October 30'th, 2024

NCIAF- Fruit Crop Production



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Site Selection
Major Factors and Considerations

- Soil Considerations –pH, salinity, texture, organic matter content
- Water – pH, salinity, food safety quality, availability
- Topography
- Climatic & Weather Factors
- Shelter (snow cover for strawberries)
- Availability of shelterbelts

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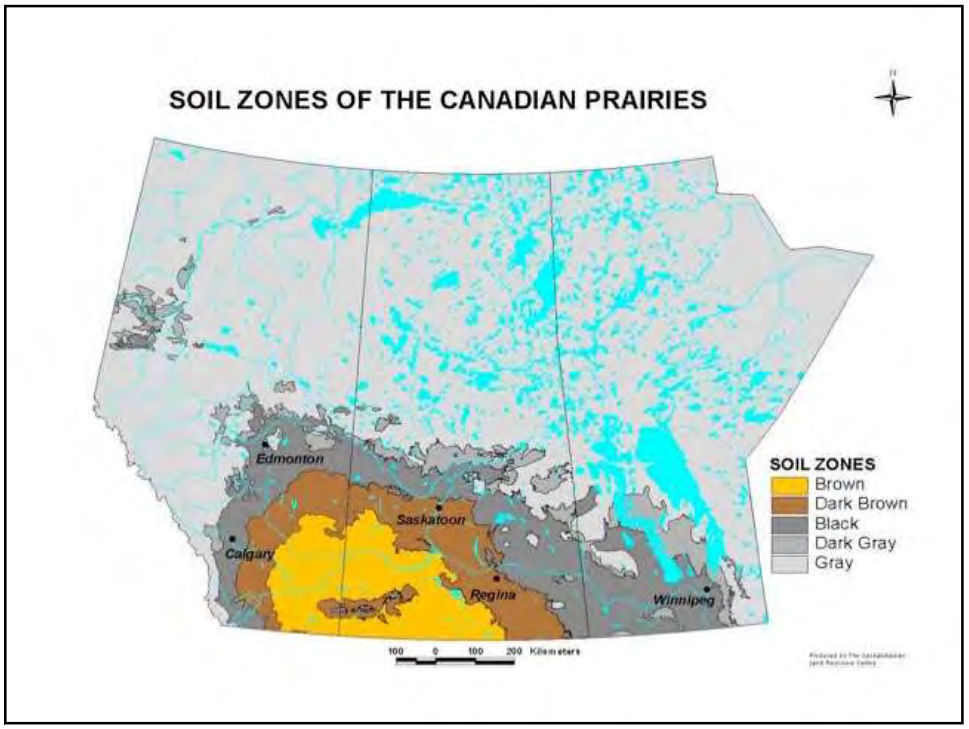

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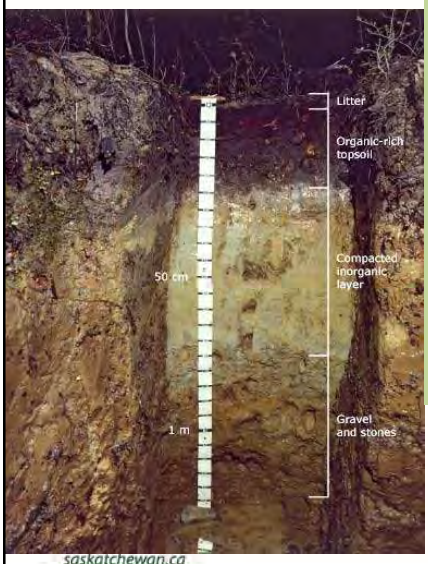
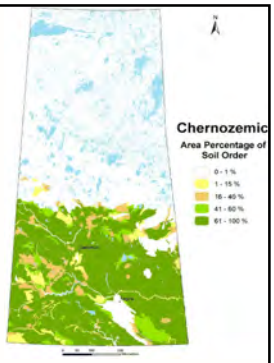
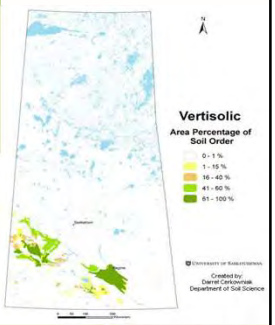
Soil Horizons:

Typical of a Black Chernozemic soil profile
Major mineral horizons A,B,C
Some prairie soils are Solonetzic (high influence of sodium on soil formation...poor permeability at Bnt layer)
Vertisolic soils have poorly differentiated soil layers due to soil mixing resulting from expansion and contraction of clays







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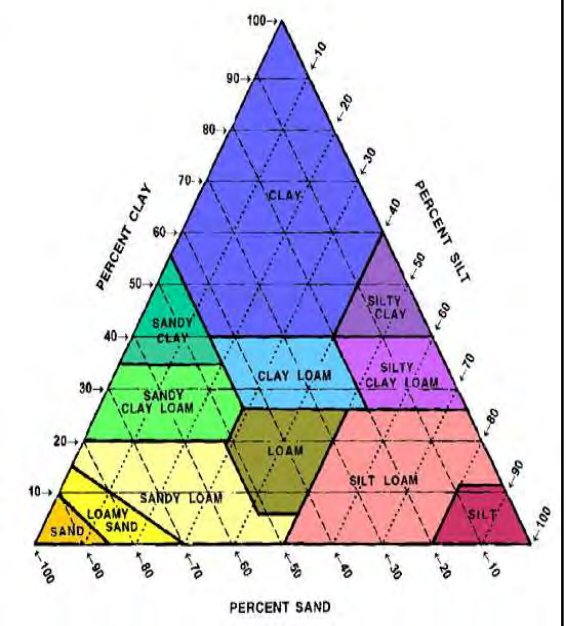
Average permeability for different soil textures in cm/hour

Sand	5.0
Sandy loam	2.5
Loam	1.3
Clay loam	0.8
Silty clay	0.25
Clay	0.05



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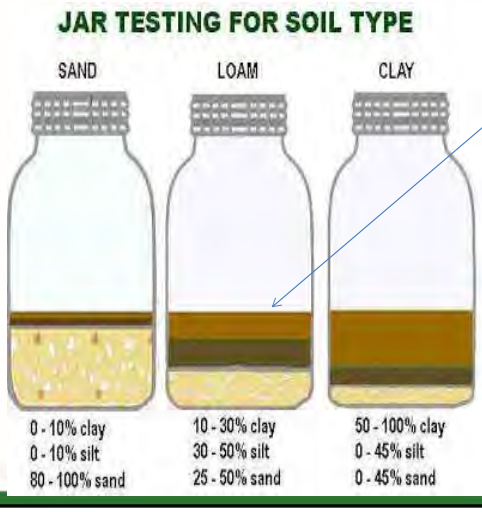
Fill clear glass/plastic jar (1 litre or larger) 1/3 full with soil.
Fill the jar with water. Cap securely and shake well... let the layers settle out.
Sediment that settles at *2 minutes* (= sand particles);
2 hours (= silt particles) and
24 hours (= clay particles).
The picture below shows a sedimentation test.



√Want Loam

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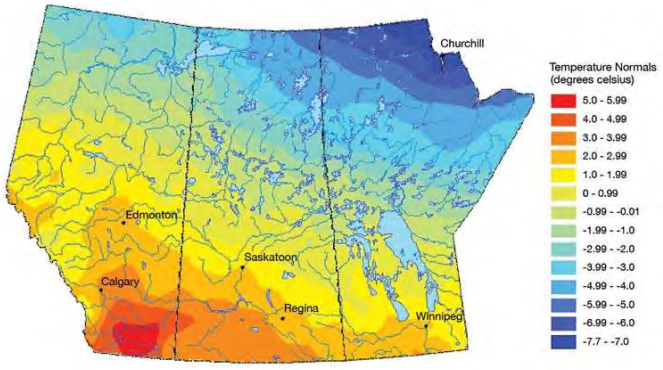
Average Temperatures



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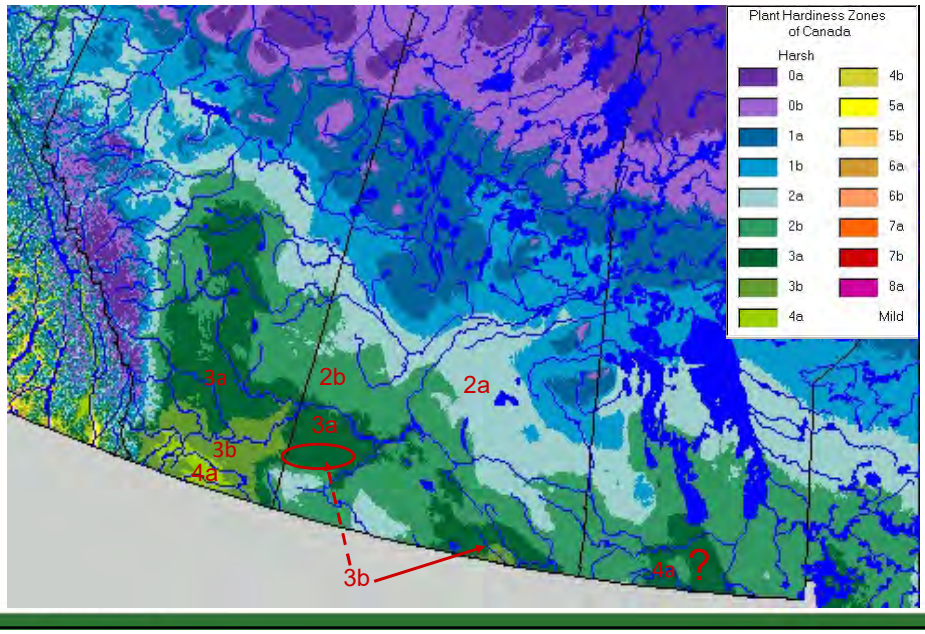
Plant Hardiness Map?



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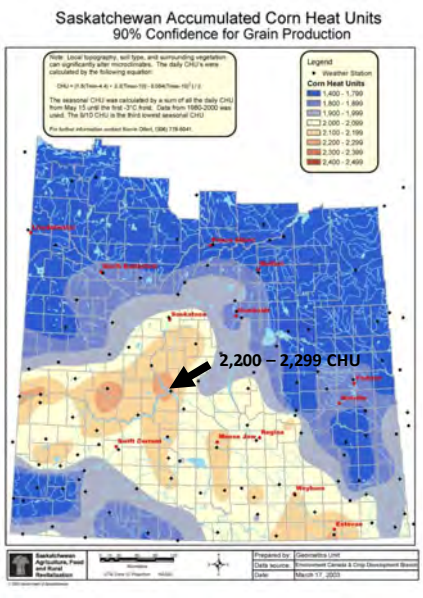
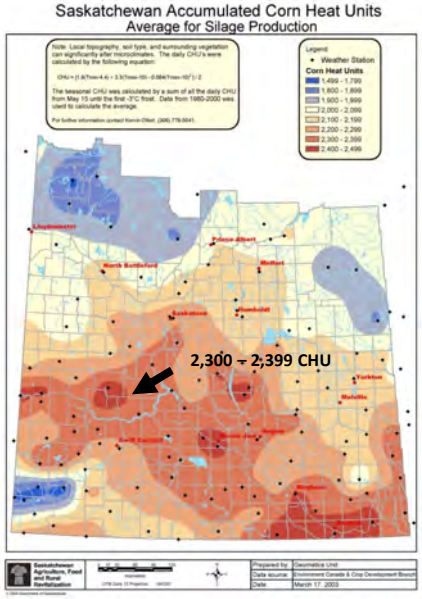
Climate for Apples or Grapes?





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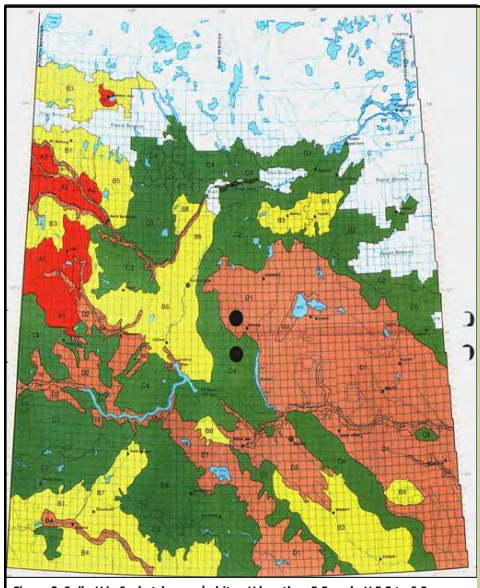

Figure 3. Soil pH in Saskatchewan (white pH less than 5.5; red pH 5.5 to 6.0; yellow pH 6.1 to 6.7; green pH 6.8 to 7.5; orange pH more than 7.5)

Source: Saskatchewan Agriculture

Yellow and green areas likely have suitable pH soil for most fruit crops (apples, black currants, sour cherries, haskap, Missouri currants, plums, raspberries, saskatoons, and strawberries) no limiting major nutrient (N-P-K) nor secondary or minor nutrient availability (Ca, Fe, S, Mg, B, Cu, Mn, Cl, Mo, Zn).

The pH in the orange area is consistently higher, and in cool wet years fruit will suffer iron chlorosis when grown in high pH soils found in this region.

White and red areas are slightly acidic soils (pH below 6.0), blueberries and lingonberries prefer acid soils, but most species would not be as vigorous because they would have limited availability of the major nutrients (N-P-K).

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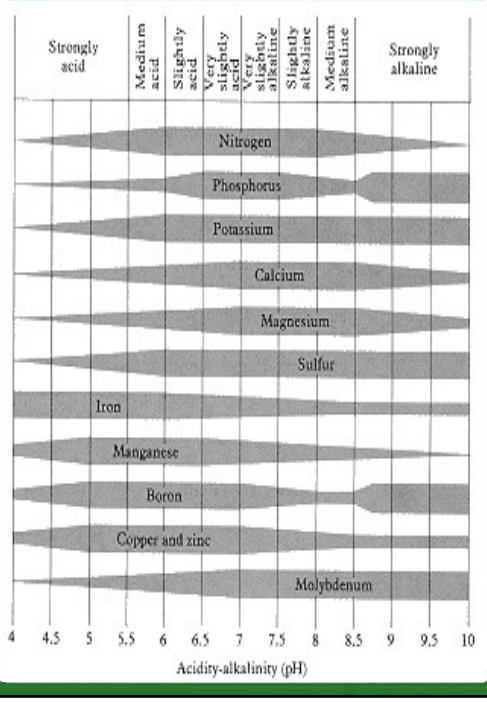
Soil Preparation

- **Soil Tilthe**
  - *Cultivation*
  - *Organic Matter incorporation*
  - *Green manure crops*
- **Problems with high pH**
  - *Fe is less available to plant, =Iron-induced chlorosis*
  - *also < B, Cu, Zn, Mn & P*
- **pH Modification**
  - *very difficult in prairie soil*
  - *buffered, not recommended*
  - *Use chelated supplements*



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Iron Chlorosis symptoms on saskatoon berry (highlighting interveinal yellowing of leaves). Symptoms are caused by the plant's inability to absorb iron in high pH soil, especially in new growth and cool wet soils (salinity symptoms look similar)

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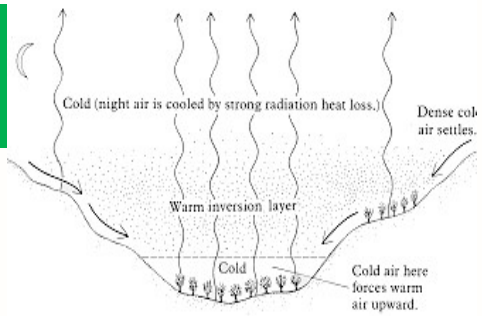
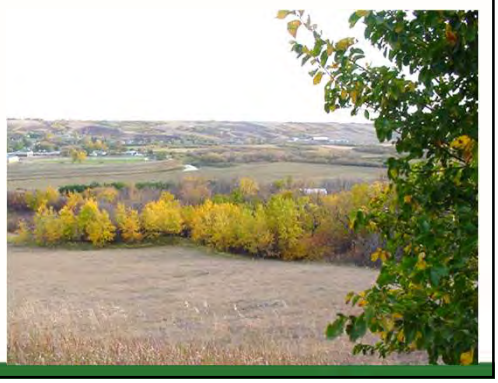
Topography

Major Considerations

- ✓**Rapid cold air drainage**
- ✓**Reduced spring frost damage at blossom time**
- **Temperature inversion at night extends season in fall**
- **Day time heat trapping**
- **Preferably 10m (30') above valley floor**





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Topography

North East Slope Best

Advantages

- *Shelter from west winds*
- *Rapid cold air drainage*
- *Reduced spring frost*
- *Increased snow trapping*
- *Prolonged retention of snow cover in spring*
- *Delayed bud break*
- *Reduced sunscald*

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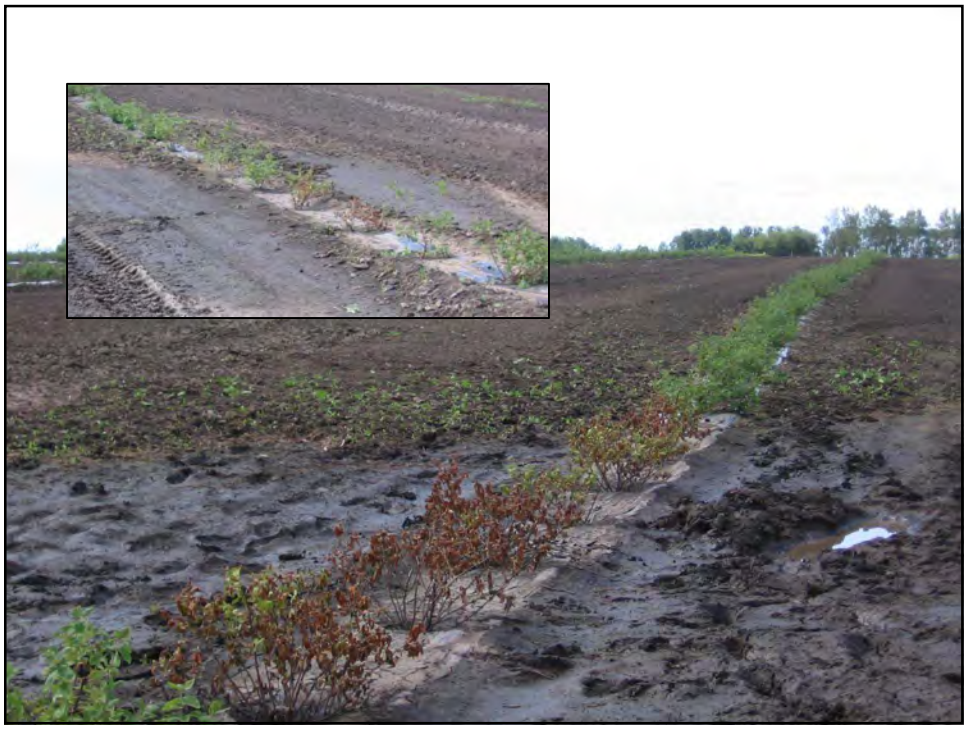

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Irrigating Fruit Crops:

- Most often plant location is permanent or perennial
- In many species the root zone is limited in area/depth
- For harvest and culture, alleyways are needed & they do not need additional watering

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Types of Trickle Irrigation

- Point Source System
- Line Source System
- Spray Emitter System

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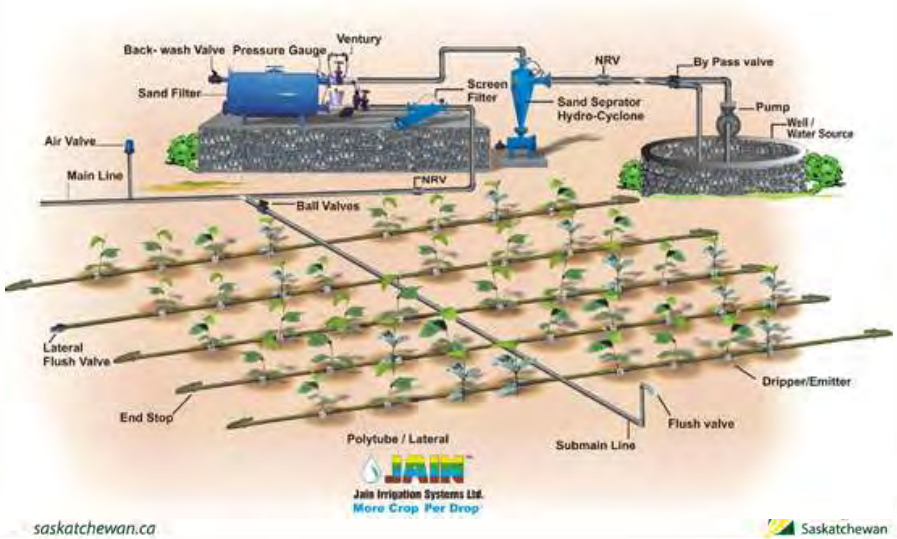
System Components:



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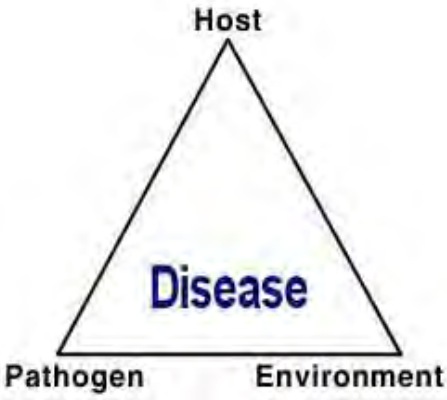
Benefit of Placing water where it is needed:

- Conserves water use
- Reduces the spread of disease
- Does not interfere with other orchard operations
- Allows easy placement of nutrients and chemicals
- (incorporate chemigation or fertigation systems)



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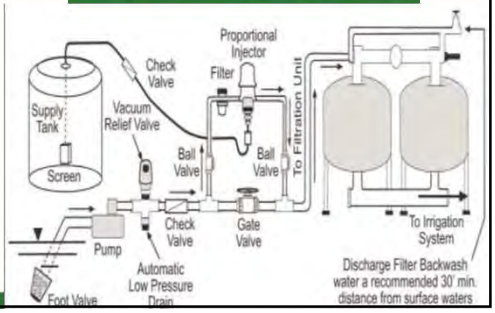
Chemigation/Fertigation

- Puts chemicals/fertilizers where they are needed
- Saves time/money
- Can be automated and programmed to match crop needs throughout the season



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Considerations:

- Water supply: quality, peak flow rate
- Daily plant water requirements
- Emitter spacing
- Emitter orifice size
- Operating pressure and flow rate
- Operating time: Less than 12 hours?
- Lateral length/ flow rate & Zone size and flow rate
- Can water supply needed zone flow rate?
- Number of zones?
- Filtration systems: emitter orifice size must be 7 times the filtration capacity (filter mesh)
- Mainline size: friction loss and pressure variation
- Contact Forrest for copy of "SK Trickle Irrigation Manual"

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Climatic Factors

Hail

- **Damage**
  - *–Damaged fruit unsaleable*
  - *–Severe damage to plants*
  - *–Loss of production, 1-3 years*
  - *–Susceptible to disease infection*
  - *–Winter injury regrowth*
- **Site Selection, Modification**
  - *–check hail insurance records*
  - *–select E, NE facing slope*
  - *–Shelterbelts reduce injury*
  - *–Hail guards -double wire, mats between rows*

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Other Climatic Factors

Wind

- **Evaporation & transpiration**
  - *–Soil and plant moisture loss*
- **Desiccation & freeze drying**
  - *–Exaggerates injury from high and low temperatures*
  - *–Increased low temperature injury*
  - *–increased dessication*
- **Wind Damage**
  - *–Reduced pollination*
  - *–Increased early fruit drop*
  - *–tree & trellis breakage*

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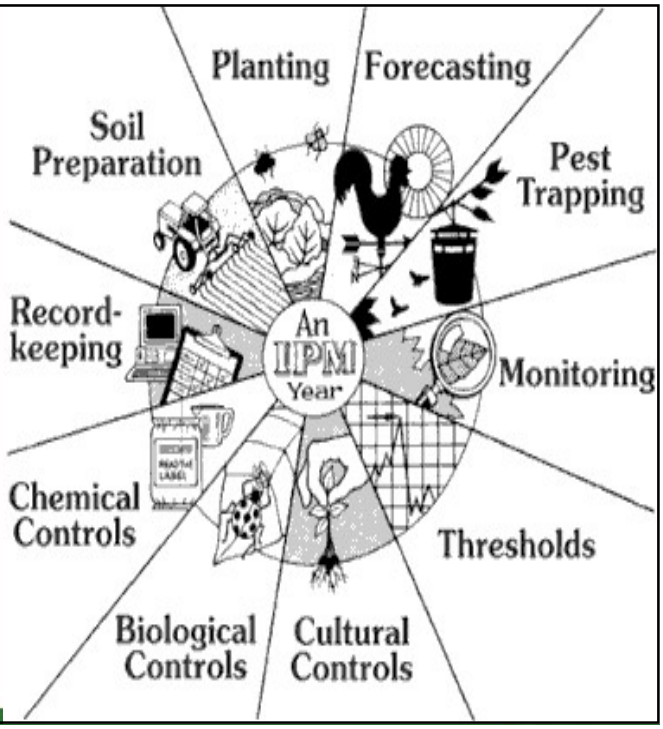
Integrated Pest Management

Understand the orchard environment and conditions that promote pests, employ all the possible tools that reduce the impact of pests… employ controls when interventions are most efficient



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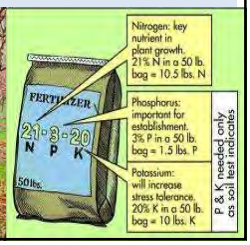
Integrated Pest Management (IPM)

- **Plant Nutrition: vigorous growth can equal increased disease susceptibility, and lower productivity…or: deficiency weakens plants and makes them more susceptible (submit foliar samples collected mid-summer and fertilize according to recommendations)**
- **Soil and water management (to optimize plant health)**
- **Weed management (weeds restrict crop growth, interfere with spray efficacy, and can serve as host for pests)**



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IPM Cont'd

- Insect: trapping, identification, economic evaluation…control measures (Spray, eliminate secondary hosts, promote beneficial insects)
- Disease: identification, weather evaluation, economic evaluation; spray control/pruning, inoculum removal from orchard

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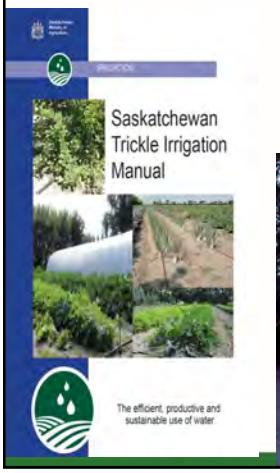
Equipment:



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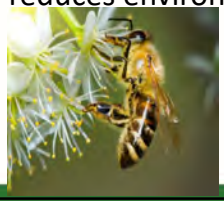
Spraying: Integrated Pest Management

- "**<u>Integrated Pest Management (IPM) is a multi-step process that helps growers make informed decisions about when and what to spray</u>**. But, the decision to spray is not the end of the process. The spray operator has a lot of decisions to make about the sprayer set-up and application method to make the job efficient and effective. **<u>Spray application is one of the most important activities regularly done in any horticultural operation</u>**. It can also be one of the most expensive. So, while it's important to be effective, it's also important to be efficient. Efficient spraying saves money and reduces environmental impact."



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Airblast 101 https://sprayers101.com/airblast101/

- **Welcome to Airblast 101**
- **Airblast 101** is home to a self-directed course designed to teach best practices in the safe, efficient and effective operation of airblast sprayers in agriculture.
- It houses a library of current information in the form of articles, factsheets, videos and PowerPoint presentations from researchers and university/government extension specialists across North America.

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Vertebrate Pests:

- Rodents: weed control, control food sources, use traps, poisons (in tubes), support predators
- Birds; physical barriers (netting) https://www.smart-net-systems.com
- Scare products, traps, predators, shot guns…☺ (https://ca.margosupplies.com/)

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Net covering Haskap at the University of Saskatchewan Field Plots July 19, 2013

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Fruit Harvest Succession

Crop	June	July	Aug	Sept	Oct	Storage
Rhubarb	////////////////					
Haskap	//////////////					
Strawberry -Junebearing	////////////////					
Raspberry -Floricane		////////////////				
Saskatoon		////////////////				
Currant-Red & White		//////////////////////				
Cherry-Dwarf		////////////////////////				
Currant-Black, Gooseberry			//////////////////////			
Cherry-Choke & Pin			//////////////////////			
Plum, Cherry plum			////////////////////////////			
Strawberry -Dayneutral			////////////////////////??????????			
Raspberry -Primocane			////////////////////////???????			
Currant, Buffalo			////////////////////????????			
HB Cranberry			////////////////////???????????			
Grapes				////////////????????		
Sea Buckthorn				//////////////////////////////////		
Apple			//			

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Haskap (Blue or Edible Honeysuckle)

Lonicera caerulea kamschatica

- **Origin** –*Boreal forests*, (Japan, Russia, N. Canada) hardy to - 45ºC perhaps colder
- **Close Relatives**
  - –Sweetberry Honeysuckle
  - –Blue fly Honeysuckle (L. villosa)
- **Shrub** 1-1.5m, precocious, 1-2 years, fruit on new wood
- **Yield** –6-7kg/mature plant
- **Fruit** -blueberry-like flavor
  - –Ripens mid June/mid July
  - –Vitamin C -50-70mg/100g
  - –Highest anthocyanins, phenols

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Apple			//++++++++			

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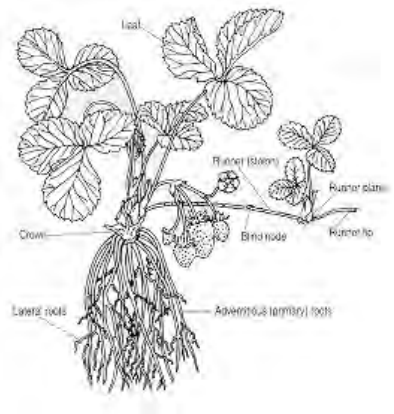
The Strawberry Plant

Biology and Morphology

- **Woody Plant**
  - *–hardy to from -8 to -10ºC*
- **Crown** *-a condensed stem*
  - *–produces leaves, stolons, daughter plants, branch crowns, flowers, fruit, new primary roots*
- **Roots** *-short lived (<1 year)*
  - *–roots replaced annually by new primary roots*
  - *–Slowly grow out of the soil*
- **Fruit Buds**
  - *–produced in summer, winter*



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Strawberry Production

Strawberries Types

Junebearing	Everbearing	Dayneutral
•Flower initiated under short day/cool conditions *•1 crop- late June-July* *•Runners in long day length/warm temperature* *•Large berries, pick and hold better* ***•Best U-Pick berries*** ***•Some good wholesale /retail/shipping***	*•Flower initiated under long & short day/cool conditions* *•2 crops-early June,Fall* *•too soft for picking, handling, shipping* ***•For home garden Use only***	*•Flower initiated under short & long day/cool to warm conditions (not hot) but not daylength sensitive* *•Continuous harvest theoretically but usually two in our conditions* *(too hot in summer)* ***•Good season extension***

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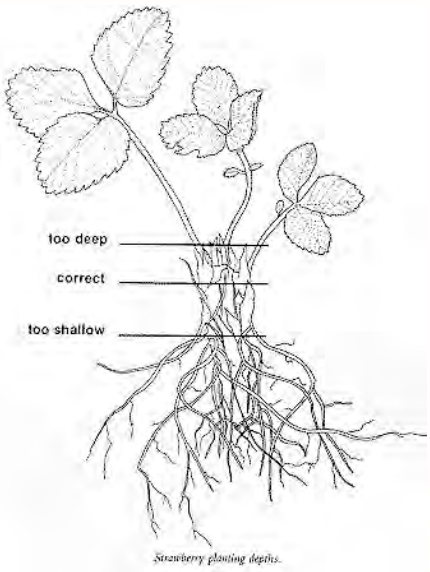
Strawberry Production

Planting Depth

Critical Factor

- *mid crown depth recommended*
- *Too shallow -primary crown roots do not develop - no runners*
- *Too deep -plant smothers, runners do not form*
- *New primary roots produced above the old*
- *Plant grows out of the ground eventually*



Strawberry planting depths.

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Strawberry Production

Weed Management -Cultural

Preparation Year

- *Summerfallow before planting, cultivation, Roundup perennials*
- *Use well composted manure*

Planting Year

- *Cultivate to runnering, filter water*
- *Hand weed - prevent reseeding*
- *Weed free straw -ammoniation*

Harvest Years

- *Hand weed, geese?, summer mulch*
- *Ammoniation of straw for mulch*
- *Crop rotation, move planting*

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Strawberry Production *Site Selection*

- **Soil** -pH <7.5, low salinity
- **Topography** –slope NE
- **Shelter** – microclimate
  –shelterbelts, windbreaks
- **Water Resources**
  –2.5-5.0 cm/wk -low salinity (shallow rooted)

  Excellent draw for Upicks

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Sea Buckthorn				//////////////////////////////////		
Apple			//++++++++			

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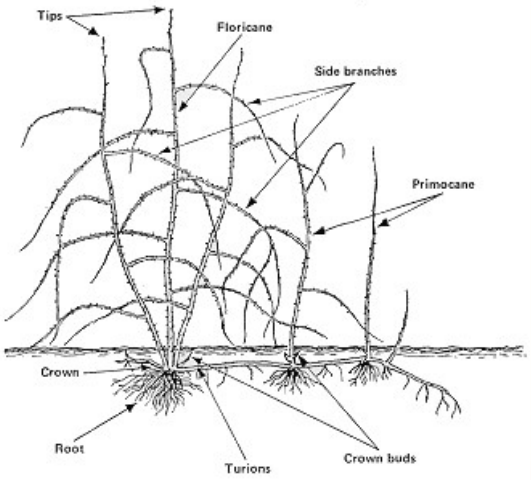
Raspberry Biology

Plantation Duration

- 10-15+ years, limited by virus
- Crown is long lived, top growth is biennial
- New shoots come from crown buds or turions (suckers)
- Can suffer top kill and come back from healthy crowns



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Raspberry Plants, 2 types of growth habit:

Floricane

- *Traditional type*
- *Fruits in 2 years*
  - *–Year1-vegetative cane*
  - *–Year2-fruit on laterals*
- *Requires annual pruning*
- *Pruning - labor intensive*
- *Medium growing season*
- *Trellising optional*
- *Insect & mite pest problems*

Primocane

- *Fruits in 1 year*
  - *–Year1-vegetative cane & fruit in fall on shoot tips*
  - *–Year2-fruits in summer (laterals) & fall (we fruit fall crop only)*
- *Pruning –annual spring mowing*
- *Less labour intensive*
- *Requires long growing season (not well suited to SK)*
- *Requires trellising*
- *Insect pest avoided, mites reduced*

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Raspberry Culture
Floricane Pruning

Alternate Row System

Dormant Spring Pruning

- Mow alternate rows each spring, burn residue, or mulch
- Narrow row with disc cultivation to 1 foot width
- Harvest remaining rows

Pruning during summer

- Maintain narrow row by discing

Second Dormant Spring

- Remove spindly late growth
- Thin remaining canes if needed
- Tip canes if needed
- Reverse rows the following year

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Sea Buckthorn				//////////////////////////////////		
Apple			//++++++++			

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Saskatoon Production

Site Selection

Topography –slight slope (NE, N, E best) delays spring blossoming, good surface drainage avoid saline seeps, low areas, boggy sites

Soil –wide range acceptable, sandy loam best
avoid clay loam & heavy clay, saline soil, pH-wide range... but not much above 7.8
Shelter -some protection from wind, need porous windbreaks not dense, need good air movement

Water Resources -good quality, non saline water, requirements are low

Choose the best site... avoid wasteland, non-arable land, boggy, saline areas
Avoid native fruit stands, junipers, elms (disease spores, insects)

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Saline Soil

- **Problem**
  - *–saskatoons are very intolerant*
  - *–intolerant of poor drainage*

- **Damage and Symptoms**
  - *–interveinal & general chlorosis*
  - *–poor vigor, stunting & dieback*
  - *–saline irrigation shock causes leaf drop & dieback*

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Saline Water Sources

- **Problem**
  - ***–saline water source***
  - ***–evaporative concentration of salts in standing water during droughts***
- **Injury & Symptoms**
  - ***–salt accumulation in leaves, soil***
  - ***–saline irrigation shock, leaf drop***
  - ***–aggravated by heat stress***
  - ***–possible dieback***
  - ***–sulfur application at high temperature is similar***

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Saskatoon Production

Fertilization

- **Preplant**
  - *–high phosphate fertilizer (11-51-0)*
  - *–based on soil tests, plant requirements*
- **Planting**
  - *–complete starter fertilizer*
- **Training Phase**
  - *–high nitrogen fertilizer*
- **Maintenance (Producing) Years**
  - *–annual application based on leaf tissue analysis, sufficiency ranges, and soil tests, cost versus response?*

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Planting

- When to plant?
  - –early spring best
- Dormant vs growing?
  - –Dormant plants best
  - –Favors rooting
  - –Growing plants -shock leaf drop, dormancy
- Potted vs bare root?
  - –Root trainers best, but only 1 year in containers
  - –Root distortion & root bound if held over

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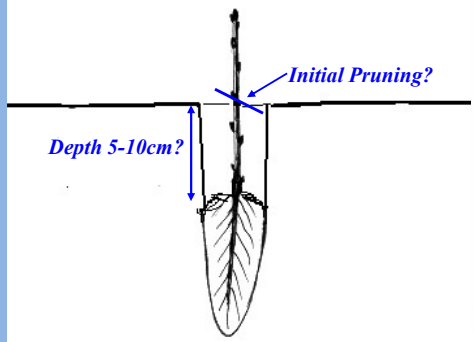
Planting Saskatoons

Trench Planting Method

- **Equipment**
  - –*cultivator spike, trencher*
- **Planting**
  - –*by hand*
- **Depth**
  - –*crown 2.5-10 cm deep?*
- **Advantages**
  - –*suckers follow row only?*
  - –*suckers reduced outside*
- **Problems**
  - –*solid row, microclimate?*
  - –*air movement ?*



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Fruit Harvest Succession

Crop	June	July	Aug	Sept	Oct	Storage
Rhubarb	////////////////					
Haskap	//////////////					
Strawberry -Junebearing	////////////////					
Raspberry -Floricane		//////////////				
Saskatoon		//////////////				
Currant-Red & White		//////////////////////				
Cherry-Dwarf		//////////////////////				
Currant-Black, Gooseberry			//////////////////			
Cherry-Choke & Pin			//////////////////////			
Plum, Cherry plum			////////////////////////////			
Strawberry -Dayneutral			////////////////////////??????????			
Raspberry -Primocane			////////????????????			
Currant, Buffalo			////////////////////????????			
HB Cranberry			////////////////////??????????			
Grapes				////////////????????		
Sea Buckthorn				//////////////////////////////////		
Apple			//++++++++			

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University of Sask. Cherry Breeding

- Dwarf Sour Cherries are the result of long term breeding efforts from various Saskatchewan based institutions
- Dr. Les Kerr made crosses (i.e. controlled pollination of selected flowers) between Prunus fruticosa and Prunus cerasus cherries pre -1940 at the Dominion Experimental Station in Saskatoon (now known as "The Forestry Farm")
- Fruticosa is a short, very hardy cherry, with poor fruit quality (top right)
- Cerasus is a tall tree with poor winter hardiness, but excellent fruit quality (bottom right)

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Dwarf Cherry Characteristics

- Plant
  - Dwarf, natural shrub
  - Hardy to -40ºC
  - Grown on own roots, no rootstock or grafting required
  - Fruits by 3rd or 4'th year
- Flowers –1, 2 & 3-yr old wood
  - Flowers late spring, no frost
  - Self-fertile, self-pollinated
  - Requires pollinator –bees/wild bees/insects

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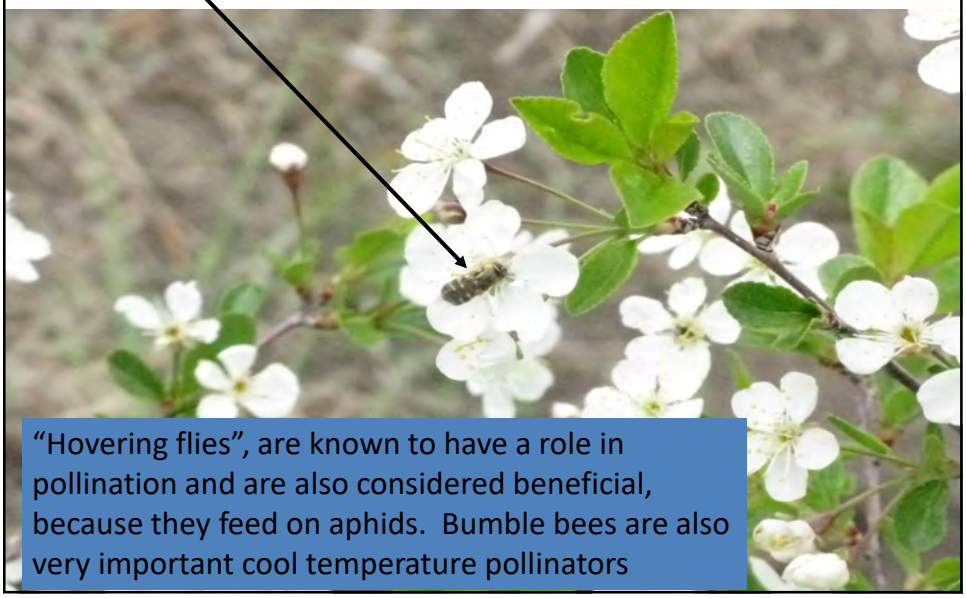
- Syrphid fly picture taken on June 11, 2009 at Hill Berry Farm...Imperial Saskatchewan 51.4 degrees Latitude



"Hovering flies", are known to have a role in pollination and are also considered beneficial, because they feed on aphids. Bumble bees are also very important cool temperature pollinators

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Fruit Harvest Succession

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Currant, Buffalo			////////////////////?????????			
HB Cranberry			////////////////////??????????			
Grapes				////////////??????????		
Sea Buckthorn				//////////////////////////////////		
Apple			//++++++++			

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Black Currant

- **The Plant**
  - *Naturally low-headed and multi-stemmed shrub*
  - *Nil to low suckering*
- **Fruiting Habit**
  - *Fruits on 1 yr old wood & lateral branches (1 yr old growth) on 2 yr old wood*
  - *Fruiting greatly diminished on older wood*

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Fruit Harvest Succession

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Rhubarb	////////////////					
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Raspberry -Floricane		////////////////				
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Grapes				////////////????????		
Sea Buckthorn				//////////////////////////////////		
Apple			//++++++++			

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Buffalo or Clove Currant

Adaptation & Site Selection

- **Characteristics**
- Native -Cypress Hills south
  - –Very Hardy –50 to 55º C
  - –Very drought resistant
  - –Self-fruitful, insect pollinated
  - –Black, gold, red or purple fruit
  - –Pruned like a gooseberry
- **Site Selection**
  - –Soil -not particular, sandy loam
  - –Little wind protection required
  - –Water desirable but optional

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New and Exotic Fruits

Hazelnuts

- **Commercial Species**
  - –**European Filbert**, Corylus avellana - not hardy
- **Native Species**
  - –**Beaked Hazelnut**, Corylus cornuta - difficult to husk
  - –**American Hazelnut**, Corylus americana -too small
- **New Hybrid Hazelnuts**
  - – Filbert x American
  - –Filbert x beaked
  - –hardy, much larger

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Fruit Harvest Succession

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Grapes				////////////????????		
Sea Buckthorn				//////////////////////////////////		
Apple			//++++++++			

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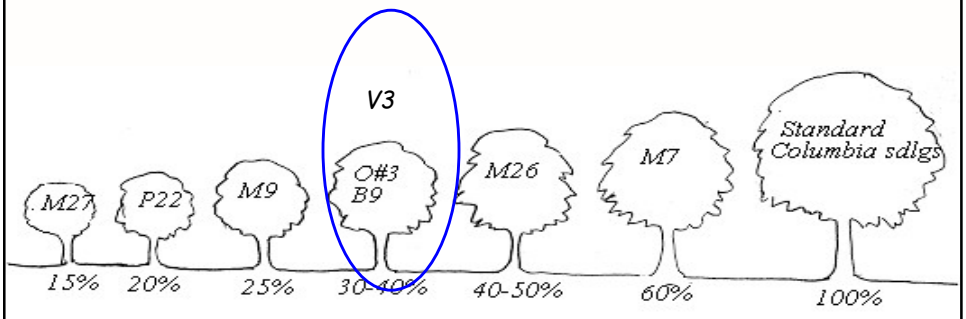
Relative Size of Scion Cultivar
Various Rootstocks

- Ottawa # 3 has 30-40% dwarfing effect
- Hardy in Zone 3 & 2, high yield efficiency
- Better fruit colour, even light distribution



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Dwarf Apple
Training Systems

- **Free Standing** -standard
  - –central leader, modified central leader, open center
- **Trellis systems** -dwarfs
  - –Tatura, Marchand, various palmettes, etc.
- **Individual tree support**
  - –for dwarf trees
  - –vertical axis, slender spindle, slender bell, etc.
  - –recommended

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New Apple Cultivars
"Prairie Sensation" *18-10-32*

Origin: U of SK

Description

Tree: Hardy in Zones 2a?
- Matures early-mid September
- Somewhat spur-type

Fruit: greenish, 50% orange red
- 7.5-8.5cm (3-3.5"), oblate round
- Flesh white, crisp, firm, fine, juicy
- Sweet, sub-acid, aromatic
- Small closed core

Storage: 4 months+, good shelf life

Pests & Diseases
- Disease reaction unknown
- Some Fire blight susceptibility
- No apple maggot problem to date

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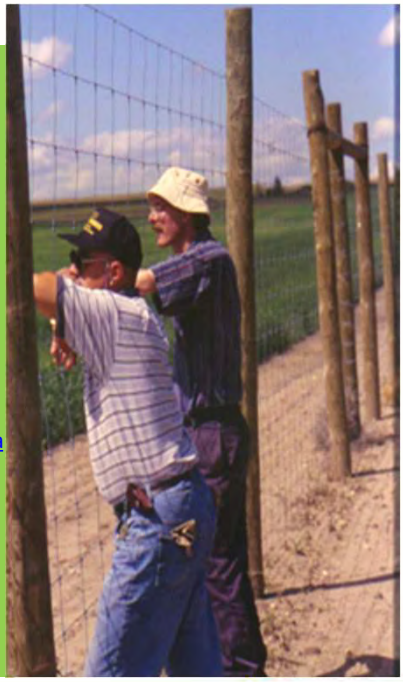
Wild Life Fencing *Deer, Moose, Elk*

- **Dogs,Hunting** –ineffective
  - –requires constant vigilance
- **Repellants**
  - –tree paint, sprays

Wildlife Damage Compensation Program: is available for all losses due to wildlife. The Saskatchewan Crop Insurance Corporation (SCIC) administers the program See: https://www.scic.ca/wildlife-damage

- Producers can receive some compensation without costs or premiums to participate.

- **Exclusion** –most effective, only permanent solution
  - –Recommend 8' tall minimum
  - –For fencing guide, see: https://library.usask.ca/gp/sk/en/deerandelkproofmar05.pdf



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