Drip System: What is it and how do we design it?

Agenda

Introduction

Why Drip?

Inline Drip

Point Source Drip

Which should I use?

How to design each type

Who is this guy?

- 25+ years in the Landscape Industry
- 3 years in the Agriculture Industry
- Experience at the distributor level, contractor level, and manufacturer level
- Have worked in the following irrigation markets- No Utah, So Utah, & Las Vegas
- Bachelor Degree in International Business

DRIP IRRIGATON

What is it?

Drip irrigation is a highly efficient method of watering plants that delivers water directly to the roots of plants in small, controlled amounts.

DISCLAIMER

There are many variables to drip that can only be learned through experience. I am very experienced with drip but know that my word is not the “law” or the “Bible”.

I’m sure many of you have used drip in the past.

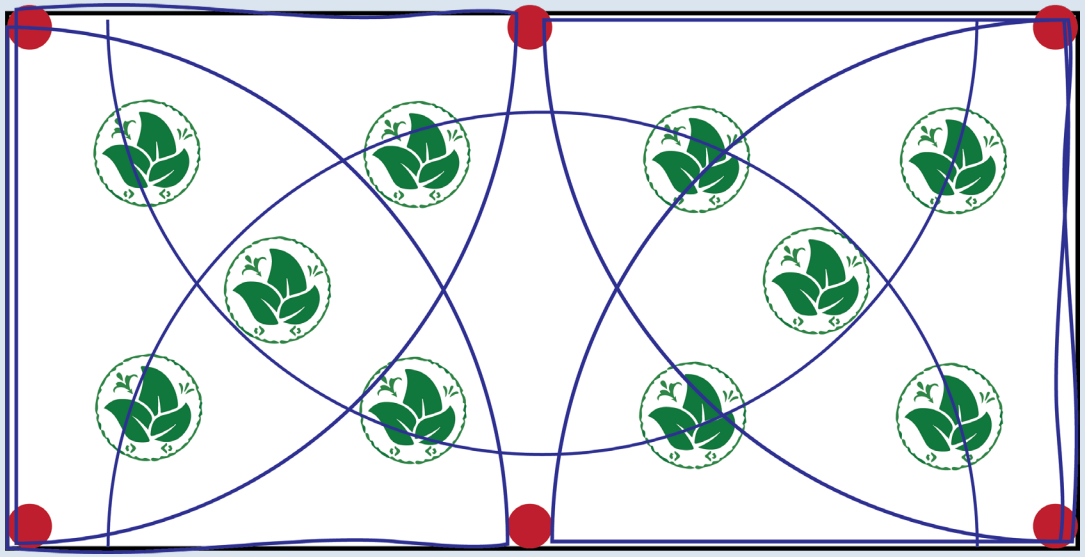
How many of you have called DRIP a four-letter word?

Drip can definitely be frustrating...

With so many differences and styles, it can be confusing.

Why should we use Drip?

SPRAYS



8 Series MPR

10° Trajectory

Nozzle	Pressure psi	Radius ft.	Flow gpm	Precip In/h ■	Precip In/h ▲
8F	15	5	0.74	2.85	3.29
	20	6	0.86	2.30	2.66
	25	7	0.96	1.89	2.18
	30	8	1.05	1.58	1.82
8H	15	5	0.37	2.85	3.29
	20	6	0.42	2.25	2.59
	25	7	0.47	1.85	2.13
	30	8	0.52	1.56	1.81
8Q	15	5	0.18	2.77	3.20
	20	6	0.21	2.25	2.59
	25	7	0.24	1.89	2.18
	30	8	0.26	1.56	1.81

Note: *All MPR nozzles tested on 4" (10.2 cm) pop-ups*

■ *Square spacing based on 50% diameter of throw*

▲ *Triangular spacing based on 50% diameter of throw*

4 Quarter - 1.2gpm

2 Half - 1.2gpm

10 min per day 3/days a week

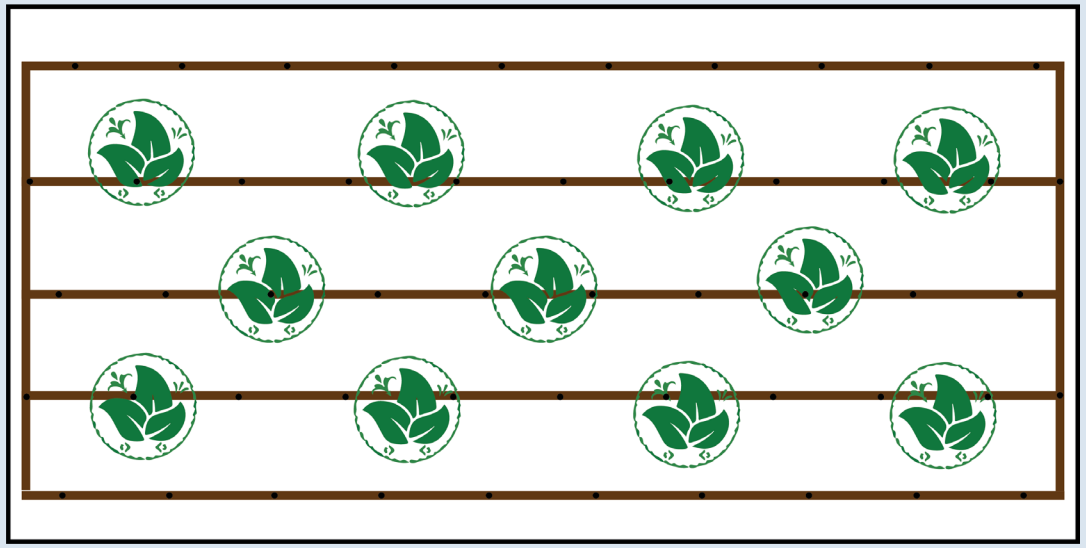
24 gallons x 3 days = 72 gal/wk

DRIP

50’ of inline tubing
.4gph x 12” spacing

20gph which is .33gpm
24 minutes for 4 days/week

32 gal/wk



Sprays use 72 gallons per week

Drip uses about 32 gallons per week

Substantial savings!!!

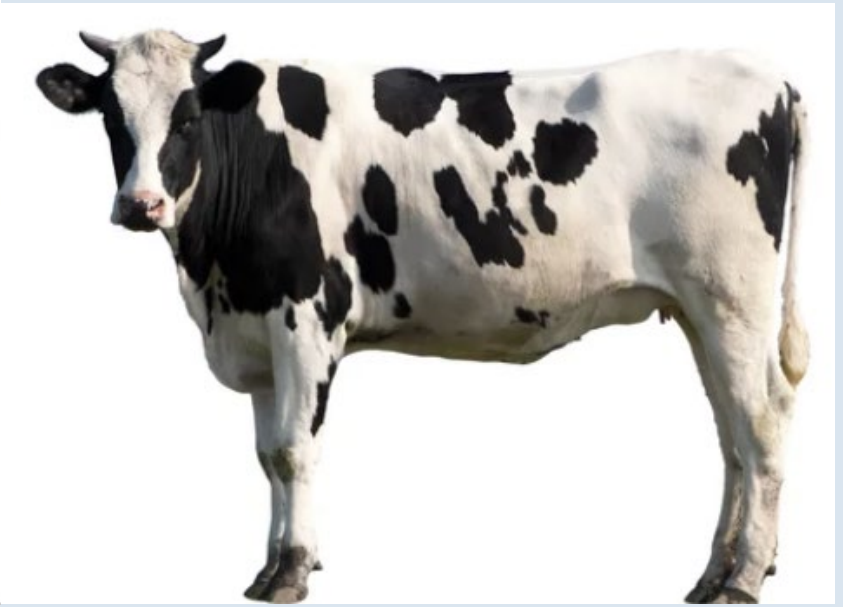
40 Gallons per week savings x 40 weeks is almost 1,600 gallons per year in 50sf.

That equates to 32 gallons per sq ft of savings per year.

WHAT DOES 1,600 GALLONS LOOK LIKE?

Dan's Tidbit

7’ wide by 6’ tall



Dan's Tidbit

For ***every*** square foot of landscape you convert from spays to drip, you will save enough water to flush a toilet over

15 times per year.

2 types of drip irrigation I want to focus on

1. Inline (as seen in picture to the right)

2. Point Source (as seen below)

Inline Drip Components

1. Controller
2. Valve Setup
3. Filter & Regulator
4. Inline Drip Tubing
5. Fittings
6. Stake

Controller Options

Valve Setup

Control Zone Kit or Filter & Pressure Regulator

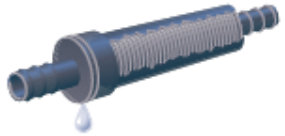
Visual of Inline Drip

Emitter is welded to the interior of the poly tubing.

History of Inline Emitters

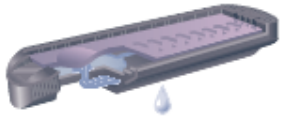
1960 Blass Invention: Coiled Dripper

1966 Laminar Dripper: Capillary Tube

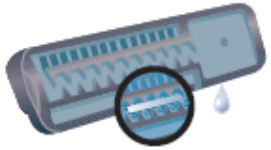


1971 Turbulent Dripper: Toothed Labyrinth

1979 Pressure Compensating (PC) Technology: Self-Cleaning



1998 TurboNet Technology: Increased Flow Path Velocity, No Plugging



2000 Maximum Uniformity: CNL, Root Barrier and Anti-Siphon

TECHLINE CV EMITTER (CNL)
TECHLINE RW/RWP EMITTER (NON-CNL)

2003 Maximum Uniformity on Slopes: Anti-Siphon, Self-Cleaning

TECHLINE DL AND EZ EMITTER

2016 Best Root Intrusion Protection: High Check Valve, Copper Oxide and Anti-Siphon

TECHLINE HCVXR EMITTER

Inline drip comes in the following flow rates, depending on the brand you choose.

.26gph, .4gph, .5gph, .6gph, .9gph, 1gph

Inline drips come in the following flow rates, depending on the brand you choose.

.26gph, .4gph, .5gph, .6gph, .9gph, 1gph

QUESTION to think about

Do you use tubing with check valves or tubing without check valves? Do you even know what you are using? If you are unaware, please ask your distributor.

With or without Check Valve

Dripline without Check Valve

- Opens at a lower pressure- usually around 6psi
- Not all the plants will receive the same amount of water
- Doesn’t work well with calcium & alkaline
- Should not be buried

Dripline with Check Valve

- Dripline with check valve opens at a slightly higher pressure- around 15 psi
- All the plants will receive the same amount of pressure.
- Keeps water in tubing, so more precise and less time to fill up.
- Can be buried

Word of Caution

Do not put them on the same system or mix them together.

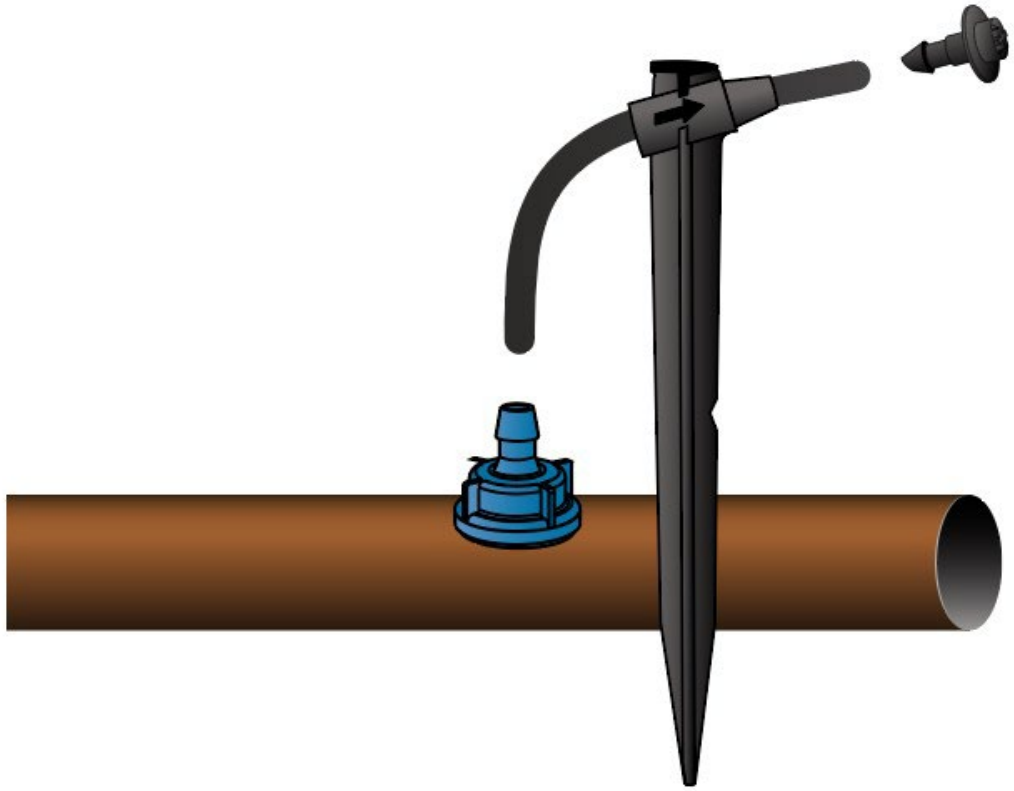
Again, if you are unaware of what you use, ask your distributor about it.

Inline Drip Fittings

Inline Drip Stakes

Some Brands that have inline drip

Point Source Drip also called “Online Drip”



Point Source Drip Components

1. Controller
2. Valve Setup
3. Filter & Regulator
4. Supply line
5. Fittings
6. Emitters
7. Distribution Tubing
8. Stake

Controller Options

Valve Setup

Point Source Drip Components -Filter & Regulator

Point Source Drip Components -Supply Line

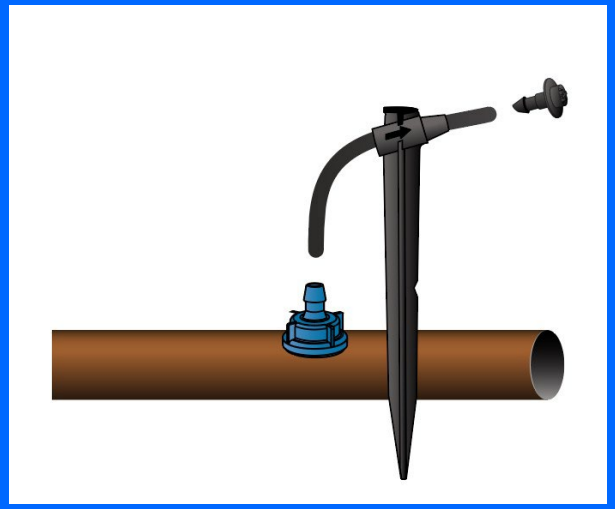
Point Source Drip Components -Fittings

Point Source Drip Components -Emitters

Point Source Drip Components -Emitters Placement

Here is the question of the day...

Which way is correct according to most manufacturers?



Point Source Drip Components -Distribution Tubing

Did you know that most ¼” Distribution Tubing is only rated to 40psi?

Point Source Drip Components -Stakes

So which style is better?

So which style is better?

BOTH- DEPENDING ON THE LAYOUT AND DESIRED EFFECT

Dan’s Preference- When to use Inline

- When the plantings are dense or medium dense
- When you want all of the drip tubing buried so it’s not visible
- Around new and established trees

Dan’s Preference- When Point Source

- Scarce planting or huge variety in plant needs
- Large difference in spacing of plants
- I found this opinion on Google:

“When plant spacings are irregular or greater than 3 feet on center Point Source Drip emitters may be the product of choice. Point Source Drip emitter are installed at or near the plants root zone, this helps to eliminate wasteful irrigation between plants.”

Designing Inline Drip Systems

Designing Drip Systems- Inline

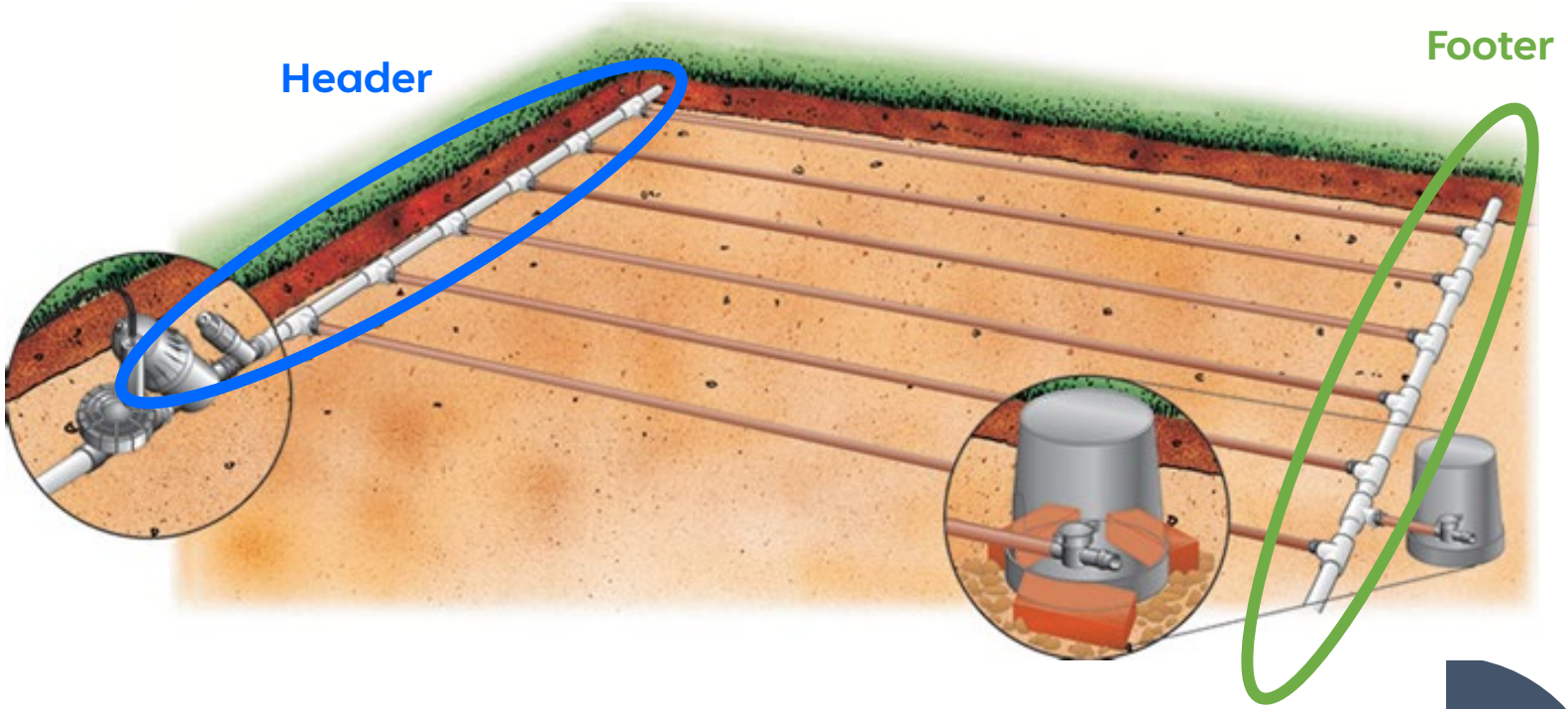
2 Different Design Techniques with inline drip:

1. Lite Design or sometimes called the “winding” design

2. Grid Pattern

Lite Design

Full Grid Design



Hydraulics for both Inline and Point Source Drip

Your amount of “total flow” per valve is restricted to the size of your mainline and supply line.

1” pipe is restricted to 12gpm

¾” pipe is restricted to 8gpm

½” pipe is restricted to 4.5gpm

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Steps for Designing an Inline Drip Grid System on 12x12 grid

Step 1- Determine the soil type
Step 2- Measure the square footage of the area you wish to irrigate
Step 3- Determine our total flow in GPM
Step 4- Determine the number of zones needed
Step 5- Look up application rate
Step 6- Figure out the run time

Step 1- Determine the soil type

For Northern Utah, I recommend the following:

If your soil type is Coarse, use the .9gph x 12” tubing
If your soil type is Sandy, use the .6gph x 12” tubing
If your soil type is Clay or Loam, use .26gph or .4gph x 12” tubing

Step 2- Measure the square footage of the area you are going to irrigate

To figure out the square footage, multiply the length by the width of the area.

Length x Width= Square Footage

Step 3- Figure out the total GPM for area

Take the total square footage and multiply it by the emitter size (in gph)
Divide by 60

That will give you the total Gallons Per Minute being used in that area

Step 4- Determine the number of zones needed

Divide the total gallons per minute by the max gpm per size of supply tubing.

1” pipe is restricted to 12gpm
¾” pipe is restricted to 8gpm
½” pipe is restricted to 4.5gpm

Step 5- Look up the application rate

APPLICATION RATE
0.42 GPH EMITTER

FLOW RATE (GPH)	EMITTER SPACING (IN.)	LATERAL SPACING (IN.)	APPLICATION RATE (IN./HR.)	TIME TO APPLY 1/4" (MIN.)
0.42	12	12	0.64	23
0.42	12	14	0.55	27
0.42	12	16	0.48	31
0.42	12	18	0.43	35
0.42	12	20	0.39	39
0.42	12	22	0.35	43
0.42	12	24	0.32	47
0.42	18	12	0.43	35
0.42	18	14	0.37	41
0.42	18	16	0.32	47
0.42	18	18	0.29	53
0.42	18	20	0.26	58
0.42	18	22	0.23	64
0.42	18	24	0.21	70

Step 6- Figure out the run time

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0.42	12	20	0.39	39
0.42	12	22	0.35	43
0.42	12	24	0.32	47
0.42	18	12	0.43	35
0.42	18	14	0.37	41
0.42	18	16	0.32	47
0.42	18	18	0.29	53
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0.42	18	22	0.23	64
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Good Starting Point (for summers)

Water 1” per week, so 4 days for 23 minutes

PRACTICE TIME

30’ x 80’
Mostly Clay, but a little loamy

Step 1- Determine the soil type

For Northern Utah, I recommend the following:

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If your soil type is Sandy, use the .6gph x 12” tubing
If your soil type is Clay or Loam, use .26gph or .4gph x 12” tubing

Step 2- Measure the square footage of the area you are going to irrigate

To figure out the square footage, multiply the length by the width of the area.

Length x Width= Square Footage

80’ x 30’ = 2,400 sq ft

Step 3- Figure out the total GPM for area

Take the total square footage and multiply it by the emitter size (in gph)
Divide by 60

2400 x .4 (gph) = 960 (gph)

960/60 = 16gpm

That will give you the total Gallons Per Minute being used in that area

Step 4- Determine the number of zones needed

Divide the total gallons per minute by the max gpm per size of supply tubing.

1” pipe is restricted to 12gpm
¾” pipe is restricted to 8gpm
½” pipe is restricted to 4.5gpm

We have 16gpm- we will need to have at least 2 valves for 1” or ¾”.

Step 5- Look up the application rate

APPLICATION RATE
0.42 GPH EMITTER

FLOW RATE (GPH)	EMITTER SPACING (IN.)	LATERAL SPACING (IN.)	APPLICATION RATE (IN./HR.)	TIME TO APPLY 1/4" (MIN.)
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0.42	12	14	0.55	27
0.42	12	16	0.48	31
0.42	12	18	0.43	35
0.42	12	20	0.39	39
0.42	12	22	0.35	43
0.42	12	24	0.32	47
0.42	18	12	0.43	35
0.42	18	14	0.37	41
0.42	18	16	0.32	47
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0.42	12	18	0.43	35
0.42	12	20	0.39	39
0.42	12	22	0.35	43
0.42	12	24	0.32	47
0.42	18	12	0.43	35
0.42	18	14	0.37	41
0.42	18	16	0.32	47
0.42	18	18	0.29	53
0.42	18	20	0.26	58
0.42	18	22	0.23	64
0.42	18	24	0.21	70

Good Starting Point (for summers)

Water 1” per week, so 4 days for 23 minutes

Designing Point Source Drip Systems

Steps for Designing a Point Source System

Step 1- Determine the soil type for emitter size
Step 2- Count the plants & determine number of emitters needed
Step 3- Determine our total flow in GPM by adding up the emitters
Step 4- Calculate the length of tubing needed
Step 5- Check flow chart to make sure you don’t exceed the max
Step 6- Determine the number of zones needed
Step 7- Figure out the run time

Point Source Design- Step 1

Determine your soil type

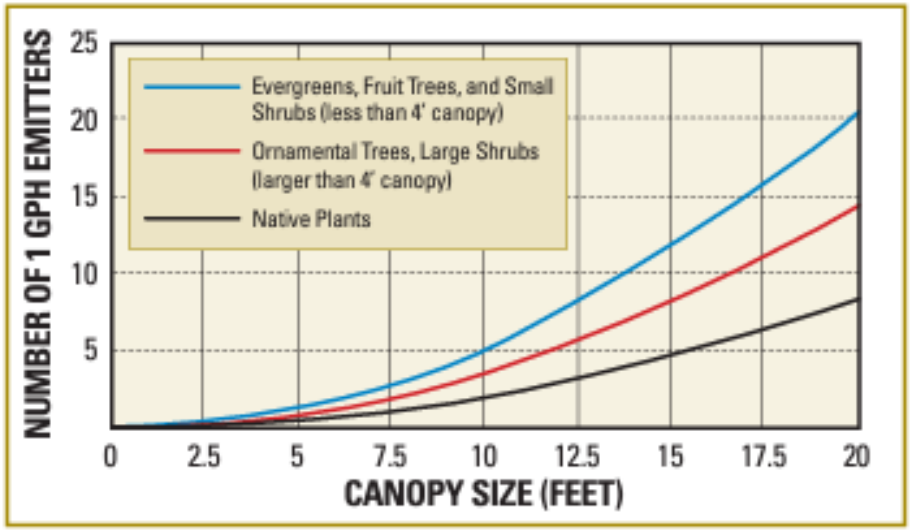
Point Source Design- Step 2

Count your plants and figure out how many emitters you will need in each size.

APPROXIMATE WETTED DIAMETER and WETTED AREA PER EMITTER (PER SOIL T

EMITTER FLOW RATE	WETTED DIAMETER PER EMITTER (FT.)		
	CLAY SOIL	LOAM SOIL	SANDY SOIL
0.5 GPH	5 - 7	3 - 5	2 - 3
1.0 GPH	7 - 8	5 - 6	3 - 3.5
2.0 GPH	8 - 9	6 - 7	3.5 - 4

SIMPLIFIED DRIP DESIGN GRAPH



Point Source Design- Step 3

Add up how many emitters you have per emitter size.

Figure out the total GPH you are using by adding up the totals for each emitter size.

Divide the total GPH by 60. That will give you your GPM.

Point Source Design- Step 4 & 5

PSI LOSS OF 100 FEET OF PIPE (

	SIZE I.D.	½" 0.622"		¾" 0.824"		1" 1.049"	
Flow GPM	Flow GPH	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss
1	60	1.06	0.49	0.60	0.12	0.37	0.04
2	120	2.11	1.76	1.20	0.45	0.74	0.14
3	180	3.17	3.73	1.80	0.95	1.11	0.29
4	240	4.22	6.35	2.41	1.62	1.48	0.50
5	300	5.28	9.60	3.01	2.44	1.86	0.76
6	360	6.34	13.46	3.61	3.43	2.23	1.06
7	420	7.39	17.91	4.21	4.56	2.60	1.41
8	480	8.45	22.93	4.81	5.84	2.97	1.80
9	540	9.50	28.52	5.41	7.26	3.34	2.24
10	600	10.56	34.67	6.02	8.82	3.71	2.73
11	660	11.61	41.36	6.62	10.53	4.08	3.25
12	720	12.67	48.60	7.22	12.37	4.45	3.82
14	840			8.42	16.45	5.20	5.08
16	960			9.63	21.07	5.94	6.51
18	1,080			10.83	26.21	6.68	8.10
20	1,200			12.03	31.85	7.42	9.84
22	1,320			13.24	38.00	8.17	11.74
24	1,440					8.91	13.79
26	1,560					9.65	16.00
28	1,680					10.39	18.35
30	1,800					11.14	20.85
35	2,100					12.99	27.74

Figure how much tubing you will need- including the length of the longest run.

Check the chart for the max run length.

Step 6- Figure amount of needed valves

Your amount of “total flow” per valve is restricted to the size of your mainline and supply line.

1” pipe is restricted to 12gpm

¾” pipe is restricted to 8gpm

½” pipe is restricted to 4.5gpm

Point Source Design- Step 7
How long to water...

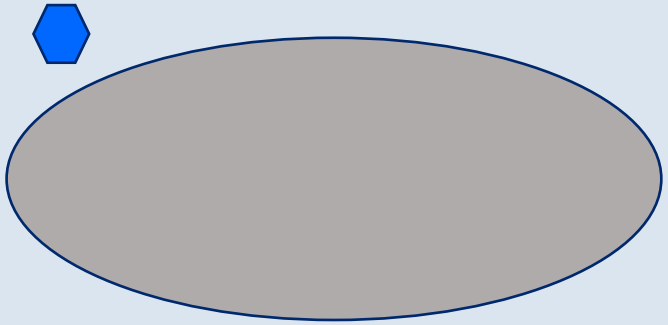
In the heat of the summer, the following is a good starting point for run times.

Small Shrubs- 5-7 gallons of water per week
Medium Shrubs- 7-10 gallons of water per week
Trees- 10-12 gallons per inch of trunk per week

Small Shrubs- 10 hrs week with .5gph
Medium Shrubs- 10 hrs week with 1gph
2” Trees- 3.5 hrs week with 8gph

Keep in mind, this is all just a starting point.

Quick Example of Point Source



- 12x22 oval planter in front with 36 small shrubs that have similar water needs.
- 20x60’ rectangle planter in the back with 56 small shrubs that have

Point Source Design- Step 1

Determine your soil type

In this example we have loamy soil.

Point Source Design- Step 2

Count your plants and figure out how many emitters you will need in each size.

We have a total of 92 small shrubs and 32 native plants.

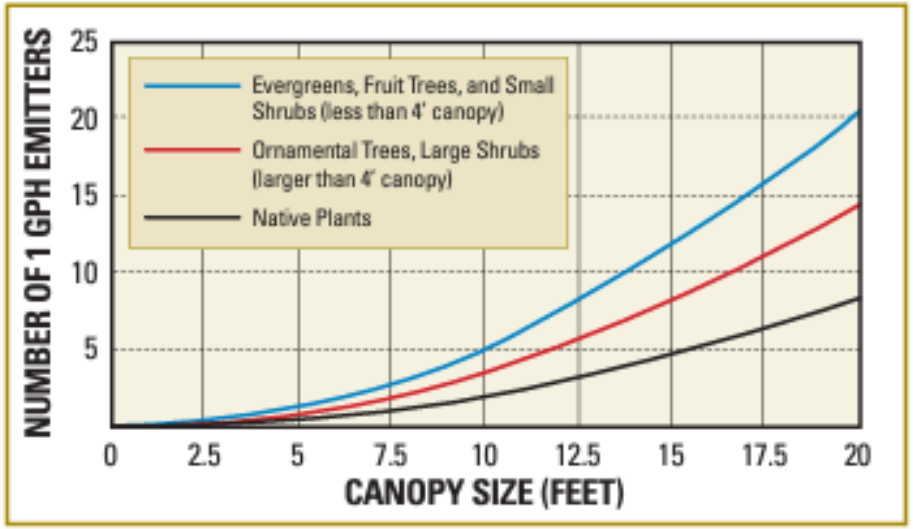
Let’s go with 1.0gph on the small shrubs and .5gph on the native plants.

APPROXIMATE WETTED DIAMETER and WETTED AREA PER EMITTER (PER SOIL TYPE)

EMITTER FLOW RATE	WETTED DIAMETER PER EMITTER (FT.)			WETTED AREA PER EMITTER (SQ. FT.)		
	CLAY SOIL	LOAM SOIL	SANDY SOIL	CLAY SOIL	LOAM SOIL	SANDY SOIL
0.5 GPH	5 - 7	3 - 5	2 - 3	20 - 38	7 - 20	3 - 7
1.0 GPH	7 - 8	5 - 6	3 - 3.5	38 - 50	20 - 28	7 - 10
2.0 GPH	8 - 9	6 - 7	3.5 - 4	50 - 64	28 - 38	10 - 13

Emitter flow rates have an impact on the soil’s ability to absorb water. The lighter the shaded box indicates the more desirable flow rate given the soil selection.

SIMPLIFIED DRIP DESIGN GRAPH



Point Source Design- Step 3

Add up how many emitters you have per emitter size.

Figure out the total GPH you are using by adding up the totals for each emitter size.

Divide the total GPH by 60. That will give you your GPM.

We have 92 small shrubs with 1.0gph emitters = 92gph

We have 32 native plants with 0.5gph emitters = 16gph

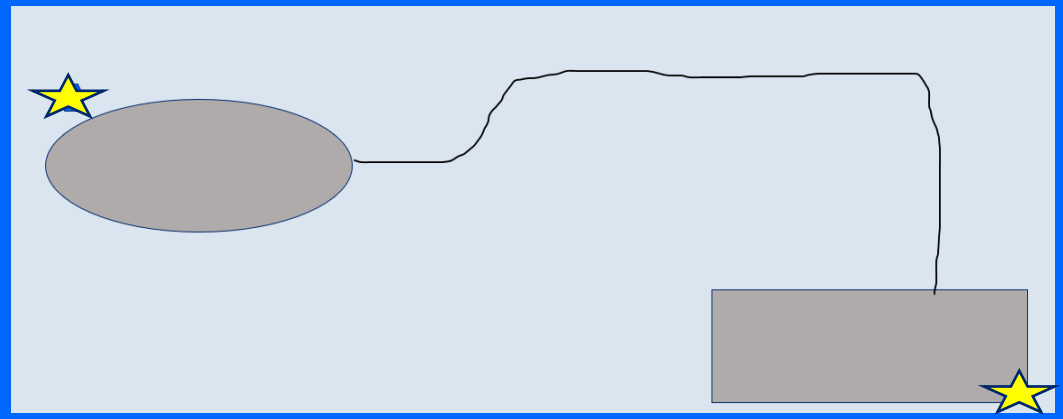
Total gph used on system- 108gph

108/60 = 1.8gpm

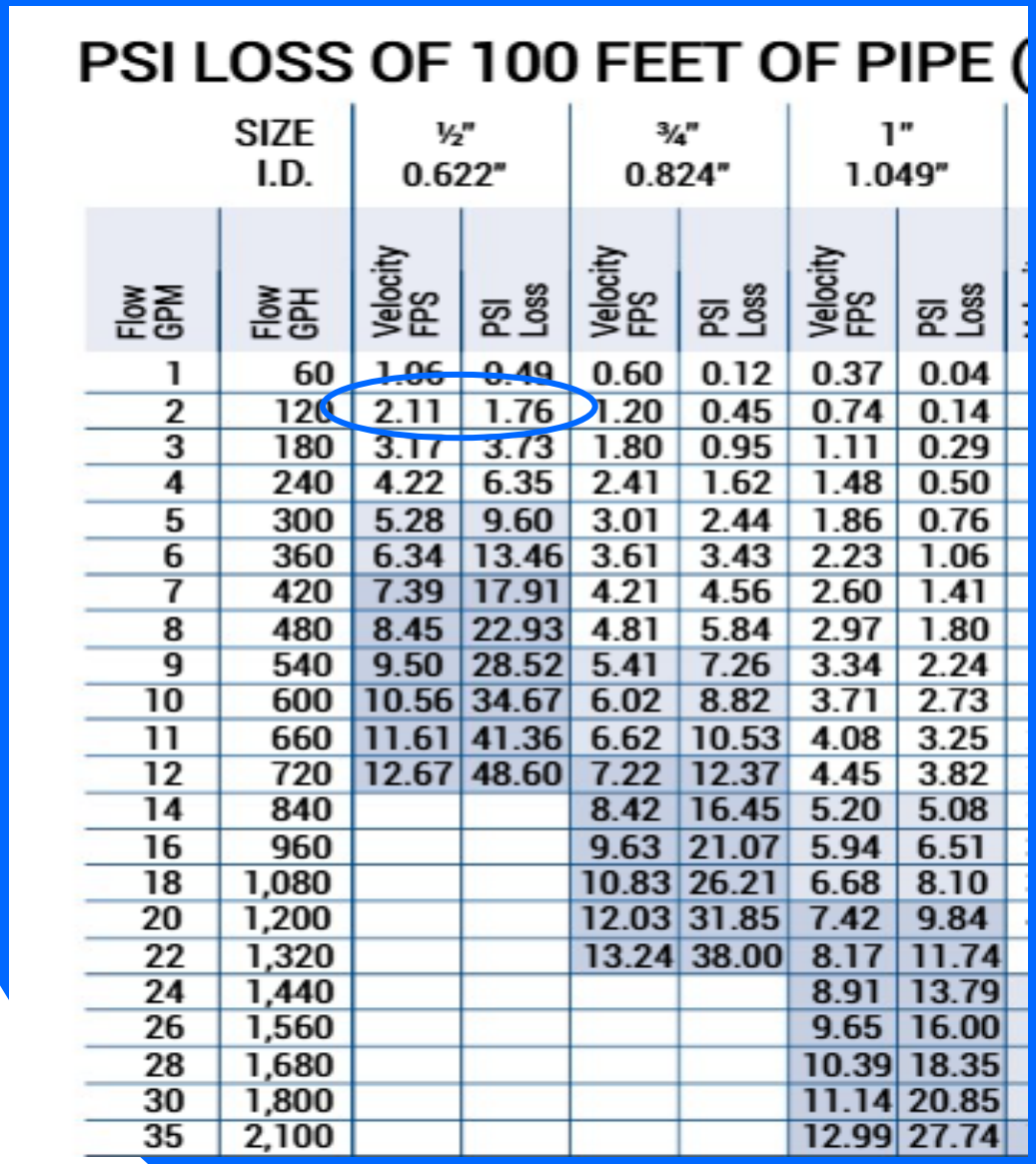
Point Source Design- Step 4

Figure how much tubing you will need- including the length of the longest run.

Check the chart for the max run length.



Our longest run is 312’ (from valve box to furthest location in back yard) and our total tubing including that run is about 1,000’.



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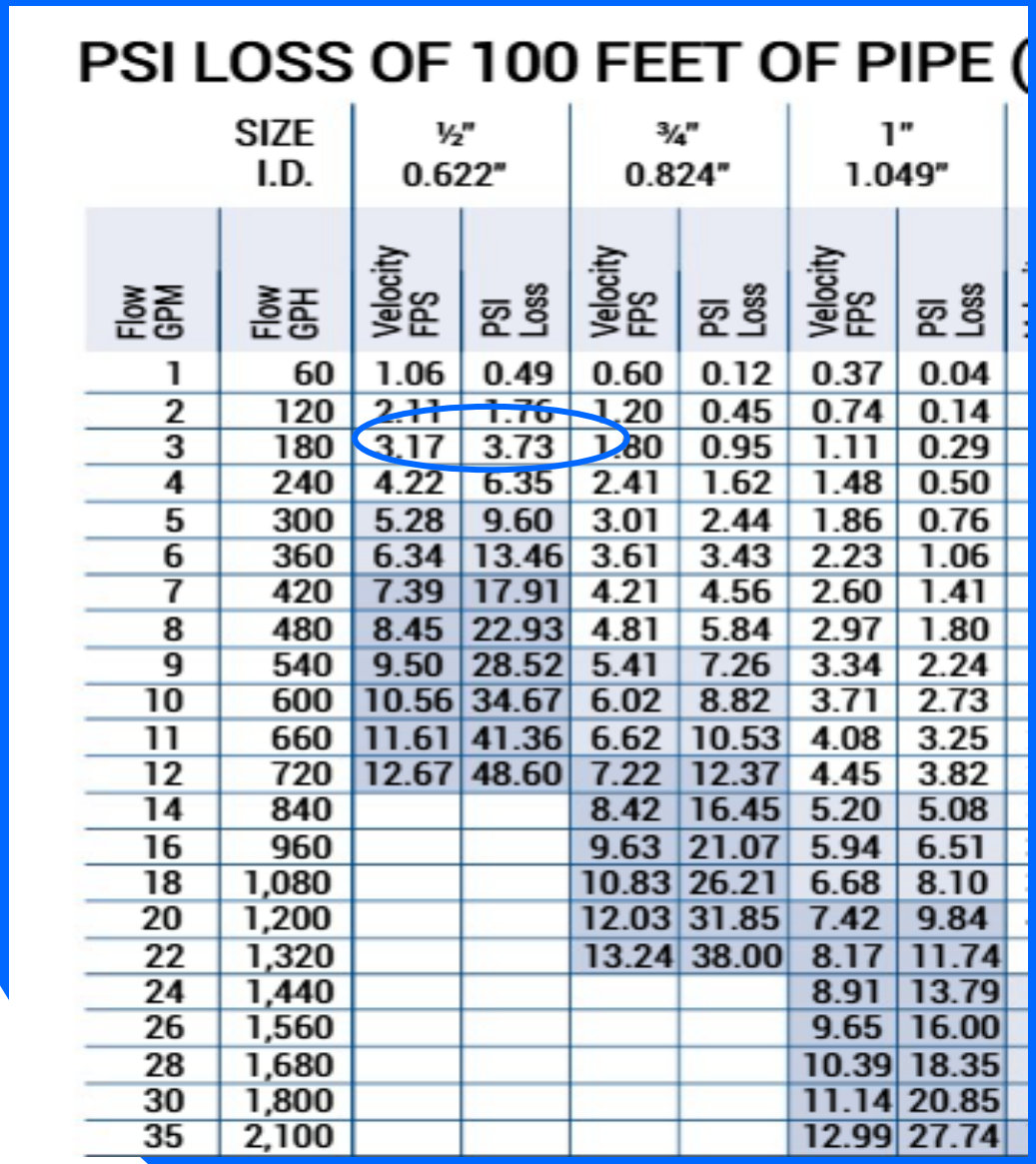
Flow GPM	Flow GPH	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss
1	60	1.06	0.49	0.60	0.12	0.37	0.04
2	120	2.11	1.76	1.20	0.45	0.74	0.14
3	180	3.17	3.73	1.80	0.95	1.11	0.29
4	240	4.22	6.35	2.41	1.62	1.48	0.50
5	300	5.28	9.60	3.01	2.44	1.86	0.76
6	360	6.34	13.46	3.61	3.43	2.23	1.06
7	420	7.39	17.91	4.21	4.56	2.60	1.41
8	480	8.45	22.93	4.81	5.84	2.97	1.80
9	540	9.50	28.52	5.41	7.26	3.34	2.24
10	600	10.56	34.67	6.02	8.82	3.71	2.73
11	660	11.61	41.36	6.62	10.53	4.08	3.25
12	720	12.67	48.60	7.22	12.37	4.45	3.82
14	840			8.42	16.45	5.20	5.08
16	960			9.63	21.07	5.94	6.51
18	1,080			10.83	26.21	6.68	8.10
20	1,200			12.03	31.85	7.42	9.84
22	1,320			13.24	38.00	8.17	11.74
24	1,440					8.91	13.79
26	1,560					9.65	16.00
28	1,680					10.39	18.35
30	1,800					11.14	20.85
35	2,100					12.99	27.74

Point Source Design- Step 5

Now we put it all together. We are flowing about 2gpm and our furthest point is 1,000'.

So, if we use ½" poly tubing, we will lose 1.76psi per 100'.

1,000' will give us 17.6psi pressure loss at the last emitter.



PSI LOSS OF 100 FEET OF PIPE (

	SIZE I.D.	½" 0.622"		¾" 0.824"		1" 1.049"	
Flow GPM	Flow GPH	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss	Velocity FPS	PSI Loss
1	60	1.06	0.49	0.60	0.12	0.37	0.04
2	120	2.11	1.76	1.20	0.45	0.74	0.14
3	180	3.17	3.73	1.80	0.95	1.11	0.29
4	240	4.22	6.35	2.41	1.62	1.48	0.50
5	300	5.28	9.60	3.01	2.44	1.86	0.76
6	360	6.34	13.46	3.61	3.43	2.23	1.06
7	420	7.39	17.91	4.21	4.56	2.60	1.41
8	480	8.45	22.93	4.81	5.84	2.97	1.80
9	540	9.50	28.52	5.41	7.26	3.34	2.24
10	600	10.56	34.67	6.02	8.82	3.71	2.73
11	660	11.61	41.36	6.62	10.53	4.08	3.25
12	720	12.67	48.60	7.22	12.37	4.45	3.82
14	840			8.42	16.45	5.20	5.08
16	960			9.63	21.07	5.94	6.51
18	1,080			10.83	26.21	6.68	8.10
20	1,200			12.03	31.85	7.42	9.84
22	1,320			13.24	38.00	8.17	11.74
24	1,440					8.91	13.79
26	1,560					9.65	16.00
28	1,680					10.39	18.35
30	1,800					11.14	20.85
35	2,100					12.99	27.74

Word of Caution

How important is the rating on the pressure regulator?

If we started with a 25psi regulator and we lost 17.6psi, we are left with about 7psi. Most pressure compensating emitters need 12-15psi to open.

I prefer 40-57psi regulators.

Point Source Design- Step 6

How long do we run the system?

Small Shrubs- 5-7 gallons of water per week
Medium Shrubs- 7-10 gallons of water per week

Small Shrubs- 5hrs week with 1gph
Medium Shrubs- 5 hrs week with 0.5gph

Any questions???

THANK YOU!

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