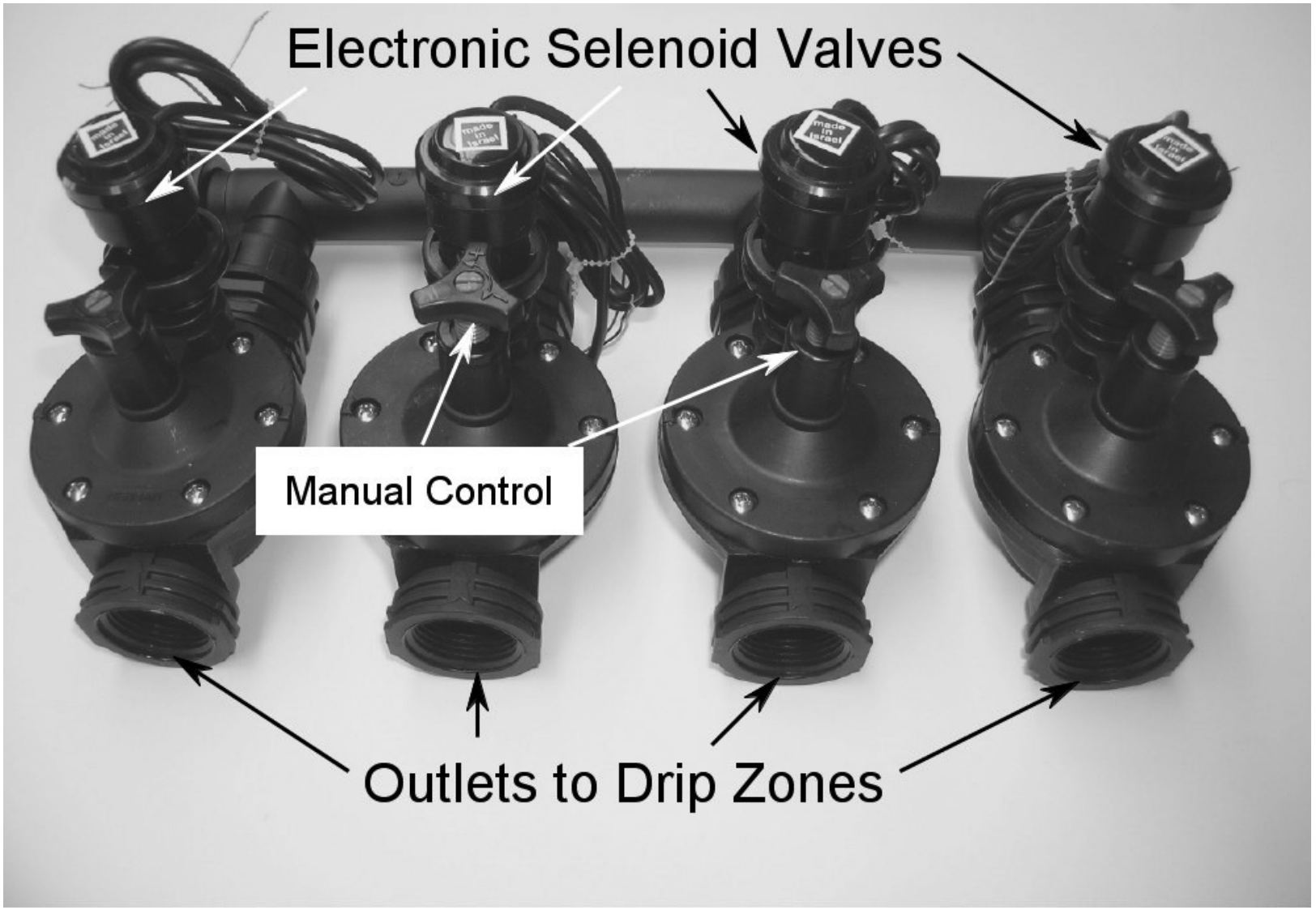



SCREEN FILTER
PRESSURE REGULATOR
DRIP TUBING


Irritrol
NOTE: The valve must be installed at least 6" above the highest emitter it controls.
2713APR Valve
Reducer Bushing
Y-Filter
Pressure Regulator
To Emitters
From Source
3/4" MPT x 1/2" Slip
Compression Adapter
(Use with Flex Tube only)

PVC valve manifold

Can be above ground or underground (in valve box)



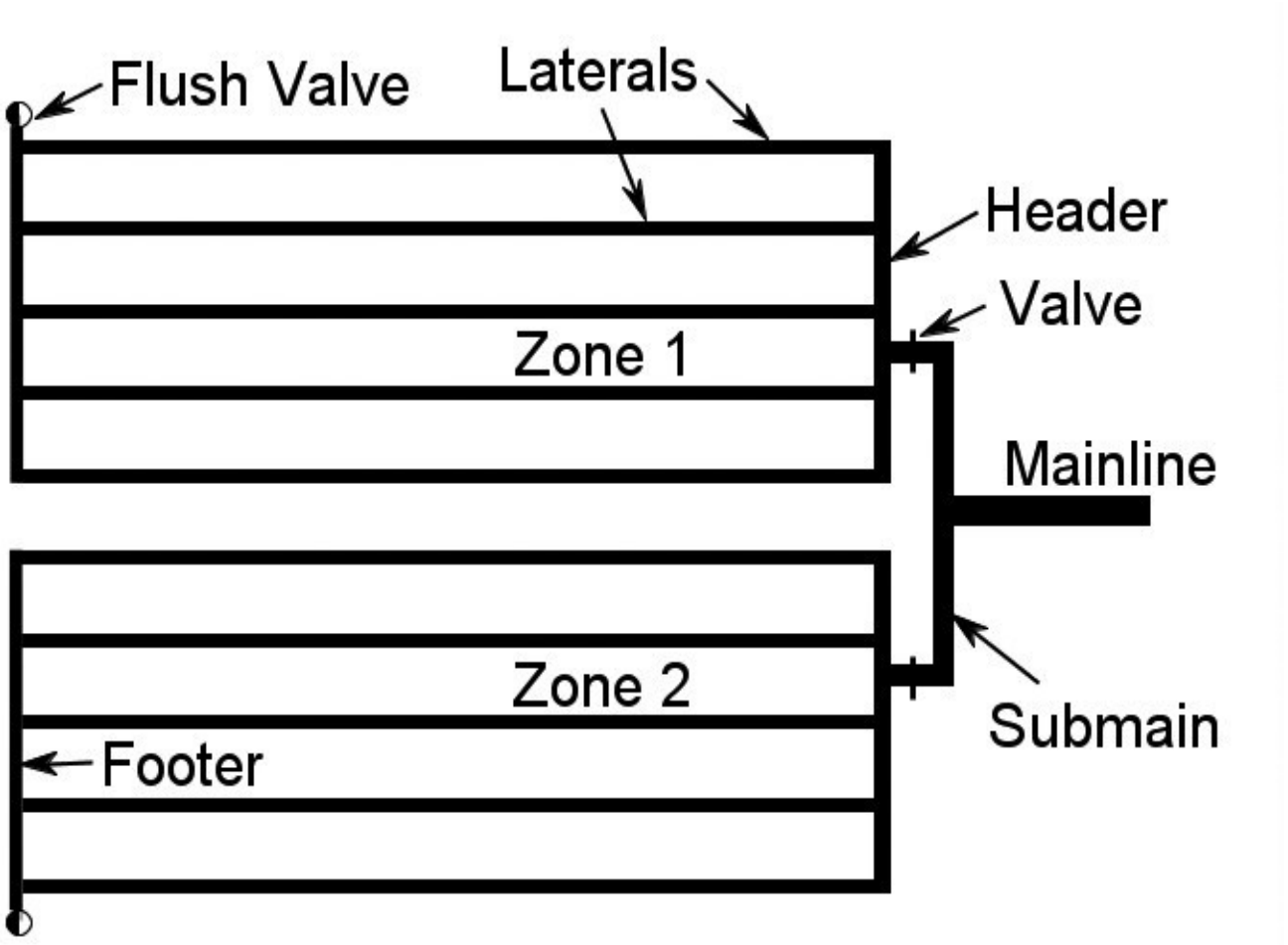
Brass manifold
Add backflow preventer and pressure regulator between hose bib and manifold

Emitter positioning
Line source or Point source?

- Line source uses a grid of tubing (usually 1/2”) with built in emitters. This works best for dense plantings like vegetable beds or ground covers.
- Point source delivers water to individual plants. This is best for less dense planting and for new plants.

Basic line source diagram

could be for vegetable beds, grapes, berries
Laterals have built in emitters



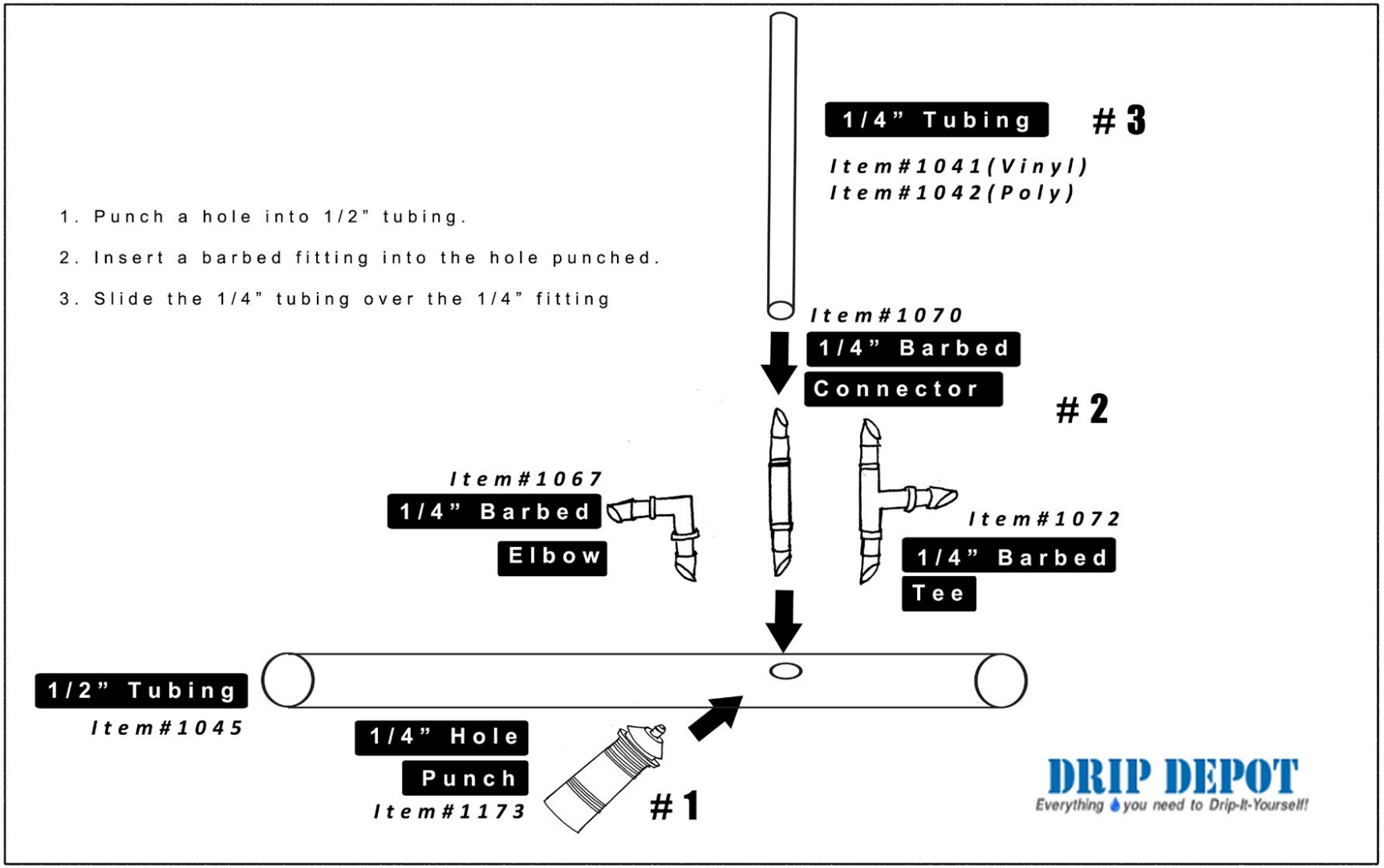
Residential line source

Notice water patterns below tubing because of slope

Pros and cons of Line source

- **PROS**
- All your irrigation is installed before your plants, so actual water coverage can be seen before plants are installed
- Coverage is more even
- Fewer parts to be disrupted by people, pets, or wildlife
- If grid is close together,the entire area can be watered
- **CONS**
- Not as good for new plants
- Can put water where there are no plants (encouraging weeds)
- May use more water since more soil is getting wet (wasted water)
- Plant placement is dictated by tubing layout
- Not for plants that require a dry root crown when mature

Point source connections



Closeup of point source

1/4” emitter tubing loop around plant
1/2” distribution tubing in upper left

Pros and cons for point source

- **PROS**
- Only applies water to the plants
- Best for new plantings
- Best for plants that require a dry root crown when mature
- Doesn’t encourage weed growth between plants
- Less wasted water
- **CONS**
- Emitter spacing needs to increase as plants grow (more for trees and shrubs)
- More pieces to get accidentally moved around by people, pets, and wildlife
- Need to calculate number of emitters needed for each plant

Steps to create an irrigation design

- Map and evaluate the site
- Divide landscape into hydrozones
- Determine plant factor for each zone
- Determine emitter specs based on soil type and slope
- Create valve zones based on system flow
- Create irrigation schedule for each zone

Map and evaluate the site

- Using graph paper, draw the site layout to scale. Include north direction arrow and the scale (IE 1”=4'). Show structures and hardscape. Show major elevation changes. Show existing plants and projected new plants or planted areas.
- Check water pressure with a pressure gauge. Check flow by timing the filling of a one gallon bucket, then convert to GPH. Do both checks at starting point of the irrigation zone.

What's your PSI or Pounds per Square Inch?

Tighten the gauge by hand and open the faucet all the way. Read at the gauge to determine the **pressure**. An ideal reading is between 45 and 55 PSI for Municipal Water. If your **pressure** is below 40 PSI or above 60 PSI, you should find out why…

- **Drip generally performs best at 20-30 psi.**

Calculating your water flow

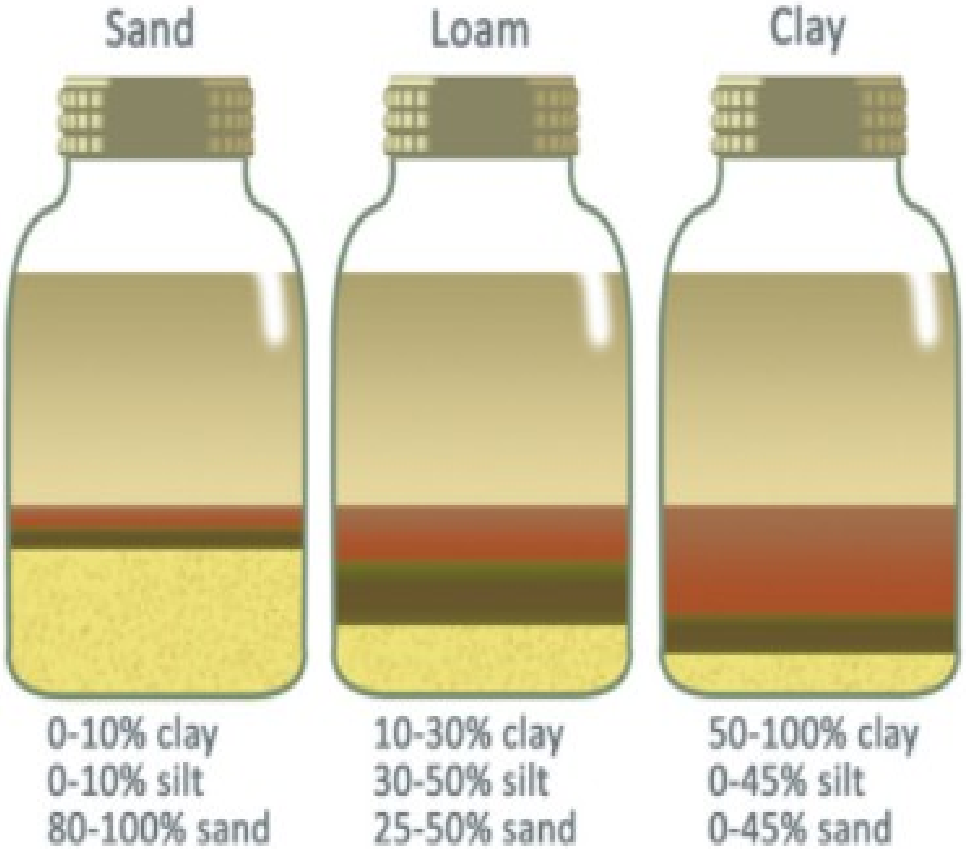
- Time how long it takes to fill a one gallon bucket
- If it took 20 seconds to fill (one third of a minute) = 3 GPM
- If it took 15 seconds to fill (one fourth of a minute) = 4 GPM
- If it took 12 seconds to fill (one fifth of a minute) = 5 GPM
- Then convert your GPM to Gallons per Hour (GPH) by multiplying GPM by 60

Soil Test

Determine your soil makeup by using the jar test to determine the percentages of sand, silt, and clay. Fill jar half full of soil (no rocks) and add a few drops of dish detergent. Fill half of remaining space with water. Shake to mix thoroughly. Sand will settle first, silt second, and clay last. Then use the chart to determine your soil type.

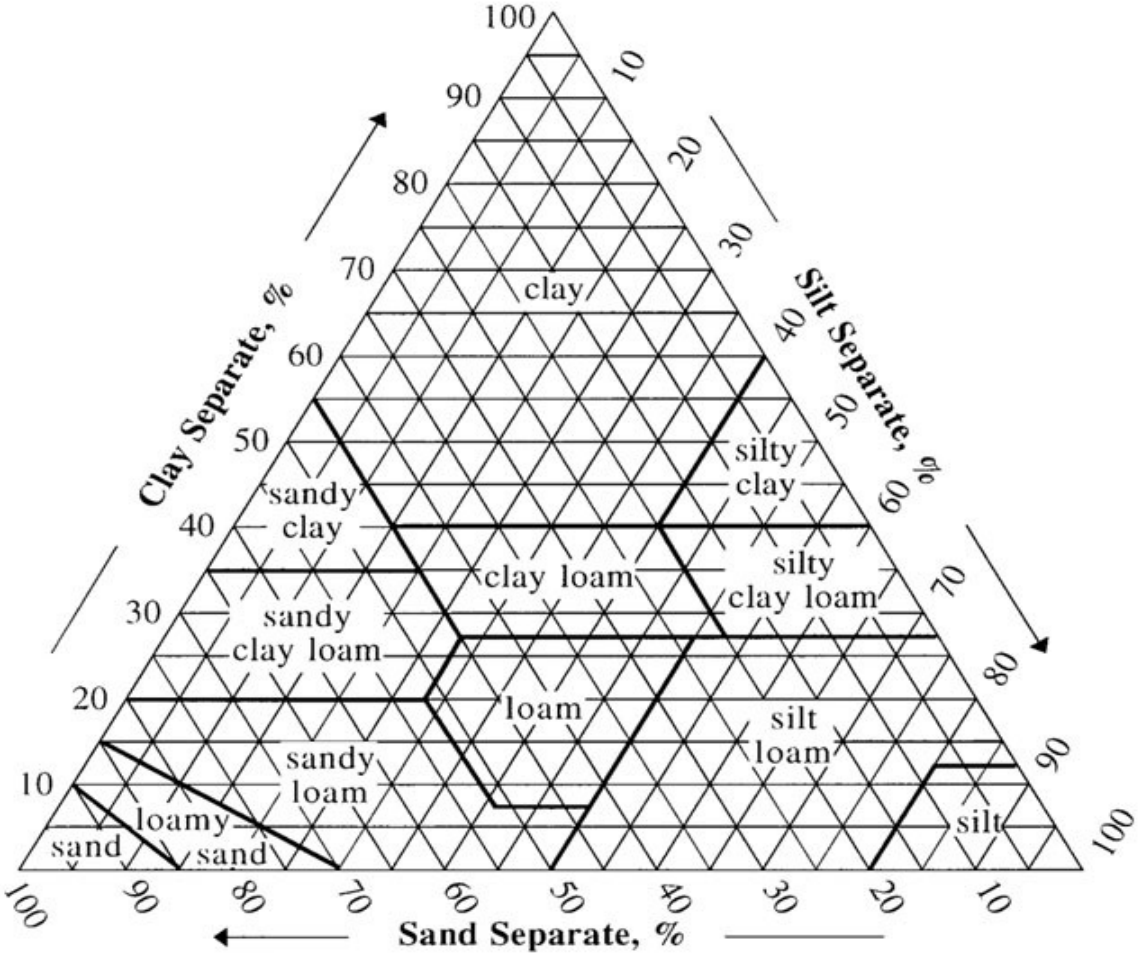
Soil Texture Jar Test

- Take soil samples from multiple places on your property. Can take several days to settle.

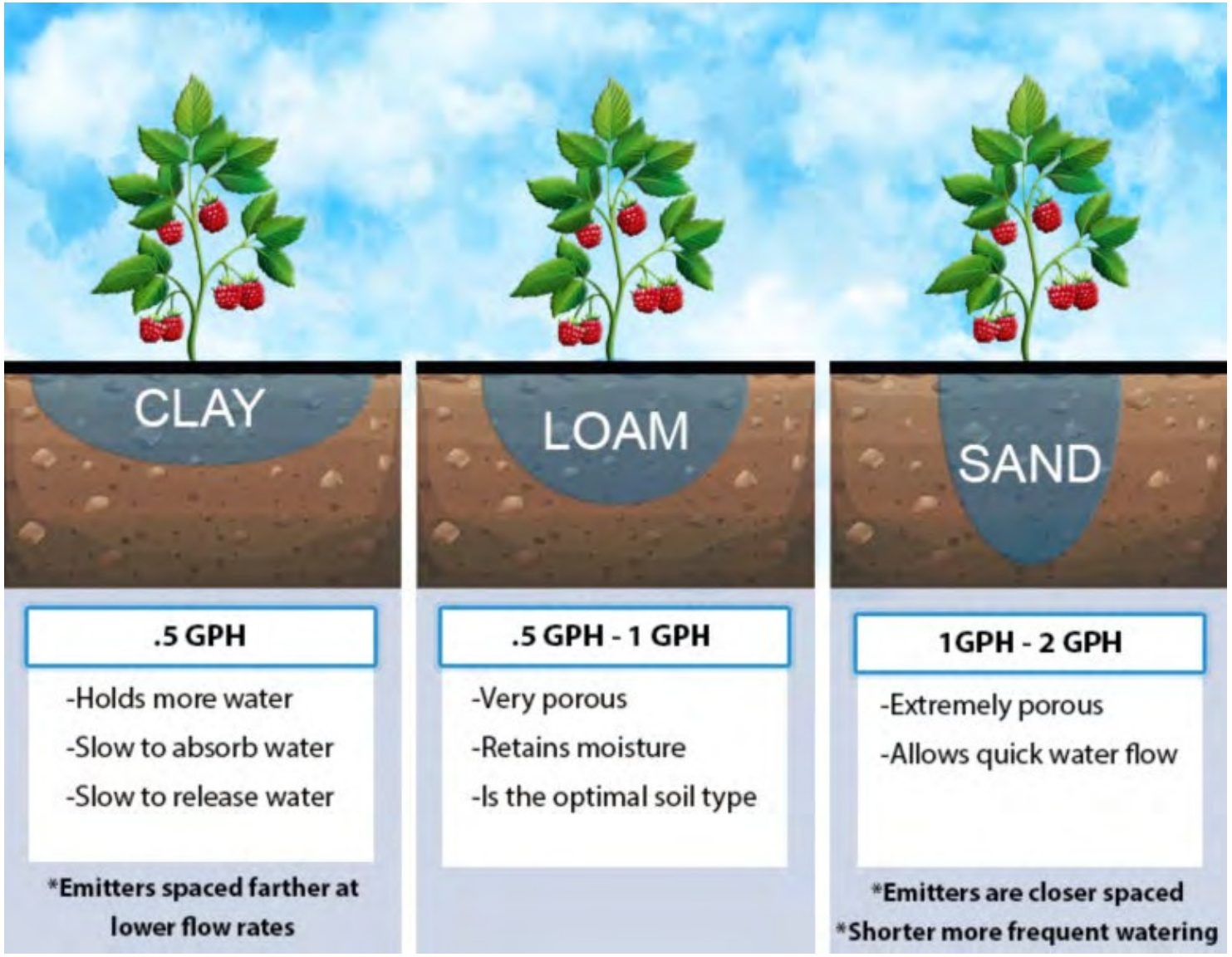


Soil type chart

only needed if your clay percentage is less than 40%



Water movement in soil



Determine emitter specs

- Match emitter flow with soil type
- **Line Source** **Point Source**
- Clay: .25 - .5 gph Clay: .5 gph
- Clay loam: .4 - .5 gph Clay loam: .5 gph
- Loam: .4 - .6 gph Loam: .5 - 1.0 gph
- Sandy loam: .6 - 1.0 gph Sandy loam: 1.0 gph
- Sand: .9 - 2.0 gph Sand: 1.0 - 2.0 gph
- These GPH numbers may need adjustment (or emitter placement adjustment) for steep slopes for point source installations.
- Spacing between the lines may need to be adjusted for line source installation on steep slopes.
- Most large emitter manufacturers have online tools

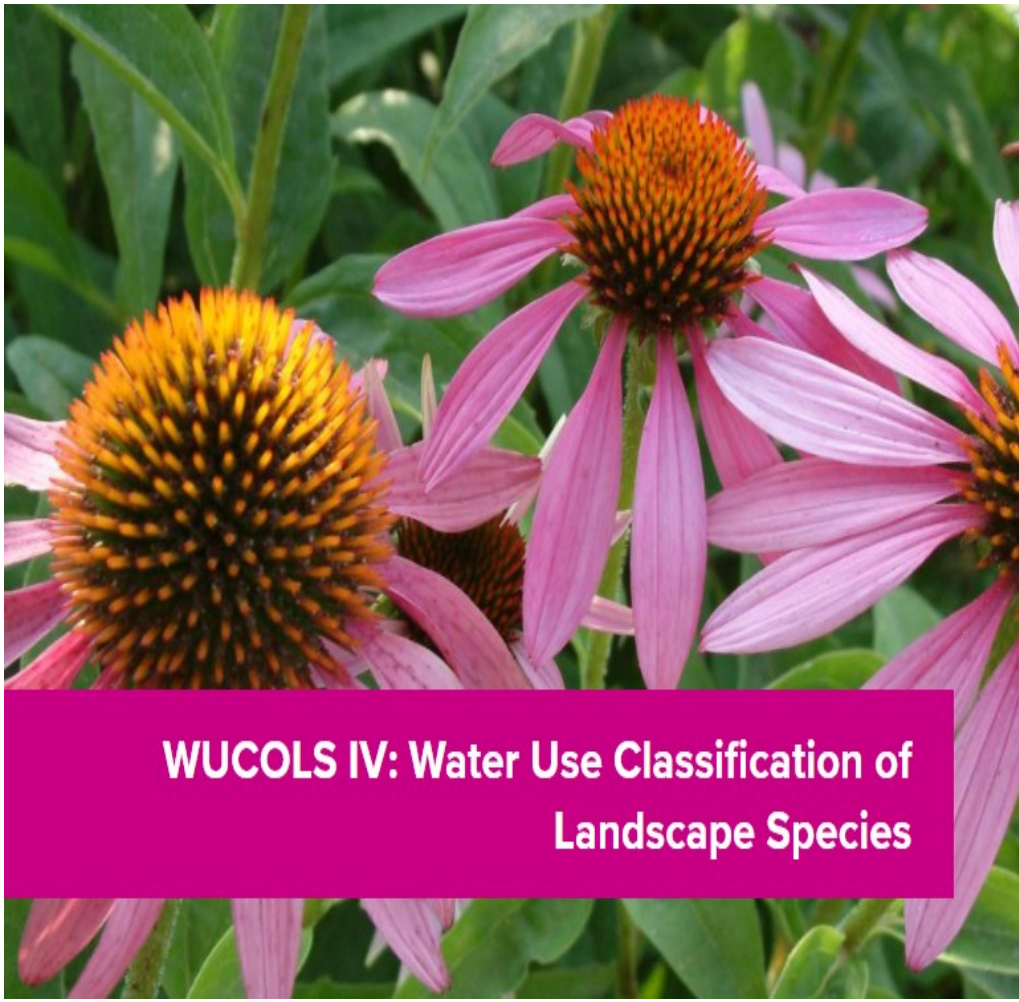
Hydrozones and plant factors

- Plants in each valve zone should be in the same water use category
- Wucols web site provides water use categories for many plants. Use Central Valley (region 2) for data.
- http://ucanr.edu/sites/WUCOLS
- Use the Wucols category in the chart on the Waterwonk site and it will give you weekly or monthly water quantity.
- http://WaterWonk.us/how-much
- The following site is a good reference for turf
- http://anrcatalog.ucanr.edu/pdf/8044.pdf

WUCOLS IV
Water Use Classification of Landscape Species

Water Use Classification of Landscape Species (WUCOLS IV) Site Map

- Home Page
- Acknowledgements
- Download WUCOLS IV Plant List
- Download WUCOLS IV User Manual
- FAQ's
- Partners
- Plant Search Database
- Plant Search Instructions
- Plant_Database_Export
- User Manual
  - Regional Committees 2013
  - Project Rationale and Goal
  - The Evaluation Process
  - Categories of Water Needs
  - Standard Conditions
  - Plant Types
  - Regions
  - Using WUCOLS Evaluations
  - Resources
- Water Requirements for Turfgrasses



Categorizes ALL plants by Water Needs. The ultimate planning and designing tools yet!

www.UCANR.edu

Plant Search Database

If you know exactly which plant you are interested in, you may search for it by name (partial names are OK, too). Otherwise, consider searching by plant type and/or water use.

See WUCOLS List for All Regions

City

Search for a city: Search for a city — or — Find a city on the map

Plant Name

Common Name or Botanical Name

Water Use

- [ ] Very Low
- [ ] Low
- [ ] Moderate / Medium
- [ ] High
- [ ] Unknown
- [ ] Not Appropriate for this Region

Plant Type

- [ ] **Gc** (Ground Cover)
- [ ] **P** (Perennial)
- [ ] **S** (Shrub)
- [ ] **T** (Tree)
- [ ] **V** (Vine)
- [ ] **Ba** (Bamboo)
- [ ] **Bu** (Bulb)
- [ ] **G** (Ornamental Grass)
- [ ] **Pm** (Palm and Cycad)
- [ ] **Su** (Succulent)
- [ ] **N** (California Native)
- [ ] **A** (Arboretum All-star)

Looking for Turf Grass?

Search Plants

Create valve zones

- Your system water flow number (from the bucket test) is the maximum GPH for each valve zone. Remember to use significantly less than the maximum for each zone.
- Put plants in the same WUCOLS category together in the same zone. If this requires too many GPH for one zone, then split them up into multiple zones.
- Online calculators and other tools can help.

Irrigation schedule

- Using the WUCOLS and WaterWonk information, calculate the required water quantity. Set your run times and frequency to provide that quantity.
- If runoff occurs, split time into separate cycles ran the same day
- Newly installed plants will need more frequent water than established plants
- Be sure to vary your run times in warmer or cooler seasons
- Check your system regularly for any broken lines, wilted plants, or runoff
- Automated systems are convenient, but manual cycles might be best for new plantings.
- New plants in existing beds will need hand watering until established.
- Do not water in late afternoon because water in tubing can be very hot

Other considerations (1)

- Keep tubing runs level by following ground contours.
- More that 8-10’ elevation change should be a different zone. Pressure compensating emitters can help. Check manufacturers web site for specs.
- New plantings need water at the nursery root ball because water doesn’t like to go from one soil type to another.
- Install flush valve at the lowest point of each zone.
- Stake down all your tubing using U shaped staples.
- Don’t bury your tubing.
- Check your Y filters frequently, especially with irrigation water or well water.

Other considerations (2)

- If water pressure is over 60PSI, use threaded fittings up to the pressure reducer.
- Coiled 1/2” and 3/4” tubing conforms to your layout much better when it is warm. Beware of crimping cold tubing.
- Match your pressure regulator with that companies recommended value for their emitters.
- Never mix mini sprayers or bubblers in the same zone as drip.
- If using multiple individual timers, make sure watering times don’t overlap.
- Using a central timer (controller) is more convenient after initial installation. It makes seasonal adjustments much easier. It also makes it easier to program run times that don’t overlap.