IRRIGATION WATER MANAGEMENT GUIDE: SIERRA NEVADA FOOTHILLS

When to Irrigate and How Much to Apply

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INTRODUCTION

Irrigation is the controlled application of water to croplands and pastureland. Irrigation is used to create an optimal soil moisture regime for maximizing crop production as well as water use efficiency. Irrigation is thus critical for food production in semi-arid and arid areas.

California has a Mediterranean climate characterized by warm and dry summers followed by typically wet and cool-to-cold winters. Within the state, there is diversity of micro-climates and varying precipitation. Therefore, irrigation throughout California is very specific to the region and the related primary cropping system.

In the Sierra Nevada foothills, irrigation applications differ from the majority of those in the Central Valley, the coastal areas, and certainly from the desert regions. Farming and pastureland systems in the Sierra Nevada foothills primarily use water from April to October, delivered through a canal system. The canals are a legacy of the gold mining era and are now operated by local water agencies. The canals convey water from a series of reservoirs, many of which originate in the upper reaches of the Sierra Nevada mountains. Water is transported to paying customers along a gradient to the south and west. Some smaller farms and ranches use well water to irrigate as well.

In this guide, you will find background information and specific concepts, calculations and resources, to assist you in determining the appropriate timing and volume of water to apply to maximize crop production.

Irrigation water management includes 1) Frequency of irrigation 2) Depth of water to be applied, and 3) Measures to increase the uniformity of applications. Irrigation management should be a set of practices designed to maximize efficiencies and minimize the labor and capital requirements of a particular irrigation system.

IRRIGATION MANAGEMENT

Throughout the western slope area of Nevada or Placer County, you will typically apply 1.5 inches of water every time you irrigate. During the hottest month(s), you will need to re-apply the 1.5 inches of water every 5 – 6 days. Note that this is a general schedule for impact sprinkler irrigation rather than drip irrigation. Drip irrigation typically only applies the amount of water lost or used each day or every two days, and irrigation occurs every day or every other day.

By knowing your soil type, soil depth, and the crop consumptive use for each month, you can be more precise in your water application, resulting in conservation of water and higher quality crops.

IRRIGATION WATER MANAGEMENT PLAN

An Irrigation Water Management (IWM) plan helps you determine when to irrigate and how much water to apply. This guide outlines the principles for developing an IWM plan specific to your crop and irrigation system. Knowing when and how much to irrigate provides plants with water when they need it most. This can help conserve water and keep vital nutrients in the soil rather than being leached out from over-irrigating. Using an IWM plan along with other tools such as soil moisture meters, weather stations, and your own experience can improve your irrigation system and crop health.

WHAT IS A MINER'S INCH?

One Miner's Inch is equal to roughly 11.2 gallons per minute.

If you purchase canal (ditch) water in Nevada or Placer County, water is most likely delivered to you in Miner's Inches. If you are a Nevada Irrigation District (NID) customer, then you will be allocated a box on the canal that has an orifice plate sized specifically for the amount of water that you purchase.

If you are a Placer County Water Agency (PCWA) customer, then you will be allocated a screened-PVC pipe, that has an interior orifice plate sized for the amount of water you purchase. The water level in the canal should be at least 6 inches above the orifice to get the amount of water purchased. Water levels in the canal commonly fluctuate during the irrigation season. However, if the water level is consistently low, contact your water provider.

IWM FACTORS

An IWM Plan is developed using the following:

- Soil(s) Information
- Crop Information
- Irrigation System Application Efficiency

SOIL PROFILE

Available Waterholding Capacity

The amount of water a soil can hold, available for plant use, is determined by the soil's physical properties. The soil texture is probably the most influential factor in determining the Available Waterholding Capacity (AWC) of the soil. Most soils will have varying textures at different depths. The following table (Table 1) gives the general range of AWC per inch of soil depth for various soil textures. More specific AWC information can be obtained from your local Natural Resources Conservation Service (NRCS) or Resource Conservation District (RCD) office.

TABLE 1. AVAILABLE WATER HOLDING CAPACITY (AWC)

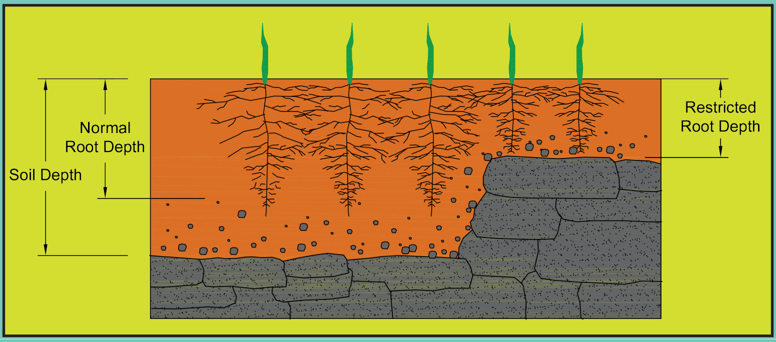
SOIL TEXTURES	Range in/in	Average in/in
Very Coarse to Coarse Texture Sand	0.01 – 0.03	0.02
Moderately Coarse Texture Sandy Loam and Fine Sandy Loam	0.09 – 0.12	0.11
Medium to Very Fine Texture Sandy Loam to Silty Clay Loam	0.15 – 0.21	0.18
Fine and Very Fine Texture Silty Clay to Clay	0.14 – 0.17	0.16
Peats and Mucks	0.17 – 0.25	0.21

USDA-NRCS NEH — Part 652, Ch. 9-6

SOIL DEPTH

Water use is most effective and efficient when the soil moisture is managed only within the necessary area. The soil depth is used to determine the area to be considered for the AWC and is called the 'Effective Rooting Depth'. This depth is based on either the maximum soil depth or the plant rooting depth, whichever is the limiting factor. Soil limitations can restrict the plant rooting depth to a depth considerably less than normal; hard-pan, high-water table, and bedrock are a few common examples. Other soils are much deeper than the plant rooting depth, however, irrigation beyond the roots cannot be utilized by the plants and is an inefficient use of water.

FIGURE 1. ROOTING DEPTH



SOIL INTAKE RATE

The soil intake or infiltration rate is the process of water entering the soil at the soil/air interface. This needs to be considered when determining the type of irrigation and flow rate of the emitters or nozzles. The irrigation application rate should not be greater than the intake rate of the soil. Excessive application rates can result in runoff, causing soil erosion. This removes valuable topsoil and can lead to other costly problems.

TABLE 2. SOIL INTAKE RATES

SOIL TEXTURE	Intake Rate (in/hr)	
	Sprinkler	Furrow
Clay, Silty clay	0.1 – 0.2	0.1 – 0.5
Sandy clay, Silty clay loam	0.1 – 0.4	0.2 – 0.8
Clay loam, Sandy clay loam	0.1 – 0.5	0.2 – 1.0
Silt loam, loam	0.5 – 0.7	0.3 – 1.2
Very fine - fine sandy loam	0.3 – 1.0	0.4 – 1.9
Sandy loam, Loamy very fine sand	0.3 – 1.25	0.5 – 2.4
Loamy fine sand, Loamy sand	0.4 – 1.5	0.6 – 3.0
Fine sand, sandy	0.5 +	1.0 +
Coarse sand	1.0 +	4.0 +

USDA-NRCS NEH — Part 652, Ch. 2-17

CROP INFORMATION

CROP ROOT DEPTH

As previously discussed, the crop root depth is used with the soil depth to determine the Effective Rooting Depth. This depth varies with the stage of crop growth. The following table (Table 3) gives the normal rooting depths for several mature irrigated crops, grown on deep, permeable, well-drained soil.

TABLE 3. NORMAL CROP ROOTING DEPTHS

CROP	DEPTH, ft	CROP	DEPTH, ft
Alfalfa	5 – 10	Grain	3 – 4
Apples	4 - 5	Grass, Pasture	2 – 4
Artichokes	4	Hops	5 – 8
Asparagus	6 - 10	Ladino Clover	2
Beans	3 – 4	Lettuce	1 – 1.5
Beets (table)	2 – 3	Melons	6
Broccoli	2	Onions	1
Cabbage	2	Peas	3 – 4
Bush Berries	4 – 6	Peppers	2 – 3
Cabbage	2	Potatoes	3 – 4
Carrots	2 – 3	Pumpkins	6
Cauliflower	2	Radishes	1
Celery	3	Spinach	2
Citrus	3 – 4	Squash	3
Corn (sweet)	3	Stone Fruit	
Corn (field)	4 – 5	Strawberries	3 – 4
Deciduous orchards	6 – 8	Tomatoes	6 – 10
Garlic	1 – 2	Turfgrass	
Grapes	4 – 6	Walnuts	12

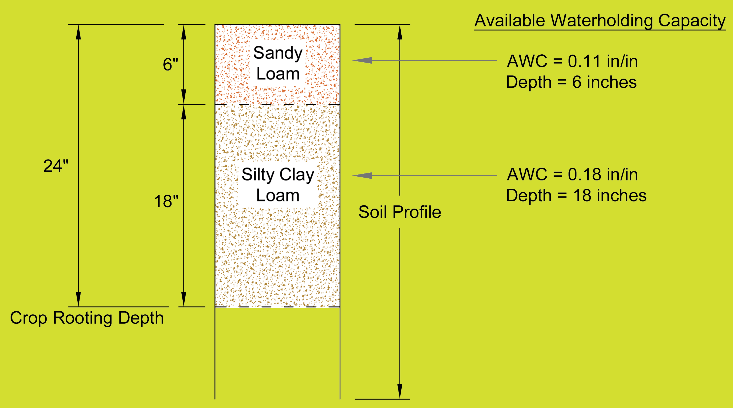
USDA-NRCS NEH — Part 652, Ch. 3-8

CALCULATING THE TOTAL AWC

The total amount of water available for plant use in the root zone is the sum of the **Available Waterholding Capacity** per inch (or foot), for various soil types within the Effective Rooting Depth. See the example below.

EXAMPLE 1. PASTURE GRASS

ASSUME THE GRASS ROOT DEPTH IS 24 INCHES (TABLE 3) AND IS GROWN IN A SOIL WITH THE FOLLOWING CHARACTERISTICS. NOTE THAT THE SOIL TYPE AND TEXTURE CAN CHANGE WITH DEPTH, WHICH CAN CHANGE THE AWC.



Sandy Loam AWC = 0.11 in/in x 6 inches = 0.66 inches

Silty Clay Loam AWC = 0.18 in/in x 18 inches = 3.24 inches

Total AWC = 0.66 + 3.24 = 3.9 inches

MANAGEMENT ALLOWED DEPLETION (MAD)

Also known as Maximum Soil Water Depletion (SWD), this is the maximum amount of moisture that can be depleted from the soil before the plant is negatively impacted. The MAD is given as a percentage of the total available moisture in the root zone (or AWC). The MAD will vary with crop type since some crops are more drought tolerant and/or have deeper roots than others. Other factors such as type of irrigation, available water supply, salinity, drainage, and labor should also be considered when determining this allowable depletion. Moisture depletion allowances usually vary from 20 to 70 percent. For guidance in selecting a depletion level for your crop and management situation, consult your local farm advisor, NRCS, or RCD.

For example, pasture, trees, and berries typically have a MAD of 50%. However, trees or berries on drip systems might not be able to apply 50% of the depleted moisture within a reasonable time frame. Therefore, use a percentage that works with the irrigation system and desired management of the specific crop.

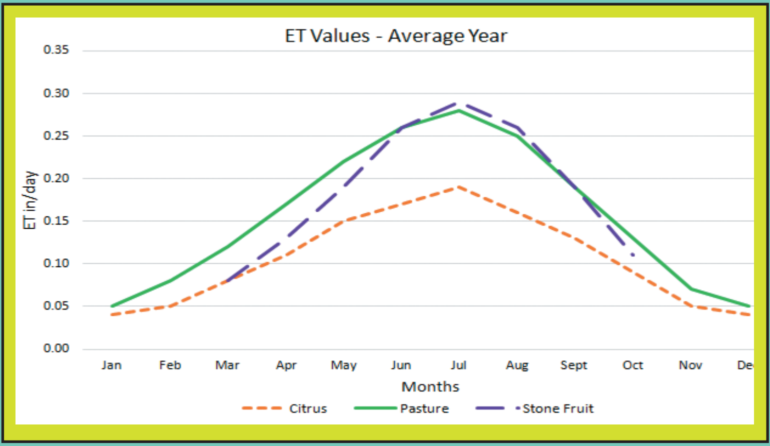
TABLE 4. RECOMMENDED MAD FOR CROP GROWTH STAGES (% OF AWC)

(Growing in loamy soils) Crop Growth Stage				
CROP	**Establishment**	**Vegetative**	**Flowering**	**Ripening/ Maturity**
Alfalfa hay	50	50	50	50
Alfalfa seed	50	60	50	80
Beans, green/dry	40	40	40	40
Citrus	50	50	50	50
Corn, grain/seed	50	50	50	50
Corn, sweet	50	40	40	40
Garlic	30	30	30	30
Grains, small	50	50	40	60
Grapes	40	40	40	50
Grass pasture	40	50	50	50
Lettuce	40	50	40	20
Mint	40	40	40	50
Nursery Stock	50	50	50	50
Onions	40	30	30	30
Orchard, fruit	50	50	50	50
Peas	50	50	50	50
Potatoes	35	35	35	50
Spinach	25	25	25	25
Sugar Beets	50	50	50	50
Vegetables				
1 to 2 ft root depth	35	30	30	35
3 to 4 ft root depth	35	40	40	40

EVAPOTRANSPIRATION RATE (ET)

Also known as the consumptive use, ET is the rate at which moisture is removed from the soil and plants due to the climate. The ET varies with crop type and changes throughout the season. Irrigation designs are typically based on the Peak ET, which occurs during the hottest months of the summer. However, an IWM Plan takes into account monthly ET values to determine how often to irrigate throughout the season.

FIGURE 3. EVAPOTRANSPIRATION RATES



WHEN TO IRRIGATE

Irrigation should be scheduled when the amount of water depleted from the soil in the root zone approaches the predetermined Management Allowed Depletion (MAD). This is referred to as the **Irrigation Frequency,** which changes throughout the season based on the climate. There are several methods for estimating the amount of water depleted from the soil.

CIMIS – California Irrigation Management Information System website that provides real-time climate data and ET values. Start by finding the weather station nearest you.

Moisture Meters – There are various types of moisture meters that can be used with varying degrees of accuracy.

Smart Sensors – Newer technology that works with some automated systems and acts as a mini-weather station to automatically determine when irrigation is required.

Feel Method – take soil samples in one-foot increments for the entire crop root zone and feel the soil to determine moisture content. The total amount of moisture depleted is the sum of the one-foot increments for the crop rooting depth. Use Table 5 (page 16) to help approximate soil moisture depletion.

TABLE 5. Feel Method

Find most appropriate soil type
to determine level of moisture/depletion

AVAILABLE SOIL MOISTURE, %	COARSE TEXTURE: Fine Sand & Loamy Fine Sand	MODERATELY COARSE TEXTURE: Sandy Loam & Fine Sandy Loam	MEDIUM TEXTURE: Sandy Clay Loam, Loam, & Silt Loam	FINE TEXTURE: Clay, Clay Loam, & Silty Clay Loam
0 – 25	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure	Dry, forms a very weak ball, aggregated soil grains break away easily from ball	Dry, soil aggregations break away easily, no moisture staining on fingers, clods crumble with applied pressure	Dry, soil aggregations easily separate, clods are hard to crumble with applied pressure
25 – 50	Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remain on fingers	Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away	Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away	Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure
50 – 75	Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon	Moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not slick	Moist, forms a ball, very light water staining on fingers, darkened color, pliable, forms a weak ribbon between thumb and forefinger	Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger
75 – 100	Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon	Wet, forms a ball with wet outline left on hand, light to medium water staining on fingers, makes a weak ribbon between thumb and forefinger	Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger	Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger
Field Capacity, 100%	Wet, forms a weak ball, moderate to heavy soil/water coating on fingers, wet outline of soft ball remains on hand	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers	Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky
NOTE: Ball is formed by squeezing a hand full of soil very firmly with one hand				
Ribbon is formed when soil is squeezed out of hand between thumb and forefinger				

IRRIGATE!

For additional information, including visual examples, go to: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051845.pdf or visit your local NRCS office

APPEARANCE OF SANDY CLAY LOAM, LOAM, AND SILT LOAM SOILS AT VARIOUS SOIL MOISTURE CONDITIONS

25-50 PERCENT AVAILABLE
1.6-0.8 IN/FT. DEPLETED

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away

50-75 PERCENT AVAILABLE
1.1-0.4 IN/FT. DEPLETED

Moist, forms a ball, very light staining fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger

75-100 PERCENT AVAILABLE
0.5-0.0 IN/FT. DEPLETED

Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger

HOW MUCH WATER TO APPLY

NET IRRIGATION

This is the amount of water that is required to replenish the soil moisture. The net irrigation is determined by multiplying the AWC by the MAD.

EXAMPLE 2. PASTURE GRASS – NET IRRIGATION

USING THE AWC CALCULATED IN EXAMPLE 1, AND A MAD OF 50%, THE NET IRRIGATION WOULD BE AS FOLLOWS:

$$\textit{Net Irrigation} = 3.9 \text{ inches} \times 50\% = 1.95 \text{ inches}$$

APPLICATION EFFICIENCY

No system is 100% efficient. The level of management along with how well the irrigation system functions will determine the application efficiency. Listed below are common application efficiencies for various types of irrigation systems that are in good working condition and under good to excellent management.

TABLE 6. IRRIGATION APPLICATION EFFICIENCIES (GOOD TO EXCELLENT MANAGEMENT)

System	Efficiency Range
Furrow	70 – 85%
Graded Boarder	70 – 85%
Basin	75 – 90%
Impact Sprinklers	70 – 85%
Rotor Sprinklers	75 – 90%
Drip or Micro-Sprayer	80 – 90%

GROSS APPLICATION

To account for inefficiencies, the total amount of water that the system will need to apply will be slightly more than the net irrigation. The following equation can be used to determine the gross application, or total amount of water, that will need to be applied.

EXAMPLE 6. PASTURE GRASS GROSS APPLICATION

$$Gross\ Application = \frac{\text{Net Application}}{\text{Application Efficiency}}$$

This example is based on an impact sprinkler system that is several years old, no leaks, head-to-head coverage, minimal wind interference, and proper management. Assume an application efficiency of **75%.** Using the Net Application calculated in Example 5, the Gross Application would be as follows:

$$Gross\ Application = {}^{1.95\text{in}}/_{0.75} = 2.6\ \text{inches}$$

Therefore, the Gross Application is 0.65 inches greater than the Net Application calculated in Example 6.

IRRIGATION SET TIME

Now that you know the amount of water that needs to be applied, let's look at how that translates to determining the irrigation set time. The irrigation set time, or the length of time that each set runs, can be calculated or measured in the field.

The following equation is used for sprinkler systems and assumes that the sprinklers have head-to-head coverage.

Head-to-Head coverage = *sprinkler spray hits the adjacent sprinklers*

IMPACT SPRINKLERS:

$$T = \frac{GA \times A}{96.3 \times Q}$$

Where:

T = Set Time, hours

GA = Gross Application, inches

A = Area, square feet (sprinkler spacing x row spacing)

Q = Nozzle Flow Rate, gallons per minute

96.3 – Conversion Factor

MICRO-IRRIGATION:

(Drip and Micro-Sprayers)

$$T = \frac{GA \times A}{1.6 \times Q}$$

Where:

T = Set Time, hours

GA = Gross Application, inches

A = Area, square feet (plant spacing x row spacing)

Q = Flow Rate per plant, gallons per hour (Multiply emitter flow rate by number of emitters per plant)

1.6 – Conversion Factor

Note that the flow rate is in gallons per hour rather than gallons per minute.

IRRIGATION WORKSHEET

SOIL INFORMATION

Soil Type/Texture____________________ Soil AWC____________in/in Soil Depth______________in

CROP INFORMATION

Crop Type____________________ Rooting Depth_______________in (Not to exceed soil depth)

Daily Peak ET__________in/day During Month of____________________

Total AWC = Soil AWC x Rooting Depth = ___________in/in **X** ___________in = ___________ inches

DESIGN INFORMATION

Management Allowed Deficiency (MAD) ___________%

Net Irrigation = Total AWC X MAD = ___________in **X** ___________% = ___________ inches

Irrigation Frequency = $\frac{\text{Net Irrigation}}{\text{ET}}$ = ____________ $\frac{in}{in/day}$ = __________ days

Application Efficiency = ___________% (NOTE that windy areas will also reduce efficiency)

Gross Application = $\frac{\text{Net Irrigation}}{\text{Application Efficiency}}$ = __________ $\frac{in}{\%}$ = ____________ inches

SPRINKLER LAYOUT

Sprinkler Type_______________________ Operating Pressure__________ psi

Diameter of Pattern____________ft Sprinkler Flow Rate, **Q** __________gpm

Lateral Spacing, **LS**____________ft (Recommended max. 50 – 60% of diameter)

Sprinkler Spacing, **SS**____________ft (Recommended max. 50% of diameter)

Application Rate = $\frac{96.3 \times Q}{LS \times SS}$ = $\frac{96.3 \times \_\_\_\_\_\_\_\_\ gpm}{\_\_\_\_\_\_\_\ ft \times \_\_\_\_\_\_\_\ ft}$ = _____________in/hr

Irrigation Set Time = $\frac{\text{Gross Application}}{\text{Application Rate}}$ = _____________ $\frac{in}{in/hr}$ = ___________hrs

Max. Number of Sprinklers Per Set = $\frac{\text{System Flow Rate}}{\text{Sprinkler Flow Rate}}$ = _____________ $\frac{gpm}{gpm}$ = ___________

NOTE: This worksheet should be used as a reference guide. For a full irrigation design, contact your local RCD or NRCS office, or an irrigation specialist.

CATCH-CANS – DETERMINING NET IRRIGATION IN THE FIELD

If equations make your head spin or you want to check your calculated values, then try catch-cans. Catch-cans are a simple way of determining how long the system needs to be run in order to apply the desired amount of water. Any straight sided container will do - coffee can, tuna can, etc. (short, wide mouth cans are nice because they are less likely to fall over). Place several catch-cans around the field or directly under a few drip emitters.

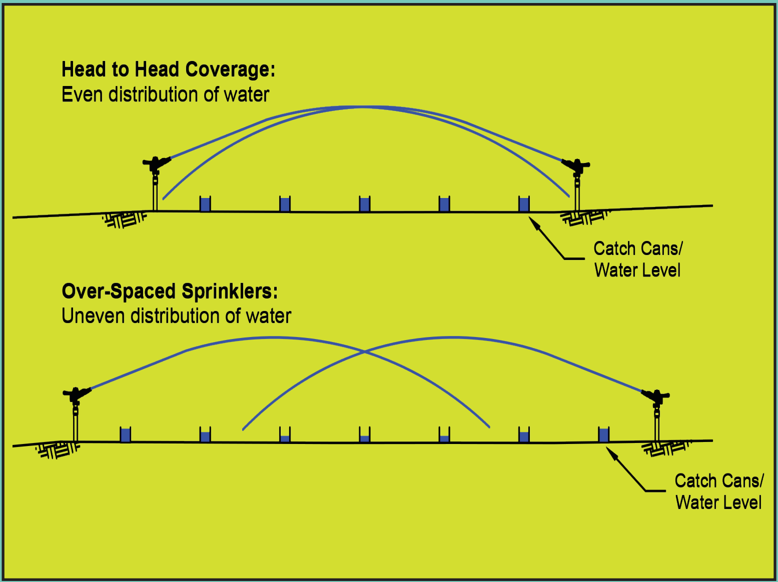
For a sprinkler system to replenish about 50% (MAD) of the AWC, the typical application is about 1.25 to 1.5 inches per irrigation set. Run the system until there is 1.25 to 1.5 in inches of water in the can. The time it takes to achieve 1.25 to 1.5 inches in the can is your irrigation set time. The irrigation set time is the length of time that each set will run, every time you irrigate. Note that the irrigation frequency, or time between irrigations, changes throughout the season due to the climate.

OTHER CONSIDERATIONS

HEAD-TO-HEAD COVERAGE

Specifically for sprinkler systems, the spray from each sprinkler should hit, or be within a few feet of, the adjacent sprinkler head. Typically, sprinklers are spaced no more than 50% of the diameter of spray and laterals are spaced no more than 60%.

Reduced growth and even brown grass can occur when the sprinklers are spaced too far apart. Running the system for longer will not fix this problem and would likely cause additional problems due to over-irrigation in some areas.



HOW MUCH WATER DO YOU NEED?

PASTURE: On average, a pasture irrigated with impact sprinklers requires roughly 8 gpm per acre.

This rate is based on the highest water needs during the hottest months of the season, typically July/August. One Miner's Inch equals 11.2 gpm and can irrigate about 1.5 acres.

Flood irrigation of pasture will require slightly more water since it is generally less efficient than impact sprinklers. Depending on the type and management of the system, as much as a full Miner's Inch per acre could be required.

MICRO-IRRIGATION SYSTEM: Systems such as drip and micro-sprayers are generally more efficient than impact sprinklers. Also, micro systems are often used for crops in rows, where the space between the rows is not irrigated. Since these systems only irrigate the crop and not the area between the rows, less water is needed. Typically, 6 – 7gpm per acre can be assumed for drip or micro-sprayers.

COMMON MISCONCEPTIONS

The amount of water required to irrigate one acre - with impact sprinklers or micro-systems - does not mean that the entire acre is irrigated at once using 8gpm or 6gpm. Rather it will take several sets to irrigate the entire acre, with each set using the full amount of water. The recommended amount of water ensures that the system will be able to get around to all the sets within the necessary time frame. This time frame is the irrigation frequency and is determined by the soil moisture and management allowed depletion (MAD). During the hottest part of the summer, the soil moisture will be depleted more rapidly than in other months. Therefore, you will need to irrigate more often to replenish the soil moisture. The time it takes to irrigate all of the sets should not exceed the irrigation frequency.

For example, if the peak irrigation frequency is 5 days and the irrigation set time is 12 hours, then the maximum number of sets would be 10 (assuming irrigation can occur 24 hours a day).

ABOUT YOUR RESOURCE CONSERVATION DISTRICTS

RESOURCE CONSERVATION DISTRICT (RCD)

RCDs are non-regulatory local agencies guided by a Board of local landowners, with a mission to conserve agriculture and natural resources. RCDs serve as a liaison between private landowners and public agencies, to implement projects that conserve natural resources and support local agriculture. RCDs provide advice to landowners regarding land and natural resources management, and serve as the local connection for our federal partner – USDA NRCS.

Placer County - Resource Conservation District
11661 Blocker Dr #120, Auburn, CA 95603
www.placerrcd.org
(530) 217-6259

Nevada County - Resource Conservation District
113 Presley Way #1, Grass Valley, CA 95945
www.ncrcd.org
(530) 798-5529

NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

The USDA, Natural Resources Conservation Service (NRCS) collaborates with farmers, ranchers, communities, and partners to voluntarily protect and enhance natural resources on private lands. NRCS provides technical and financial assistance to improve the environment through implementation of conservation practices on agricultural operations. If you're interested in learning more about how to improve your farming operation and help conserve natural resources, contact your local NRCS office to get started at www.nrcs.usda.gov.

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