Managing Your Soil Moisture

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Irrigated Crop Production Update
January 17, 2018
Lethbridge, AB

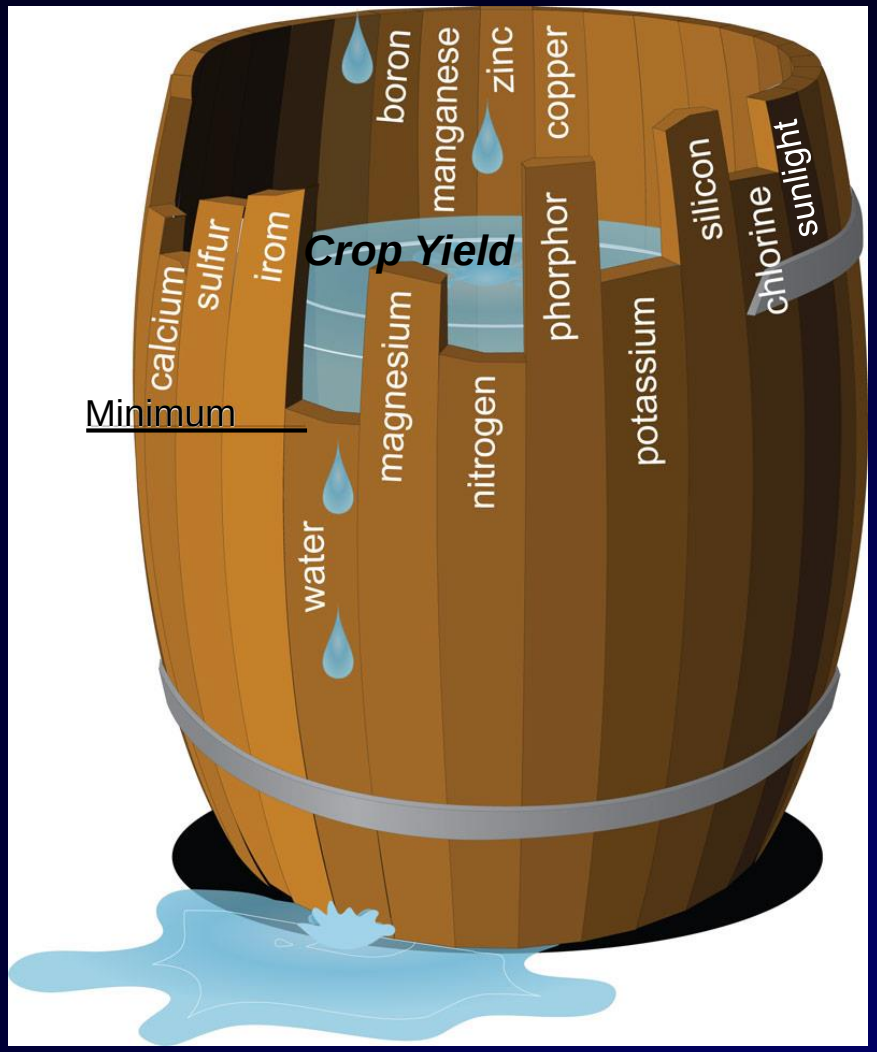
Alberta
Agriculture
and Forestry

Outline

- Step-by-Step Soil Moisture Management
  1. Make a decision
  2. Understand your irrigation system
  3. Understand your soil
  4. Understand your crop water requirements
  5. Understand the impacts of weather
  6. Put it all together
  7. Evaluate and adjust

Step 1: Make a Decision

Liebig's Law of the Minimum (1873)



Decrease in potential crop yield and quality

- Insufficient water
  - Water stress during reproductive stage (fewer seeds)
  - Premature ripening
  - Light kernel weight
- Excess water
  - Restricted root growth (insufficient soil air)
  - Promotion of crop disease (moist conditions)
  - Lodging (excess forage production)
  - Environmental/economic issues
    - Wasted water (runoff, evaporation, drainage)
    - Nutrient loss
    - Unnecessary cost (water, energy)
    - Public perception

Step 2: Understand Your Irrigation System

Irrigation System Factors Affecting Soil Moisture Management

- Flow rate
  - What is the gallonage of your pivot? 900 GPM?
  - Is your pivot output what it should be?
- Efficiency
  - What is your application efficiency?
- Uniformity
  - Are you getting uniform coverage along your pivot?
- Equipment function
  - Have your pump impellers been adjusted to any changes in flow rate?
  - Do you have a variable frequency drive if you are using variable rate irrigation?

Gross and Net Irrigation Applications

Days to complete circle	US Gallons/minute					
	700	800	900	1000	1100	1200
	Gross water application (mm)					
1	7.1	8.1	9.1	10.1	11.1	12.1
2	14.2	16.2	18.2	20.2	22.2	24.2
3	21.3	24.3	27.3	30.3	33.3	36.3
4	28.4	32.4	36.4	40.4	44.4	48.4

Days to complete circle	US Gallons/minute					
	700	800	900	1000	1100	1200
	Net water application (mm) at **85% efficiency**					
1	6.0	6.9	7.7	8.6	9.4	10.3
2	12.1	13.8	15.5	17.2	18.9	20.6
3	18.1	20.7	23.2	25.8	28.3	30.9
4	24.1	27.5	30.9	34.3	37.7	41.3

Source: Dr. Ross McKenzie

Step 3: Understand Your Soil

Soil Characteristics Affecting Soil Moisture Management

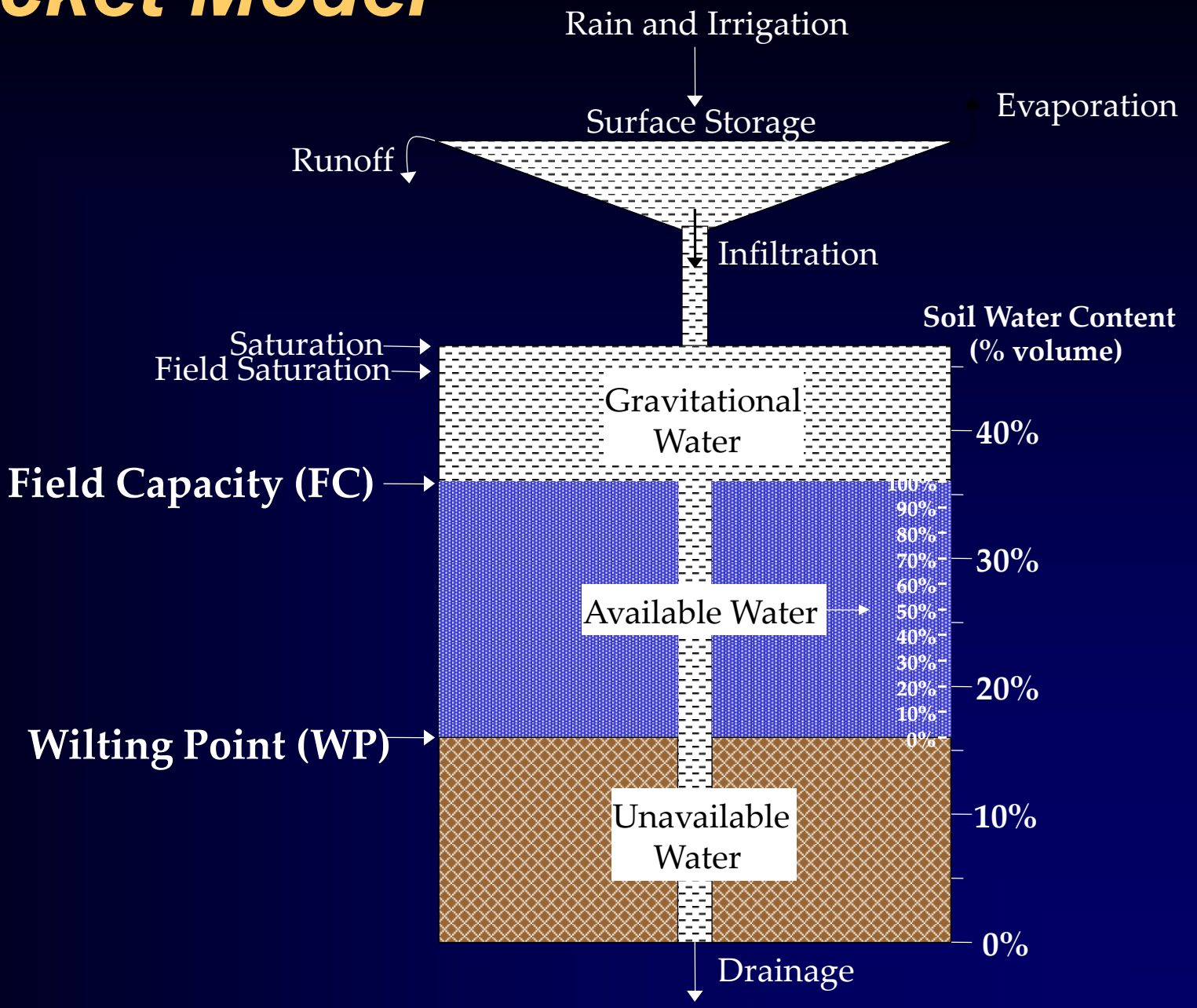
- Spring soil moisture content and soil moisture throughout the growing season
- Soil texture
  - Plant available water (AW)
  - Permanent wilting point (WP)
  - Field capacity (FC)
  - Saturation
  - Gravitational water
  - Unavailable water
  - Infiltration rate
- Soil layers/horizons

Soil Texture

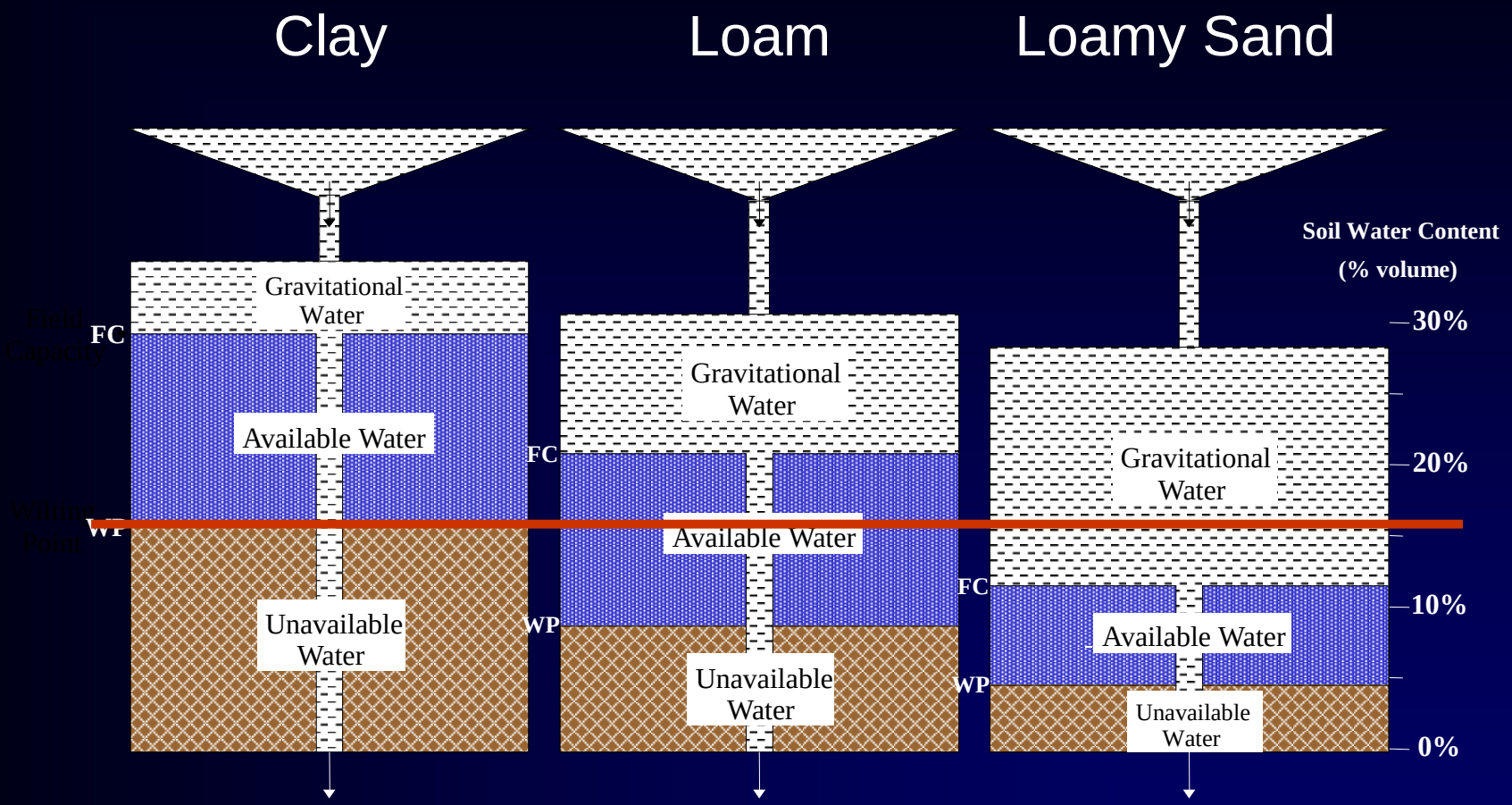
Soil texture also affects:

- susceptibility to wind/water erosion
- potential problems with crusting/water logging
- tillability/drawbar pull

"Bucket Model"



FC and WP vs Soil Texture



Soil Water Content 17% by volume

Methods for Determining Soil Moisture

- Remote sensing (drone or satellite imagery)
- Soil moisture probes (connected or wireless)
- Dutch auger and hand feel method

https://www.nrcs.usda.gov

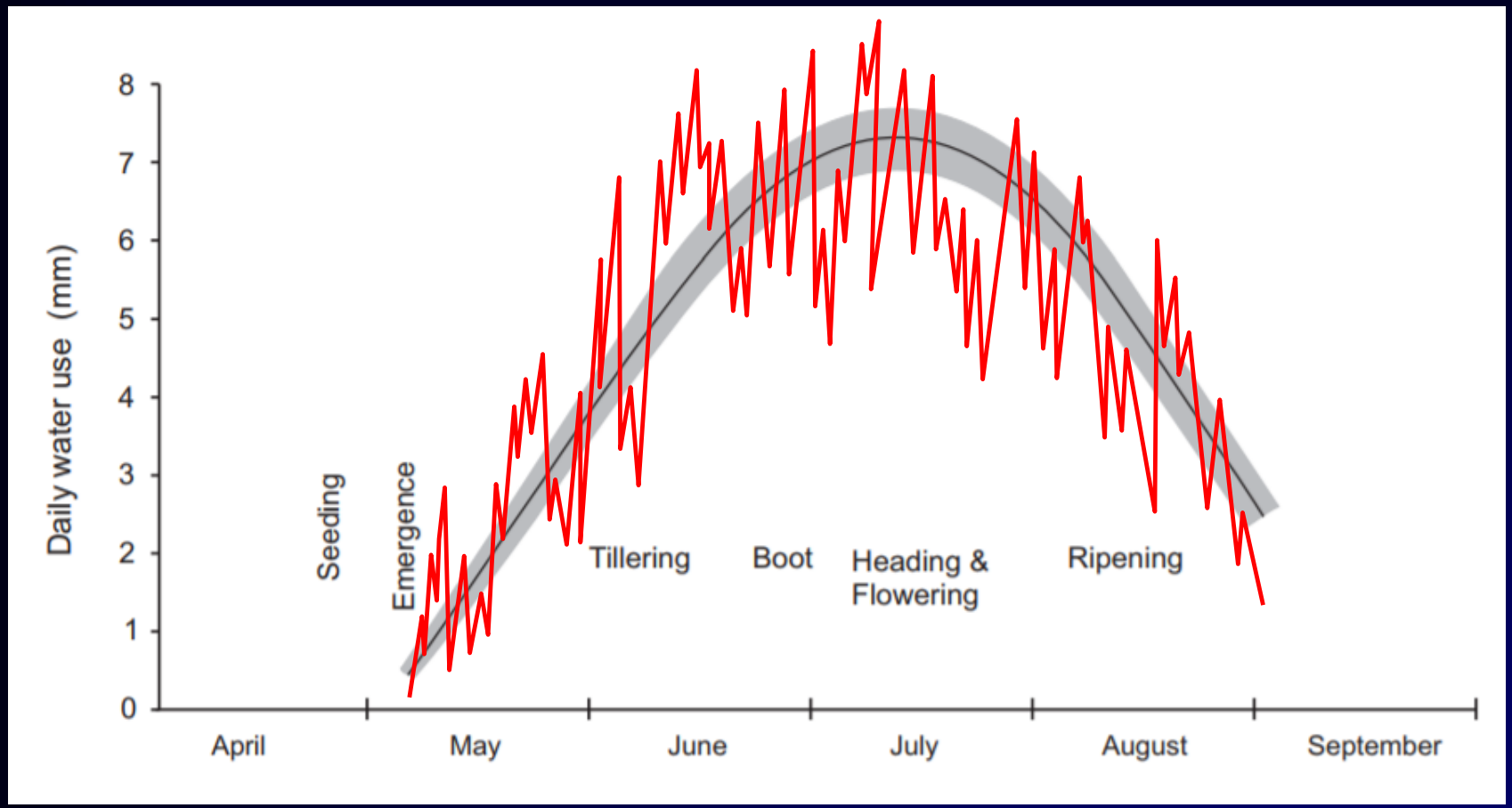
Step 4: Understand Your Crop Water Requirements

Crop Factors Affecting Soil Moisture Management

- Crop type and variety (effective root zone)
- Stage of growth
- Plant population density and health
- Weeds and insect pests
- Target yield (fertility)
- Crop quality requirements
- Impacts of irrigation down-times (haying & spraying)

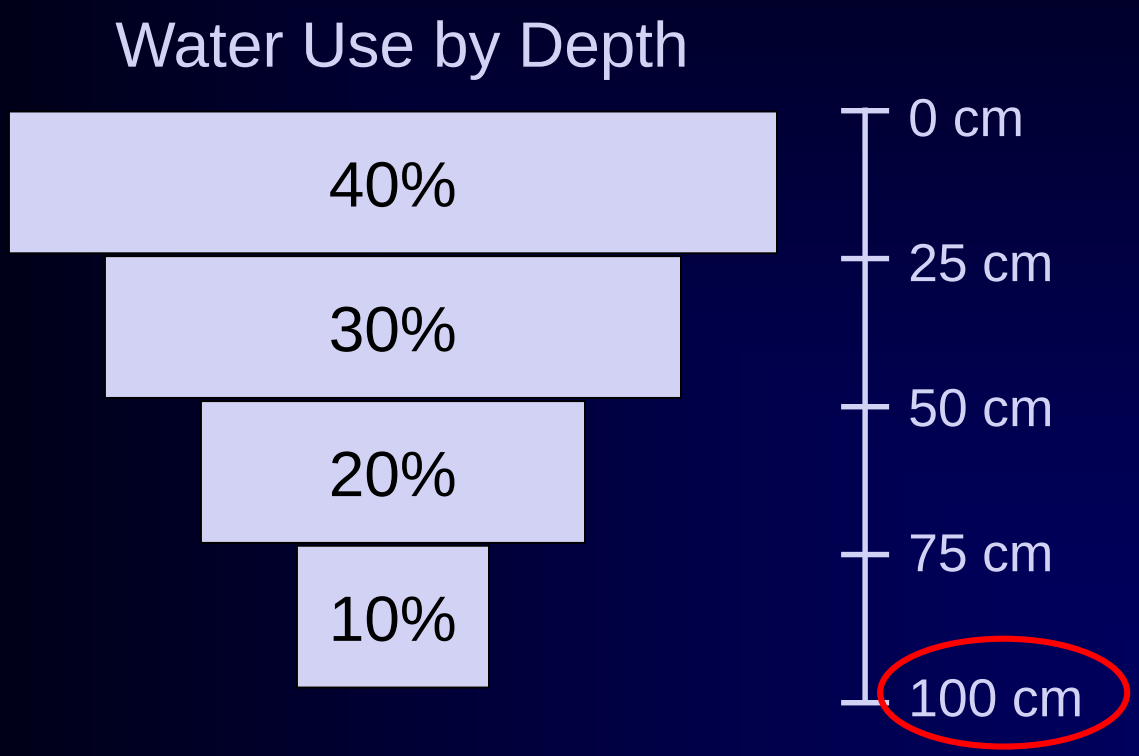
Daily Crop Water Use

- Spring Wheat in Southern Alberta



Crop Water Use by Depth

For a mature crop

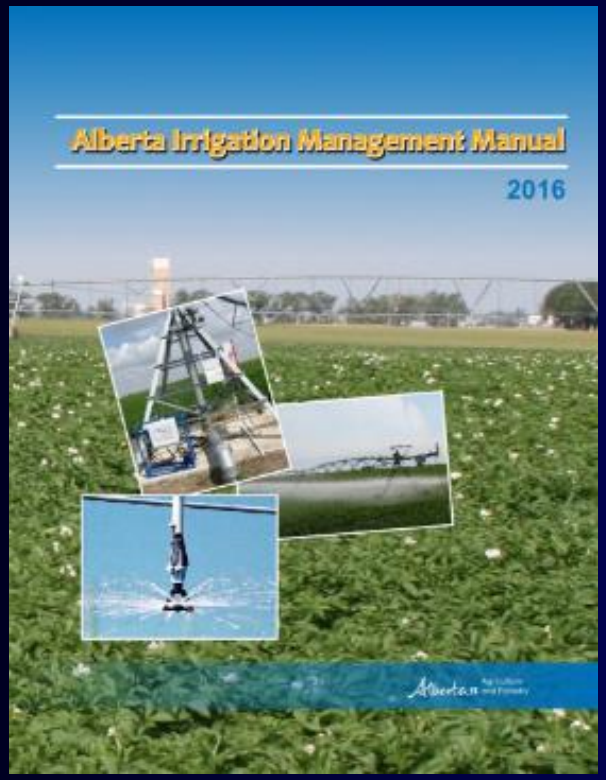


- Most water used by mature plants occurs in the surface 50 cm
- Remember this is affected by growth stage

Crop Water Use Publications

- Irrigation Management Manual
- Irrigation Scheduling Fact Sheets

http://www.demofarm.ca



Step 5: Understand the Impacts of Weather

Weather Factors Affecting Soil Moisture Management

- Precipitation
  - Amount
  - Intensity (infiltration)
- Potential evaporation rate
  - Temperature
  - Solar radiation
  - Wind speed/duration
- Disease risk
  - Relative humidity

Alberta Weather Information

- Irrigation Management Climate Information Network (IMCIN)

  http://www.imcin.net

- IRRI-Cast: Crop Water Use Report

  https://agriculture.alberta.ca/acis/imcin/irricast.jsp

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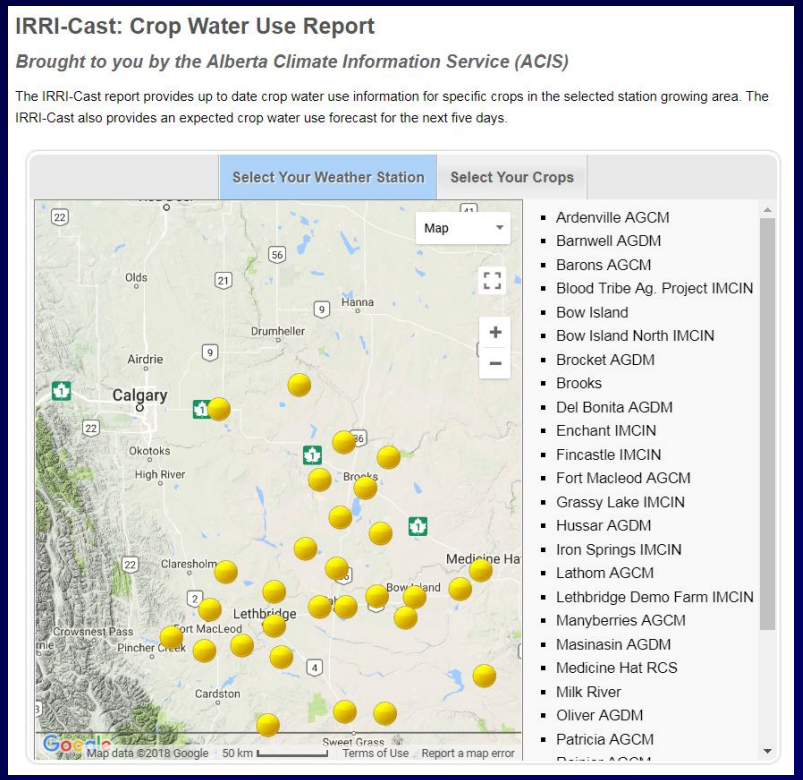


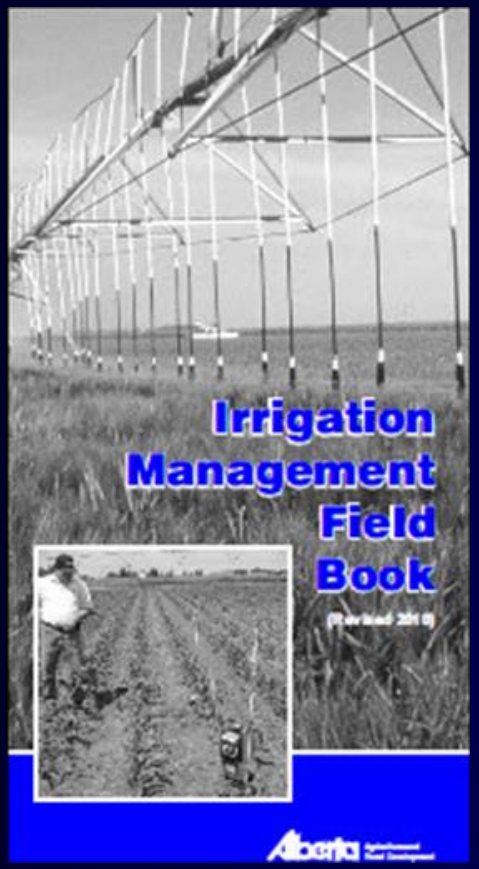
Step 6: Put It All Together

- Choose a method to integrate the irrigation system, soil, crop, and climate information in order to determine your best rate, amount, timing (RAT) of irrigations

"Cheque Book Method"

- Irrigation Management Field Book

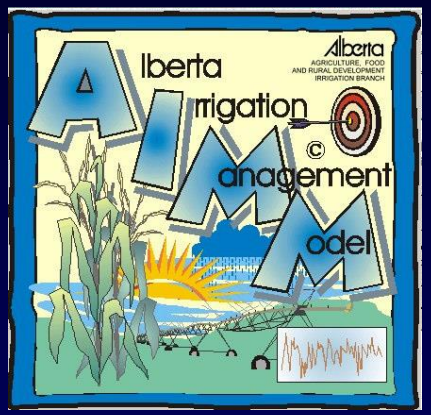
http://www.demofarm.ca



- *Get a free copy at our display booth*
- *Go to demofarm.ca for a PDF version*

Irrigation Management Models

- Alberta Irrigation Management Model (AIMM) http://agriculture.alberta.ca/acis/imcin/aimm.jsp



- Irrigation Scheduler App

  http://weather.wsu.edu/is/ WASHINGTON STATE UNIVERSITY

- Irrigation Training Courses

Step 7: Evaluate and Adjust

- Determine what worked well, what didn’t work, how best to proceed next year

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