



Irrigating Small Acreages

The basics of irrigation, plant selection, and water rights for your small acreage

Colorado
State
University

Extension



Overview

- Ditch operation
- Water rights
- Irrigation systems
- Basic irrigation principles
- Crop needs and plant selection

On small acreages, it is important to know your parameters regarding water use





Ditch Operation

- Most ditches in Colorado are operated by ditch companies
- Shares in ditch water are bought or inherited
- Contact the ditch rider for your ditch to find out what shares you own, and to what this entitles you



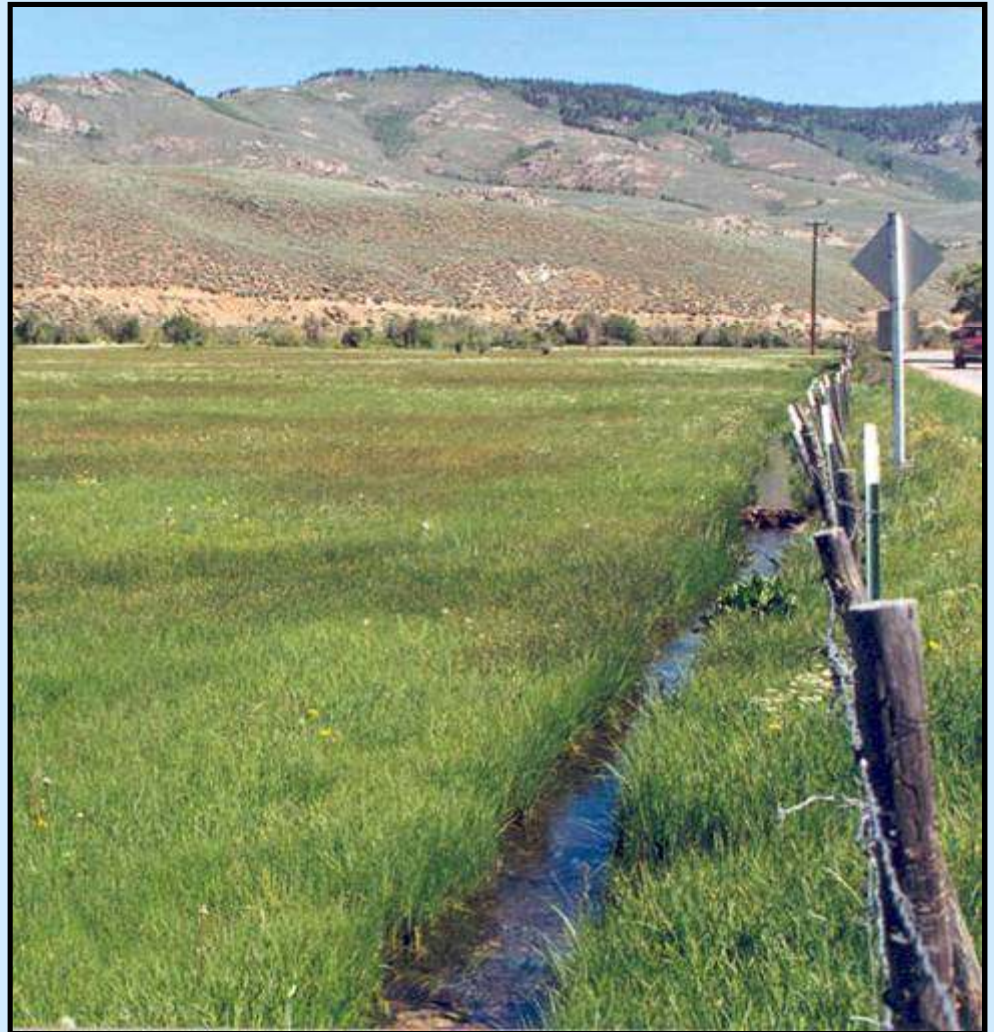
Ditch Rights and Responsibilities

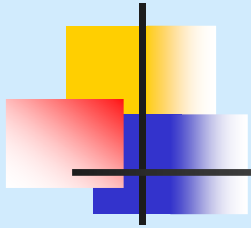
- If you own property that has an irrigation ditch, you have rights and responsibilities
- Contact the ditch company before you make any modifications that may affect ditch operation



Ditches for the Non-owner

- Water in ditches running through your property is off-limits unless you have ownership in the ditch company





Ditches for the Non-owner

- If you are not a member/owner, you do not need to do any maintenance
- You may not obstruct, divert, or impound the flow of water in any way
- You must allow ditch riders and water owners easement through your property for maintenance, debris clearing, flow check, or any other “reasonably necessary” operations



Ditches for the Owner/User

- Ditches are managed by ditch companies
- A ditch rider usually maintains and adjusts the flow of water in a ditch





Ditches for the Owner/User

- You may be required to attend work days or work as a ditch rider if your association solicits for help
- You may need to take charge of the clearing of your ditch
- If your water rights are less senior than those of your neighbor, they have the right to have you close your gates until they receive their full allotment



Some Water Terminology

1 acre foot

= 1 acre of land, 1 foot deep

= 325,850 gallons

1 acre inch

= 27,158 gallons

1 cubic foot per second (cfs)

= 7.48 gallons of water passing a point every second.

= 450 gpm

1 cfs for 24 hours

~ 2 acre-feet

Ditch Co Share

= Depends



Water Rights and Regulations: Ground Water for Irrigation

- In Colorado, a permit from the Division of Water Resources is required to drill a well
- This permit will tell you:
 - out of which aquifer you may pump
 - how much you may pump
 - the uses allowed



Water Rights and Regulations: Surface Water

- You may not withdraw water from any surface source – *even if it is on your property* – without a water right to divert an allocation from the stream or ditch on or near your property



Irrigation Systems

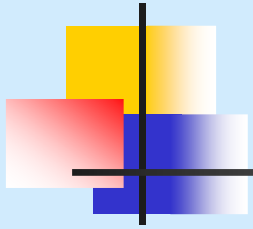
- In choosing a system, keep in mind the needs of your potential crops, limitations of your water availability, and your soil type
- Basic irrigation types:
 - flood
 - sprinkle
 - drip





Irrigation System Efficiency

Irrigation System	Typical Efficiency (% Range)
Flood	25-50
Furrow	25-60
Big Gun	50-75
Side Roll	60-85
Center Pivot	70-85
Drip Irrigation	75-95



Flood Irrigation

- This is the oldest and most common form of irrigation
- Advantages:
 - low input cost
 - low maintenance
- Disadvantages:
 - low efficiency
 - increased labor
 - poor uniformity



Furrow/Ditch Irrigation

- A form of flood irrigation, this type includes parallel furrows down which the water runs
- Advantages:
 - control of delivery
 - time
 - space
- Disadvantages:
 - high labor
 - low efficiency



Sprinkler Systems

- Numerous forms:
 - lateral wheel lines
 - big guns
 - portable hand lines
 - pivots
- Advantages:
 - high efficiency
 - low labor requirement
- Disadvantages:
 - cost
 - operation and maintenance requirement
 - requires pressurized water source



Trickle or Drip Irrigation

- These systems apply water slowly under low pressure
- They are very precise, therefore more efficient
- Water can be applied above or below ground
- Advantages
 - fewer weeds
 - higher efficiency
 - less time and labor
 - reduced runoff
 - reduced pumping cost
- Disadvantages
 - higher initial cost
 - management time
 - filtration required





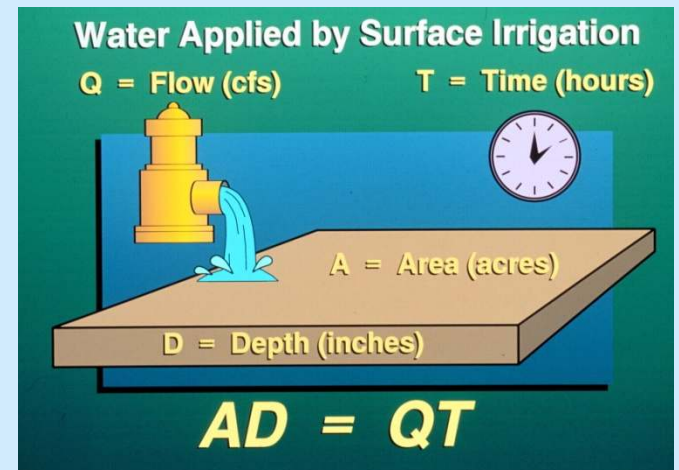
System Performance

- Uniformity:
 - getting the same amount of water to all parts of your field
 - monitor your fields for wet or dry patches following irrigations
 - consider system upgrades such as field leveling, shorten runs, new nozzles or other upgrades for continuous problems



Application Amount

- Measurement:
 - learn to use flume, weir, or other measurement devices installed on property
 - ask ditch rider, NRCS or neighbors for advice
 - use irrigator's equation to determine application depth:
area x depth = flow x time
- See: Irrigated Field Record Book (XCM-228) for tables and equations for flow



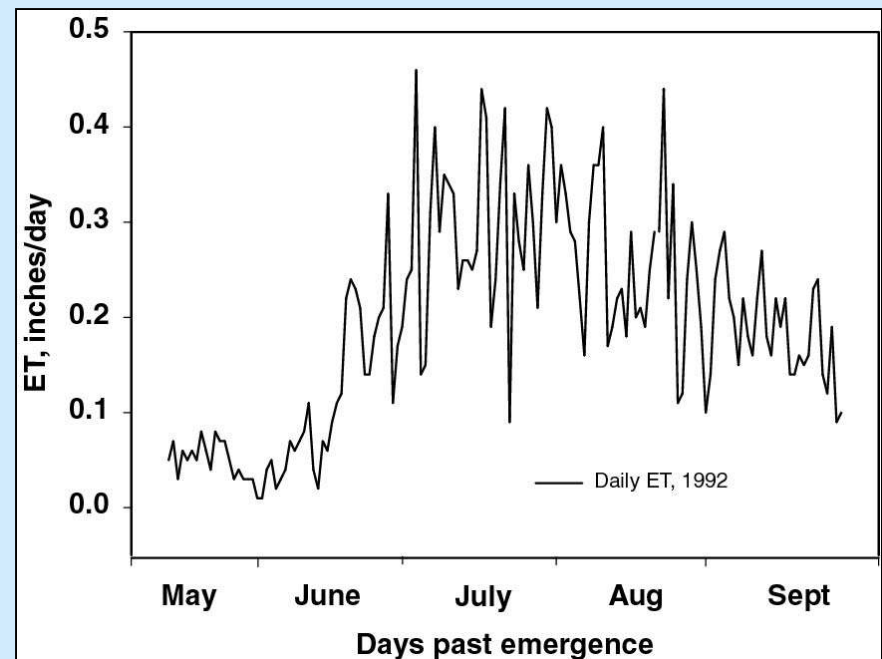


Irrigation Management – Scheduling

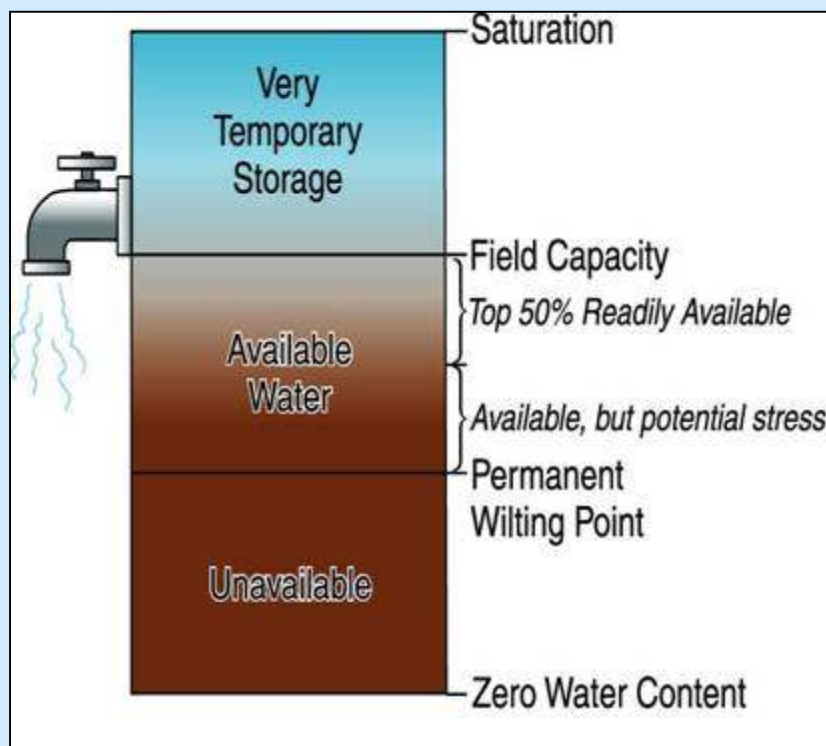
- Irrigation scheduling is the decision of when and how much water to apply to a field
- Minimizes crop water stress
 - prevents over- and under-irrigation
- Helps to control salinity
- Requires:
 - plant water use information (ET)
 - soil water holding capacity information

Plant Water Use

- Evapotranspiration (ET):
- A combination of:
 - evaporation
 - transpiration
- Total water taken up by the air from plants and soil surface
- Varies daily due to changing weather conditions



Soil Water Holding Capacity



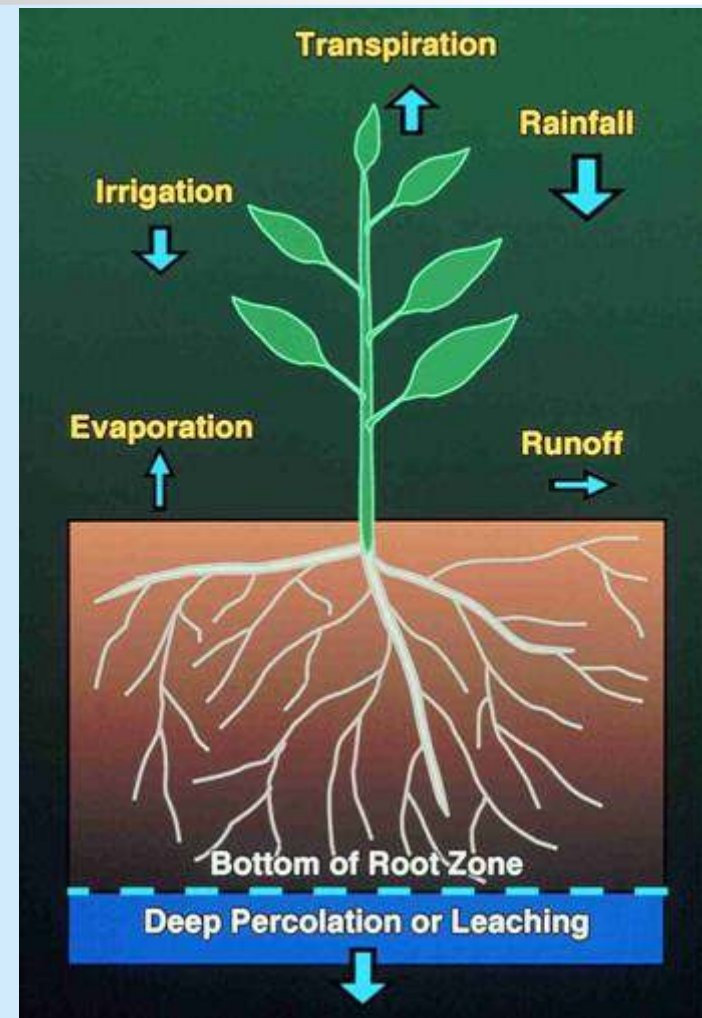
Range of Plant Available Water

Inches water / foot soil

Soil Texture	Low	High
Coarse sands	0.6	0.8
Fine sands	0.8	1.0
Loamy sands	0.8	1.2
Sandy loams	1.2	1.5
Fine sandy loams	1.5	2.0
Silty loams	2.0	2.5
Silty clay loams	1.8	2.4

Irrigation Scheduling

- Consider the water held by the soil as a bank account
 - Credits:
 - Precipitation
 - irrigation
 - Debits:
 - Plant water use – evapotranspiration (ET)
 - Deep percolation and runoff
- Tracking debits and credits keeps the soil water balance in optimum conditions for plant growth



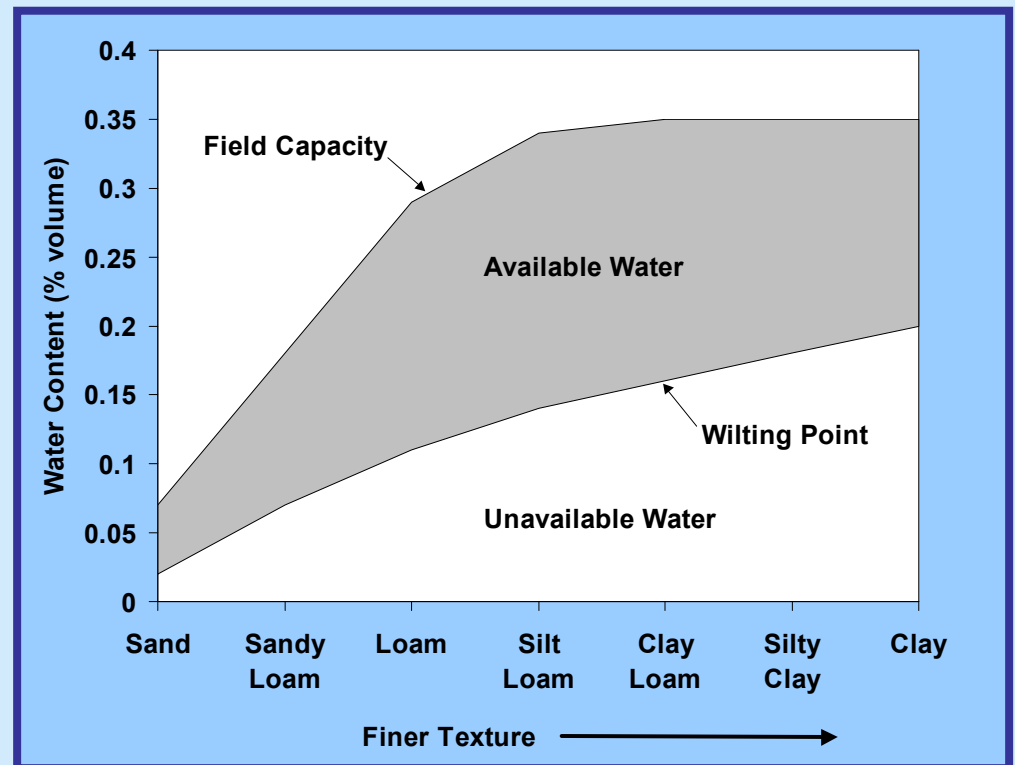
Basic Tools for Irrigation Scheduling

- Shovel or soil probe
- Rain gauge
- ET reports
(www.coagmet.com)
- Knowledge of rooting
zone depth



Irrigation Scheduling

- Typically, you should irrigate before your soil reaches 50% available water holding capacity
- Plant appearance is usually *not* an accurate method of scheduling irrigations





The “Look and Feel” Method

- Dig down to the root zone of a crop/pasture and pick up a handful of soil
- With practice, you can reasonably estimate available soil moisture with this method (see NRCS pamphlet)





Select Plants According to Available Water Supply

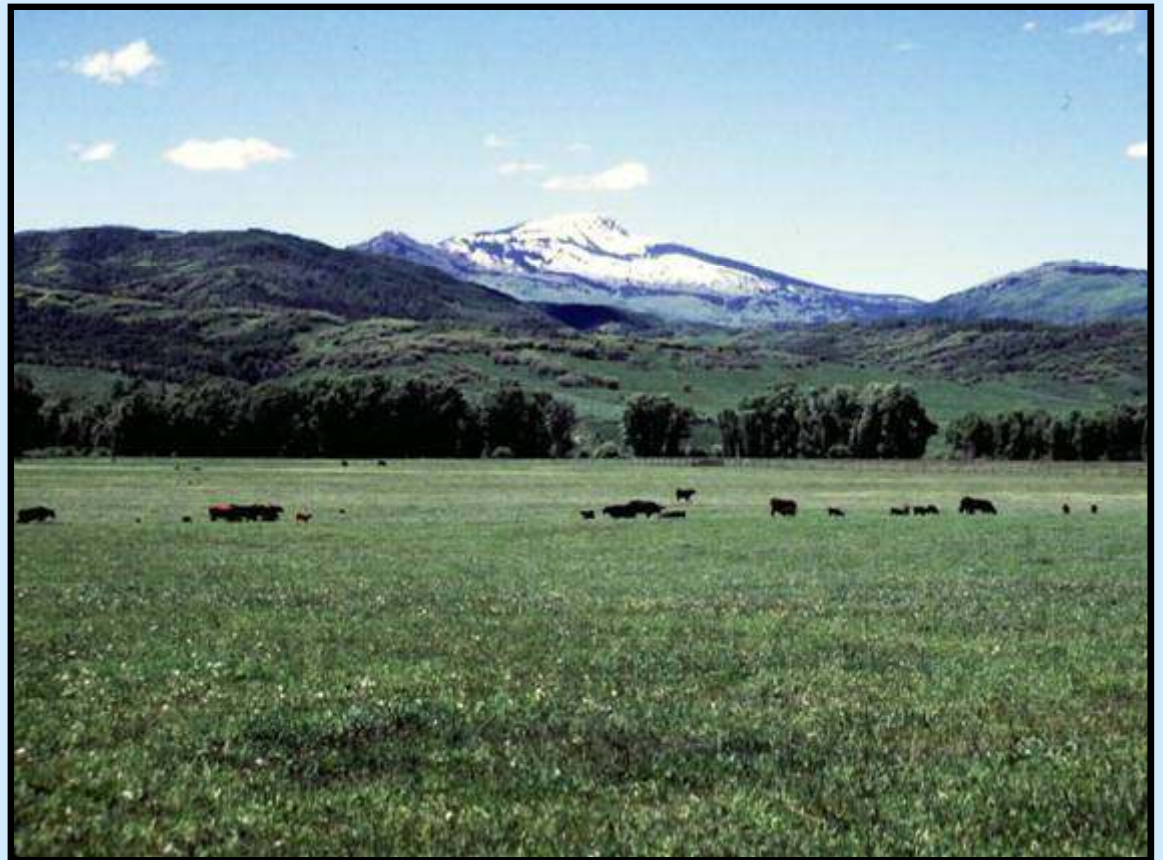
- Examples – net water requirements (ET – rain):

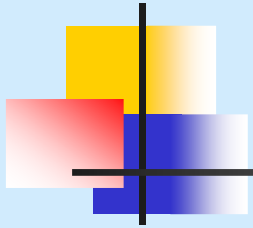
Crop	Alfalfa Hay	Sweet Corn	Pasture /Grass	Tomatoes	Winter wheat (fall)	Winter wheat (spring)
County						
	----- inches per season -----					
Weld	23	15	22	17	2	10
Mesa	32	18	27	23	1.6	12
Kiowa	31	16	26.4	20.8	1.8	10.5

- Certain crops (alfalfa) can require less water by allowing to go dormant, but will produce less

Proper plant selection (pasture examples)

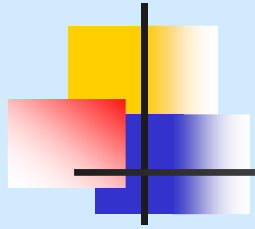
- Cool Season:
 - wheat
 - rye
 - oats
 - barley
 - orchardgrass
 - meadow brome
 - tall fescue
- Warm Season:
 - sorghum
 - little bluestem
 - sideoats grama
 - blue grama
 - yellow indiagrass
 - switch grass
 - alkali sacaton





Summary

- Ditches, surface water, and ground water all operate on a permit/rights system in Colorado
- Choose an irrigation system that fits your land characteristics and management time and ability.
- Manage your water properly by learning irrigation scheduling techniques
- Choose plants to match water amount and timing



More Information:

- More information can be found on the Colorado State University Extension Website:
 - <http://www.ext.colostate.edu/menuwater.html>
 - Look for crop fact sheets