

Adapting to Increased Climatic Variability

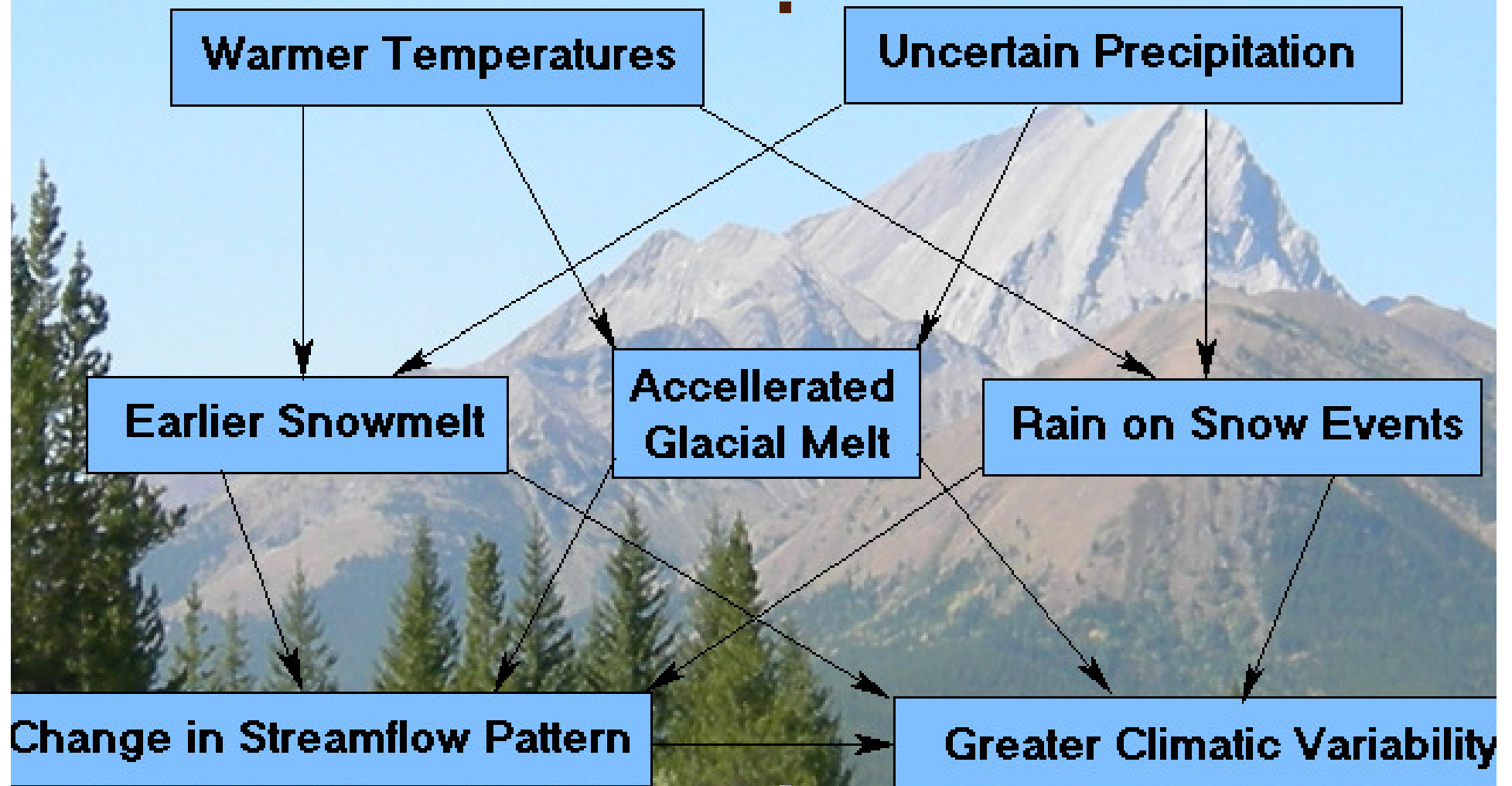
Hans Schreier

INSTITUTE FOR RESOURCES & ENVIRONMENT, UBC



Columbia Basin Trust: April 14-16, 2008

Expected Impacts of Climate Change in the Columbia Basin



Climate Change and Land Use Change Interact

Climate Change



Land Use Change



What you as an individual can do to adapt to increased climatic variability



What You Can Do in the Columbia Basin to Adapt

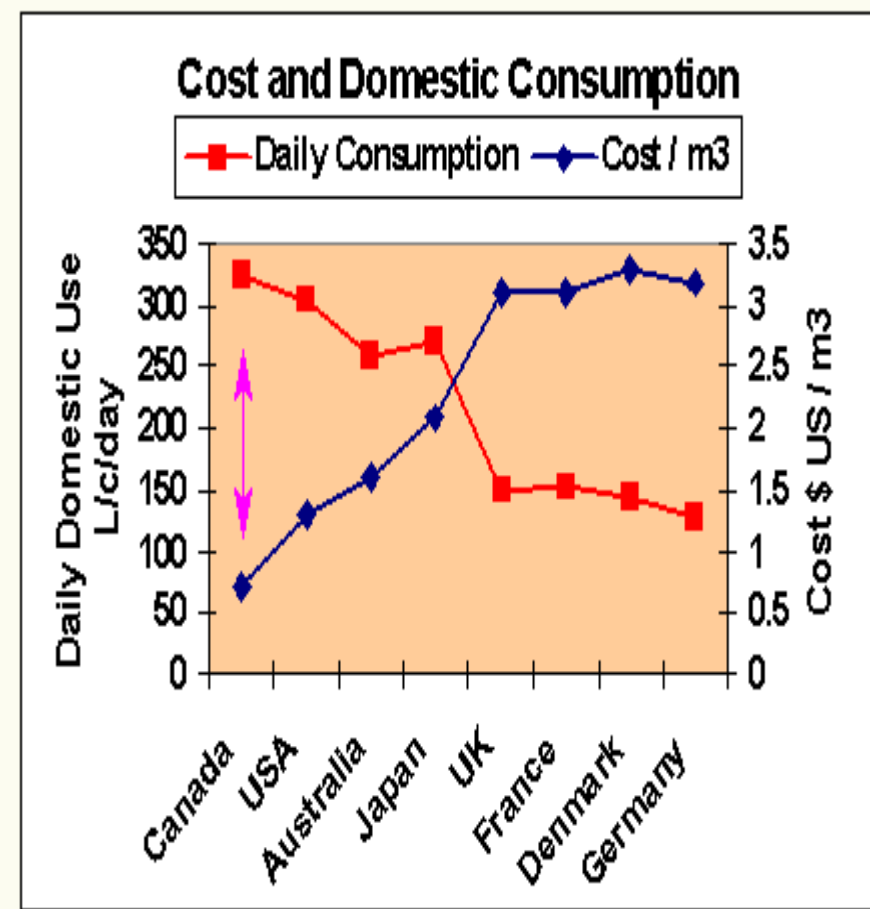
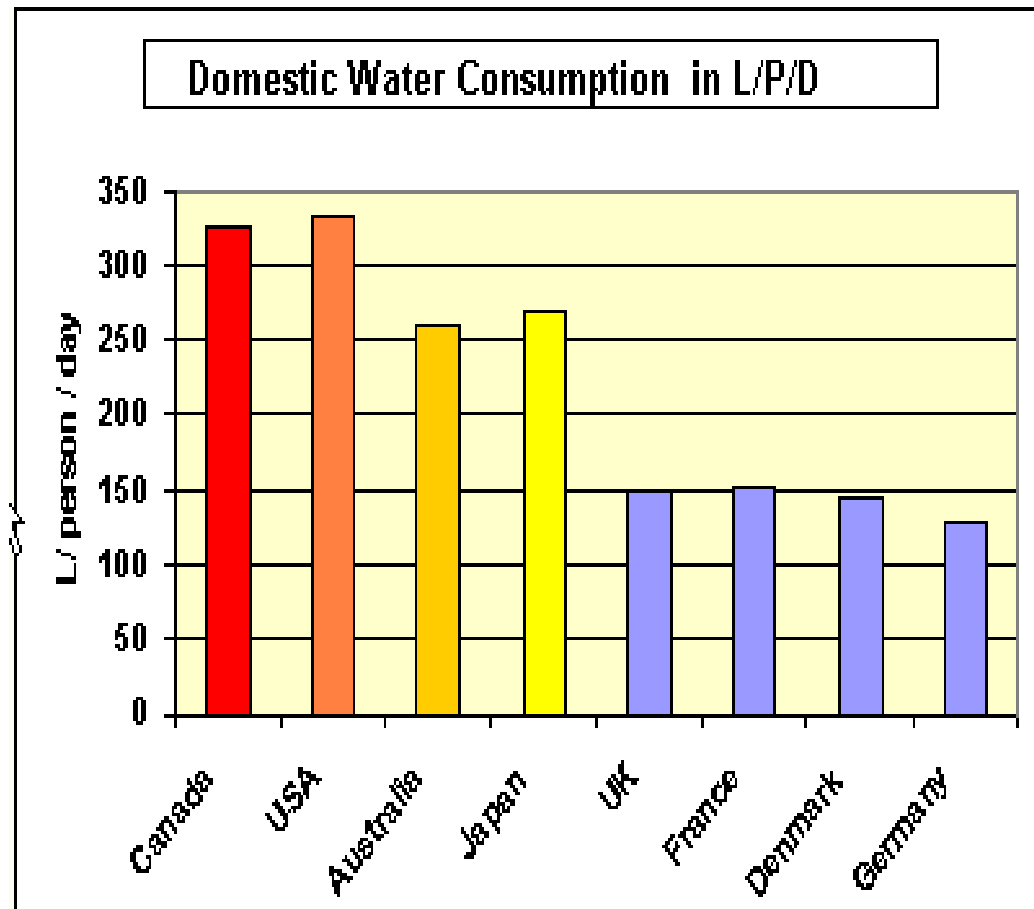
SCALE	TRADITIONAL APPROACH	INNOVATIVE APPROACH
Individual Site (Property) Indoor Outdoor	Waste Water	Water Conservation
	Drain & Remove (Piping)	Retain Rain on Site
Neighbourhood (Subdivision)	Drain & Remove (Piping)	Store & Delay Runoff
Watershed	Store Runoff (dams) Channalize Flow Protective Structures	Delay & Reduce Floods, Large Buffer Zones & BMP's

Innovative & Efficient Domestic Water Use



Site or Property	Innovations
Indoor Collect Rain & Reuse Water Conservation Reduce Footprint	Water Metering (Smart Meters) Low Flush Toilets Water Efficient Appliances Don't Drink Bottled Water
Outdoor Keep Rain on Site Detention & Infiltration Focus on Light Rain	Green Roof Roofwater Harvesting and Re-Use Minimize Impervious Surfaces Pervious Pavement 30 cm Topsoil Requirements Encourage Urban Tree Planting

Domestic Water Consumption & Cost



Bottled Water: See Fine Print
No information on Na and Nitrate but information on Fat content

DASANI

EAU REMINÉRALISÉE
OSMOSE INVERSÉE - NON GAZEIFIÉE
MATIÈRES DISSOUTES .35ppm

WATER, MAGNESIUM SULPHATE, POTASSIUM CHLORIDE, SALT, OZONE. EAU, SULFATE DE MAGNÉSIUM, CHLORURE DE POTASSIUM, SEL, OZONE. ©/MD. REGISTERED TRADE MARK OF/MARQUE DÉPOSÉE DE THE COCA-COLA COMPANY. USED UNDER LICENCE/UTILISÉE SOUS PERMIS. MANUFACTURED BY COCA-COLA BOTTLING COMPANY/FABRIQUÉE PAR LA COMPAGNIE D'EMBOUEILLAGE COCA-COLA, TORONTO, ONTARIO M4H 1B8. CONSUMER INFORMATION/ RENSEIGNEMENTS: 1-800-438-2653

RETURN FOR REFUND WHERE APPLICABLE
RETOURNER POUR REMBOURSEMENT
LÀ OU APPLICABLE

DASANI

REMINERALIZED WATER
REVERSE OSMOSIS - NON-CARBONATED
TOTAL DISSOLVED SOLIDS .35ppm



au Vive des Volcans

volvic, Eau Minérale Naturelle

volvic

Eau Minérale Naturelle

50cl

le haut de la bouteille et dans la se han qui suit son ouverture.
Bouteille exclusivement destinée à contenir l'eau minérale de Volvic.
Conditionnement autorisé par le Ministère de la Santé.
Sources Clairvic - Société des Eaux de VOLVIC
63530 VOLVIC PUY DE DÔME FRANCE



3 057640 117008













Our spring water is one of the naturally purest spring waters bottled in the world with one of the finest mineral contents. It is bottled at the source in a modern facility and tested continually to prove its purity. Enjoy a refreshing drink of our natural spring water and you will agree...

The Difference is Clear.

Product of Canada / Produit du Canada



Trump Ice

Natural Spring Water
Eau de Source Naturelle
Ozonated / Ozonée

Fluoride ions: 0.06ppm / ions de Fluorure: 0.06ppm

Nutrition Facts

Serving Size 8 fl. oz. (240 ml)
Servings per Container: About 2

Amount Per Serving	% Daily Value*
Calories 0	
Total Fat 0g	0%
Sodium 0mg	0%
Total Carbohydrates 0g	0%
Protein 0g	0%
Potassium 0g	0%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may vary.

Site (Property) Scale : Green Roofs

Tradition



Innovations



Don't Drain Roofwater, Harvest it and Reuse it

Site: Roofwater Harvesting



Tradition

Roofwater into
Stormwater Drain

Green Roofs

Rain Harvesting

Imperviousness

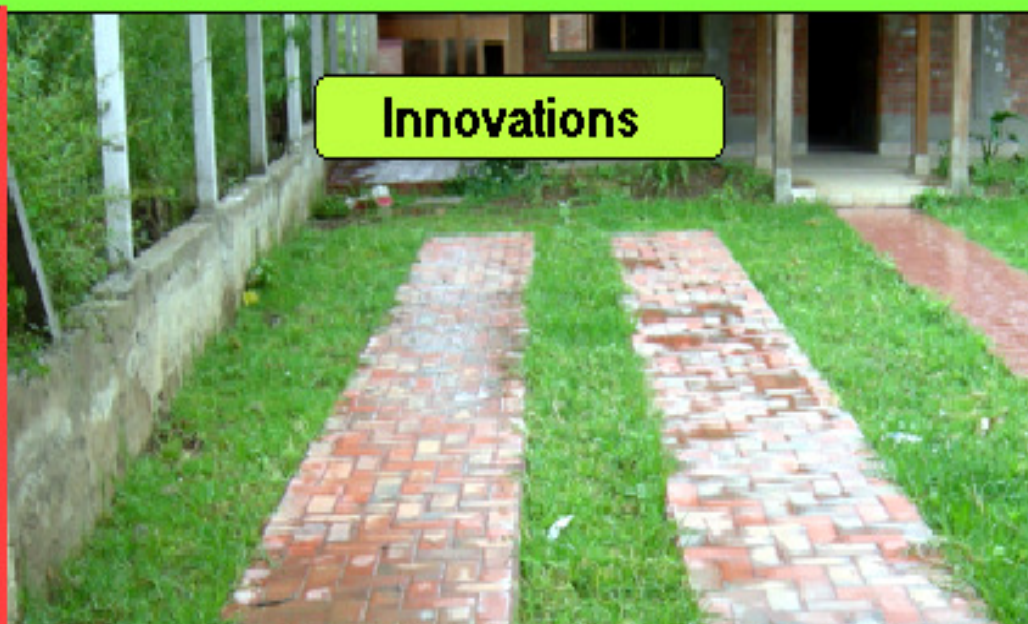


Site (Property) Scale : Minimizing Imperviousness

Tradition



Innovations



Green Roofs

Rain Harvesting

Imperviousness



Site: Topsoil and Xeriscaping

Tradition



Topsoil

Trees

**Add at least 30-50 cm
of top soil before adding turf**



**It reduces irrigation
needs by 30-40%**

Innovation



Xeriscaping



Urban Trees can Intercept & Evapotranspire 30-50% of the Rainfall

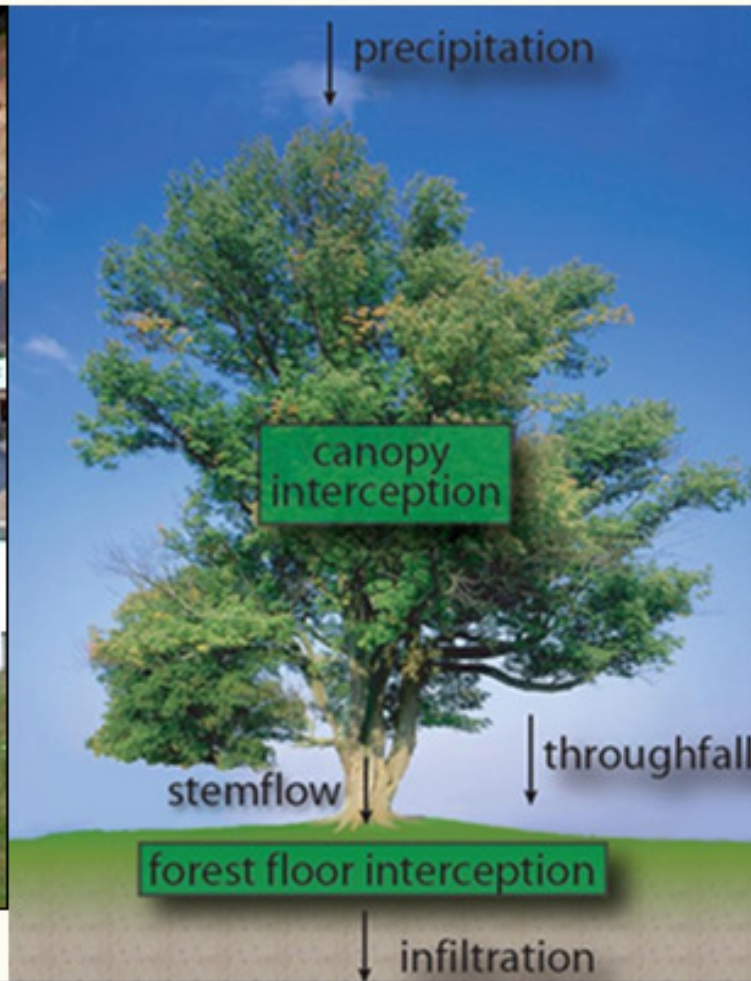
Site: Topsoil and Xeriscaping

Tradition



Topsoil

Trees



Innovation



Neighborhood Scale

Delay Runoff
Detention & Filtration
Focus on Heavy Rain

Innovations

Smaller Roads (no Curbs & Gutters)
Swales for Road Runoff
Detention Ponds (Wetlands)
Pervious Pavement
Innovative Parking Lots

Neighborhood: Small Roads (no Curbs or Gutters)

Tradition



Innovations



Small Roads

Swales

Detention &

Pervious

Parking Lots



Neighborhood Scale : Swales

Tradition



Small Roads

Swales

Detention &

Pervious

Parking Lots



Innovation



Neighborhoods : Detention Ponds and Wetlands

Tradition



Small Roads

Swales

Detention &

Pervious

Parking Lots

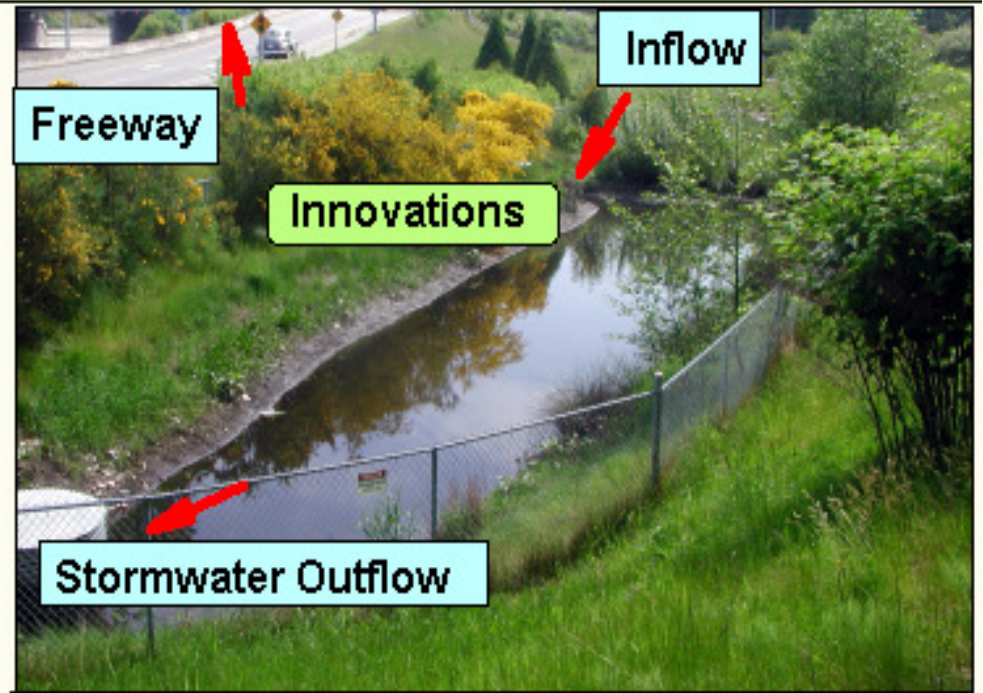


Freeway

Innovations

Inflow

Stormwater Outflow



Neighbourhoods: Pervious Parking Lots

Tradition

Innovation



Small Roads

Swales

Detention &

Pervious

Parking Lots

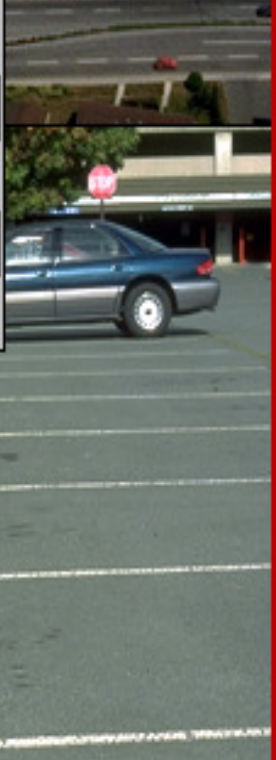


Tradition

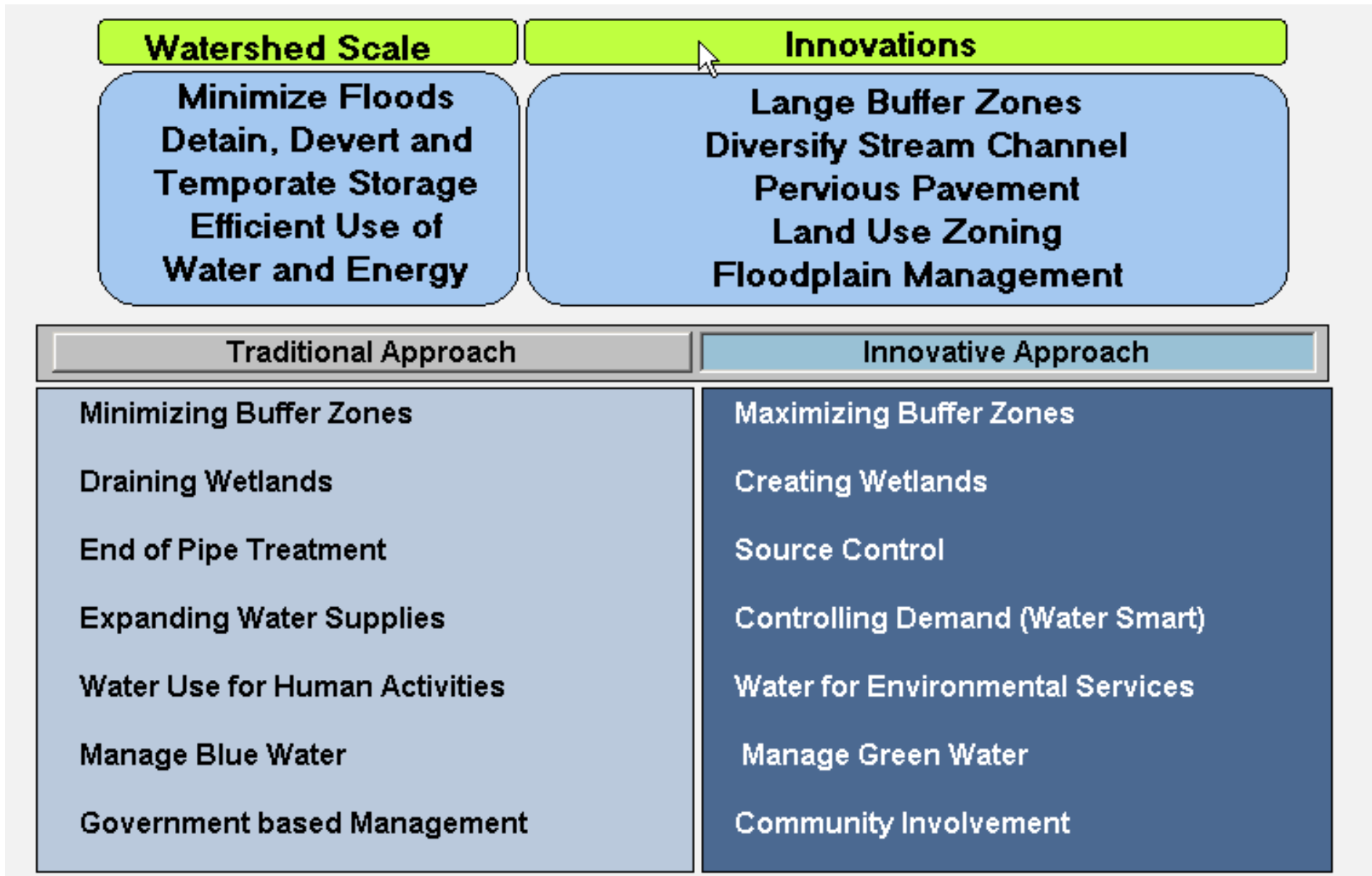
Innovations



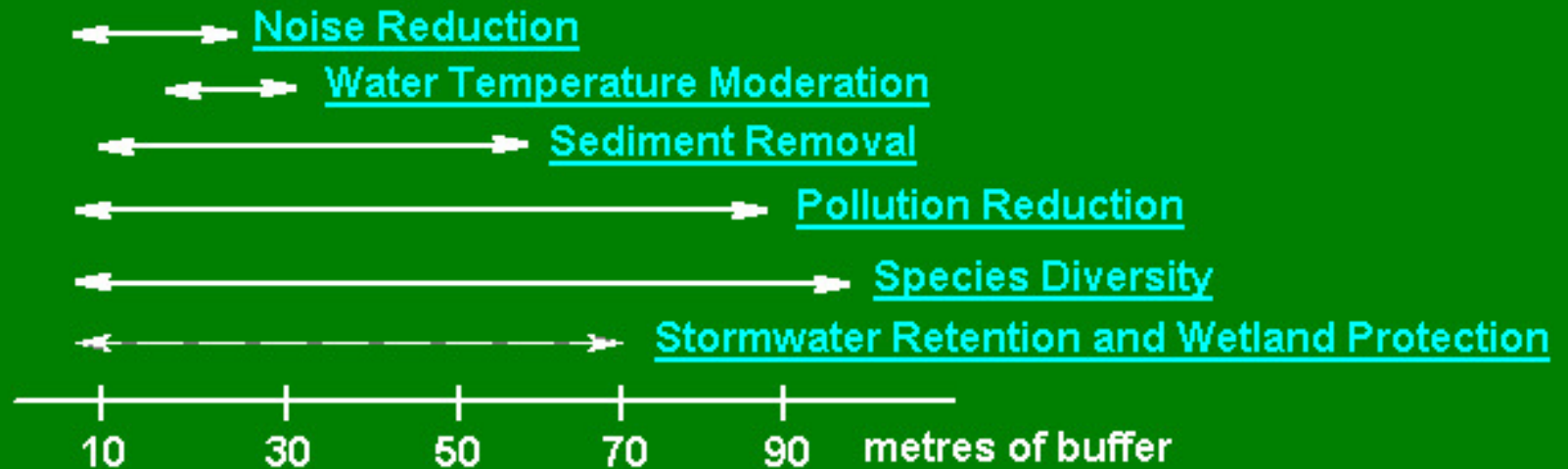
Small Roads
Swales
Detention &
Pervious
Parking Lots



At the Watershed and Regional Scale



Wide Buffer Zones for all Buffer Function to Work



Poor Buffers

Buffer
functions





**Constructed Wetlands in Cities
to retain and purify stormwater**

Water Needs for Agriculture (70% of Freshwater Use)



We need to increase food production by 50% over the next 40 years!

Can we increase the irrigated areas in agriculture ?

Can we produce more food from rainfed agricultural land ?

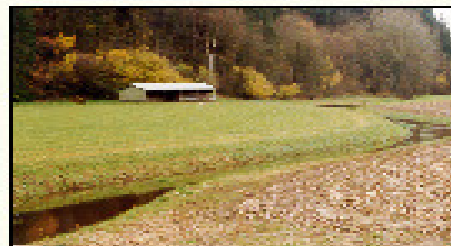
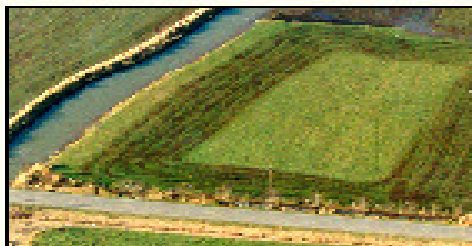
When:

- 1. Demand for water for other uses is increasing**
- 2. The agricultural land base is shrinking**
- 3. Climatic variability is increasing**
- 4. Soil and water degradation problems are increasing**



New Zealand

Beneficial Management Practices in Agriculture – What not to do!





Resource roads are the greatest source of sediments

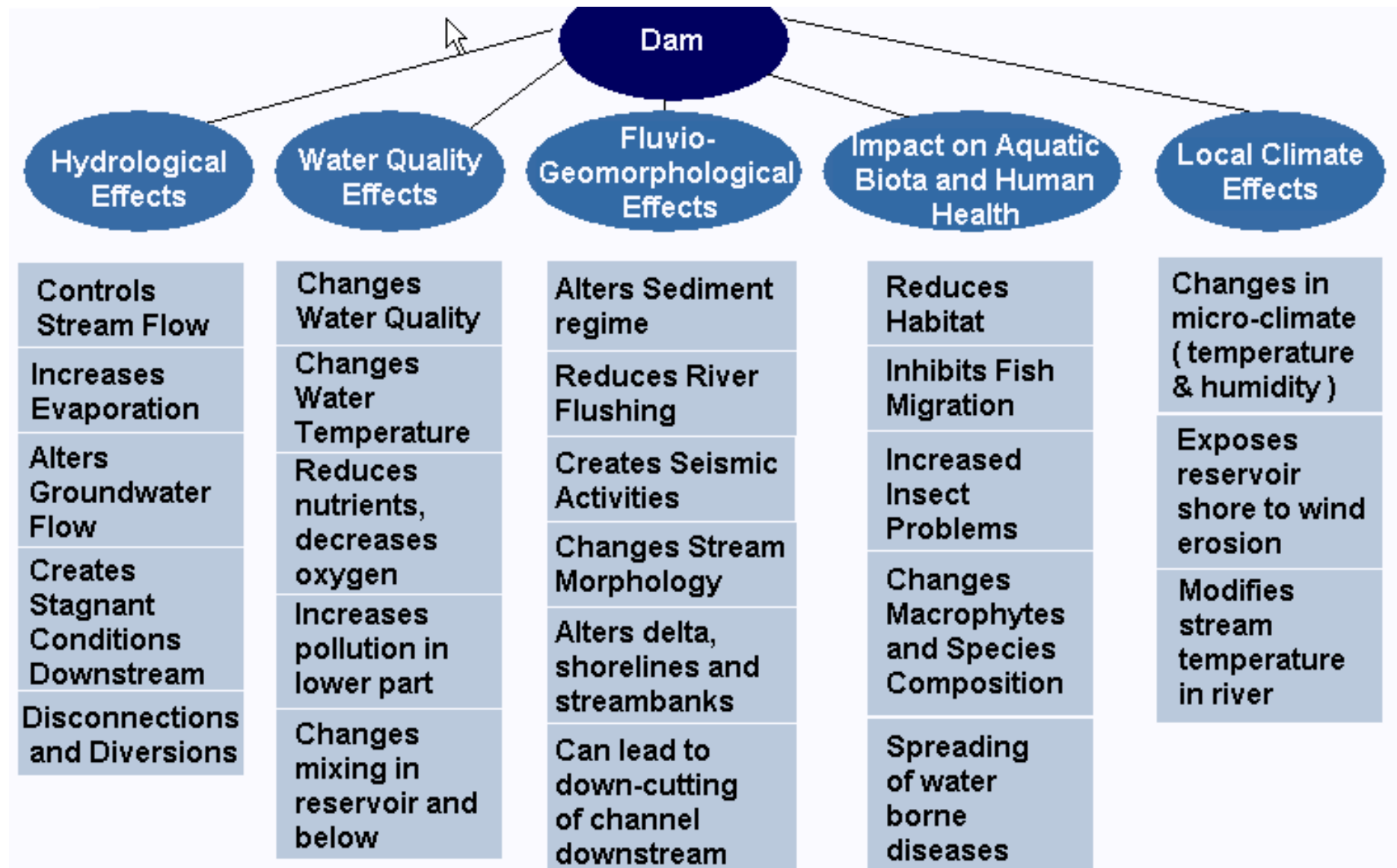
British Columbia has:

200,000 km of paved roads but

450,000-500,000 km of resource roads

Sediment Sources

Impacts of Dams on Stream Ecosystem



Snow Making Requires Large Quantities of Water 25-30% Sublimates

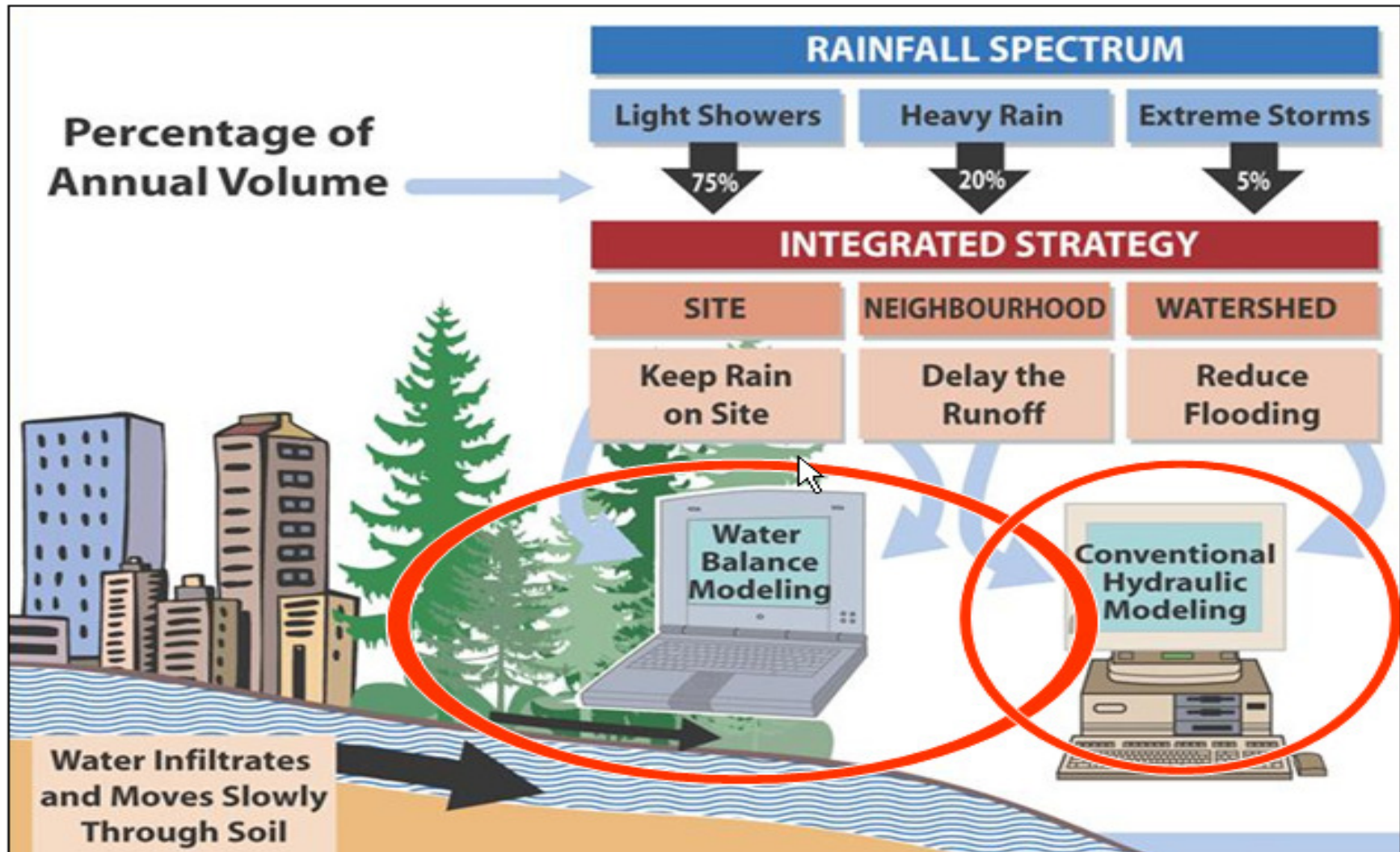


Snow Security

Reducing the Risk?

Snow Making Machines Ready to Assure a Successful Season

Water Balance Modelling (See: Waterbucket.BC)



Non-point sources of pollution and cumulative effects

