Irrigation Systems: Problems & Solutions

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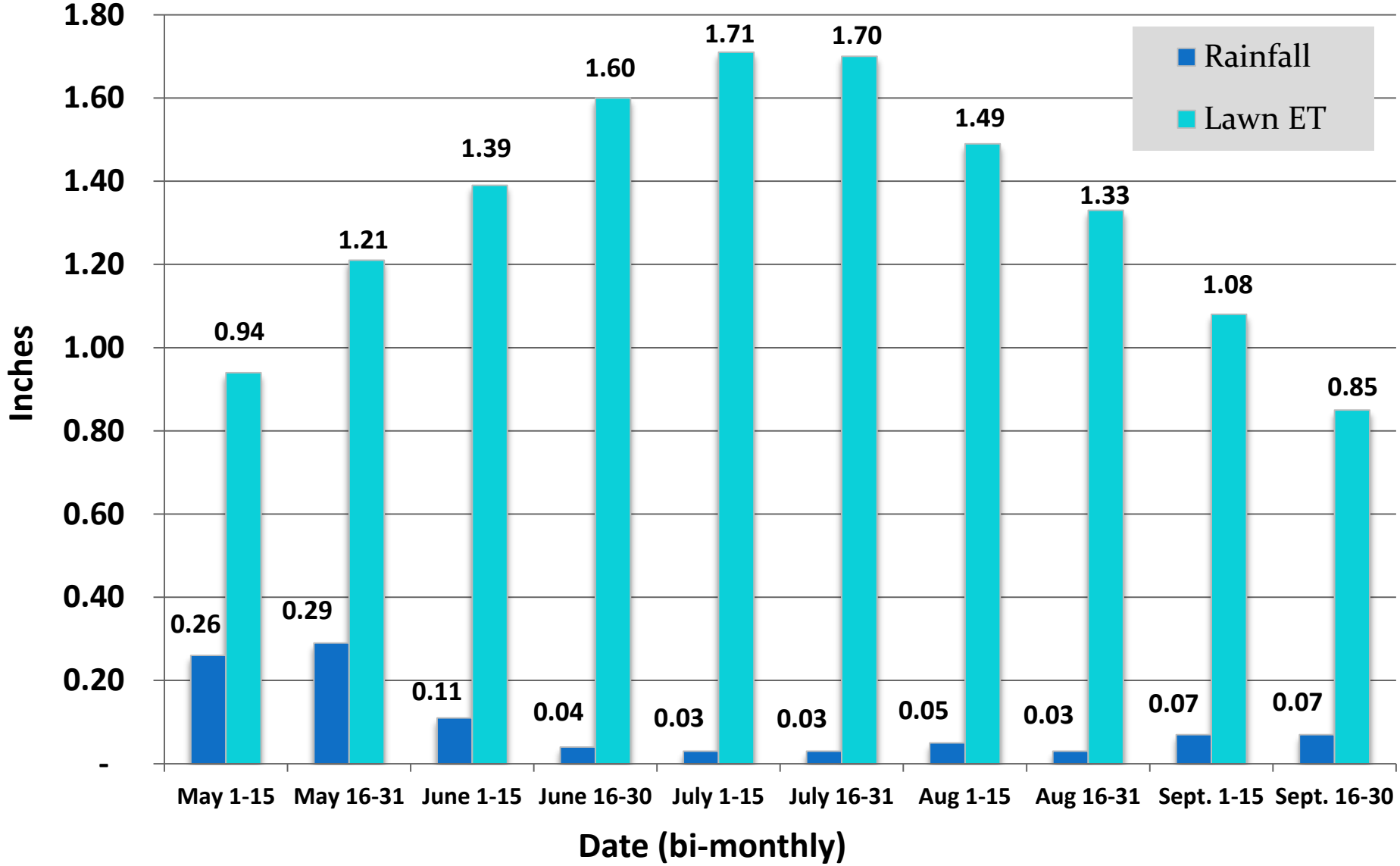
Water Conservation Specialist
November 3, 2018

Older Irrigation Controllers

Innovative Design

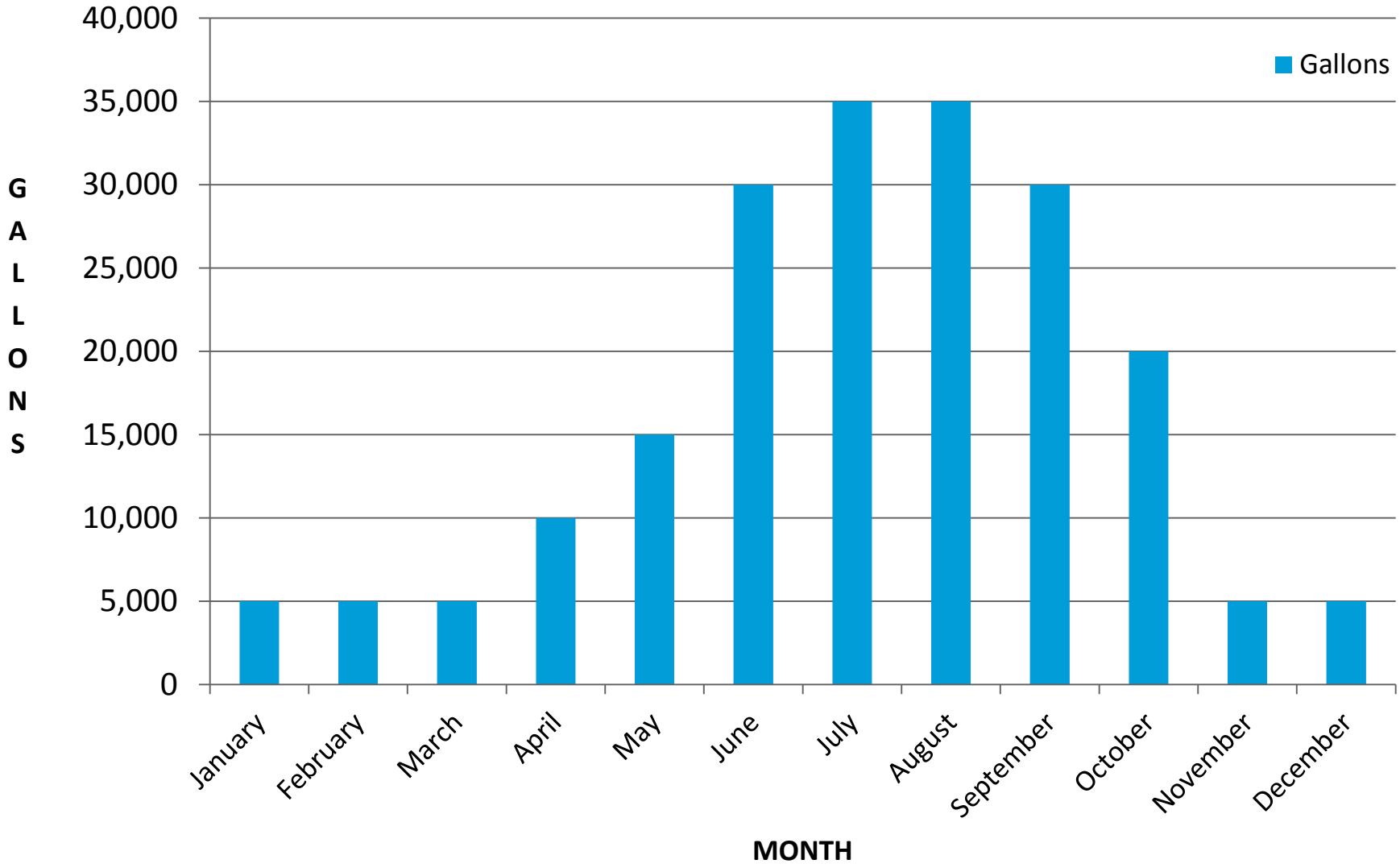
Evapotranspiration (ET) & Rainfall



Q: What percentage of home water use is used on landscapes?

- Under 15%
- 25%
- 40%
- Over 50%

Average Residental Water Usage



Irrigation Efficiency

- Big portion of water used in irrigation is lost to leaks, poor scheduling and problems that could be fixed with some minor adjustments.

- There are many ways to maximize our water use in the landscape and fine tune our irrigation systems to minimize waste.

What it is NOT

Photo: Courtesy of AWWA -PNWS Conservation Committee

What it Can Be

Water-Wise Irrigation & Landscaping

- Planning

- Sensible lawn areas

- Plant selection

- Soil preparations

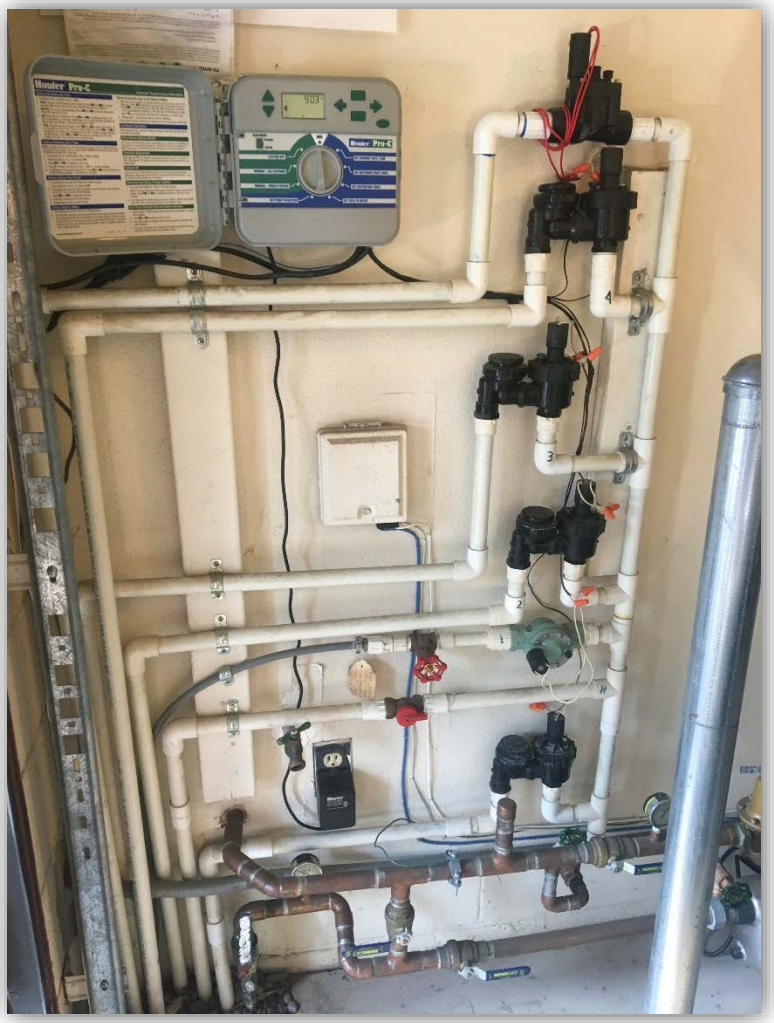
- Mulches

- Proper irrigation

- Maintenance

Good Irrigation Design Criteria

- **Valves** and **pipes** are sized appropriately.
- Sprinkler **application rates** are similar on each zone.
- Appropriate and adequate **pressure** for each zone.
- Zones are separated by **micro-climate** and **hydro-climate**.



Sprinkler Application Rates (PR)

Fixed Spray Sprinklers

(1.5 in/hr.)

Rotating Sprinklers

(0.625 in./hr.)

Standard spray sprinklers apply water at a faster rate than rotating sprinklers

Sprinkler Options

Application Rates

0.4 - 2.0 in./hr.

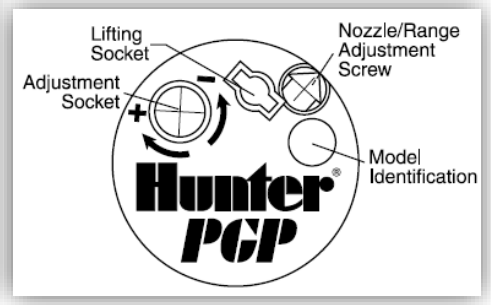
Adjustment Tools

Variable Arc Nozzles
VANs

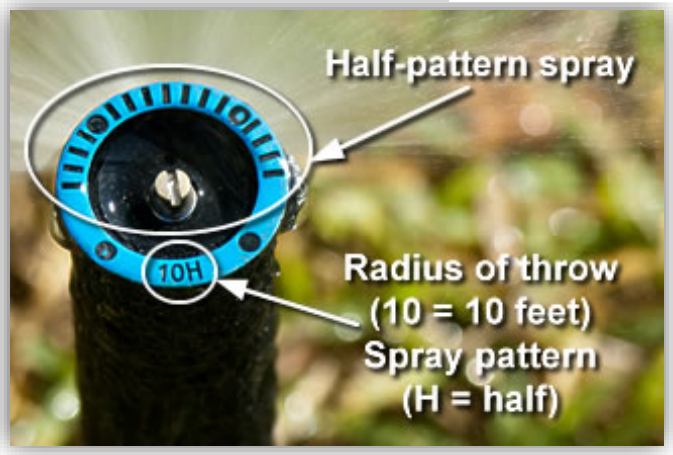
Fixed Spray
w/Filter

Stream
Rotor

Standard Rotors



Fixed Spray



Drip Irrigation Options

Inline drip w/emitters

Application Rates

0.3 - 0.5 in./hr.

Drip emitters

Inline drip

Micro-sprays

Soaker Hose

Bubblers

What's Wrong With This Picture?

Sprinklers emit water at different rates so should be on separate zones.

Micro-Climates

Micro–climate: An area in a landscape that has two different environmental factors. Ex: Sun vs Shade

Hydro-Zones

Hydro–zone: grouping plants with similar water needs on the same zone. Ex: Lavender with Rosemary

High Water Pressure

- What causes high pressure?
  - System pressure
  - Failure in pressure reducer
- Identifying high water pressure
  - Misting and rainbows
  - Missing drip emitters
  - Leaks
- Fixing high water pressure
  - Pressure Reducing Valve (PRV)
  - Decrease on individual zones
  - Expand the zone

Sprinkler Pressure Ratings

Install pressure regulation when pressure exceeds the specifications of your sprinklers.

- **Drip:** 20-30 psi
- **Pop-up sprays:** 30-50 psi
- **Rotating sprinkler:** 50-70 psi

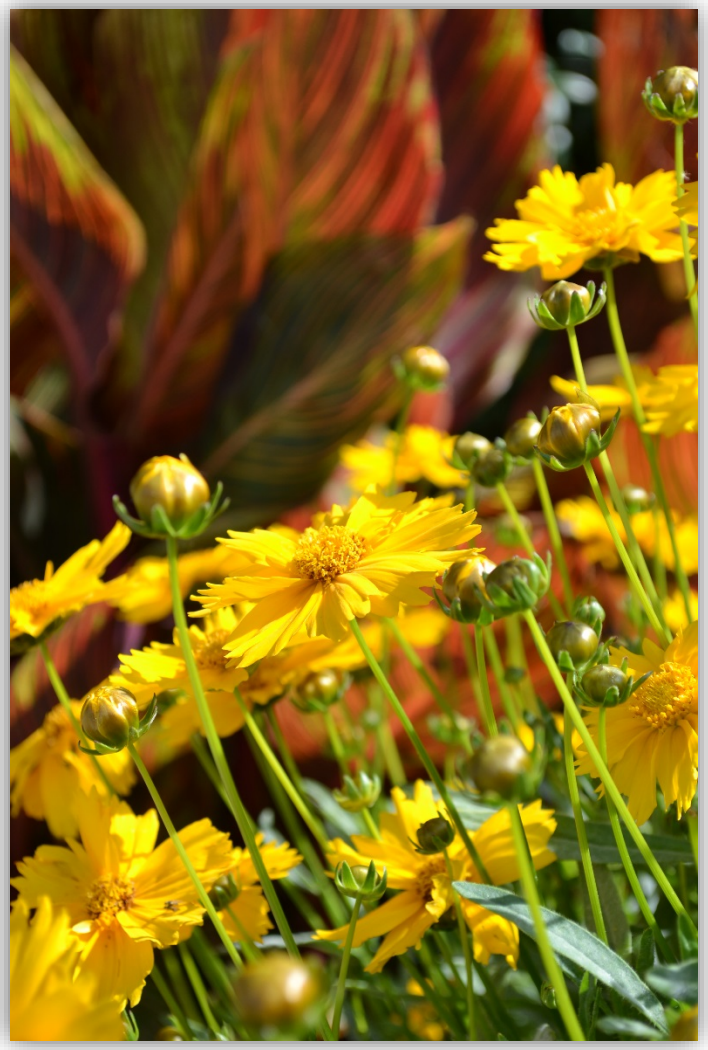
NOTE:
10% over recommended pressure
= 15% more water used.

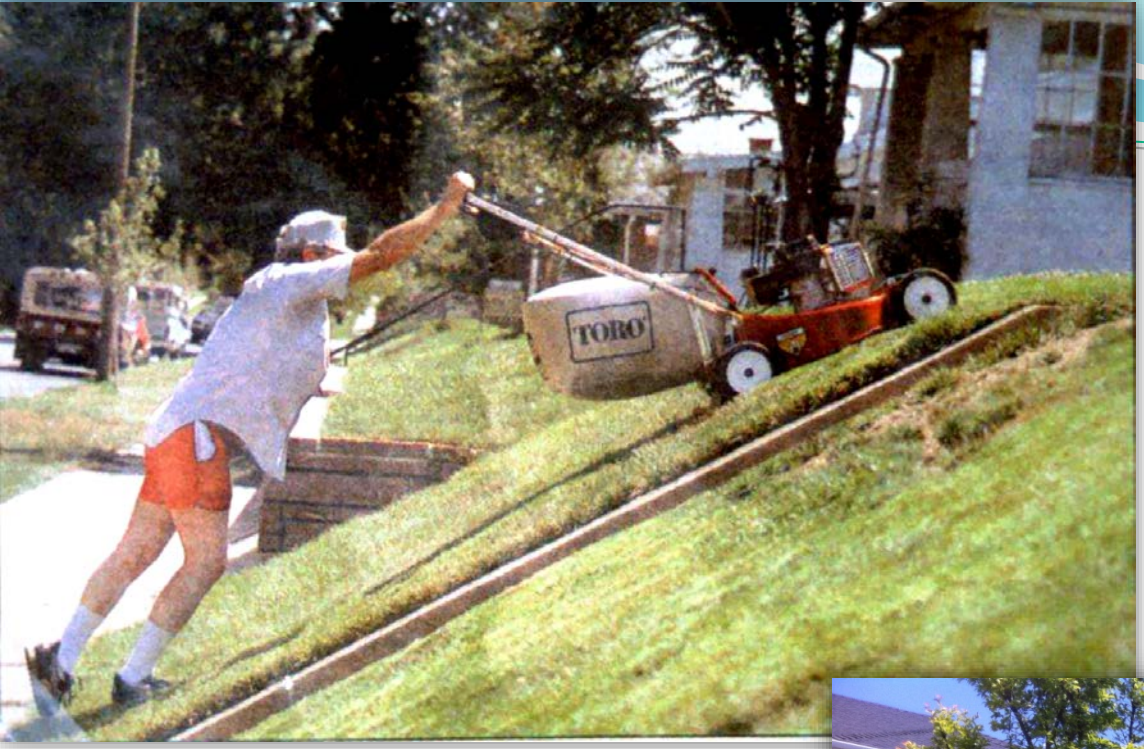
What About Low Pressure?

- What causes low pressure?
  - System pressure
  - Leak
  - Failure of pressure regulator
- Identifying low water pressure?
  - “Donuts”
  - Leaks
  - Low flow on sprinklers
- Fixing low water pressure?
  - Fix leak
  - Split Zones
  - Less sprinklers
  - Use low application rates

Good Landscape Criteria

- Minimize **slopes** in landscapes
- Choose **drought tolerant** or **native** plants when possible
- Choose plants that fit your natural **microclimates.**
- Place plants according to their water needs **hydro-climate**.
- **Amend soil** & use **mulch** in garden beds

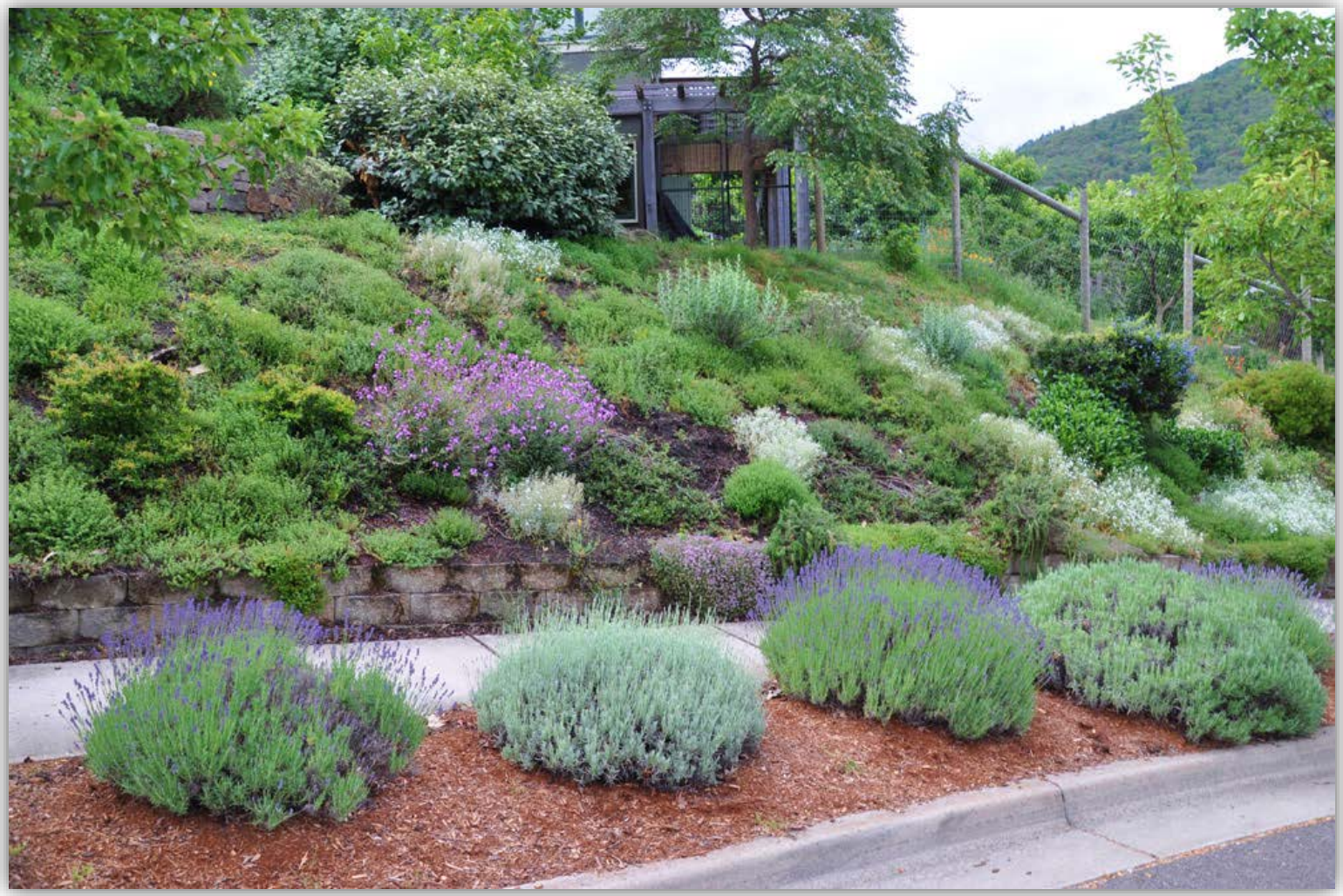




"Cycle and soak" is a method used to water in short intervals

Terracing help to reduce slopes and minimize run-off.

Use Ground Covers on Slopes



Natives and Climate Adapted Plants

Salvia (Sage)

Rudbeckia hirta
(Black-Eyed Susan)
(Gloriosa daisy)

Dianthus

Narrow Strips of Lawn

- High maintenance
- Difficult to water efficiently
- Generally serve little function

Soil Preparation & Amendments

- Improving your soil promotes long term health and drought resistance of your landscape.
- Use 3-4 cubic yards organic matter per 1,000 square feet.
- Provides area for deep root growth.
- Breaks up clay soils.
- Improves water holding capacity of sandy soils.
- Provides beneficial nutrients.

Soil Problems & Solutions

- Compacted Soils
- Thatch- is usually caused by soil compaction, over watering or over fertilizing.

Aeration Can Help!

- Reduces the effects of compaction which improves water infiltration.
- Opens the way for water and fertilizer to reach the root zone of your lawn.
- Helps create growth pockets for new roots.

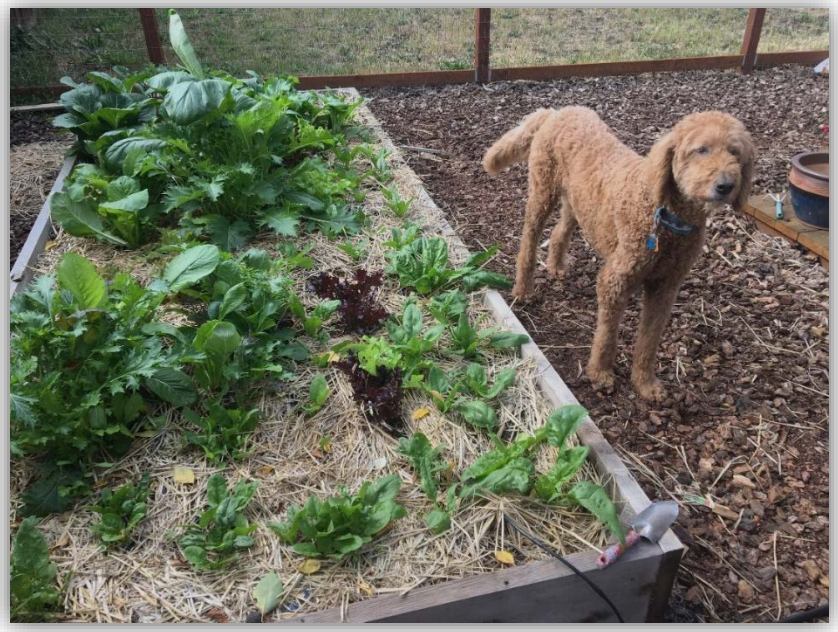
Mulches

- Reduces evaporation, holds in soil moisture, decreases weed growth and soil erosion.
- Include bark chips, wood grindings and pole peelings, plus rocks and gravel.
- Plants can serve as living mulches.
- Place mulches 2” – 4” deep between plants.
- Don’t use sheet plastic as a weed barrier.

Photo: Courtesy of www.sunset.com

Pros and Cons of Raised Beds

- Pros
  - Make a good loamy soil
  - Aesthetic style
  - Not as many weeds
  - Less soil compaction
- Cons
  - Soil dries out faster
  - Have to water more often
  - Initial construction cost



Good Controller Scheduling Practices

- Set timing based off the weather – Use local Evapotranspiration (ET) data to make a watering schedule
- Make changes to schedule every couple weeks as the weather changes.
- Use “percent adjust” to make timing adjustments easier
- Water every other day (in most cases)
- Turn off sprinklers when it rains.

Courtesy of Hunter Industries

Controller Components

- Programs
- Zones
- Start Times
- Days of the week
- Run Times
- Percent Adjust

MANUAL START
PRESS & HOLD
PRG
RUN
Hunter® Pro-C
BYPASS
ACTIVE
RAIN SENSOR
SYSTEM OFF
MANUAL - SINGLE STATION
SEASONAL ADJUSTMENT
SET PUMP OPERATION
SET CURRENT DATE / TIME
SET PROGRAM START TIMES
SET STATION RUN TIMES
SET DAYS TO WATER

Sprinkler Controllers

Set it and Forget it ??

No!

Regular Adjustments

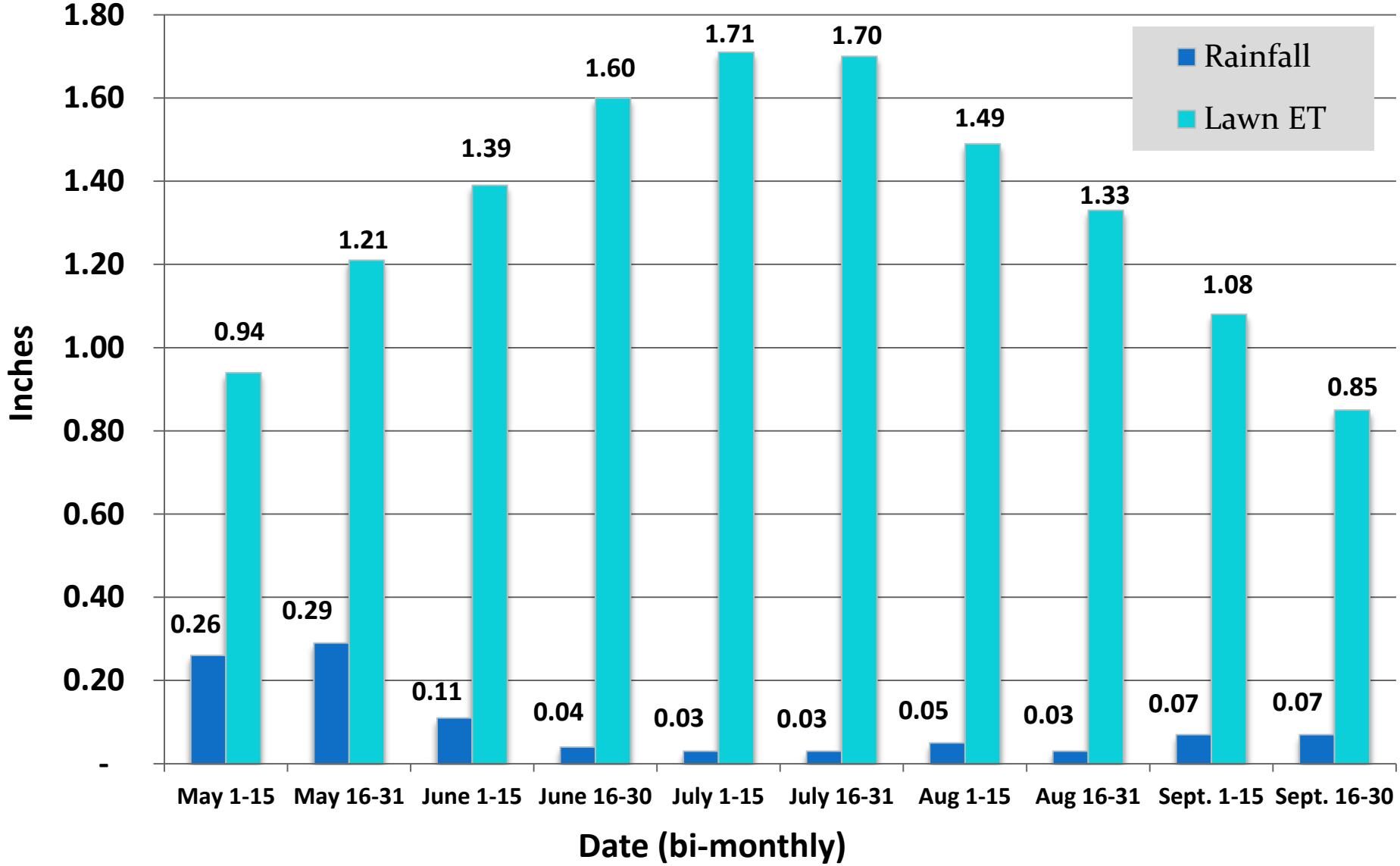
Save up to 60% on water use

Sample Lawn Watering Schedule

Biweekly Period	Approximate Lawn Water Needs (Inches per Week)[1]	Total Watering Time Per Week for Standard Spray Heads[2]	Total Watering Time Per Week for Rotary Heads[2]
May 1-15	0.94	38 Minutes	90 Minutes
May 16-31	1.21	48 Minutes	116 Minutes
June 1-15	1.39	56 Minutes	134 Minutes
June 16-30	1.60	64 Minutes	154 Minutes
July 1-15	1.71	68 Minutes	164 Minutes
July 16-31	1.70	68 Minutes	164 Minutes
Aug 1-15	1.49	60 Minutes	144 Minutes
Aug 16-31	1.33	54 Minutes	128 Minutes
Sep 1-15	1.08	44 Minutes	104 Minutes
Sep 16-30	0.85	34 Minutes	82 Minutes

- Lawn 100%
- Vegetables 75%
- Shrubs 40 - 60% (shady, part sun, sun)
- Drought Tolerant Shrubs 20 – 40%

Evapotranspiration (ET) & Rainfall



Program A	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Sprinkler Type	Pop-up Sprays	Rotors	Rotors	Pop-up Sprays	Drip
Type of Plants	Lawn (full Sun)	Shrubs (part sun)	Lawn (full sun)	DT Shrubs (full sun)	Shrubs
Start Times	6 a.m.	6 a.m.	6 a.m.	6 a.m.	6 a.m.
Minutes / Cycle					
Cycles per Day	1	1	1	1	1
Days per Week	4	4	4	4	4
TOTAL Minutes / Week					

Lawn min/week = (ET ÷ PR) x 60 **Example: (1.71÷1.5) x 60 = 68 minutes**

Shrubs in Part Sun: (1.71 * .50) = ÷1.5) x 60 = 34 minutes

Drip Scheduling

- Watering needs are dependent on type of **plants** being watered, type of **emitters** being used and the **flow rate** of each emitter.
- Wide variety of emitters with different application rates (flow rates). Between 0.5- 8 gph
- Average application rate is between 0.3 – 0.5 inches per hour

Photo: Courtesy of www.rainbird.com

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Start Times	6 a.m.	6 a.m.	6 a.m.	6 a.m.	6 a.m.
Minutes / Cycle	9	10	21	4	15
Cycles per Day	1	1	1	1	1
Days per Week	4	4	4	4	4
TOTAL Minutes / Week	36	40	84	16	60

Weather Data: Bureau of Reclamation:

Date	Lawn ET
15-Jul	0.18
16-Jul	0.28
17-Jul	0.3
18-Jul	0.26
19-Jul	0.26
20-Jul	0.23
21-Jul	0.22
Total	1.73

Rotating Sprinkler: 0.625 in./hr.

Spray Sprinkler: 1.5 in./hr.

Drip (Varies): 0.3 - 0.5 in/hr.

		Lawn ET (inches)	PR (In. per hr.)	Minutes	Total min. per week	
		1.73	1.5	60	69.2	
Lawn ET (inches)	50%	PR	Minutes	Shrub ET	Shrub ET / PR	Total min. per week
1.73	0.50	1.5	60	0.87	0.58	34.6

www.usbr.gov/pn/agrimet

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- Shrubs 40 - 60% (shady, part sun, sun)
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Reading Your Meter & Calculating Water Use

CITY OF ASHLAND

1.) Example

Reading #1

Reading #2

(Days or minutes between readings)

First Date or Time: _____ Second Date or Time: _____

2.) Water Use (Cubic Feet):

Reading #2 _____ (cubic feet)

Reading #1 – _____ (cubic feet)

= _____ (cubic feet used)

3.) Average Water Use:

Cubic Feet Used: _____

÷ _____ (# of days or minutes between readings)

= _____ (average cubic feet per day or per minute)

4.) Water Use (gallons):

Cubic feet used: _____

x 7.48 gallons

= _____ (gallons used)

5.) Practice

(Days or minutes between readings)

irst Date or Time: _____ Second Date or Time: _____

ater Use (cubic feet):

ading #2 _____

ding #1 – _____ (cubic feet)

= _____ (cubic feet)

_____ (cubic feet used)

Water Use:

eet Used: _____

÷ _____ (# of days or minutes between readings)

= _____ (average cubic feet per day or per minute)

s):

_____

x 7.48 gallons

_____ (gallons used)

your
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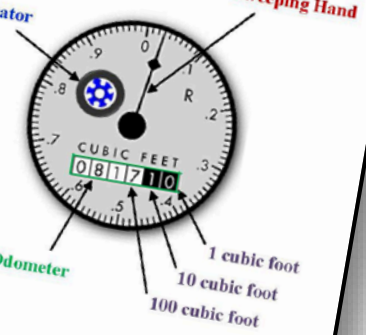
This will

nklers for 5 minutes
nute
= 80 cubic feet / week
allons)
= 2,393 gallons)



Calculating Application Rate (PR)

- An area of 1000 square feet is receiving a total of 10 gallons per minute. Using the precipitation rate formula, we can determine the precipitation rate as follows:

$$PR = \frac{96.25 \times \text{Total GPM}}{\text{Total Area}}$$

$$= \frac{96.25 \times 10}{1000}$$

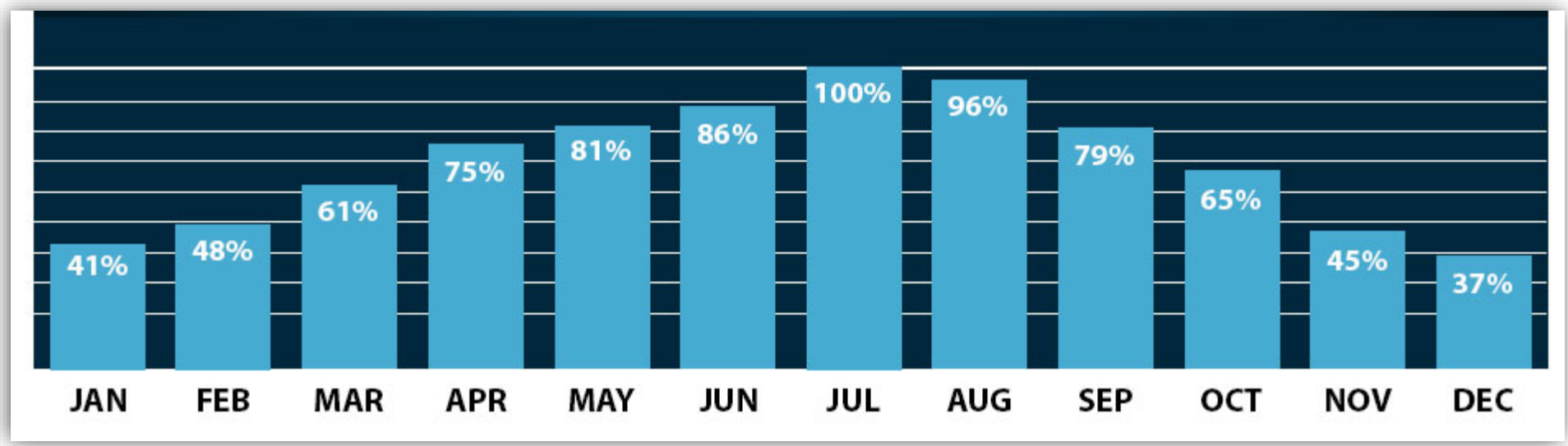
$$= .96 \text{ in./hr.}$$

Gallons/Peak Month Per Ft^2 of Lawn:

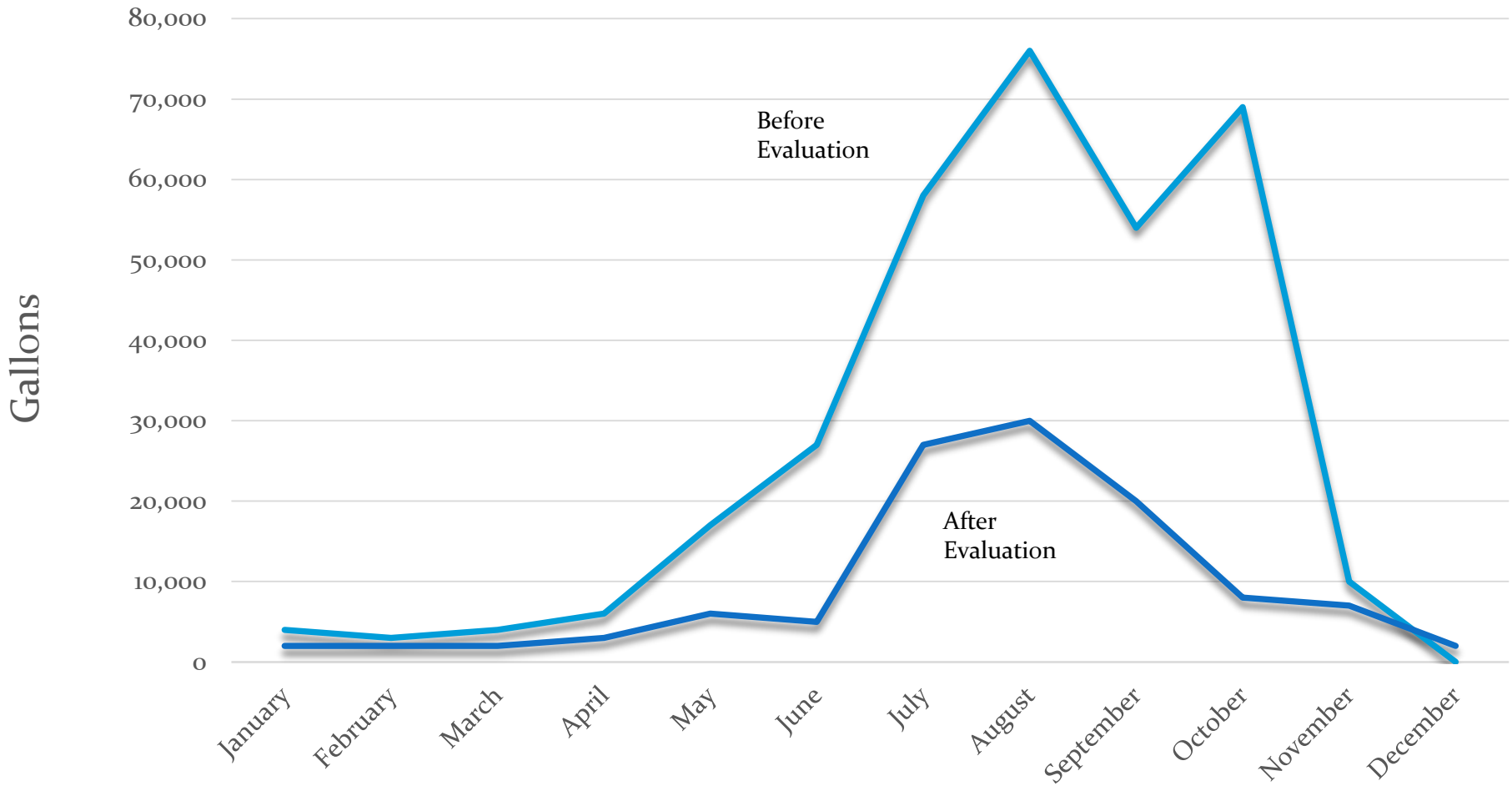
- Assume lawn ET = 1.8” per week or 1.8 / 12 ft per week
- 4.9 gallons per month per ft^2 of lawn.
- So 2,000 ft^2 lawn x 4.9 gal = 9,800 gal in peak month.
- Shrub area would need 25% - 60% of the lawn ET.
- Shrub area is 2,050 ft^2 x 2.9 = 5,950 gallons per month.

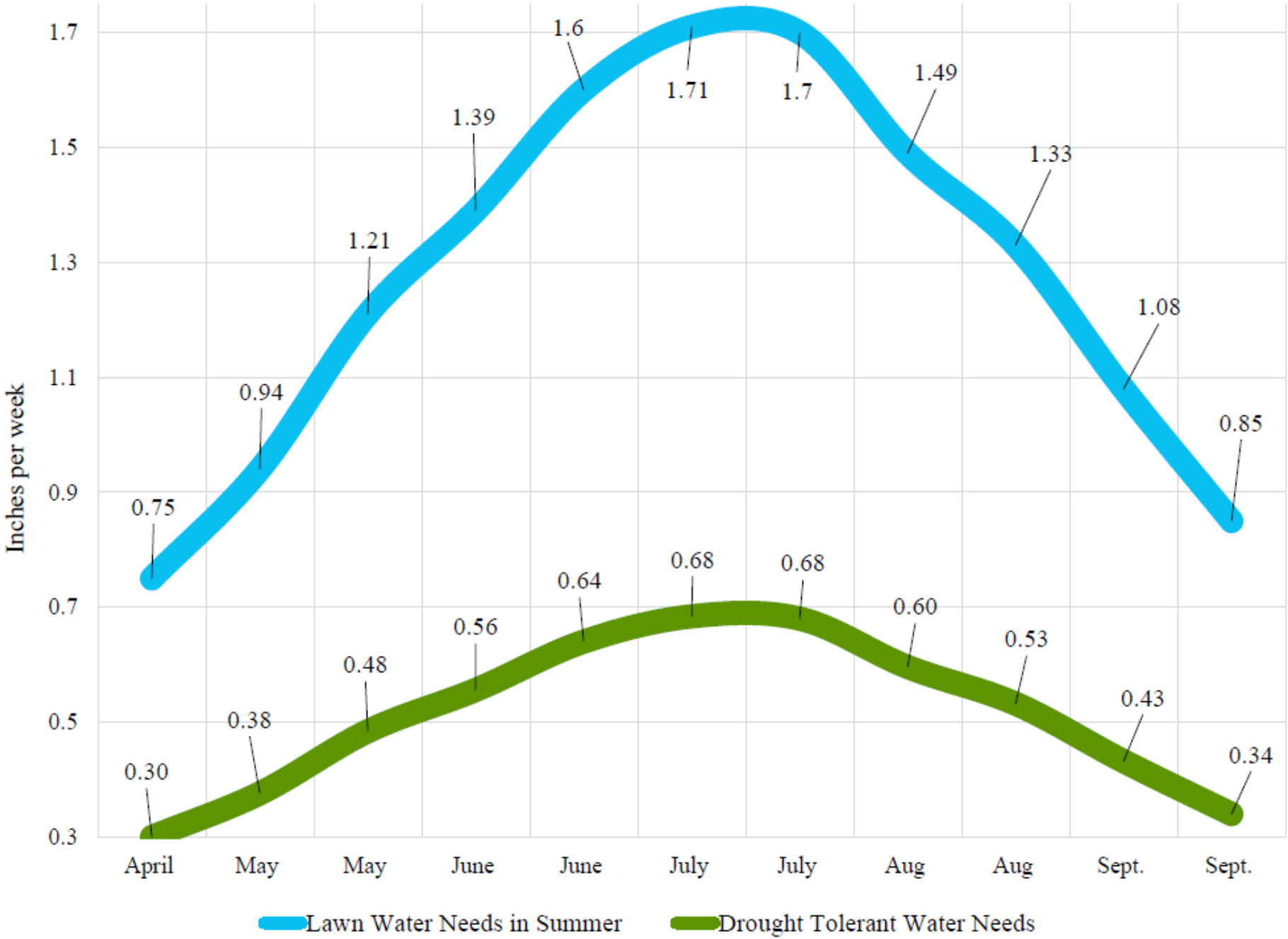
Scheduling Made Easy

Seasonal Adjust



Scheduling & Savings




Inches per week
1.7
1.5
1.3
1.1
0.9
0.7
0.5
0.3
0.75
0.94
1.21
1.39
1.6
1.71
1.7
1.49
1.33
1.08
0.85
0.30
0.38
0.48
0.56
0.64
0.68
0.68
0.60
0.53
0.43
0.34
April
May
May
June
June
July
July
Aug
Aug
Sept.
Sept.
Lawn Water Needs in Summer
Drought Tolerant Water Needs

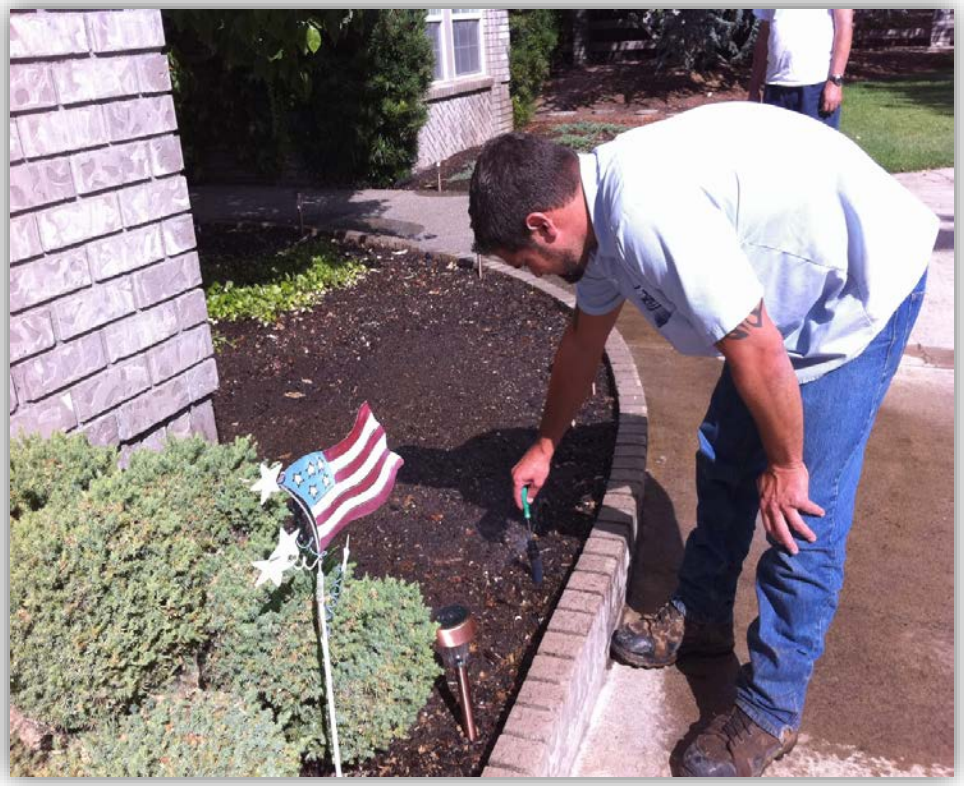
Smart Controllers

- Rain or soil moisture sensors can be added.
- Interrupt irrigation when rainfall or adequate soil moisture is detected.
- Cost of equipment is offset by your water savings.

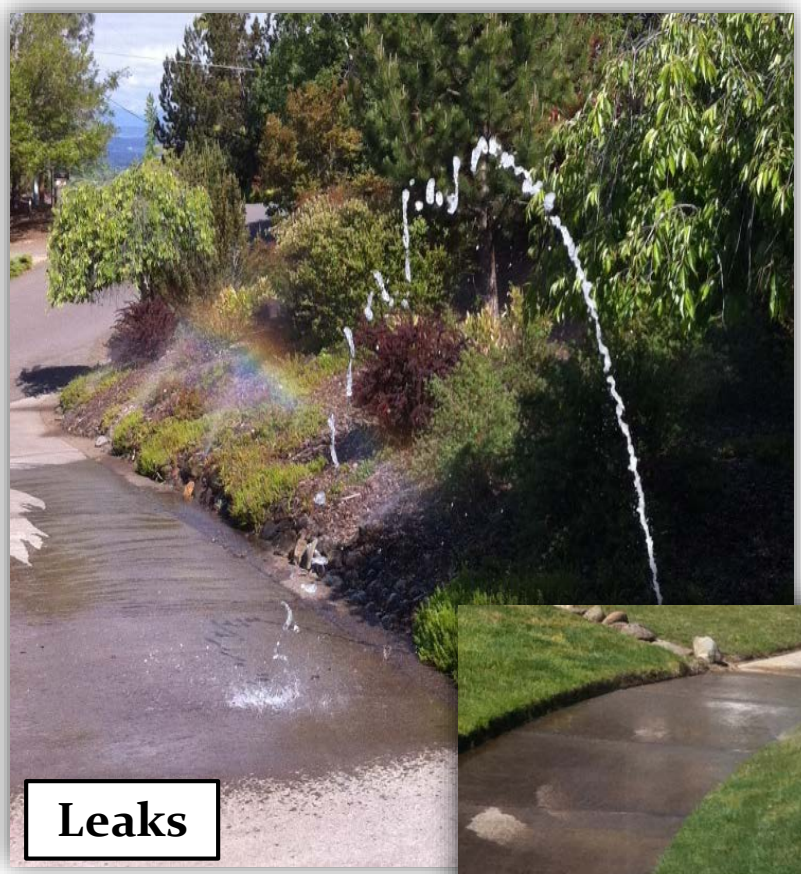
- Smart controllers can account for soil type, slope, plant type, ET data – waters to your landscape's specific needs.

Irrigation Maintenance & Troubleshooting

- Clogged heads
- Low head drainage
- Misaligned sprinklers
- Obstructions
- Leaks



Maintenance Issues



Leaks

Broken Sprinklers

Sprinkler Overspray

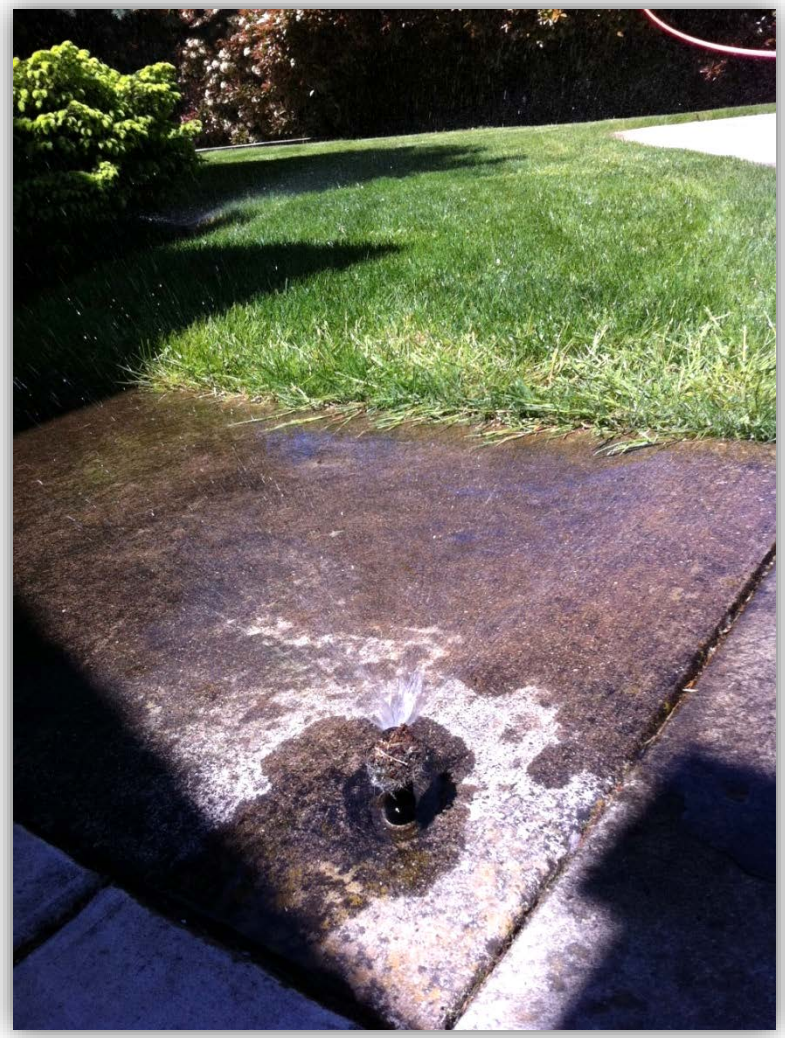
Troubleshooting Brown Spots

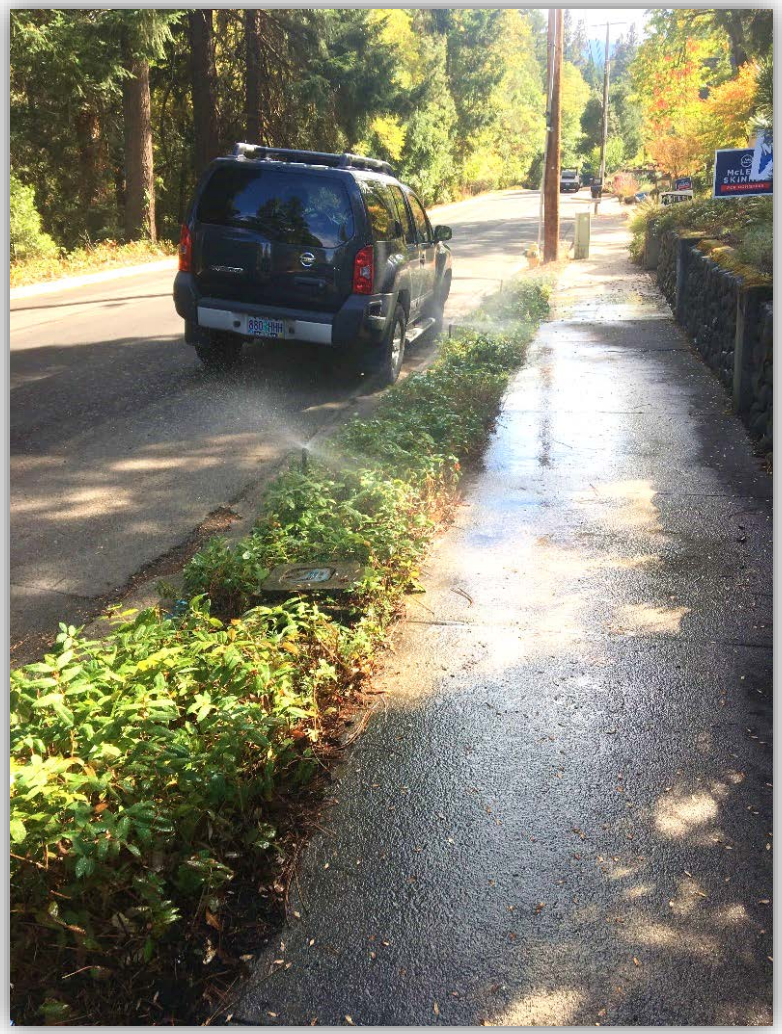
- Check the design or sprinkler function (clogs)
- Don't turn up for longer time - Spot water if cannot change design
- Over watered

Low Head Sprinkler Drai

- Solutions
  - Add a Check Valve
  - Replace with sprink with built-in check
  - Plant high water ne plants nearby

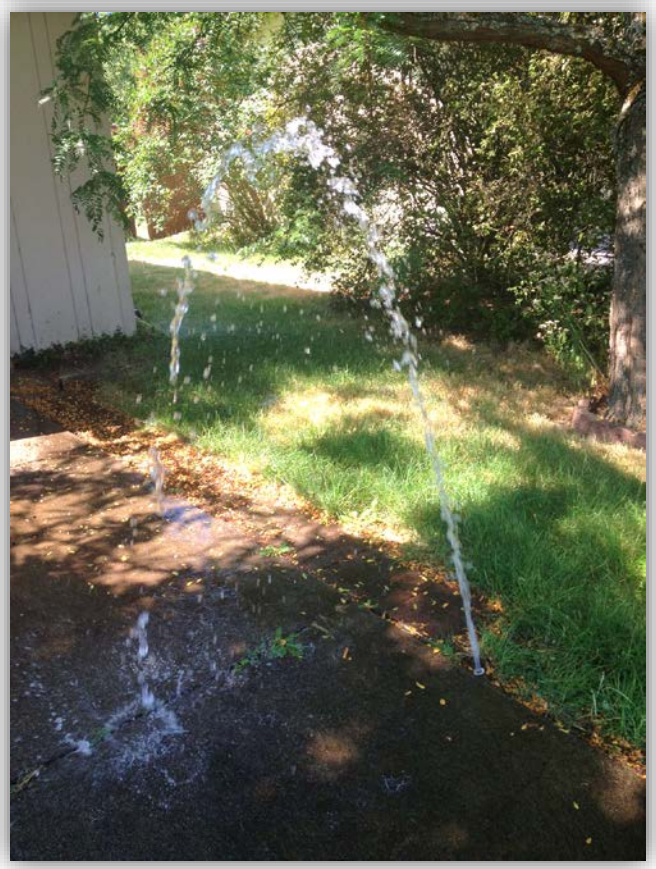
Misaligned Sprinklers





Obstructions

Leaks!



Where are the leaks?

- Common places to find leaks:
  - In the main service line
  - In your irrigation system
  - In your toilet

- Common leaks in irrigation
  - Between the backflow preventer and valve box
  - A malfunctioning valve or backflow
  - Broken sprinkler

Dos and Don'ts of Drip

Dos

- Use on shrubs and trees
- Use to irrigate slopes
- Run for longer periods of time and less days
- Periodically check for clogged or missing emitters

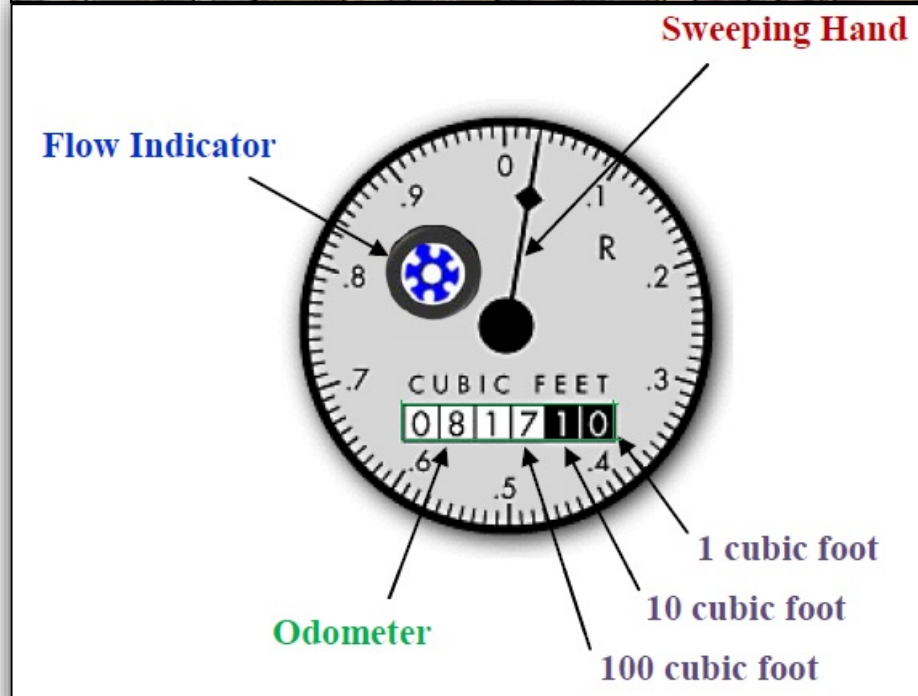
Dos and Don'ts of Drip

Don’ts

- Combine with spray heads
- Use duct tape to fix a leak
- Wrap drip around tree trunks
- Run for longer than an hour at a time

GIVE ME
MORE WATER!
Drawing by
Stephanie Danyi
2017

1 2 3 4 5 6 7 8 9 10
DRY
MOIST
WET
MOISTURE
METER


Sweeping Hand
Flow Indicator
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
R
CUBIC FEET
0 8 1 7 1 0
1 cubic foot
10 cubic foot
100 cubic foot
Odometer

Additional Resources

- Ashland www.ashlandsaveswater.org
- Medford www.medfordwater.org
- Jackson Soil & Water
  - www.jswcd.org
- OSU Extension
  - www.extension.oregonstate.edu
- Ewing Irrigation
  - www.ewingirrigation.com
- Rainbird
  - www.rainbird.com
- Hunter
  - www.hunterindustries.com

Request a sprinkler evaluation!

Questions?

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julie.smitherman@ashland.or.us

541-552-2062

Water-Wise Landscaping Website

www.ashlandsaveswater.org

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