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**Water Management & Climate Change  
in the Okanagan Region, Canada:  
Highlights from Interim Report**



Presented at  
**The Aspen Global Change Institute**

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“Learning from Regions: A Comparative Appraisal of  
Climate, Water, and Human Interactions in the Colorado and  
Columbia River Systems”

# *Water Management & Climate Change in the Okanagan Region, Canada: Highlights from Interim Report*

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*Presented at Aspen Global Change Institute  
June 7, 2003*



# **Okanagan Climate Change & Water Management Study Team**

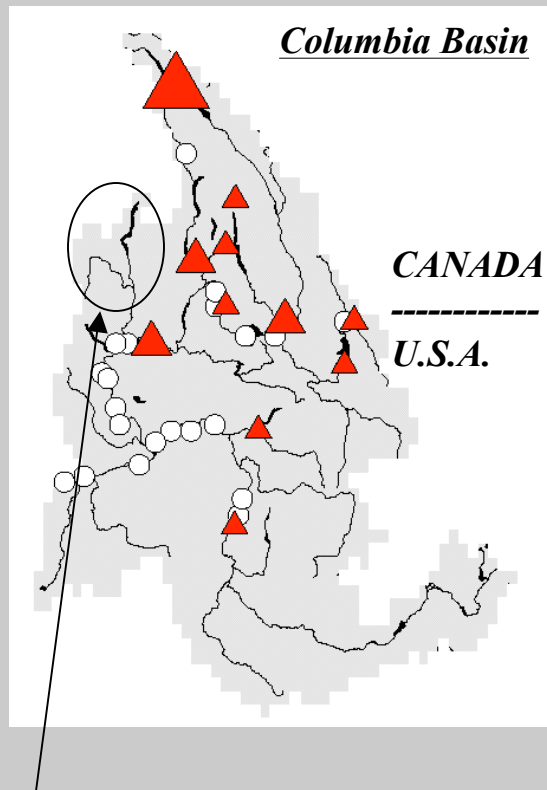
- **Stewart Cohen** – Adaptation & Impacts Research Group-EC, Institute for Resources Environment & Sustainability-UBC, Vancouver
- **Denise Neilsen, Scott Smith, Grace Frank, Walter Koch** – Pacific Agricultural Research Centre-AAFC, Summerland
- **Younes Alila, Wendy Merritt** – Forest Resources Management, UBC
- **Mark Barton, Roger McNeill, Bill Taylor** – Pacific & Yukon Region-EC
- **Tina Neale, Philippa Shepherd, Jeff Carmichael, James Tansey** – Institute for Resources Environment & Sustainability, UBC
- **Brian Symonds**, B.C. MoWLAP, Penticton

*Thanks to **Andrew Reeder**, City of Summerland; **Toby Pike**, Water Supply Association for their assistance to the study team.*

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# Water Resources in the Okanagan Basin

*Part of the Columbia Basin, British Columbia*



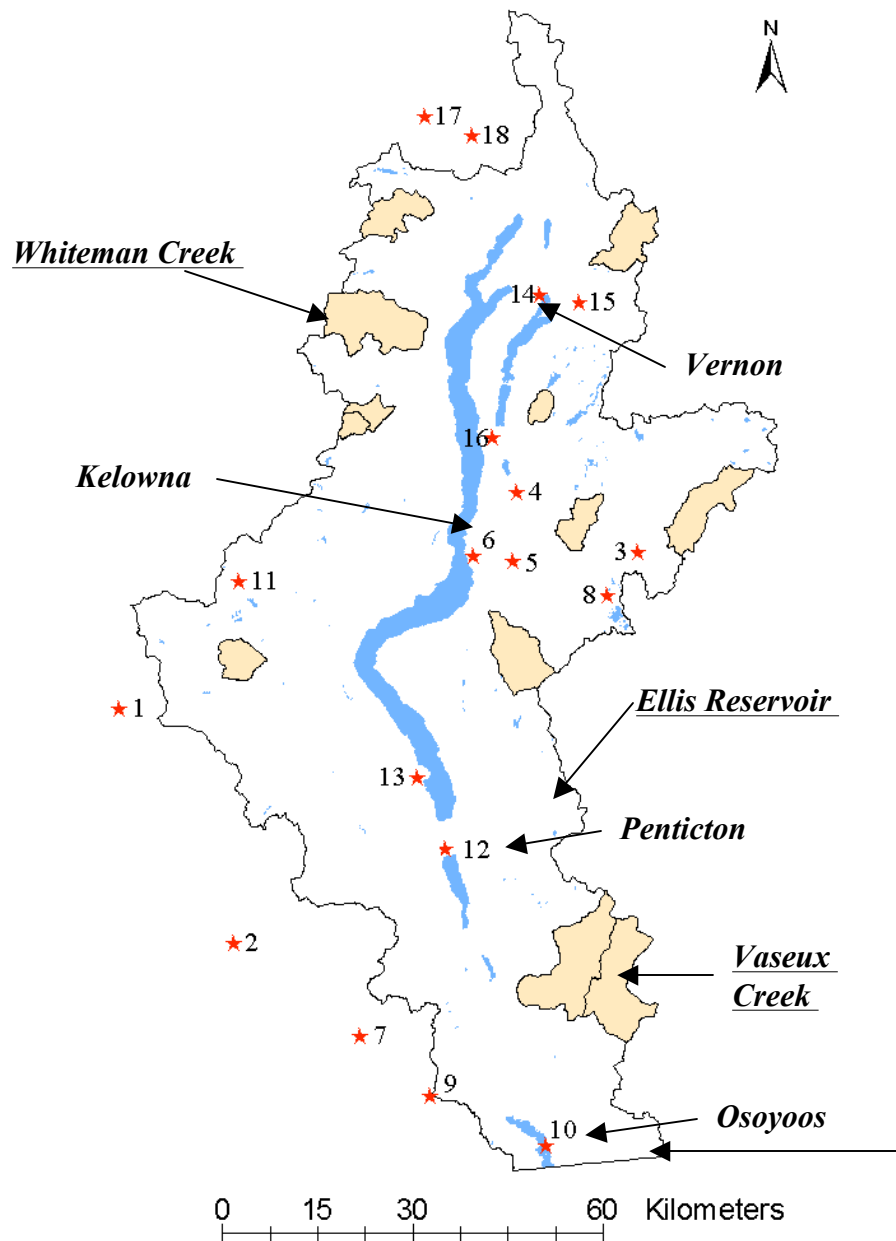
*Okanagan-Similkameen  
British Columbia*

- Area = 8200 km<sup>2</sup>
- Okanagan Valley = 160 km in length
- Population = 530,000 (1999 approx.); 13 municipalities, 3 regional districts, 4 First Nation communities, 59 “improvement districts”
- Agriculture: 2278 farms, 78,300 ha (3% decrease since 1976 due to urbanization)
- Summer & winter tourism
- Forestry: >4 million m<sup>3</sup>/year

*Source: Cohen and Kulkarni (2001); map from Alan Hamlet (U. Washington)*

# Water Management & Climate Change in the Okanagan, British Columbia





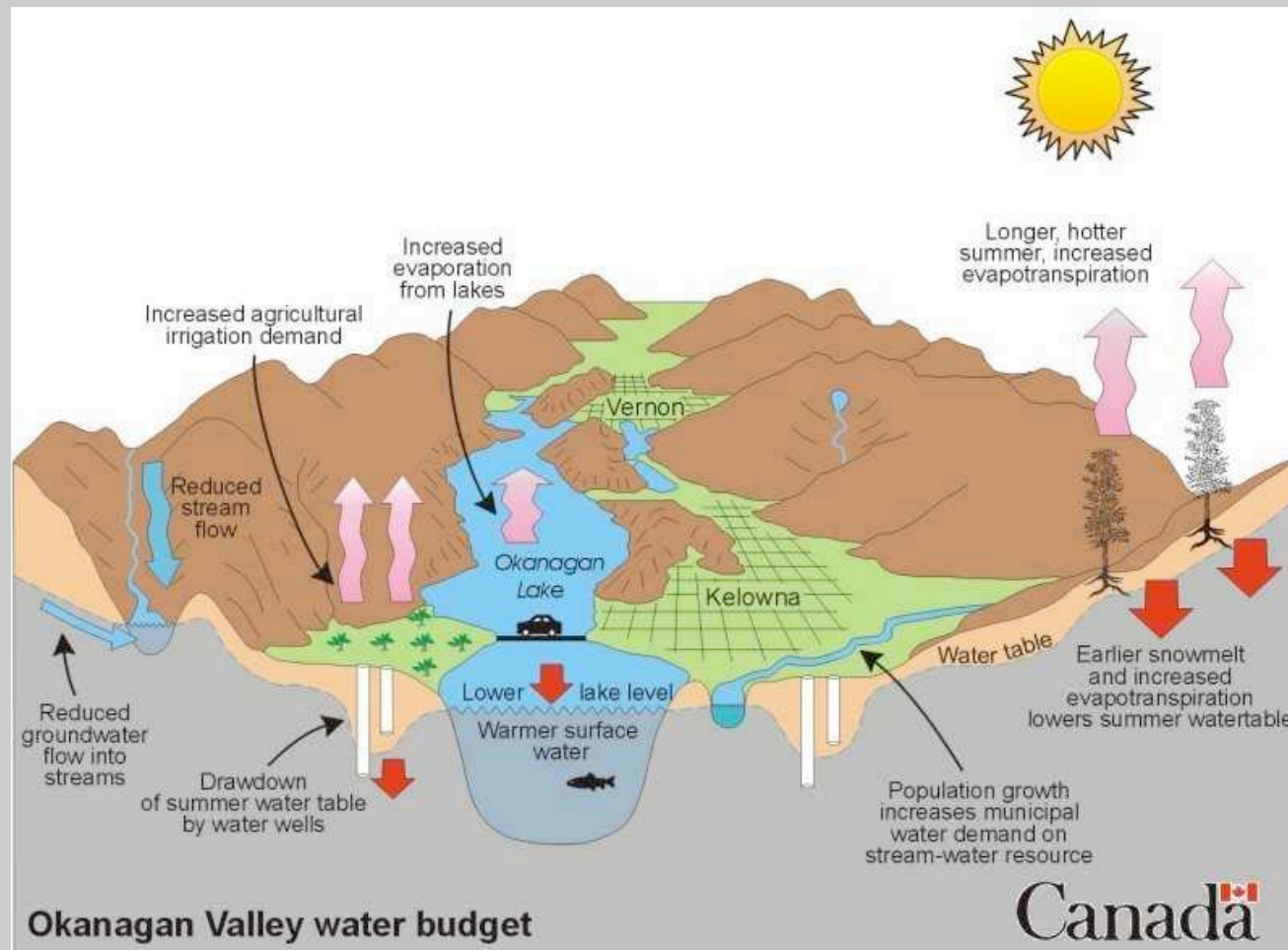
**Meteorological stations and unregulated watersheds used in calibration and testing of the UBC Watershed Model in the Okanagan Basin, British Columbia.**

**CANADA**

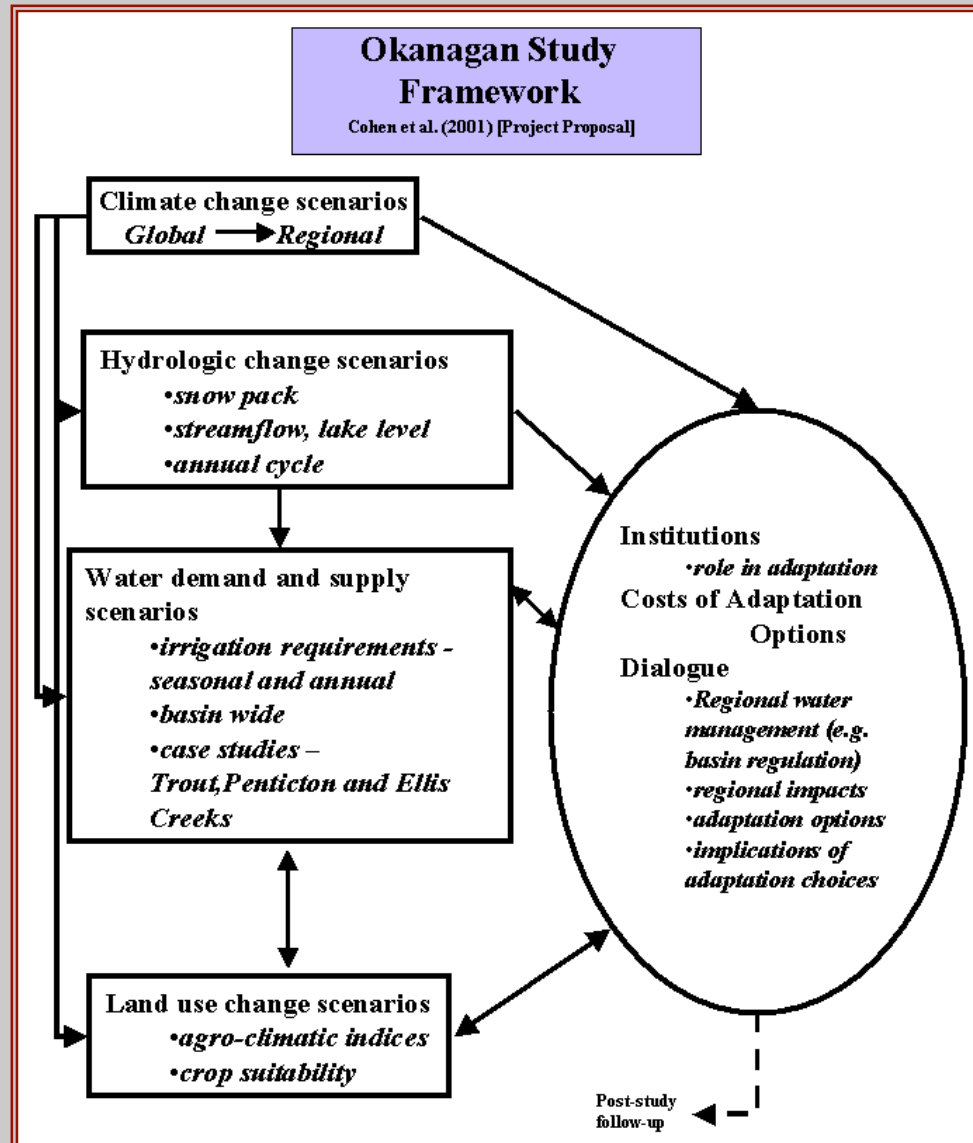
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**U.S.A.**



# Okanagan Climate Change Scenario: Implications for Water Management



# Water Management & Climate Change in the Okanagan—Study Framework, 2002-04





# Okanagan PIA Framework

## Dialogue 2000-01

- Climate change IS92a
- Hydrology: 6 creeks
- Regional development context
- Focus groups
  - Adaptation options list

## Crop Water Demand 2000-01

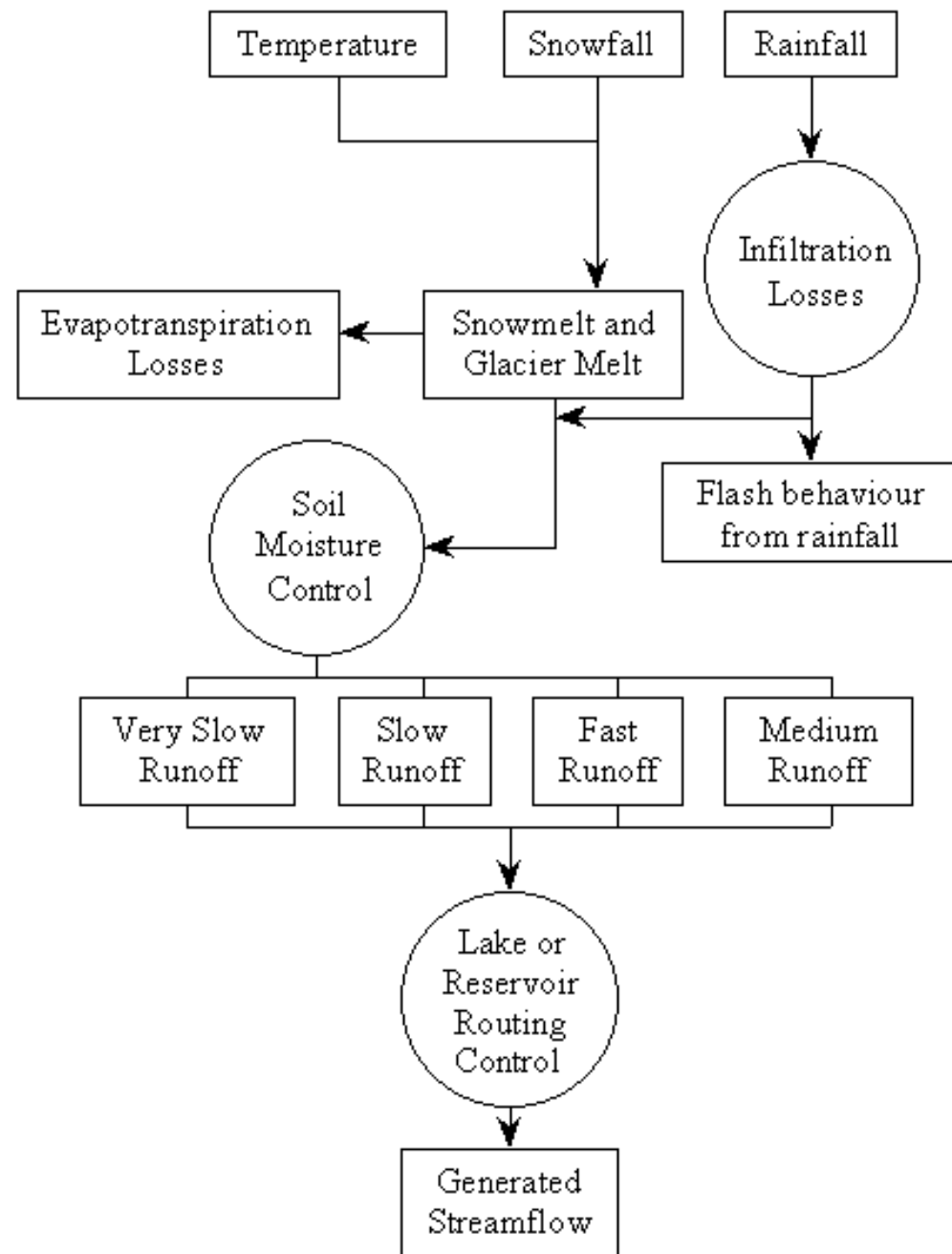
- General estimate for South Okanagan

## Expanded Dialogue 2002-04

- Climate change--SRES
- Surface hydrology
  - Whole basin
- Crop water demand
  - Major crops
- Land use change scenarios
- Water supply & demand scenarios
- Water institutions
  - Irrigators
  - Early adopters
- Adaptation cost options
  - General estimates
- Focus groups
  - Implementation of adaptation options

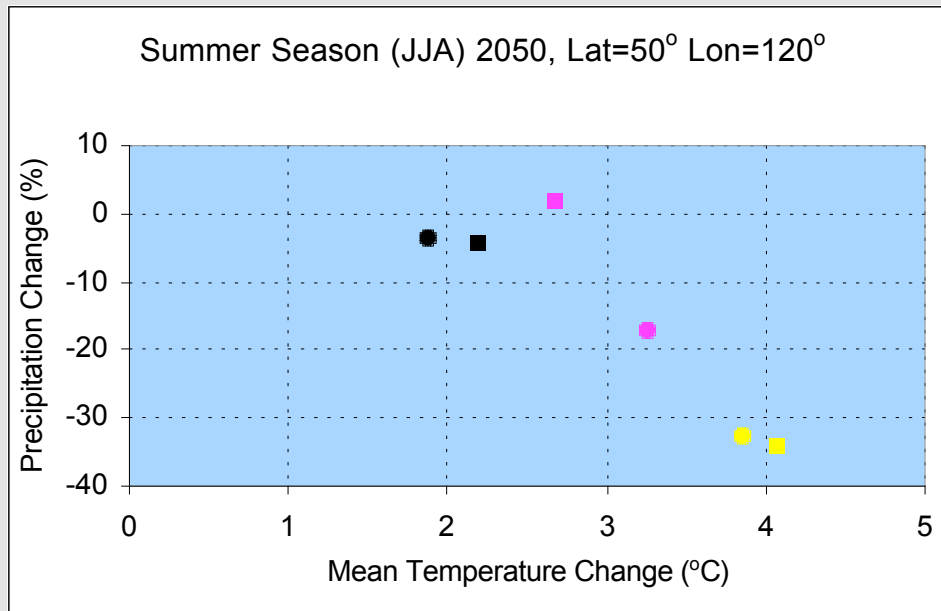
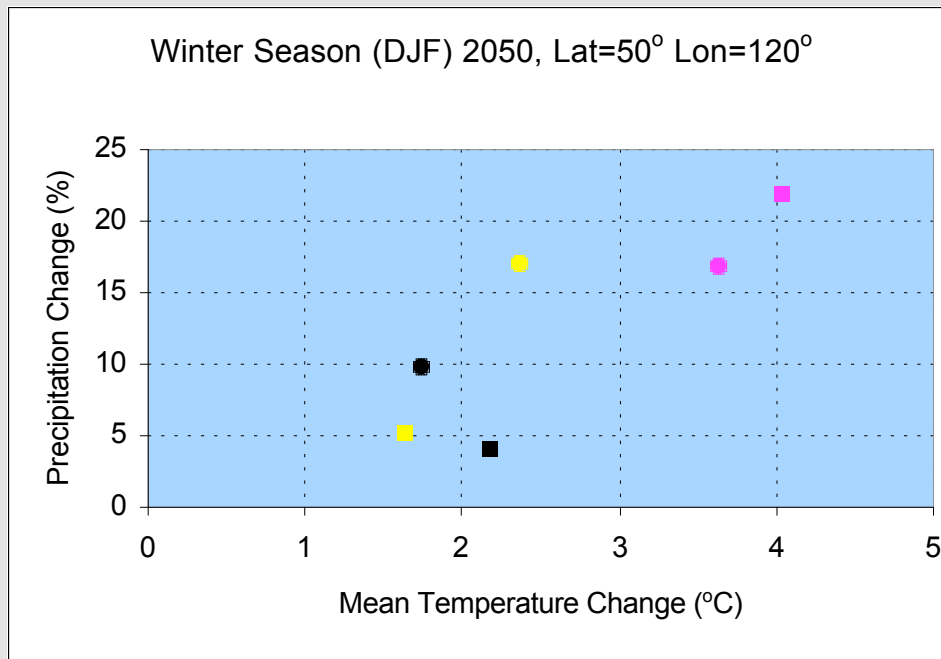
## Proposed PIA 2004-06

- Climate change—Monte Carlo simulations
  - Variability, extremes
- Hydrology—whole cycle
  - Surface
  - Groundwater
  - Land disturbance
- Crop water demand
  - Update
- Fisheries impacts
- Adaptation cost options
  - Subregional estimates
- Regional water policy
- Interactive dialogue on adaptation
  - STELLA software
  - Posters
  - Project website

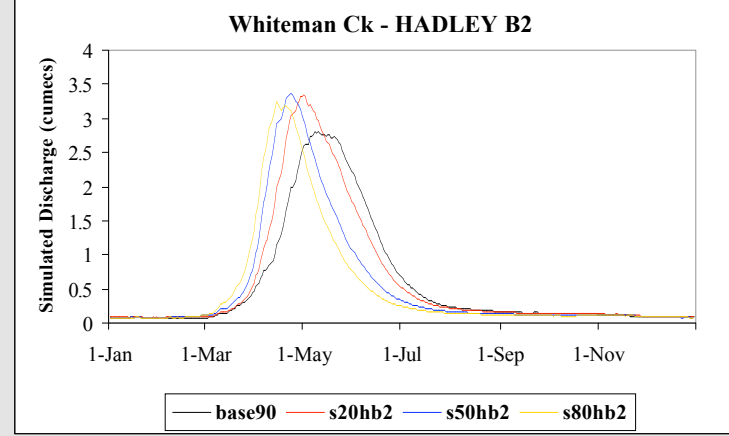
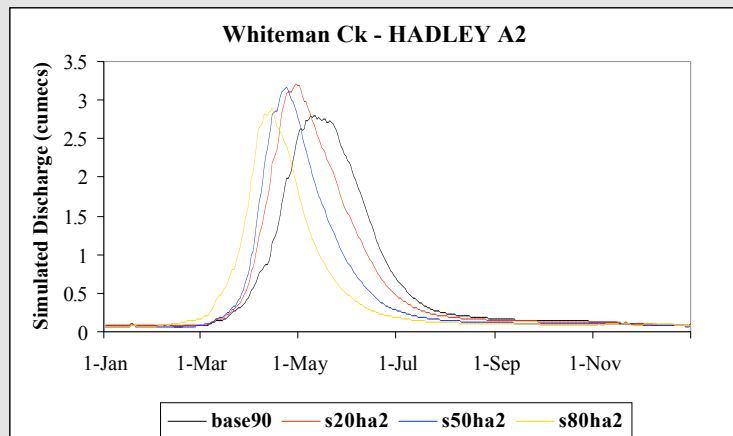
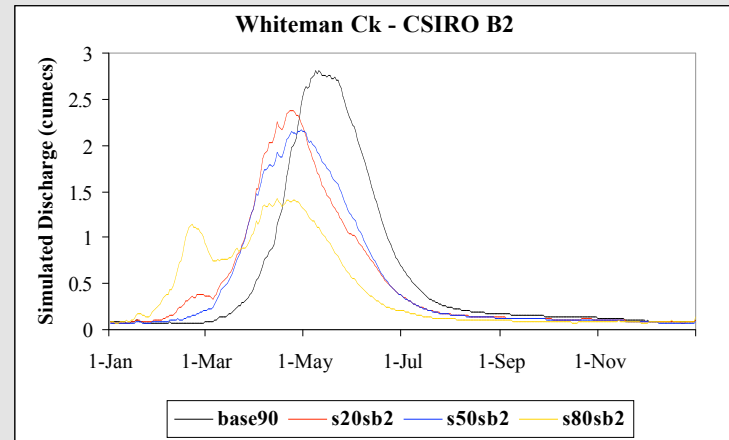
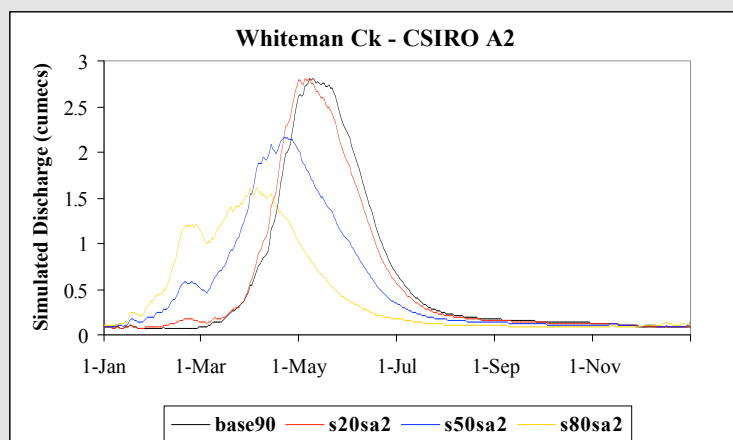
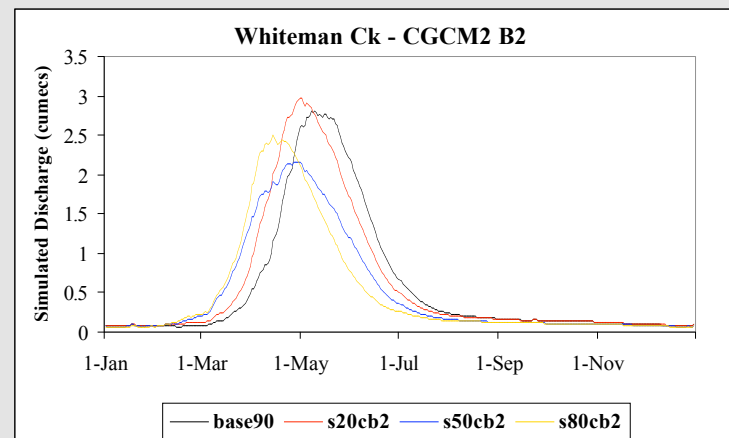
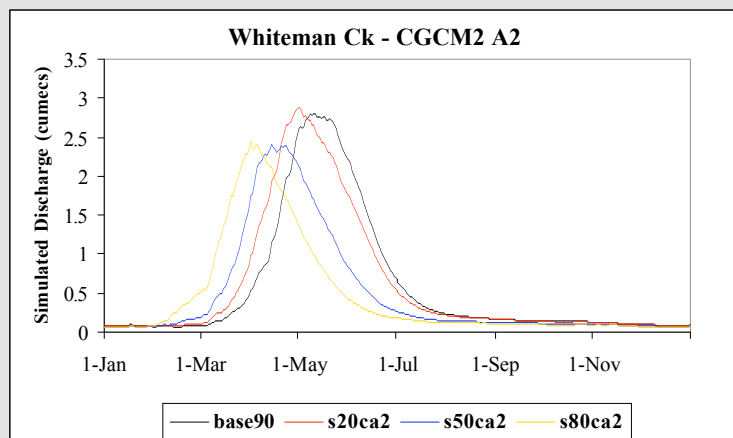


**Structure of the UBC Watershed Model** (*Quick, 1995*). This is a ‘semi-distributed’ model in which the watershed is split into elevation bands

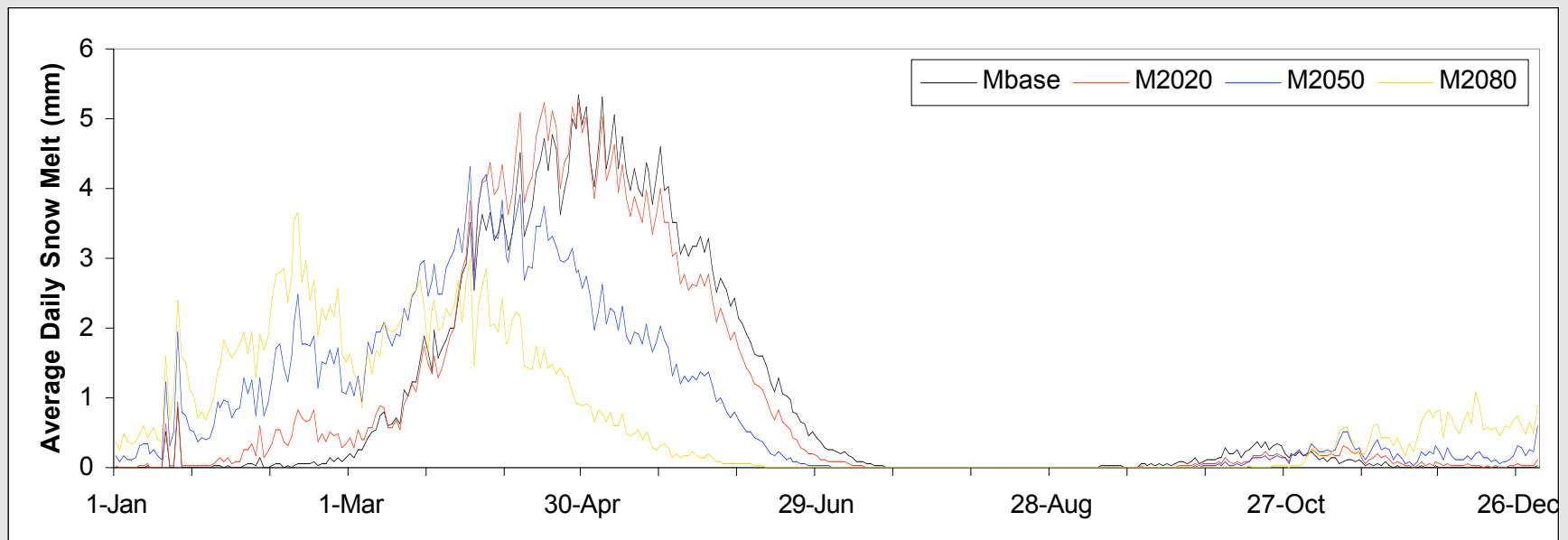
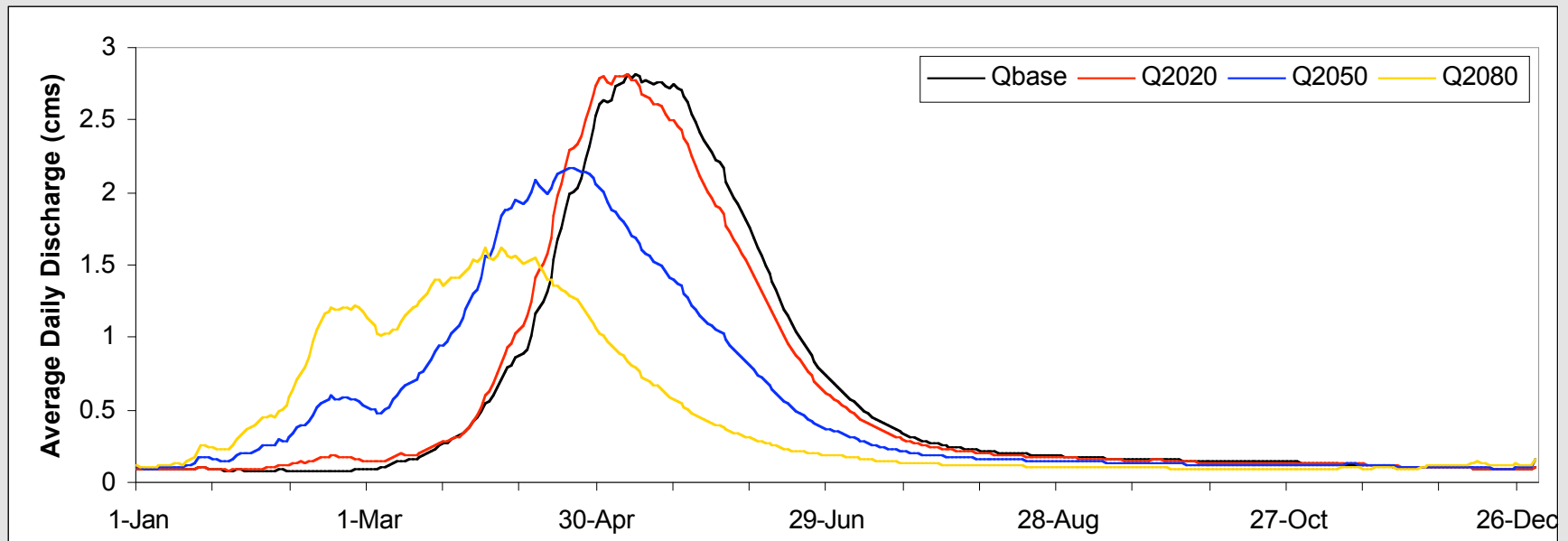
# *Climate Change Scenarios for 50 °N, 120°W*



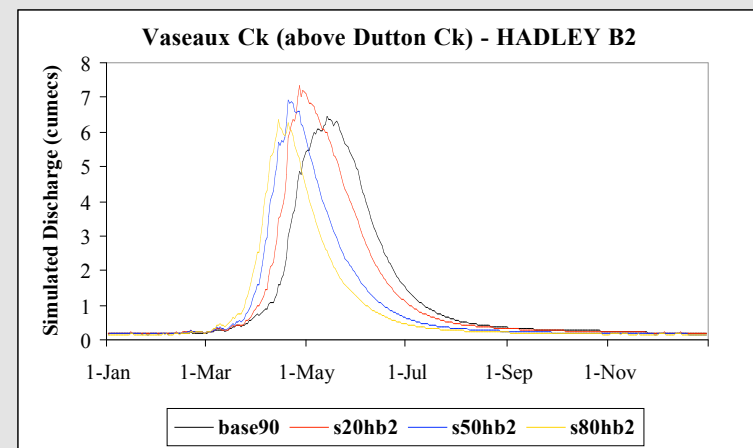
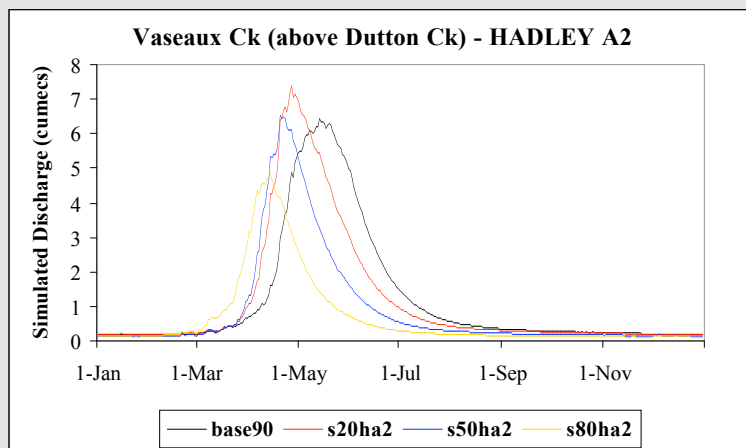
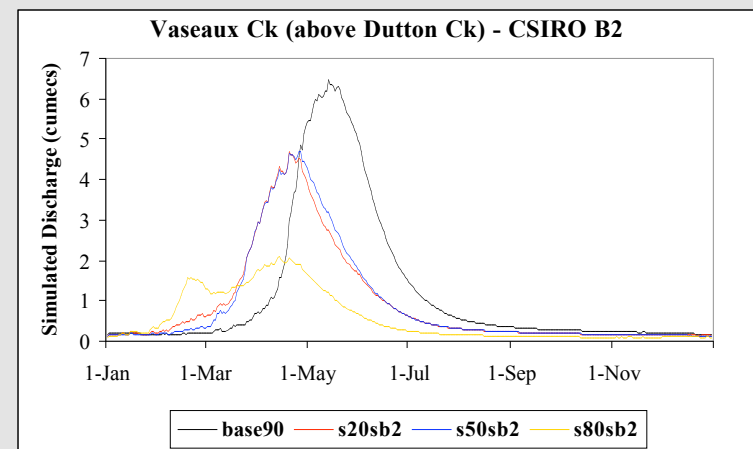
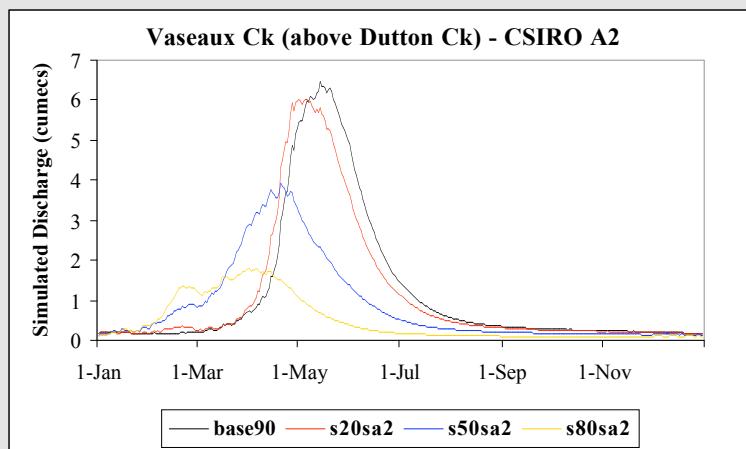
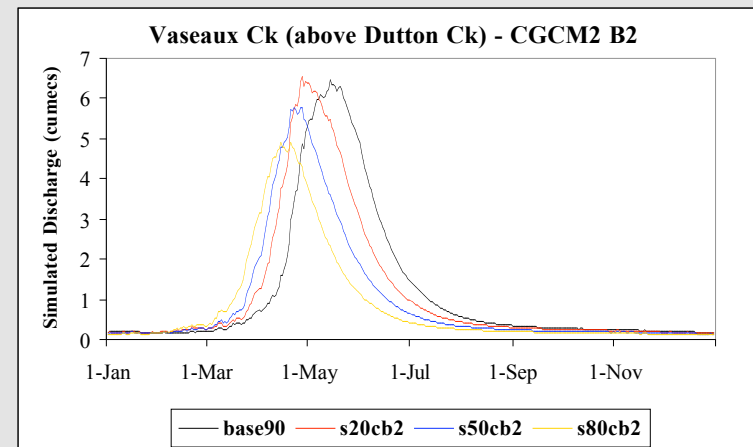
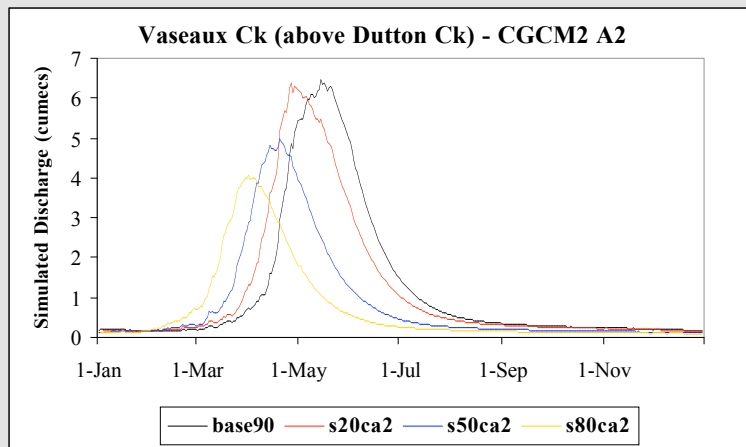
- Legend
- CGCM2 A21
  - CGCM2 B21
  - CSIROMk2 A21
  - CSIROMk2 B21
  - HadCM3 A22
  - HadCM3 B22



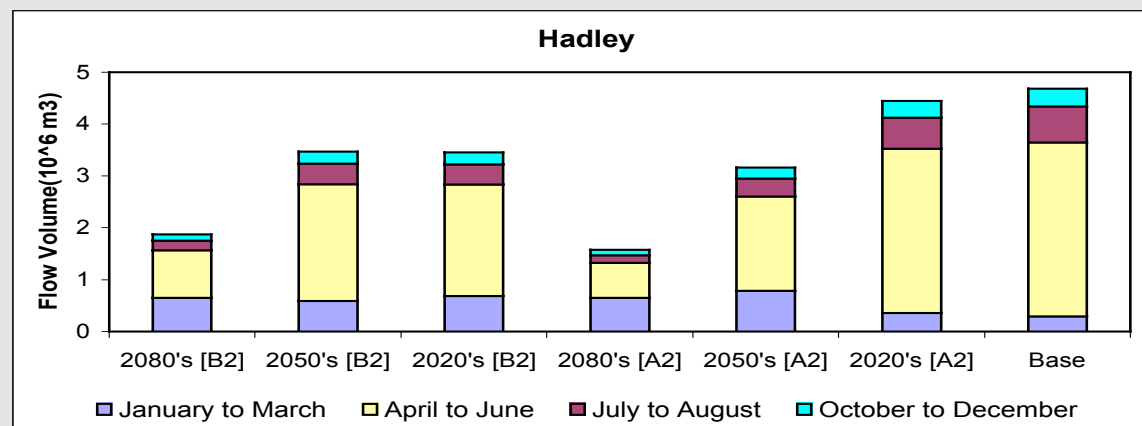
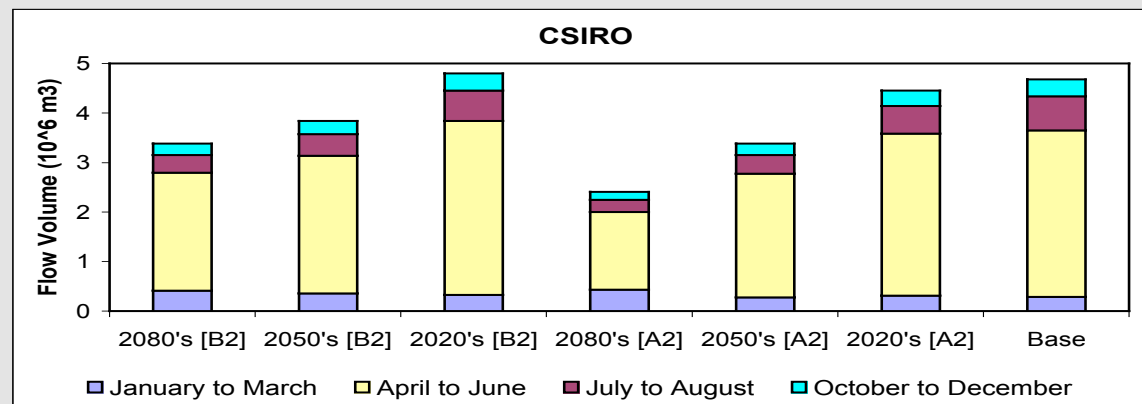
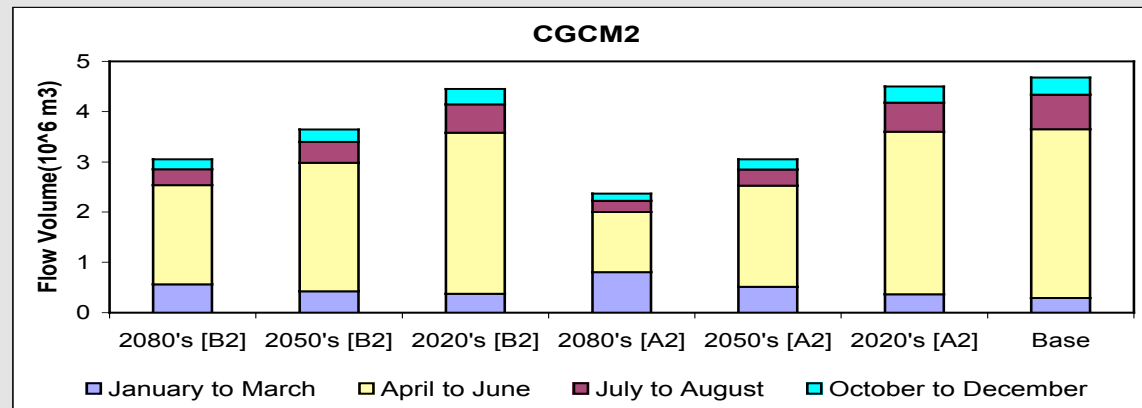
# *Whiteman Ck: CSIRO A2*



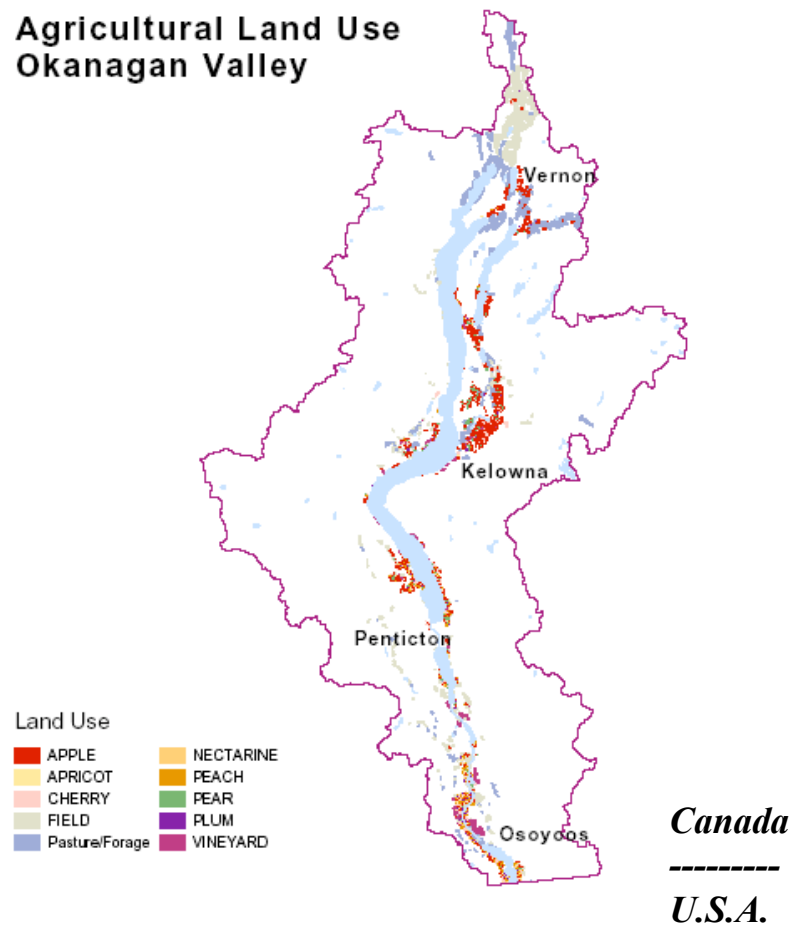




# Base & scenario mean seasonal flow volumes at Ellis Reservoir



## Agricultural Land Use Okanagan Valley



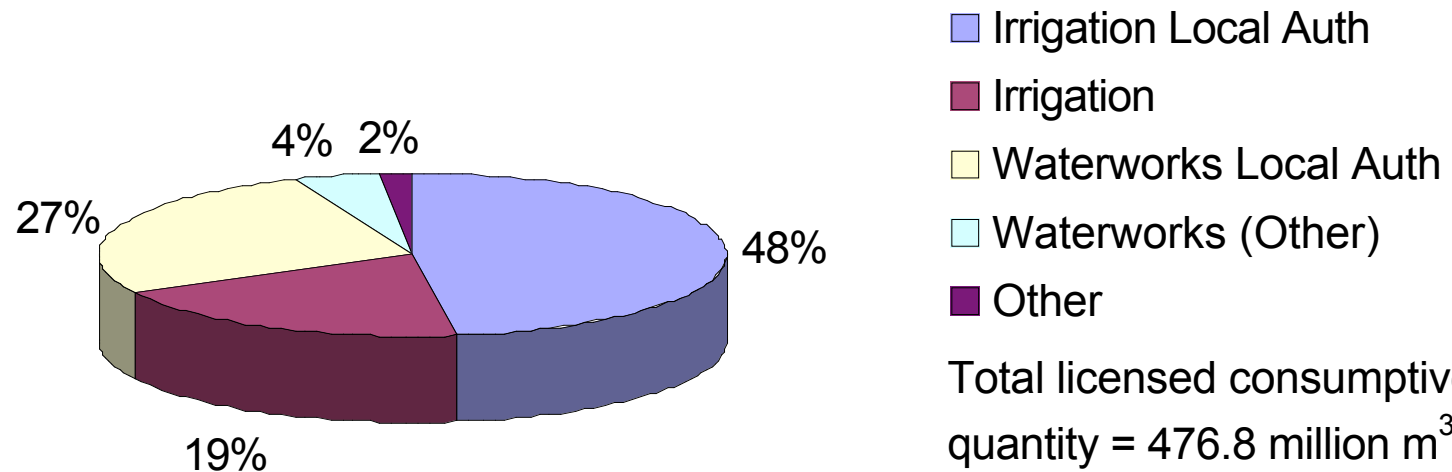
## Water Purveyors Districts Okanagan Valley



## Okanagan Basin Allocation for Consumptive Purposes.

*Total allocation = 1.05 billion m<sup>3</sup>. Number of streams 'fully recorded' = 235 of 300.*

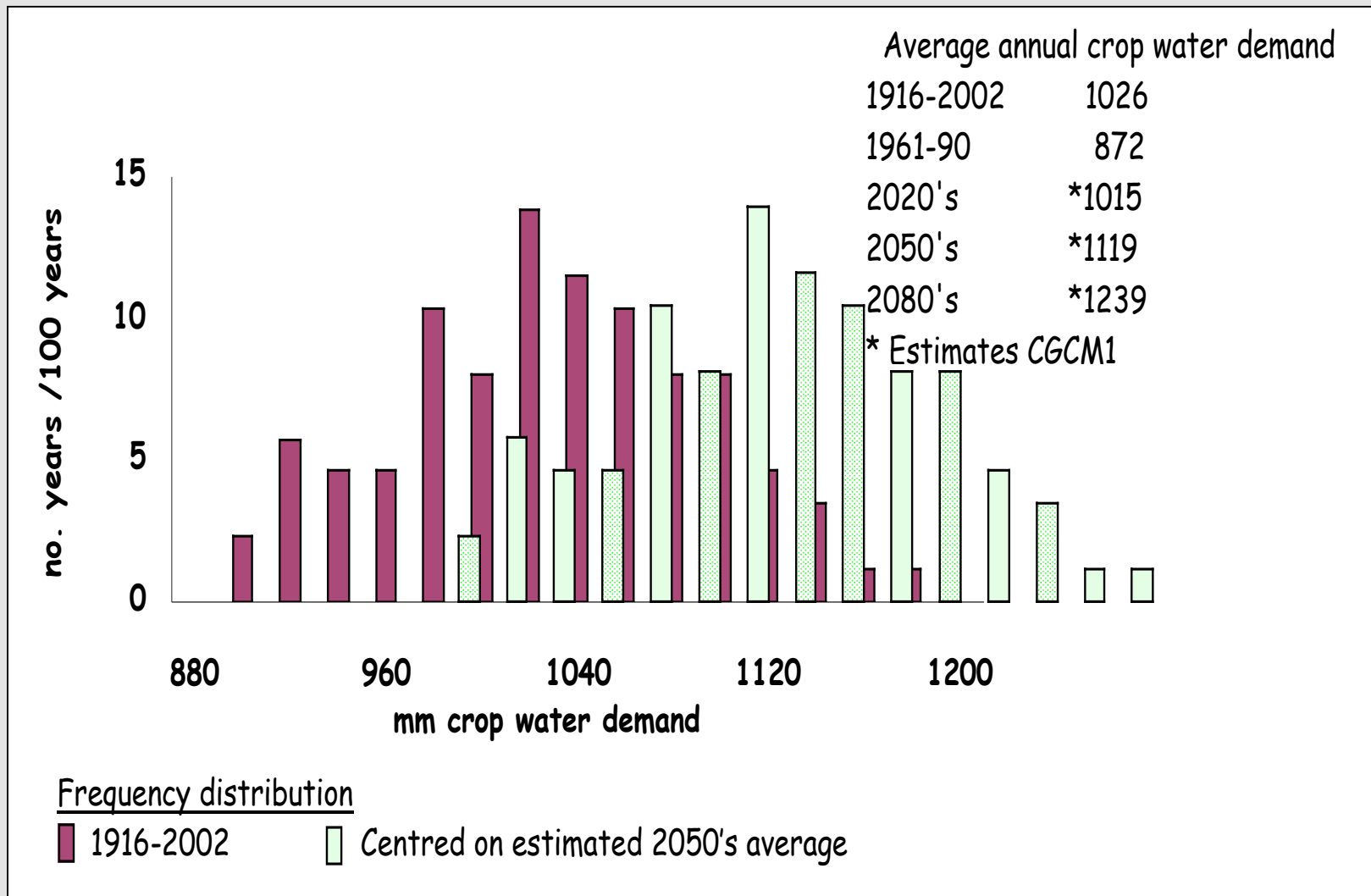
### Okanagan Basin Licensed Consumptive Quantity by Purpose



Total licensed consumptive quantity = 476.8 million m<sup>3</sup>

Source data: Land and Water BC, Water License Query. Accessed July 4, 2002

# Crop water demand for hypothetical hectare of apple at Summerland, for historical and 2050's scenario climate



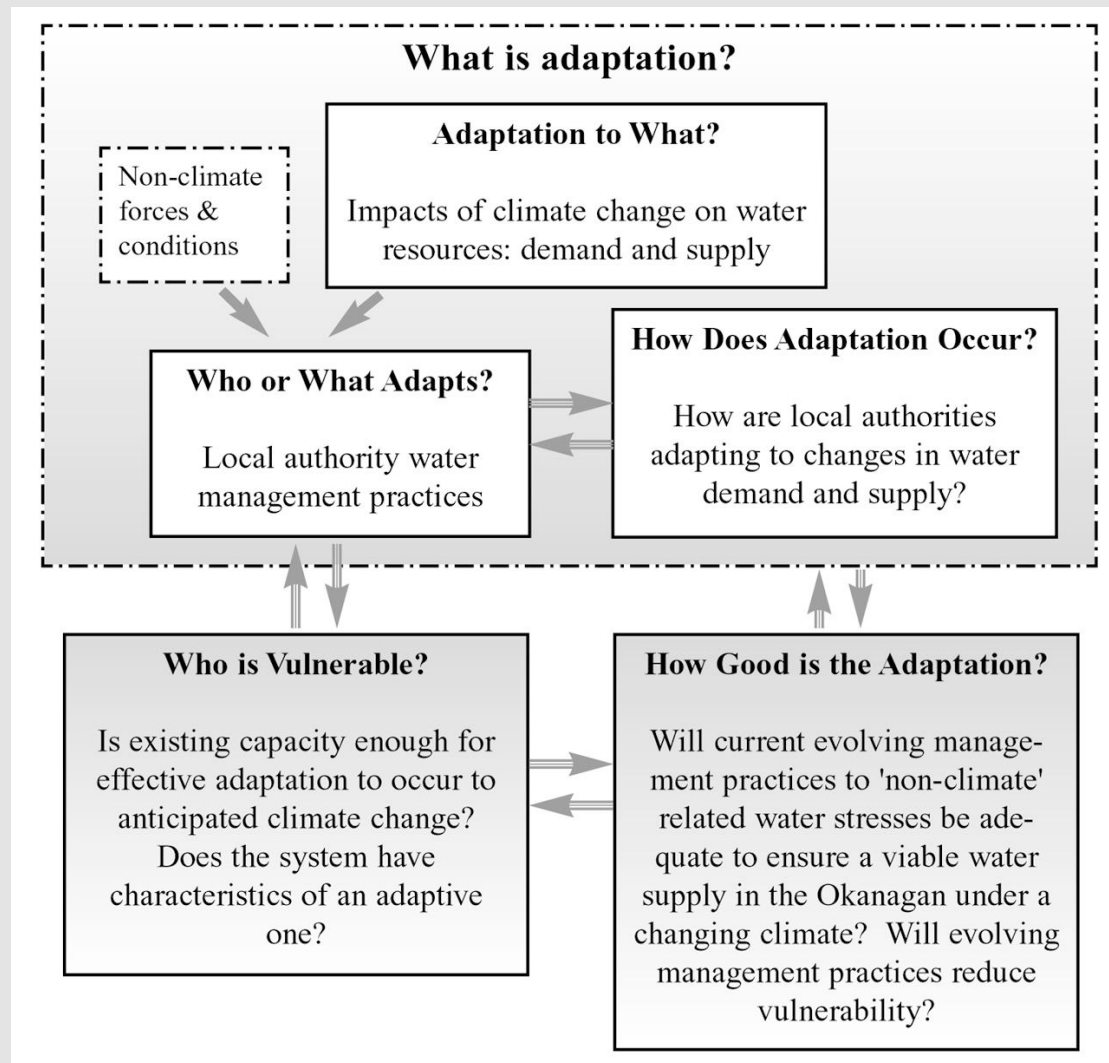


# Costs of Adaptation Options in the Okanagan

	<u>Cost (CAN\$/acre-ft.)</u>	<u>Water saved or supplied</u>
<b><i>Irrigation scheduling:</i></b> -large holdings	\$500	10%
-small holdings	835	10%
<b><i>Trickle irrigation:</i></b> -high demand areas	1500	30%
-medium demand areas	1666	30%
<b><i>Metering:</i></b> -lowest cost	1882	30%
-higher cost	2300-3400	20-30%
<b><i>Public education:</i></b> -large & medium communities	835	10%
<b><i>Leak detection:</i></b> -average	1567	10-15%
<b><i>Storage:</i></b> -lowest cost	600	limited
-medium-high cost	1000-1500	limited
<b><i>Lake pumping:</i></b> -lowest cost	648	0-100%
-low cost (no balancing)	1160	0-100%
-higher cost	2200-2700	0-100%

*1 acre-ft. = 1233.5 m<sup>3</sup>; 1 m<sup>3</sup> = 1000 litres*

# Adaptation is embedded within the local context



# Early Adopters Case Studies

- *Kelowna*—domestic water metering
- *Vernon* – water reclamation program
- *South East Kelowna Irrigation District (SEKID)* – metering, scheduling and educational activities for irrigators
- *Greater Vernon Water Utility* – amalgamation of Armstrong, Vernon, Coldstream & NORD

# Factors that Influence Adaptation Decision Making

- ***Drivers***—population & development pressures, funds or regulations from other levels of government, internal concerns, etc.
- ***Enabling factors*** – staff/management/political interest, previous experience (e.g. pilots), etc.
- ***Barriers*** – costs, attitudes, control, acceptance, etc.
- ***Obstacles*** – attitudes, communication problems, who pays, etc.
- ***Conflict resolution*** – education, incentives, scientific evidence/information, comfortable governance/management structure, etc.

# **Lessons from Early Adopters**

## **Case Studies**

- Signal detection and evaluation (does the ‘signal’ mean that there is a ‘problem’?)
- Access to funds
- Desire to act; a local champion
- Initial conditions (e.g. state of finances, local awareness)



# Next Steps?

- Complete crop water demand projections
- Focus group sessions to consider potential adaptation portfolio, and its implementation
  - Homogeneous groups during fall 2003
  - Heterogeneous groups during winter 2003-04
- Interim Report available at SDRI-UBC site:  
*<http://www.sdri.ubc.ca>*
- Final report to be released summer 2004