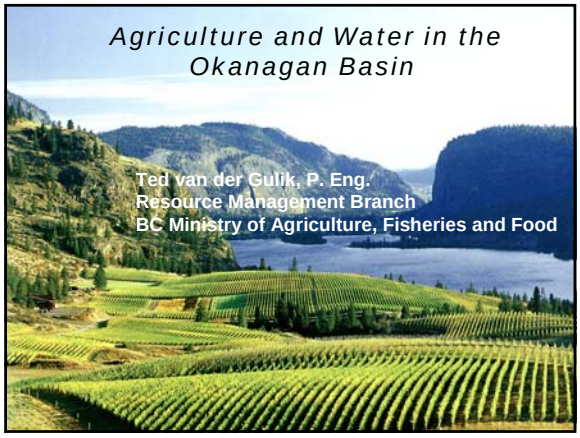
Agriculture and Water in the Okanagan Basin



Ted van der Gulik, P. Eng.
Resource Management Branch
BC Ministry of Agriculture, Fisheries and Food

Water Sources for Agricultural Irrigation in BC

	Water Use
Surface Water:	
Self Pumped	65%
Supplied by a purveyor	23%
Groundwater	
Self Pumped	7%
Supplied by a purveyor	5%
Dams and Storage	2500

Water Licencing in the Okanagan

Ardsa program amalgamated individual licences under the authority of irrigation districts in the 1960's - Irrigation districts were built with Agriculture funding to supply water for agriculture.

Irrigation districts are now being incorporated into the municipal structure – municipal water supply is taking priority in many areas.

Municipalities are currently not accurately accounting for agricultural water supplies.

Water security under the current water supply system is in jeopardy – agricultural representation is not sufficient

Agricultural Irrigation System Types

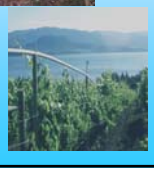
Forage Systems

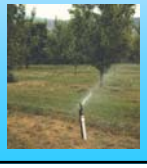
- Center Pivot
- Wheel line
- Hand line
- Travelling Gun
- Stationary Gun

Agricultural Irrigation System Types

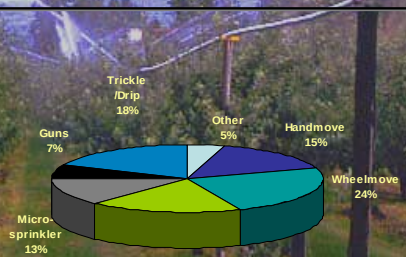
Horticulture Systems

- Handline
- Overhead sprinkler
- Undertree sprinkler
- Microsprinkler
- Drip / Trickle





Irrigation System Types in the Okanagan



Irrigation Efficiencies

Types of System	System Efficiency [%]	Range of Costs [$/acre]	Labour Cost [hr/acre/irrigation]
Handmove	60 – 75	400 – 650	1.2
Wheelmove	60 – 75	550 – 900	0.5
Stationary Gun	50 – 65	350 – 700	1.2
Travelling Gun	55 – 70	700 – 1,100	0.3
Solid Set	60 – 75	1,200 – 2,000	0.15
Centre Pivot	65 – 85	700 – 1,260	0.05
Trickle	85 – 95	1,400 – 2,250	0.05

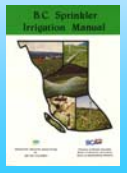
Agricultural Irrigation

- Need good quality water – not drinking water
- Peak of season - need to irrigate 24 hours /day – 7days a week
- Systems are designed to match peak conditions – usually run at peak flow
- Peak flow and annual allocation are based on climate and soil type – crop and irrigation system type may change over time

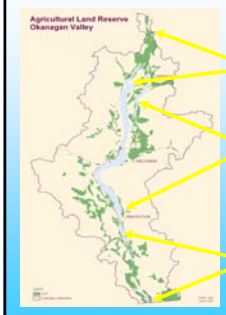
Irrigation Design Guides

Trickle

Sprinkler



Agriculture Water Use



Northern Basin
- Peak flow rates 4.5 – 5 gpm/acre
- Annual requirement 16 – 26 inches
  400 – 650 mm

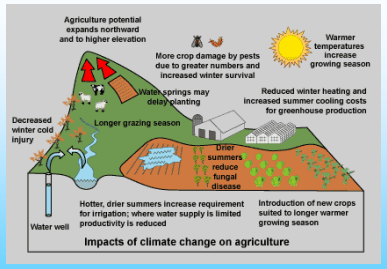
Center Basin
- Peak flow rates 6 – 7.5 gpm/acre
- Annual requirement 20 – 30 inches
  625 – 750 mm

South Basin
- Peak flow rates 8 - 9 gpm/acre
- Annual requirement 30 – 40 inches
  750 – 1000 mm

Okanagan Water Use

Over 85% is Used for Outdoor Purposes:
~70% for Agricultural Irrigation
>15% for Turf Irrigation

Okanagan Climate Change



A warmer climate could lead to changes in water supply and demand in the Okanagan:
- *Supply would decrease and seasonal peak stream flows would occur earlier due to earlier snowmelt.*
- *Annual volume would decrease.*
- *Agricultural and residential water demand would increase.*

"The water resources of the Okanagan will be totally allocated in less than 15 years."

"To move toward sustainable water management…requires changes in practices now."

Water OUT = Water IN!
What's the Balance?

Why Develop an Agricultural Water Management Plan?

- Agriculture is the largest water user in many parts of British Columbia
- Agriculture is a consumptive user, unlike other sectors
- Competition between urban, fisheries, recreation and agriculture for water will increase
- Climate change will drive the need to be more efficient

Achieving an 'Okanagan Water Balance' Relies on Changing Behaviour at the Site Scale

- **What Is Our Starting Point?**
- **Where Do We Want To Be?**
- **How Will We Get There?**

"Look Back to Look Ahead"

Agriculture Water Demand Model

Objective:
Develop a model that calculates agriculture's water needs by purveyor, municipality, district and sub-watershed.

Methodology:
Determine Property-by-Property water use

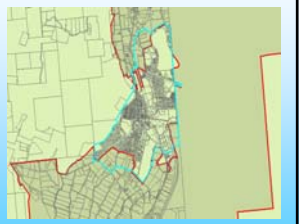
Result:
Planning Tools that secure water for current and future agricultural needs

Agriculture Water Demand Model

- Develop a unified cadastre for the Okanagan
- Collect land use information on:
  - Cropping
  - If irrigation is used or not
  - Irrigation system type
- Develop a model to:
  - Determine current water needs for each property
  - Determine future needs

Unified Cadastre

- Data from all regional districts has been amalgamated into one GIS data layer
- Provides a methodology for storing land use attributes for the entire basin – both urban and agriculture.
- Allows for the program to determine agricultural water needs for the basin, water purveyor, watershed or municipality.



Land Use Inventory

Collect and link information on crop type and irrigation system type

Crop Type:

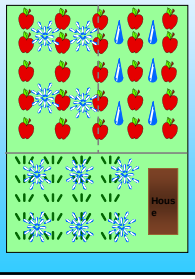
Apple

Pasture

Irrigation System Type:

Sprinkler

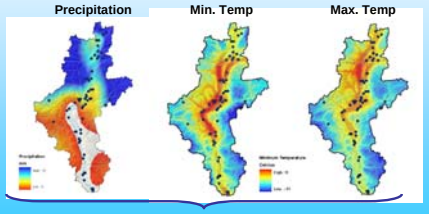
Drip



CLIMATE DATA INTERPOLATOR

Methods:

Daily surfaces of precipitation and temperature modeled.

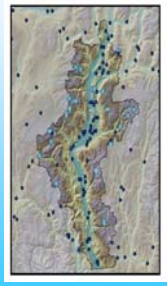


Water Supply Model (ACCESS)

Agriculture Water Demand Model

Climate data

- A climate model is being developed on a 500 m x 500 m grid
- Provide current climate data based on historical and current information
- Climate change scenarios will be developed



Agriculture Water Demand Model

Database is linked to cadastre

- Land use / irrigation system
- Climate
- Soil type

Water use is determine by an algorithm that calculates water requirement for each property

Agriculture Water Demand Model

Products developed:

Data on current and future agricultural water requirements for the whole basin

Information can be generated by:

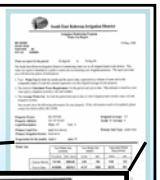
water purveyor
regional district
municipality
watershed

Purveyor Water Use Evaluation Model

Model will be developed for purveyors that will link

- Land use / irrigation system / calculated water use
- Meter / water use

Water Use Report



Water Use

	Your Water Use (volume)		Your Water Use (depth)		Calculated Water Requirement	
	US gallons	cubic meters	inches	mm	inches	mm
Current Month	741100	2805.06	4.96	126	4.85	123
Year to Date	6133500	23215.3	41.07	1043	32.33	821

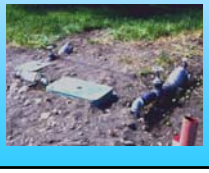
Average Water Use for:
apple low density

	Average Use for Properties with Similar Soil and Crop Type		Amount Over or Under the Average		
	inches	mm	inches	mm	%
Current Month	3.12	79	1.84	47	60
Year to Date	32.73	831	8.34	212	25

Management Tools – Changing Behaviour at the Site

- Improving irrigation system efficiency
- Monitoring water use

- Certified Designs
- Irrigation Assessments
- Irrigation Scheduling



Agricultural Metering

- Metering allows for:
  - Monitoring of actual use
  - Allows targeting of high water users
  - Can be used to allocate water during a drought
  - Develop an equitable pricing structure – increasing block rate

Metering Purpose

The meter does ***NOT*** save water.

The meter is only a tool to:

- Ensure a fair distribution of water
- Ensure that agriculture is allocated sufficient water to meet needs
- Assist districts to manage water and provide a useful tool in times of drought

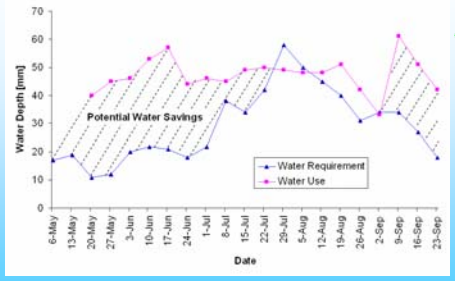
Okanagan Metering Projects

- Meters are instal
- Demonstrate use of soil moisture data using Tensiometers and Watermarks

- Schedule irrigation using data collected
- Hold field days for scheduling demonstration

1. Vernon
2. Glenmore
3. Westbank
4. Summerland
5. Black Mountain

Improving Water Management



Irrigation System Performance

1. **Efficiency:** Select the most efficient type of irrigation system possible
2. **Uniformity:** Design the system to obtain the best uniformity
3. **Scheduling:** Schedule irrigation timing according to local site, soil moisture and climate data

Certified Irrigation *Designer* (CID)

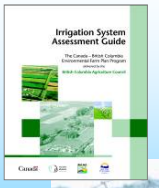
Certification is available in:

1. Sprinkler
2. Drip
3. Residential
4. Commercial

Requirements:

1. Pass a written exam

Agriculture Irrigation System Assessment



Environmental Farm Planning Process

Sprinkler and Trickle/Drip Systems:

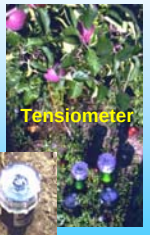
- Agricultural irrigation management
- System assessment
- Operation
- Scheduling
- Energy efficiency

Irrigation Scheduling Techniques

1. **Soil Moisture Monitoring**
2. **Climate Monitoring**

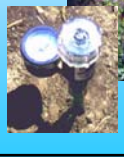
Soil Moisture Monitoring

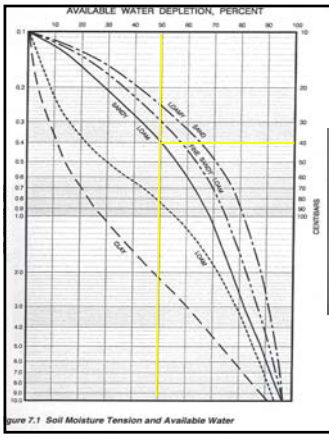
Electrical Resistance Block
Watermark



Tensiometer

TDR





igure 7.1 Soil Moisture Tension and Available Water

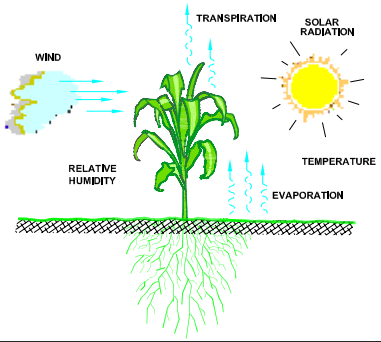
When To Irrigate?

An irrigation system in a sandy loam soil with a root depth of 1 m.
Is scheduled to begin irrigation when the available water has been depleted by 50%
Irrigation should start when the sensor Reaches 40 centibars

Climate Monitoring

Climate Station

Evapotranspiration (ET)



The rate at which water is transpired by plants and evaporated from plants and soil surface.

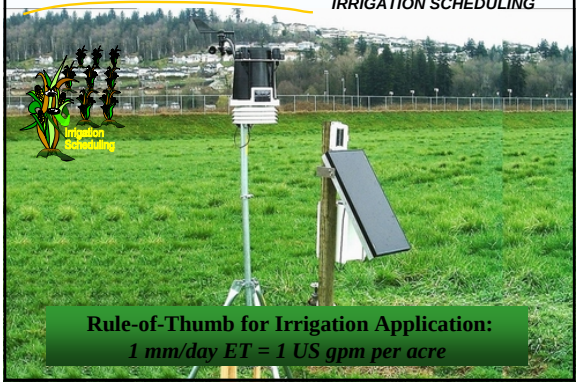
Checking ET Online

farmwest.com

- *Close to 100 climate stations throughout B.C.*
- *Real-time climate data*
- *Five-day weather forecast, ET and more*
- *Schedule irrigation at your finger tips*

farmwest.com

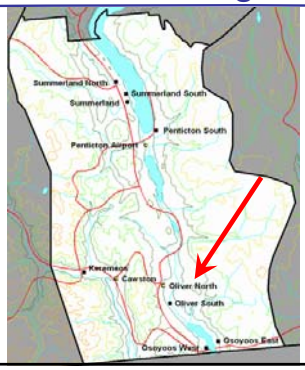
Real Time ET Data for IRRIGATION SCHEDULING

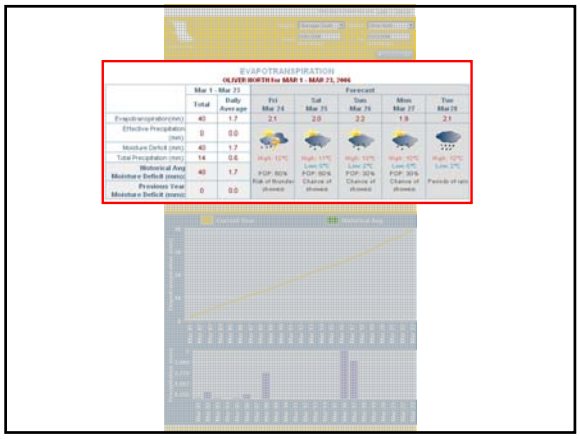


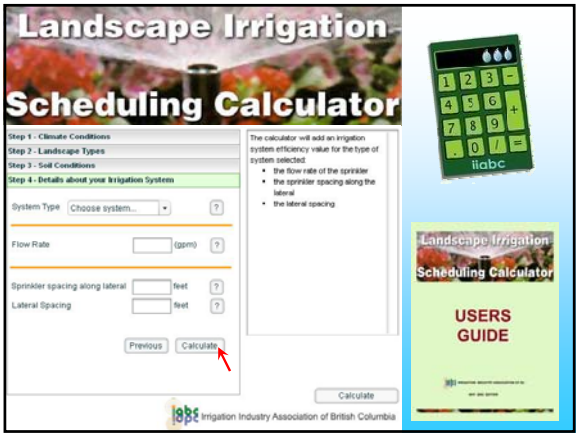
Rule-of-Thumb for Irrigation Application:
1 mm/day ET = 1 US gpm per acre

Station Map

South Okanagan







British Columbia Food Security

Agriculture "legacy" gives the Okanagan a sense of place

In 2001 we needed 2.15 million hectares for overall food sufficiency and 217,000 hectares of irrigated land in BC to be self sufficient in fruit, vegetables and dairy

By 2025 we will need 2.78 million hectares and 281,000 hectares of irrigated land

Current estimated total irrigated land is 189,000 hectares

Agriculture Action Plan

1. **Local government planning processes (regional growth strategies and OCP's) retain agricultural lands. Develop Agricultural Plans that promote agriculture.**
2. **Water needs to be reserved for the ALR for future use.**
3. **Water that is currently allocated to agriculture will remain with agriculture – conservation efforts will be used for further food production or adaptation to climate change.**
4. **Municipalities and water purveyors have fair agricultural representation consisting of commodity nominated representatives.**
5. **Pricing of water for agriculture is affordable and equitable for the sector.**
6. **Drought Management plans should be developed on a watershed basis.**
7. **Okanagan Basin Water Board policies are consistent with the Provincial Water Strategy**