

Irrigation Scheduling

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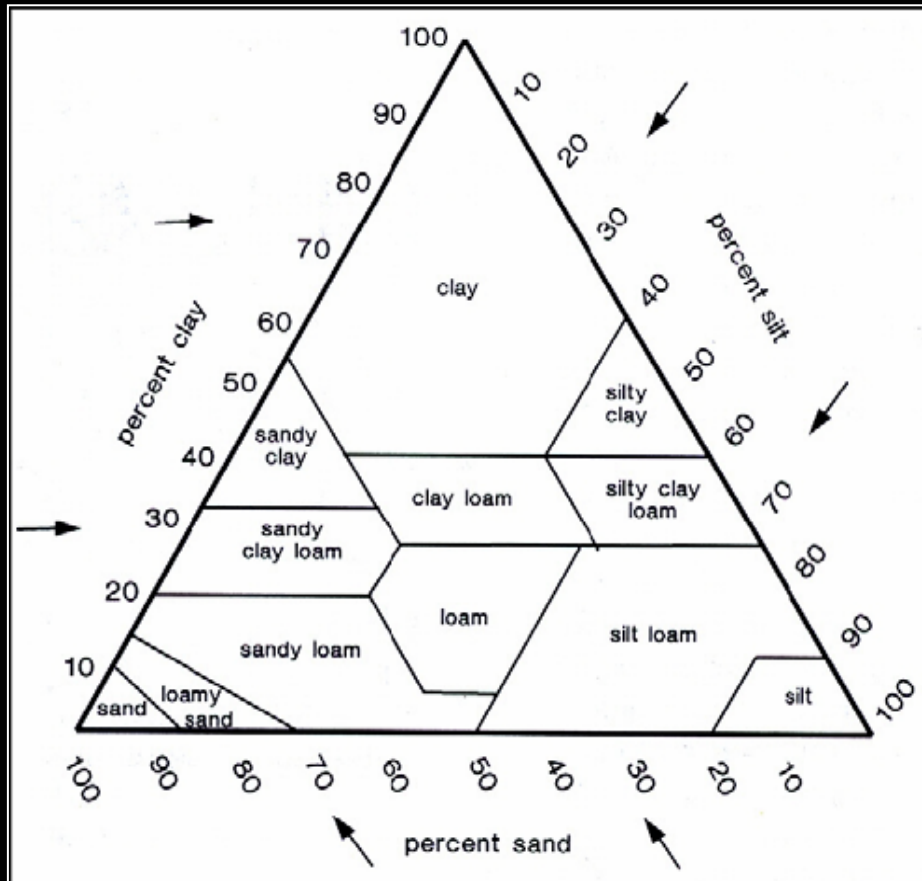
What is Irrigation Scheduling?

- 💧 Ensures that water is consistently available to the plant and that it is applied according to crop requirements

Outline

- 💧 Soil/Water relationships
 - ☀ Soil texture
 - ☀ Water holding capacity
- 💧 Soil moisture content
 - ☀ Feel method
 - ☀ Equipment
 - ☀ AIMM
- 💧 Crop/Water relationships
 - ☀ Crop water requirements
 - ☀ Critical requirement stages
 - ☀ Rooting zones
 - ☀ Allowable depletion
- 💧 Irrigation system operation

Soil/Water Relationships – Soil Texture

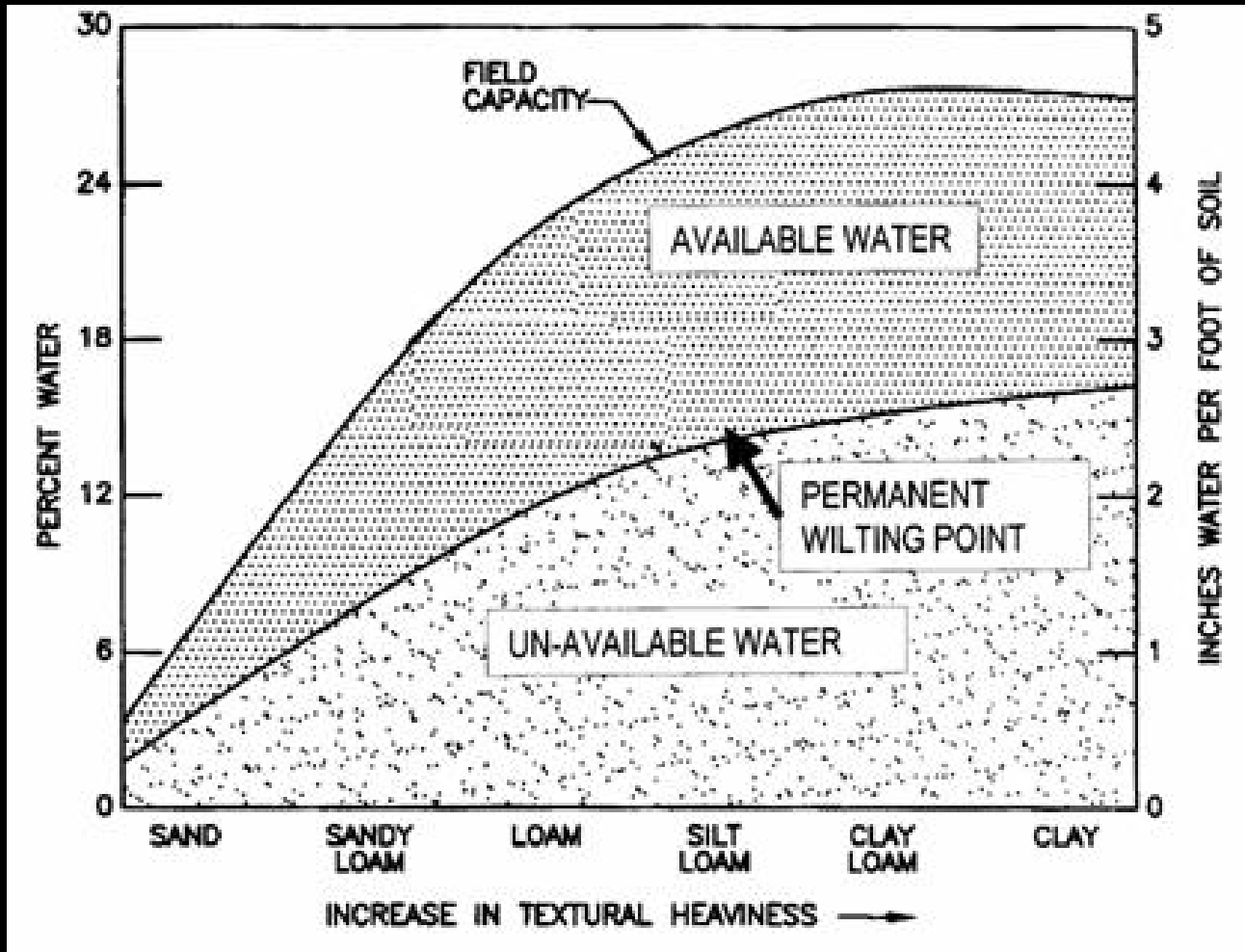


How?

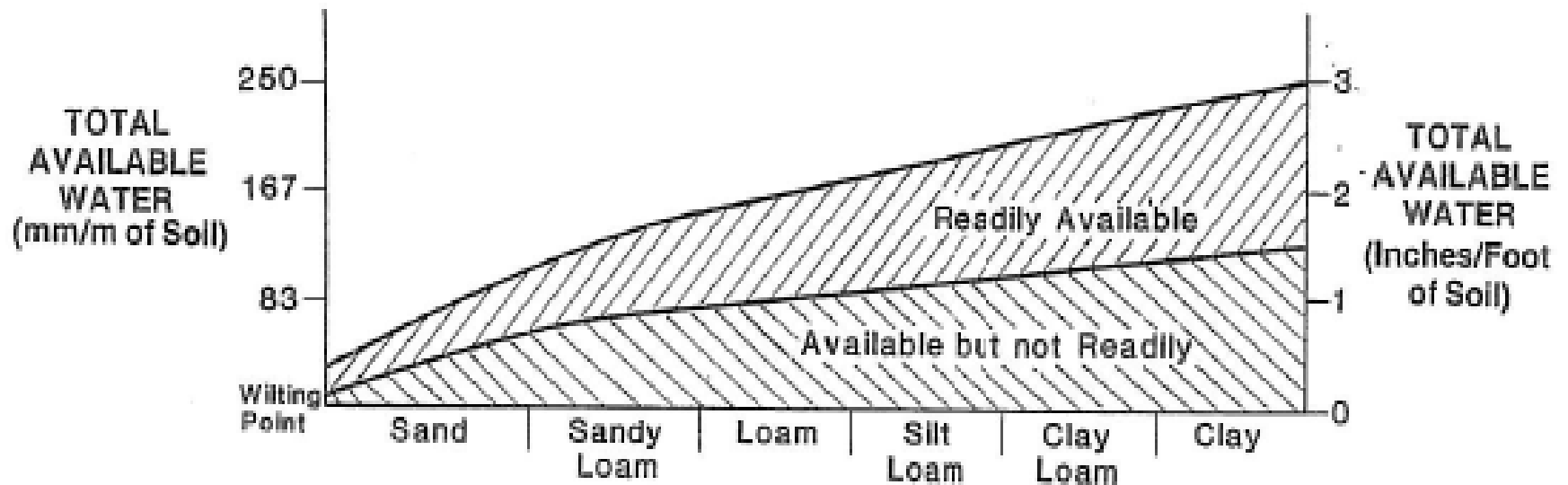
- 💧 By feel
- 💧 Refer to your Agro-Environmental Report or soil test report



Soil/Water Relationships



Soil/Water Relationships



Soil/Water Relationships – Water Holding Capacities

Texture	% Field	% Wilting	% Available Moisture	Available Moisture	Infiltration Rate **	
	Capacity *	Point *	Holding Capacity *	inches/foot	mm/hr	in/hr
Loamy Sand (LS)	10	5	5	0.84	25	1.00
Sandy Loam (SL)	18	8	10	1.68	18	0.70
Fine Sandy Loam (FSL)	20	9	11	1.85	15	0.60
Very Fine Sandy Loam (VL)	22	10	12	2.02	13	0.50
Silt Loam (SiL)	22	10	12	2.02	9	0.35
Loam (L)	24	12	12	2.01	8	0.30
Clay Loam (CL)	26	13	13	2.23	6	0.25
Clay (C)	40	22	18	3.02	4	0.15

Soil Moisture Content – The feel method

Probe the soil at one foot increments



Know your soil texture

Firmly squeeze handful of soil
and observe

50-75% AM

Sandy loam



50-75% AM

Clay loam

Soil Moisture Content – The feel method

Percent of Available Moisture	Sandy Loam	Loam	Clay Loam
0 - 25	Dry, loose, flows through fingers	Powdery, sometimes slightly crusted but easily broken down into powdery conditions	Hard, baked, cracked; difficult to break down into powdery condition
25 - 50	Appears to be dry, will not form a ball with pressure	Somewhat crumbly but will hold together from pressure	Somewhat pliable, will ball under pressure
50 - 75	Tends to ball under pressure but seldom will hold together when bounced in the hand	Forms a ball, somewhat plastic, will slick slightly with pressure	Forms a ball, will ribbon out between thumb and forefinger, has a slick feeling
75 - 100	Forms a weak ball, breaks easily when bounced in the hand, will not slick	Forms a ball, very pliable, slick readily	Easily ribbons out between thumb and forefinger, has a slick feeling
100 (Field capacity)	Upon squeezing no free water appears on soil, but wet outline of ball is left on hand, soil will stick to thumb when rolled between thumb and forefinger	Same as sandy loam	Same as sandy loam

Soil Moisture Content – Monitoring Equipment



Tensiometer



Watermark™ sensor



Gypsum blocks

Computer Model

- Irrigation Management Climate Information Network (IMCIN)

- Alberta Irrigation Management Model (AIMM)



Field

- Bagshaw
- Pederson**
- Test Field
- True North
- Vestre - alfalfa
- Vestre - Corn

Sample Site

- 1**
- 2

Field Information

Field Name Area (ha)

Crop Type Turnout Number

Planting Date

Seeding Rate

Plant Spacing (cm)

Row Spacing (cm)

Harvest Date(s)

	Harvest Date	Crop Yield	Units
*			

Field Comments

Precipitation Gauge ...

Network Block ...

Land Location



Save

Exit

Field

- Bagshaw
- Pederson
- Test Field
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- Vestre - Corn

Sample Site

- 1
- 2

Field | Inputs | System | Pump | Sample Site | **Moisture** | Model | Tables | Graphs

Available Soil Moisture Measurements For Current Sample Site

	Sample Date	Measured Soil Moisture 50% Root Zone (mm)	Modeled Soil Moisture 50% Root Zone (mm)	Measured Soil Moisture 100% Root Zone (mm)	Modeled Soil Moisture 100% Root Zone (mm)
▶	23-May-08	36	36	104	104
	19-Jun-08	46	77	118	144
	10-Jul-08	78	67	174	131
*					

Correct To Measured Soil Moisture

Moisture Inputs For Current Sample Site

	Date	Gross Irrigation Application (mm)	Effective Irrigation Application (mm)	Rainfall (mm)
▶	26-May-08	25.4	19.3	1.27
	31-May-08	17.0	12.9	0
	07-Jun-08	0.0	0.0	14
	11-Jun-08	16.0	12.2	0
	17-Jun-08	0.0	0.0	16.51
	23-Jun-08	0.0	0.0	10.16
	02-Jul-08	10.2	7.7	10.16
	08-Jul-08	17.8	13.5	31.75
	09-Jul-08	0.0	0.0	5.08
	10-Jul-08	0.0	0.0	6.35
	16-Jul-08	22.9	17.4	12.7
	23-Jul-08	26.2	19.9	3.05
	29-Jul-08	15.2	11.6	2.54
	06-Aug-08	50.8	38.6	0
	13-Aug-08	0.0	0.0	12.7

Totals To Date 219 167 169

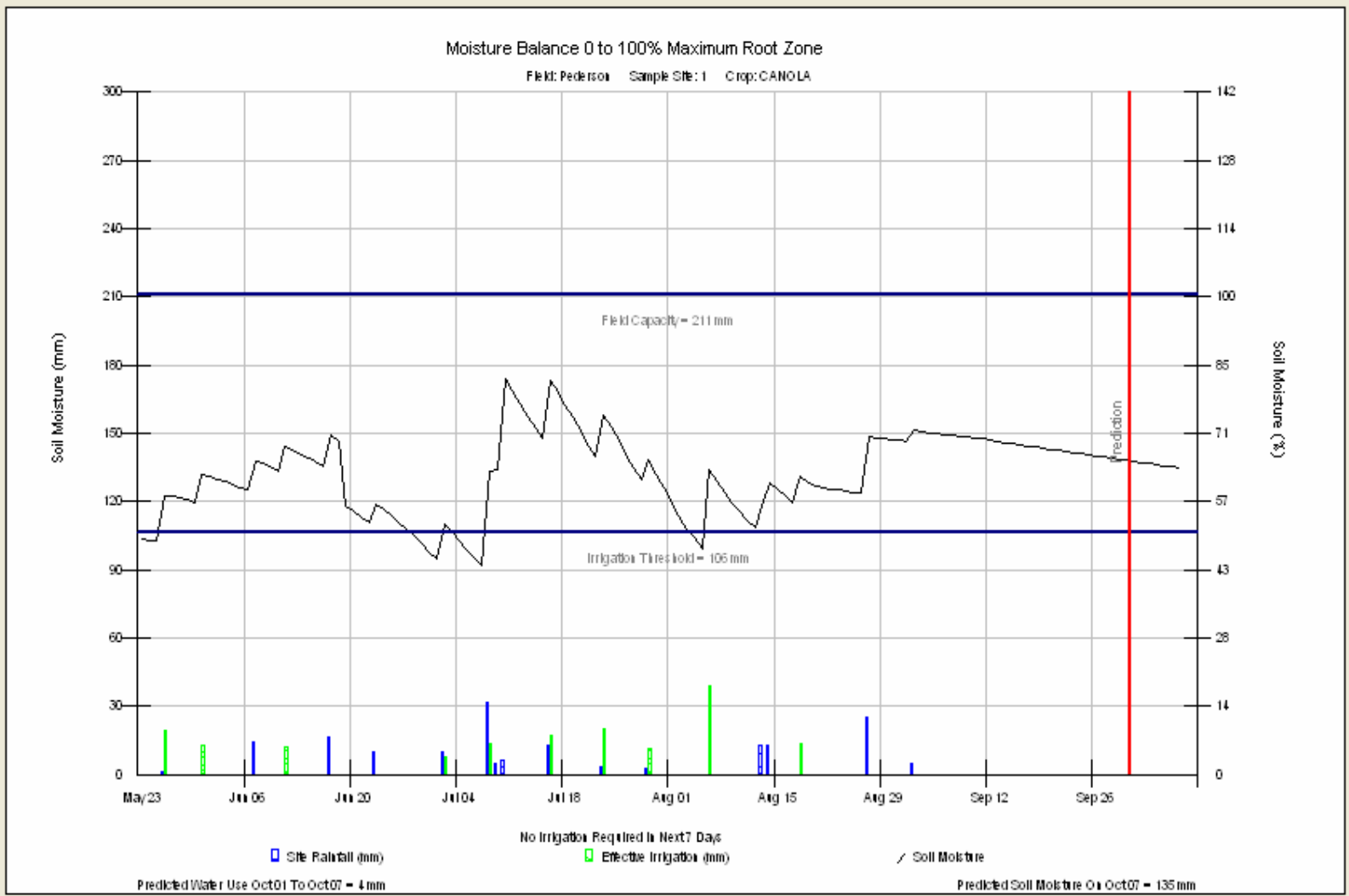


Save

Exit

- Field
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Graph Moisture Balance 0 to 100% Maximum Root Zone Start End Print Export



- Sample Site
- 1
 - 2



Save

Exit

Crop Water Relationships

- 💧 Established water holding capacity of the soil
- 💧 Selected a moisture monitoring method
- 💧 Determine and monitor the crop's consumptive use

Crop Water Requirements

Seasonal crop water use (Seasonal ET)

- Amount of water used by plant for growth and cooling

Crop	Seasonal Crop Water Use (mm)
Alfalfa	620
Grass	500
Potatoes	520
Faba beans	610
Corn	
Silage	470
Wheat	
Hard	460
Soft	480
Canola	430
Flax	410
Peas	400
Barley	
Forage	390
Malt	430
Dry beans	380

Crop Water Requirements

Daily crop water use (Daily ET)

Crop	Peak Moisture Use (mm/d)
Alfalfa	8.0
Grass	7.0
Potatoes	6.0
Faba beans	8.0
Corn	
Silage	6.0
Wheat	
Hard	7.0
Soft	7.0
Canola	7.0
Flax	7.0
Peas	6.0
Barley	
Forage	7.0
Malt	7.0
Dry beans	6.0

Critical irrigation period coincides with the crop stage that accumulates daily peak water use

Crop	Critical Water Requirement Period
Alfalfa	All the time, especially after cutting
Grass	All the time
Wheat: Hard spring Soft spring	Tillering and flowering Tillering and flowering
Barley	Tillering through flowering
Canola	Late vegetation/spiking through flowering and pod development
Flax	Flowering
Corn: Grain Grazing Silage	Tasseling and grain filling Tasseling and grain filling Tasseling and grain filling
Peas	Beginning of flowering
Potatoes	Tuber initiation and tuber bulking
Dry beans	Late bud through pod formation
Faba beans	Beginning of flowering

Crop Water Relationships

- Rooting zone determines the amount of water available to crop
- Shallow rooting depth = smaller zone to extract water

Crop	Active Root Zone (m)
Alfalfa	1.2
Grass	0.8
Potatoes	0.8
Faba beans	0.8
Corn	
Silage	1.0
Wheat	
Hard	1.0
Soft	1.0
Canola	1.0
Flax	1.0
Peas	0.8
Barley	
Forage	1.0
Malt	1.0
Dry beans	0.8

Crop Water Relationships

Allowable depletion

💧 %

💧 Amount of water that can be removed from the soil before an irrigation

Crop	Allowable Depletion (%)
Alfalfa	60
Grass	50
Potatoes	40
Faba beans	35
Corn	
Silage	50
Wheat	
Hard	50
Soft	50
Canola	50
Flax	50
Peas	40
Barley	
Forage	50
Malt	50
Dry beans	40

Irrigation Operation

- 💧 Canola can require 14 inches irrigation
- 💧 Centre pivot efficiency = 0.80
 - ☀ Irrigation applied = 17.5 inches
- 💧 Designed for 7 US gal/minute/acre (900 gpm)
 - ☀ 0.3 inches/acre/day
- 💧 Need to operate system 52.5 days to apply 17.5 inches

Irrigation Scheduling Assistance

Outlook

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Lana Shaw, PAg.

Swift Current

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