Section 9

IRRIGATION CONTROLLERS

LEARNING OBJECTIVES

1. Understand the function of an irrigation controller
2. Understand the various types of irrigation controllers
3. Understand the parameters required to program a conventional controller
4. Programming a conventional controller
5. Understand how a weather based irrigation controller works
6. Using sensors to improve irrigation efficiency

1. IRRIGATION CONTROLLERS

- Understand the function of an irrigation controller

1.1-1.2 CONTROLLER FUNCTION

- The primary function of an irrigation controller is to control the operation of electric irrigation valves and the delivery of water to the landscape

- If used properly, irrigation controllers can efficiently manage the application of irrigation water and provide reliable operation of irrigation systems at any time of day or night

2. IRRIGATION CONTROLLER TYPES

- Understand the various types of irrigation controllers

2.1-2.6 IRRIGATION CONTROLLER TYPES

- Indoor or outdoor
- Residential or commercial
- Conventional controllers
  - Non-volatile memory
- Weather based irrigation controllers (WBICs)
  - Use local weather, landscape conditions, and type of irrigation equipment to determine schedule
- Soil moisture-based controllers
  - Use soil moisture sensors to measure soil moisture within the root zone

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2.7-2.9 IRRIGATION CONTROLLER TYPES

- WiFi irrigation controllers
  - Control remotely, convenient data feed
- Central control systems
  - Enable control of a network of compatible irrigation controllers
- Conventional wiring or two-wire systems
  - Two-wire uses only two wires combined with a decoder

3. CONVENTIONAL IRRIGATION CONTROLLER PARAMETERS

- Understand the parameters required to program a conventional controller

3.1 PROGRAMS

- Programs are separate irrigation schedules to allow the water manager to group hydrozones with similar interval needs together
  - e.g. program A for turf zones, program B for shrub zones, and program C for trees
- Each program will irrigate all of the zones selected to run on the same days of the week and with the same number of cycles
- Hydrozones are grouped together in the same program based on factors such as:
  - Water requirements of the plant material, root depth, microclimate, soil type, emission device, time to runoff
  - Other factors such as convenience and constraints of the controller

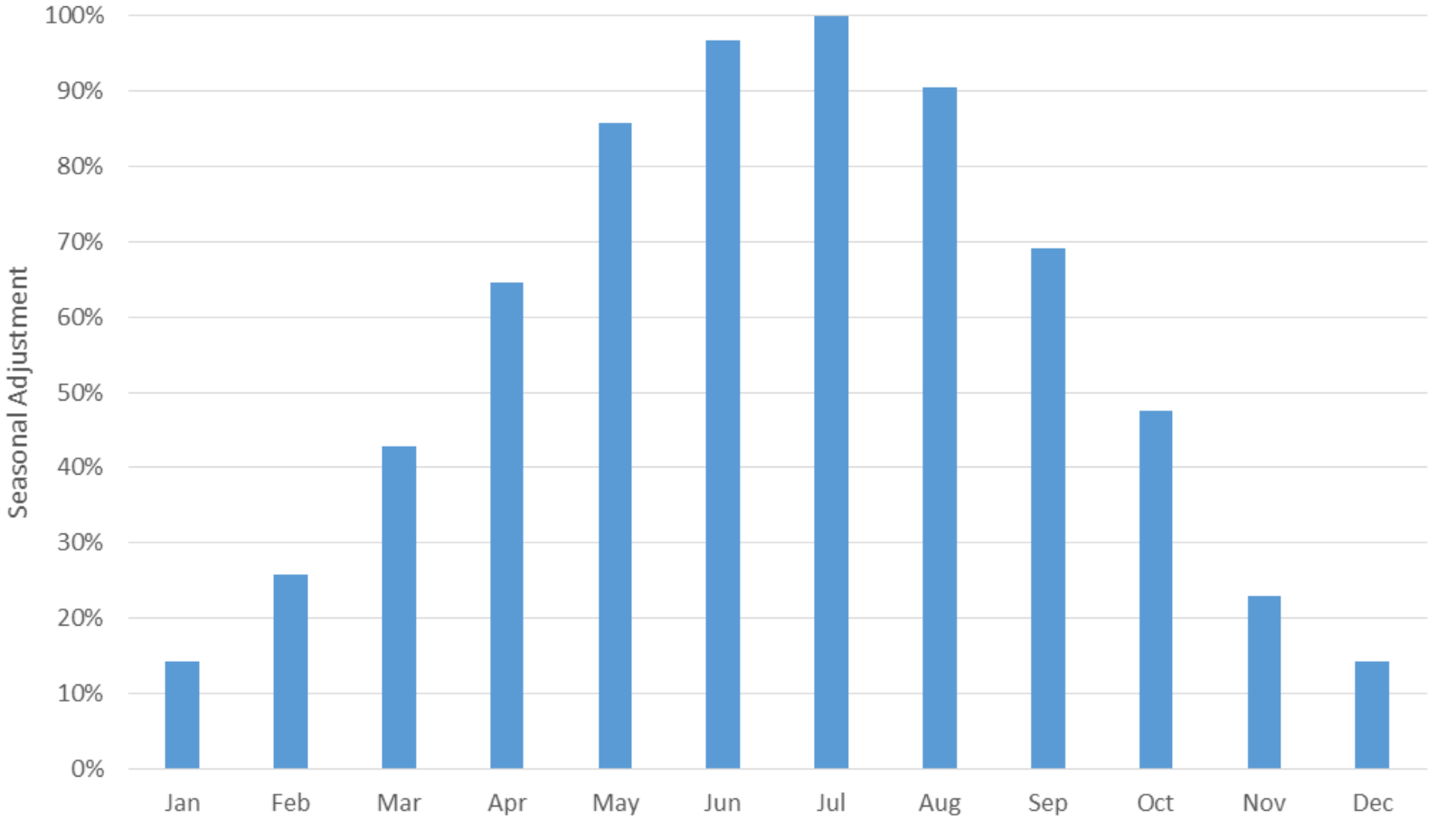
3.2-3.3 START TIME & RUN TIME

- Start time is the time of day that a given program will commence
  - Multiple start times
  - Cycle and soak
- Run time is the length of time that the controller will run the program for each start time
  - Separate run time for each station on the controller
  - Run time should be less than the observed time to runoff

3.4-3.5 WATER DAYS & SEASONAL ADJUSTMENT

- Water Days are the days of the week that the controller will run
  - Specific days
  - Odd/even days
  - Interval watering
- Seasonal adjustment is a global percentage adjustment that adjusts all, or selected, programs and run times
  - Saves time and money
  - Enter run time for hottest month, use seasonal adjustment to reduce in other months

3.5 EXAMPLE: CIMIS ZONE 5



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4. PROGRAMMING A CONVENTIONAL CONTROLLER

- Programming a conventional controller

4.1 EXAMPLE

Plant Type	Low Water Use Plants	Moderate Plants	Cool Season Turf	Cool Season Turf
Irrigation Type	Inline Drip	Inline Drip	Rotating Sprinklers	Fixed Spray Sprinklers
Station	1	2	3	4
Program	A	B	C	D
Start Times	6 a.m., 6:30 a.m.	7 a.m., 7:30 a.m.	4 a.m., 5 a.m.	4 a.m., 4:30 a.m., 5 a.m., 5:30 a.m.
Run Time	28	24	20	4
Water Days	Su	We, Sa	Odd	Even
Weekly Run Time	56	96	140	56

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4.2 CONSIDERATIONS

- Multiple start times and/or cycle and soak
- Available programs
- Monthly or bi-monthly schedule
- If there are insufficient programs to input the desired schedule, the water manager must look for alternatives or adjust the schedule
    - Combine stations 3 and 4 onto one program if a cycle and soak feature is available
    - Combine stations 1 and 2 onto one program

4.3 HUNTER X-CORE

- Central dial to select function
- + and – buttons to change values
- ◀ and ▶ buttons to progress and go back
- PRG button to select program

4.4 IRRITROL RAIN DIAL

- Central dial to select run time, start time, and days
- Function switch to select set programs, run, or off
- + and – buttons to change values
- Program switch to select program
- Manual button for manual operations, to access special functions, and a next button
- Semi-auto button used to manually start an automatic watering program

5. WEATHER BASED IRRIGATION CONTROLLERS

- Understand how a weather based irrigation controller works

5.1 WBIC DIFFERENCES

- Differences in how the WBIC is programmed:
  - Peak month irrigation run time and frequency
  - Field data such as irrigation device, plant type, soil type, root depth, slope, and microclimate
- Different WBICs will generate different schedules due to differences in the assumptions used and variations in features

5.2 WATERING FREQUENCY AND RUN TIME

- Based on the concept of management allowable depletion (MAD)
- Variable watering frequency with fixed run time
  - Number of days between watering changes
- Fixed watering frequency with variable irrigation run time
  - Number of days between watering constant

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5.3-5.4 EPA WaterSense & SWAT

- EPA WaterSense provides a list of WaterSense labeled irrigation controllers
- Smart Water Application Technologies (SWAT) is a coalition of water purveyors, equipment manufacturers and irrigation practitioners that develops testing protocols and promotes water-efficient products including WBICs

5.5 POTENTIAL ISSUES WITH WBICs

- Proper programming to reflect site conditions
- ET data may not match site conditions
- Data connection issues
- On-site ET data requires proper setup and maintenance
- Observation and system tuning essential

6. SENSORS FOR IRRIGATION CONTROLLERS

- Using sensors to improve irrigation efficiency

6.1 SENSORS FOR IRRIGATION CONTROLLERS

- Sensors for irrigation controllers are devices that interrupt the electrical signal in response to specific site conditions and modify the operation of the irrigation controller
- The use of sensors can save significant amounts of both time and water

6.2 ET SENSORS

- ET sensors can upgrade a standard controller to a WBIC
- They are weather sensors that determine evapotranspiration and adjust the controller based on local weather conditions
- ET sensors require a compatible controller
- ET sensors typically incorporate rain and freeze sensors to shut down the irrigation system

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6.3 FLOW SENSORS

- Flow sensors shut down the irrigation system when a specified level of overflow or underflow has occurred
- Many flow sensing systems automatically send flow alerts to the water manager
- Flow sensors can prevent:
  - Catastrophic water waste in the event of a pipe rupture or other leak
  - Property and landscape damage
  - The loss of valuable plant material due to a non-functioning valve

6.4 SOIL MOISTURE SENSORS

- Soil moisture sensors measure soil moisture within the root zone and can be programmed to shut off the irrigation system when the desired soil moisture level has been reached
- Typically located in the ground within specific hydrozone boundaries
- Can be used to override the irrigation schedule when the measured soil moisture content indicates that irrigation is not required
- Can make-up for inefficiencies in the irrigation schedule of both conventional controllers and WBICs
- Rely on the position chosen being a reliable representation of the entire zone and/or system

6.5-6.7 RAIN, WIND, & FREEZE SENSORS

- Rain sensors shut down the irrigation controller during periods of measurable rainfall
  - Inexpensive and can save significant amounts or water due to rain events during the regular irrigation season
- Wind sensors shut down the irrigation controller during periods of high wind
  - Wind sensors are useful for overhead irrigation in unprotected areas
- Freeze sensors prevent the irrigation system from operating in freezing temperatures

7. IRRIGATION CONTROLLER REVIEW QUESTIONS

- Using sensors to improve irrigation efficiency

7. IRRIGATION CONTROLLER REVIEW QUESTIONS

1. What is the primary function of an irrigation controller?
2. If used properly what are some of the benefits that an irrigation controller can provide?
3. What is the difference between an indoor and an outdoor irrigation controller?
4. How is a WBIC different from a conventional controller?
5. What is a potential application for a central control system?
6. What are the four parameters needed to program a conventional irrigation controller?
7. Explain how the seasonal adjustment feature of a conventional controller works?
8. True or false: All WBICs require the user to enter field data about the irrigation system, plants and soil to determine the irrigation schedule.

7. IRRIGATION CONTROLLER REVIEW QUESTIONS

9. True or false: There are several different approaches used by WBICs for watering frequency and run times.
10. Where would you look to find a list of WBICs that have been independently certified to ensure that they can adequately meet the watering needs of a landscape without overwatering?
11. What are some potential issues with WBICs?
12. Describe how sensors for irrigation controllers work.
13. Describe how soil moisture sensors can be used to improve the irrigation efficiency of both conventional controllers and WBICs.