DRINKING WATER WATERSHED PROTECTION

Public Information Meeting
October 10th 2013
Parksville, BC

REGIONAL DISTRICT OF NANAIMO

City of Parksville

CITY OF NANAIMO
THE HARBOUR CITY

PRESENTATION

1. DWWP update
   - → Program 1
   - → Program 2
   - → Program 3
   - → Program 4
   - → Program 5
   - → Program 6
   - → Program 7
2. Water Budget
   - → Background
   - → Overview
   - → Methodology
   - → Findings
   - → Conclusion
3. Watershed Management
   - → What & Why
   - → How & Who

REGIONAL DISTRICT OF NANAIMO

Introduction

In 2008, residents voted to establish a Drinking Water and Watershed Protection Service…

Today, we are going to talk about where we are:

- **DWWP program update**
- **Water Budget Study review**
- **Integrated Watershed Management Planning**

DRINKING WATER WATERSHED PROTECTION

Introduction: Partnerships

Our program is founded on partnerships and collaboration

Municipalities:

City of Parksville

CITY OF NANAIMO THE HARBOUR CITY

District of Lantzville

The public: residents, community associations, streamkeeper groups, professionals, students.

Other governmental organizations:

BRITISH COLUMBIA The Best Place on Earth

Natural Resources Canada | Ressources naturelles Canada

Canada

Other RDN departments:

REGIONAL DISTRICT OF NANAIMO

Sustainability, Wastewater, Rec & Park

Introduction: Program development

2008

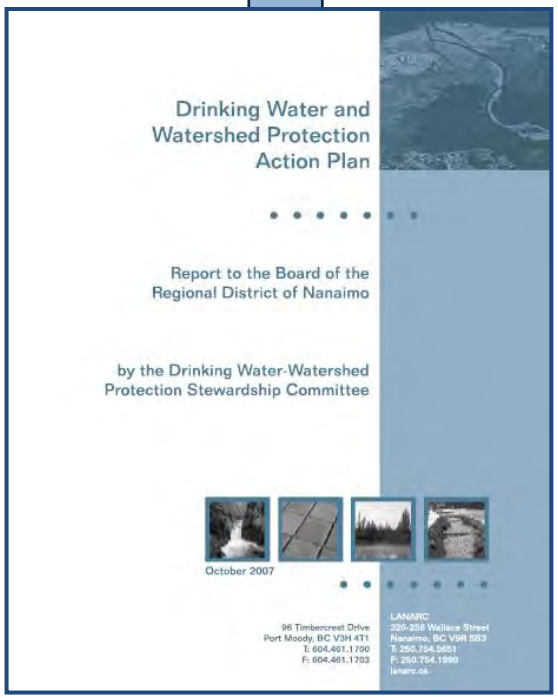
The RDN became **the first regional government in British Columbia to start a Drinking Water & Watershed Protection service**

2009-Present

The DWWP is guided by a **technical advisory committee** of experts from: forestry, hydrogeology, academia, community stewardship, fisheries, water services

The program is guided by the an Action Plan that outlines the key goals and objectives

7 Program Actions



1. DWWP Program Update

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REGIONAL DISTRICT OF NANAIMO

PRESENTATION

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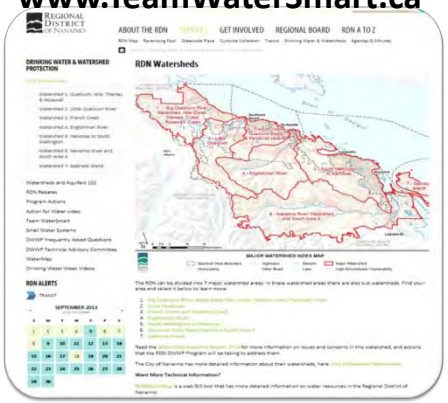
DWWP update: Program 1

Public Awareness and Involvement

- Free Workshops
- Websites
- Community Booth
- Home Visits
- School Program

wellSMART

www.TeamWaterSmart.ca



we practice watersmart because every drop counts irrigation

www.RDNgetinvolved.ca

REGIONAL DISTRICT OF NANAIMO

DWWP update: Program 1

Public Awareness and Involvement

School Program: Fieldtrips

From the classroom….

To the watershed…..

2014 – field trips for Gr. 4 & 5

- Nanaimo River watershed
- Englishman River watershed

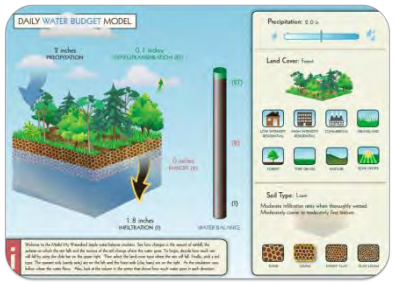
PRESENTATION

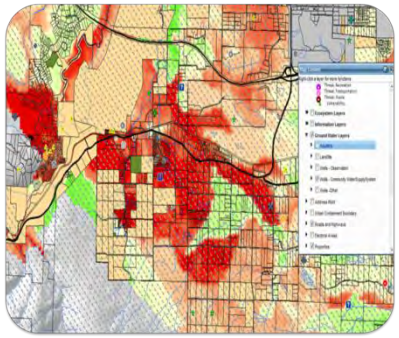
REGIONAL DISTRICT OF NANAIMO

DWWP update: Program 2

Water Resources Inventory & Monitoring

- Water Budget Study
- Water Map
- Provincial Observation Well Network Expansion
- Volunteer Well Level Monitoring
- Community Watershed Monitoring





PRESENTATION

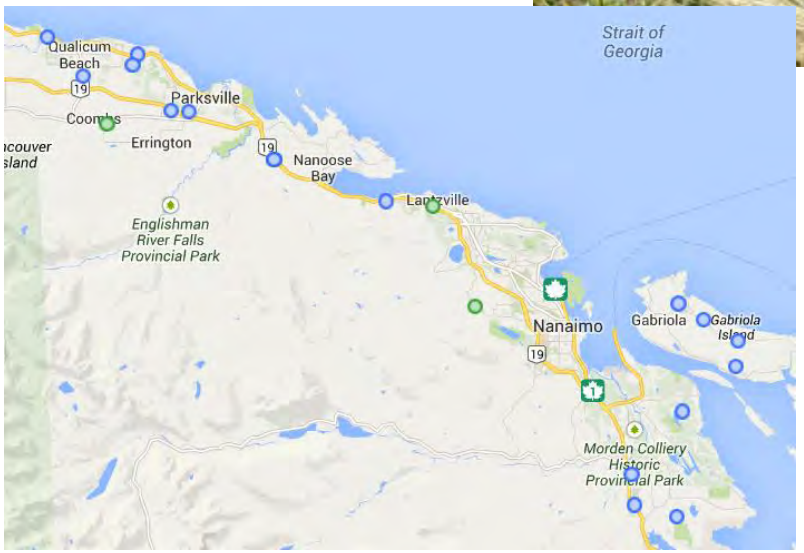
REGIONAL DISTRICT OF NANAIMO

DWWP update: Program 2

Water Resources Inventory & Monitoring: Highlights

Provincial Observation Well Network Expansion

Groundwater monitoring



Volunteer Well Level Monitoring

PRESENTATION

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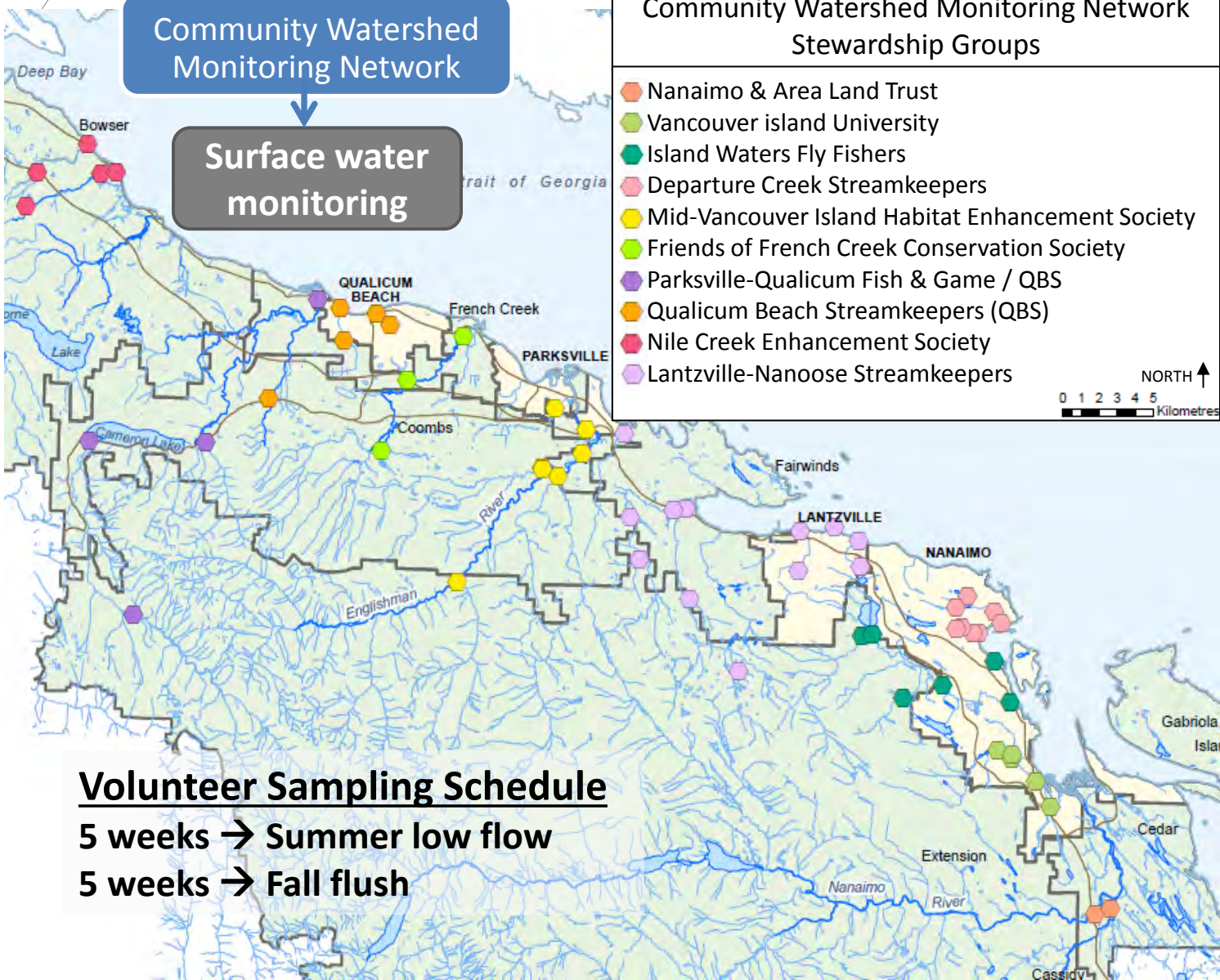
DWWP update: Program 2

Water Resources Inventory & Monitoring: Highlights

Community Watershed Monitoring Network

Surface water monitoring



Volunteer Sampling Schedule

5 weeks → Summer low flow

5 weeks → Fall flush

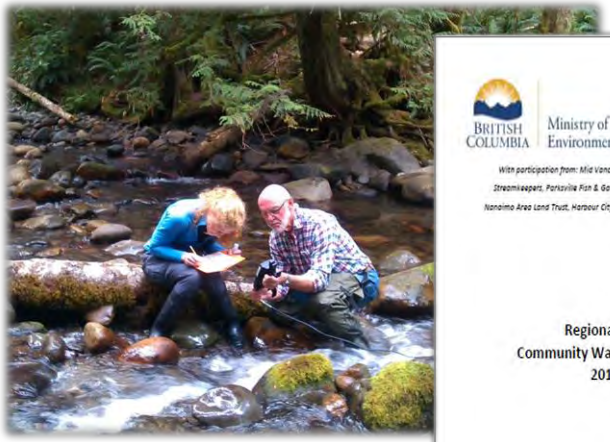
PRESENTATION

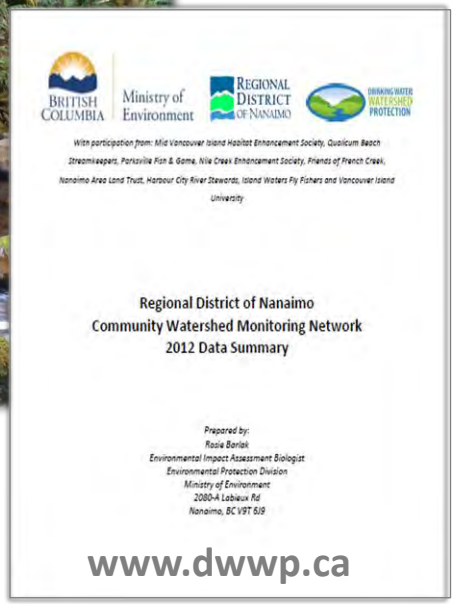
REGIONAL DISTRICT OF NANAIMO

DWWP update: Program 2

Water Resources Inventory & Monitoring: Highlights

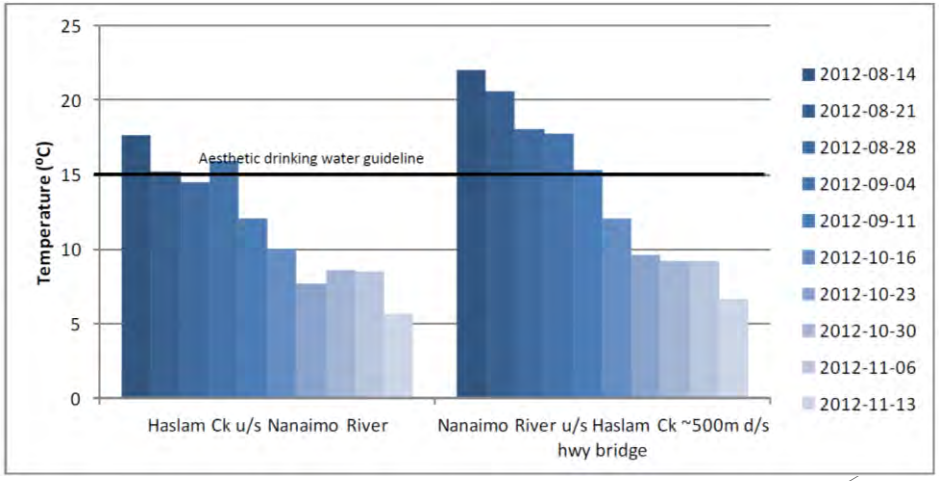
Community Watershed Monitoring Network





Measurements

- **Temperature**
- **Turbidity**
- **Dissolved Oxygen**
- **Specific Conductance**



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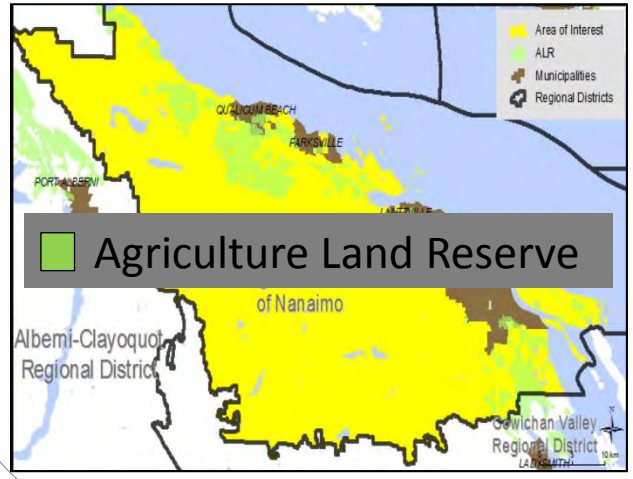
DWWP update: Program 3

Land Use Planning & Development

Agricultural Water Demand Model



Yellow Point Development Permit Area

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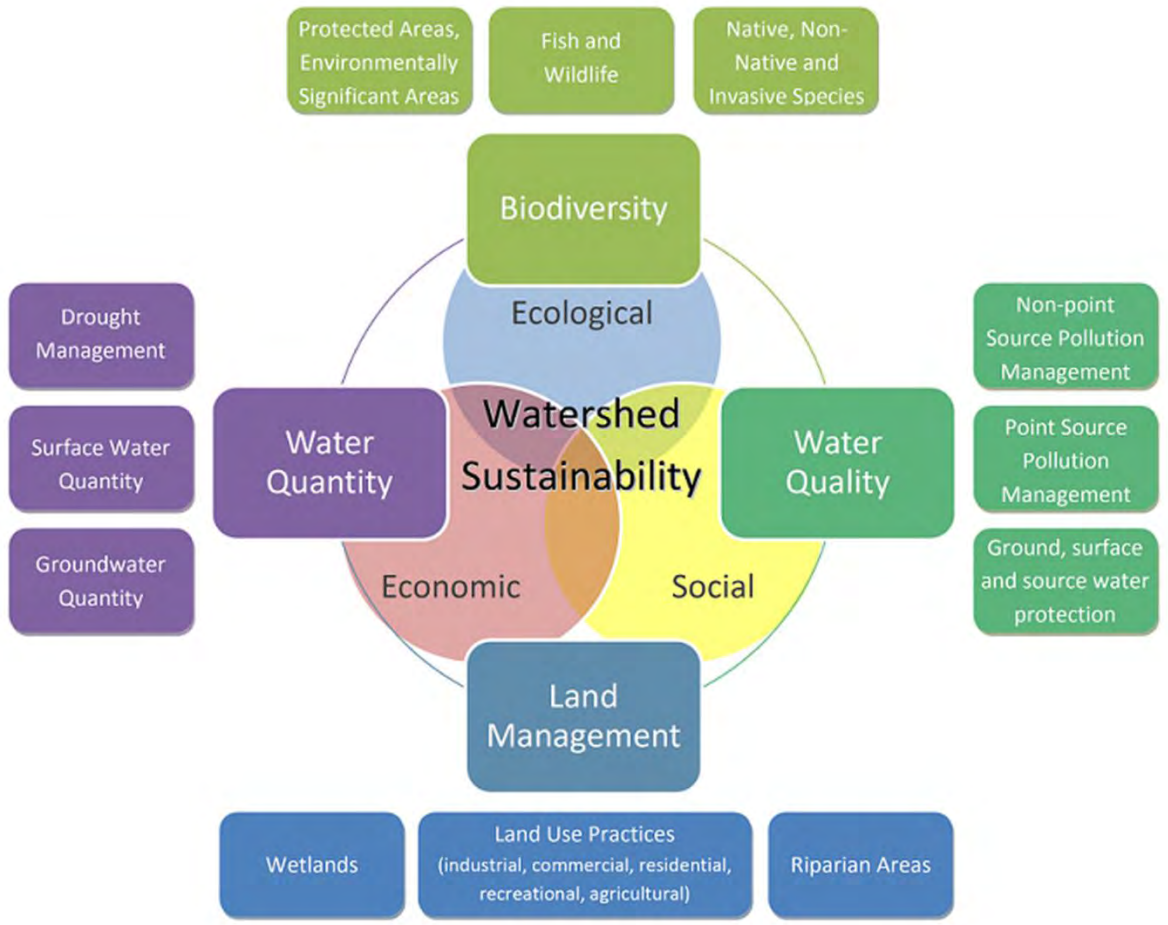
DWWP update: Program 4



PRESENTATION

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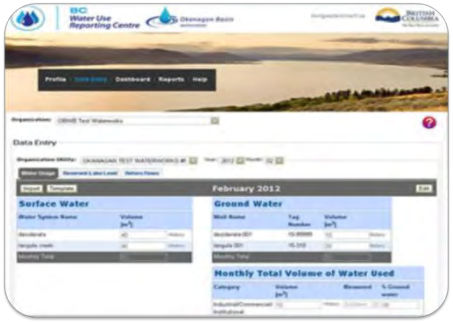
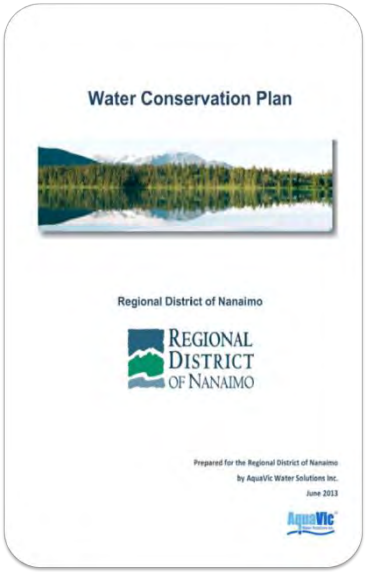
DWWP update: Program 5



Water Use Management

- Water Conservation Plan
- Toilet Replacement Rebate
- Water Purveyor Working Group
- Water Use Reporting Centre
- Rainwater Harvesting Incentive & Guidebook



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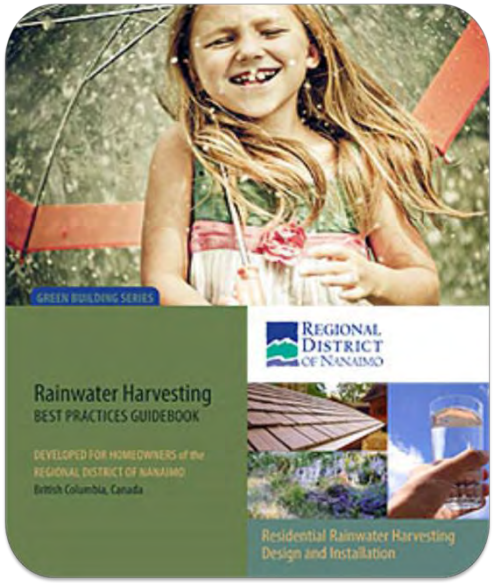
DWWP update: Program 5

Water Use Management

$750 rebate for > 1000 imperial gallons

Rainwater Harvesting Incentive & Guidebook



Storing winter/spring rainwater for summer usage takes pressure off aquifers & municipal supplies

PRESENTATION

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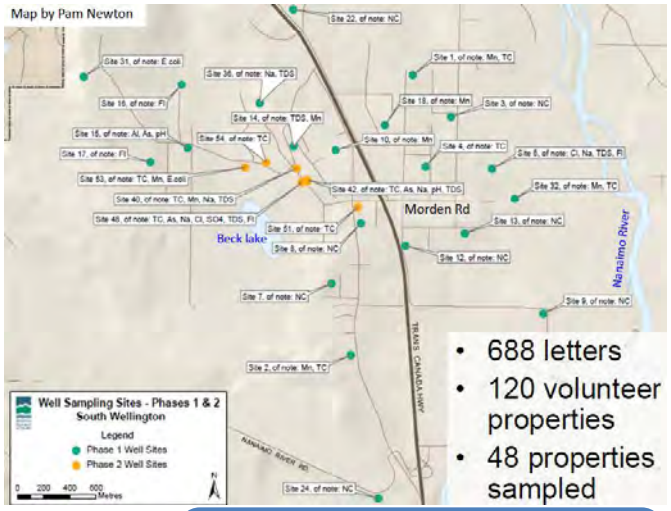
DWWP update: Program 6

Water Quality Management

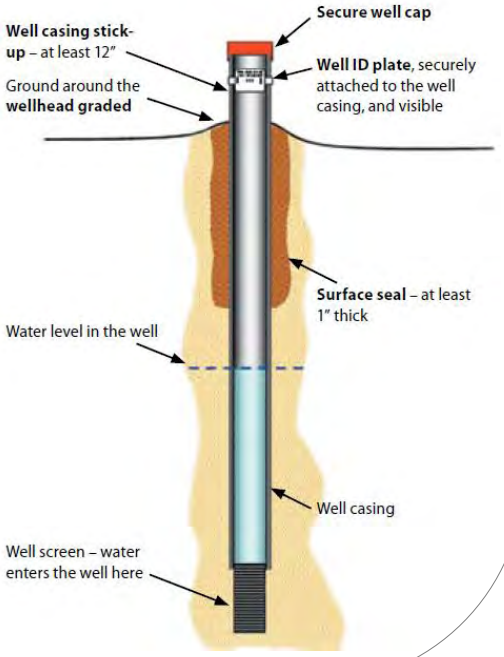


2011 Volunteer Well Water Quality Survey

New!

Rural Water Quality Stewardship Program

No.	Rebate Item
1	Well Cap
2	Surface Seal
3	Well Casing Stick-up
4	Well deactivation
5	Water Quality Testing



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DWWP update: Program 7

Adapting to Climate Change

- **Sustainability -** ensure sustainable aquatic ecosystems with intact riparian vegetation and adequate instream flows.
- **Adaptability -** find ways to do more in-season management of water that is based on real time data.
- **Collaboration -** public processes at the watershed level that develop information and inform decision-making in a public way
- **Efficiency -** conservation of water and more efficient use

2. Water Budget Study

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Water Budget Study

7 Water Regions within the RDN:

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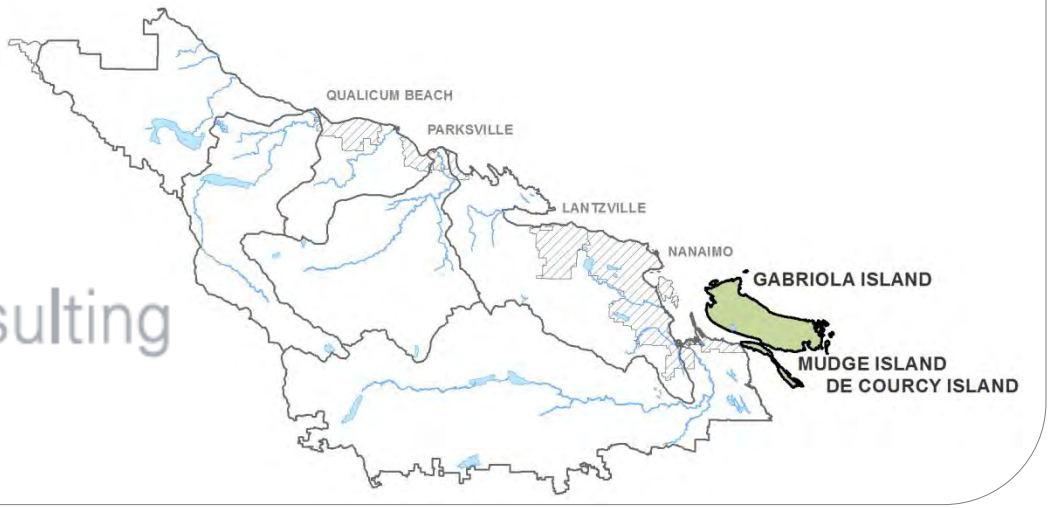
Water Budget Study

- **Gabriola, Mudge, & Decourcey Water Budget Project Report**

Prepared by:

srk consulting



- **Vancouver Island Water Budget Project Report**

Prepared by:

Waterline Resources Inc.

REGIONAL DISTRICT OF NANAIMO

Water Budget Study: Background

Project Goal

To **improve understanding** of regional water resources by:

- Identifying **water stores**
- Estimating **how much water** they hold
- Characterizing **how water moves** between the stores
- Identifying water stores **under stress**

Justification

The Water Budget Project was specifically developed to…..

✓ Meet the goal of the DWWP program:

[to ensure that we have a sufficient, safe and sustainable supply of water]

✓ Address the direction of the 2010 Snapshot Report:

[to ensure sufficient clean water for human, environmental, and economic needs]

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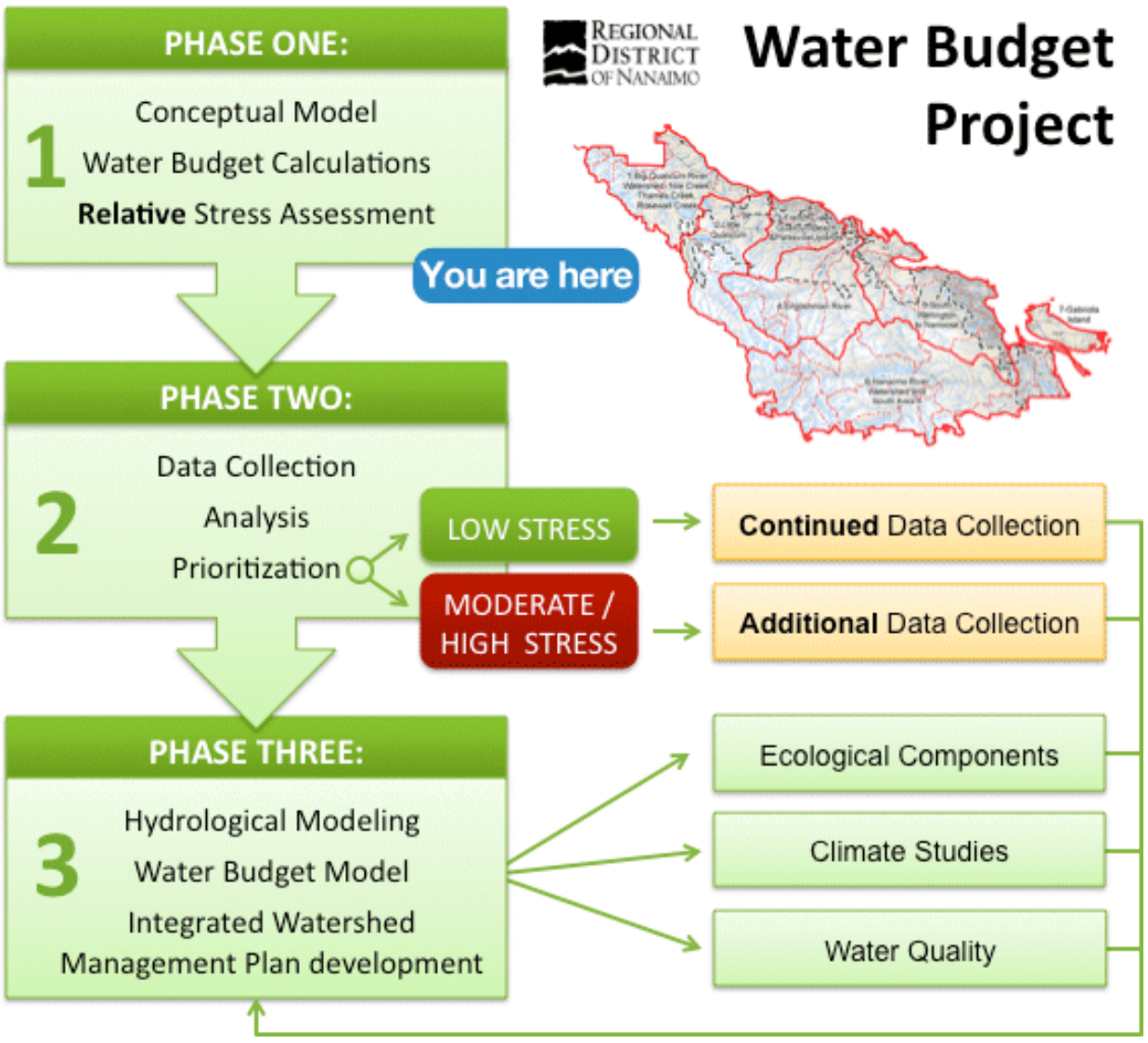
Water Budget Study: Project overview



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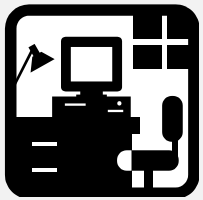
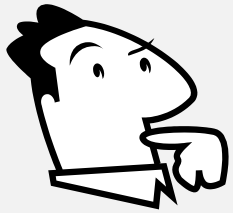
Water Budget Study: methodology

1. Desk study:
   - resource mapping
   - Data compilation



2. Data collection:
   - Water level monitoring
   - Pump tests
   - Geological logging

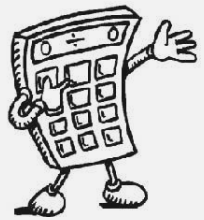
3. **Conceptual model development**
   - Based on physical characteristics
   - Current scientific understanding



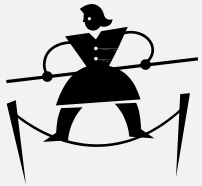
4. **Water budget calculation**

   = INPUT – OUTPUT + Δ STORAGE

   (Rainfall, US gain) (ET, DS loss, abstraction)



5. **Stress assessment**
   - Low Stress → surplus
   - Moderate Stress → balance
   - High Stress → deficit



REGIONAL DISTRICT OF NANAIMO

Water Budget Study: methodology

Conceptual model development

Example.....

Groundwater flow

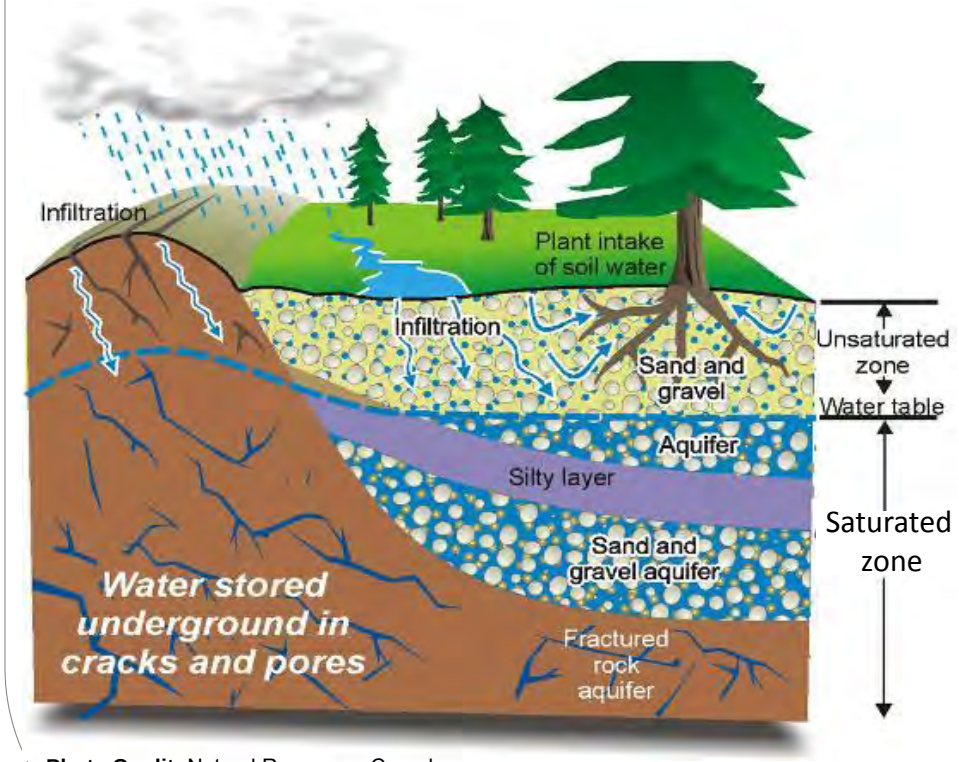
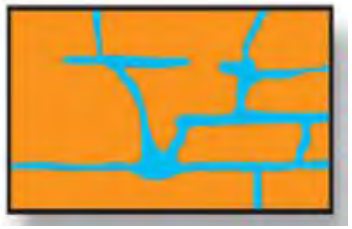
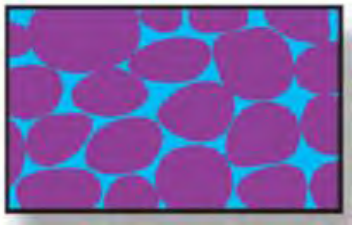


Photo Credit: Natural Resources Canada

1. 

Water in rock fractures

2. 

Water between grains

PRESENTATION

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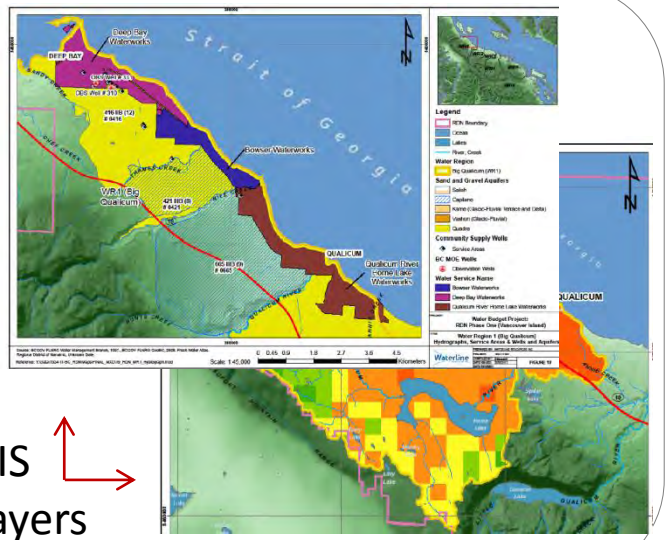
Water Budget: VI Conceptual model development

A

GIS based approach:

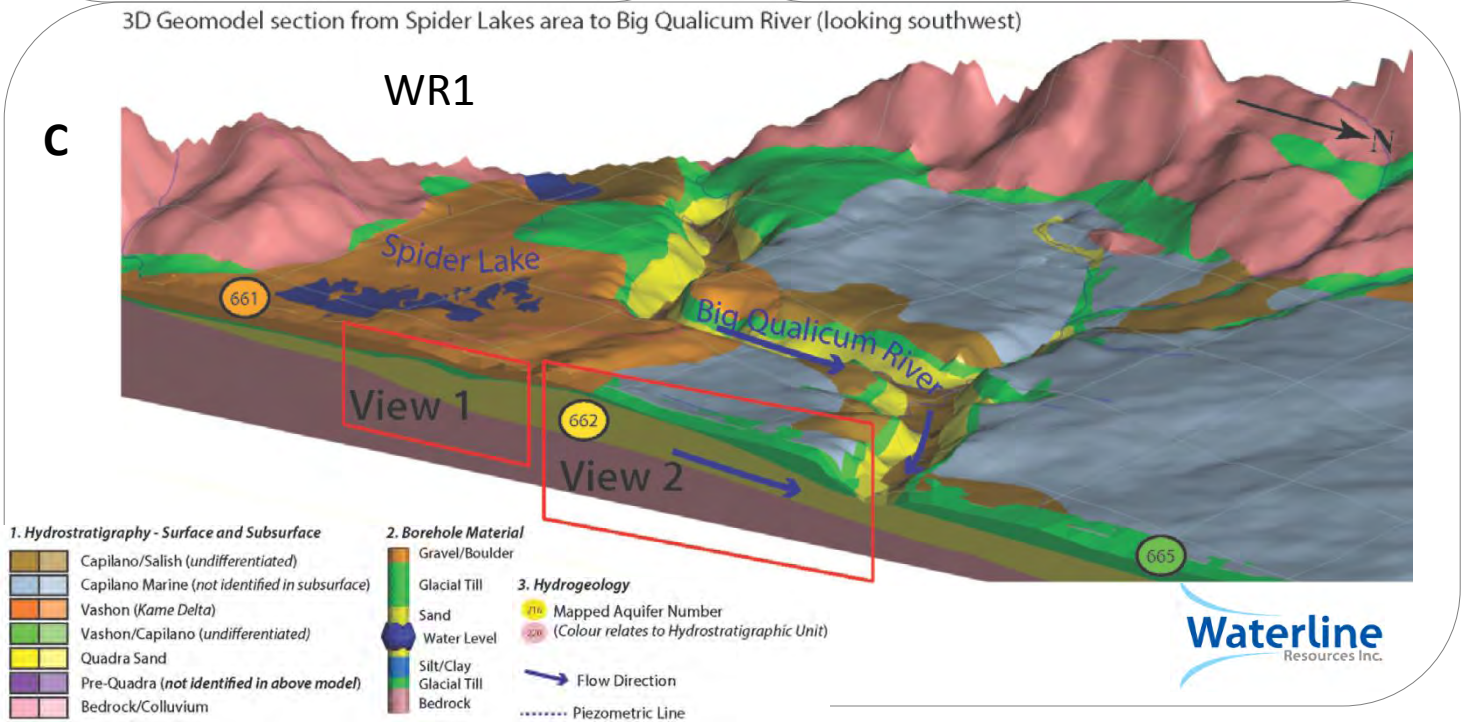
- Topography maps
- Climate data
- Land cover maps
- Geological maps
- Water level
- Aquifer properties

B



GIS Layers

C



PRESENTATION

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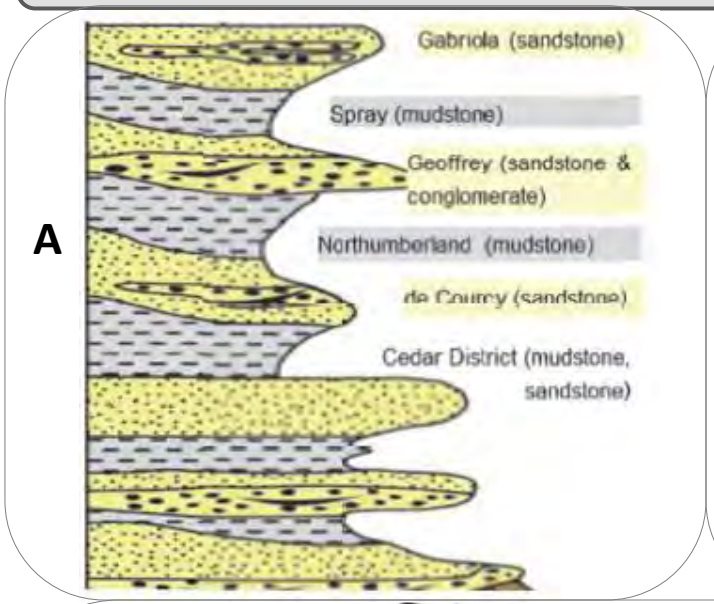
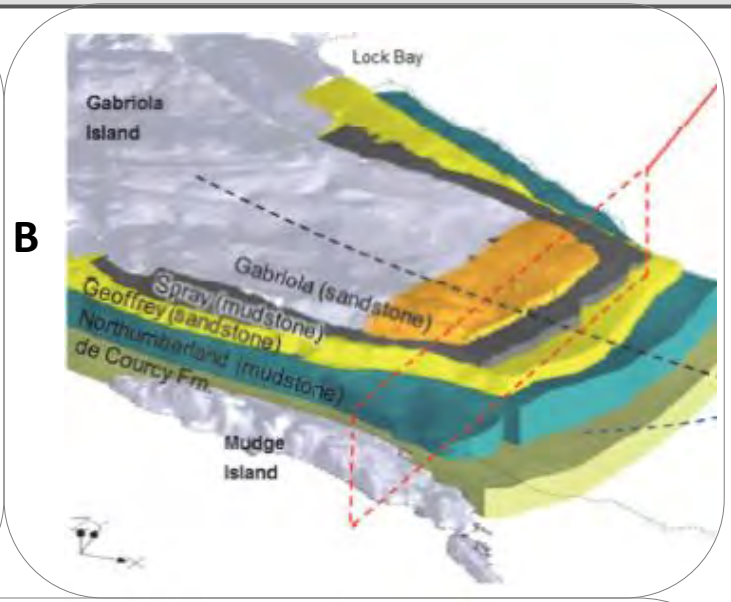
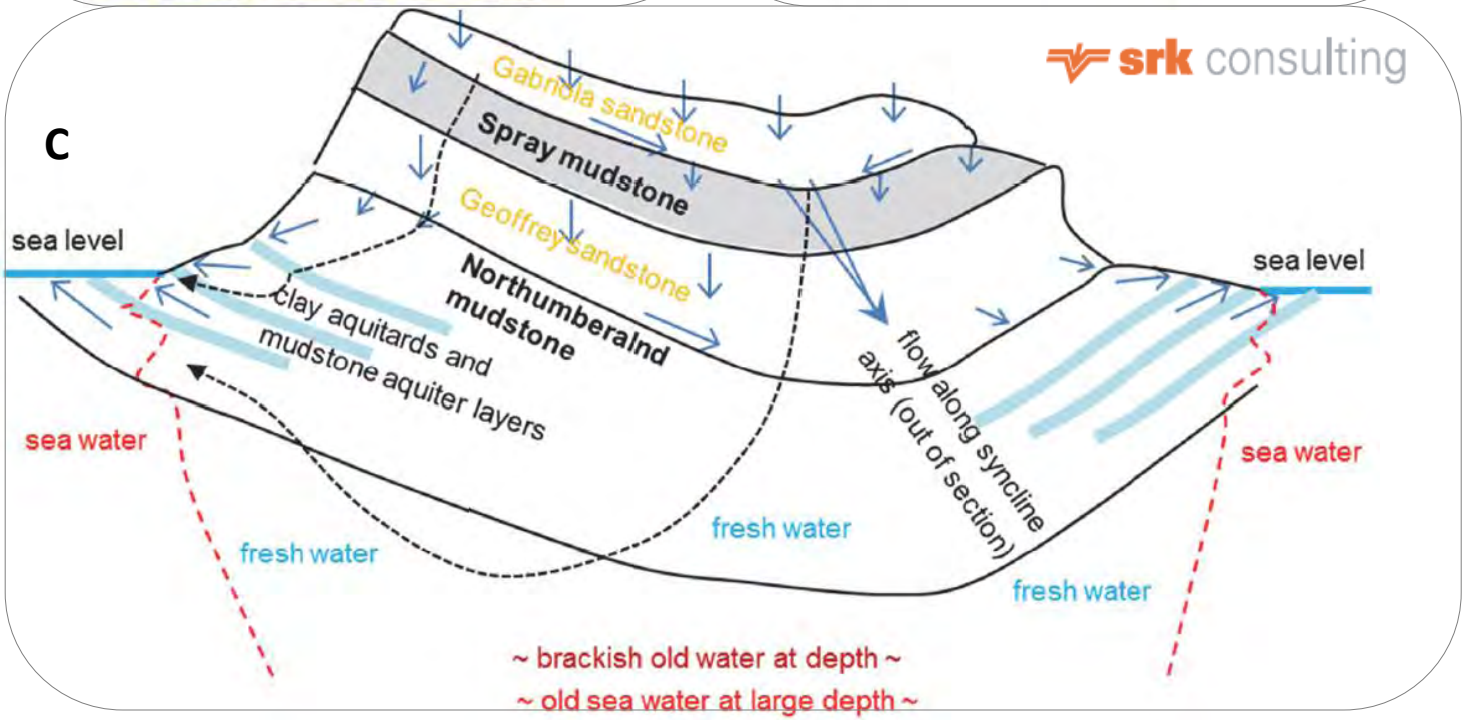
Water Budget: Gab conceptual model development







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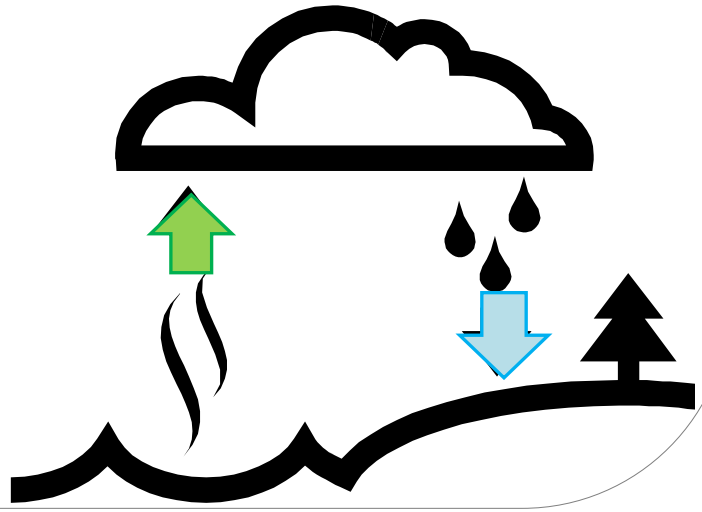
Water Budget Calculations

Accounting…..

for water…..

= input – output + ▽storage

(rainfall) (evaporation)



PRESENTATION

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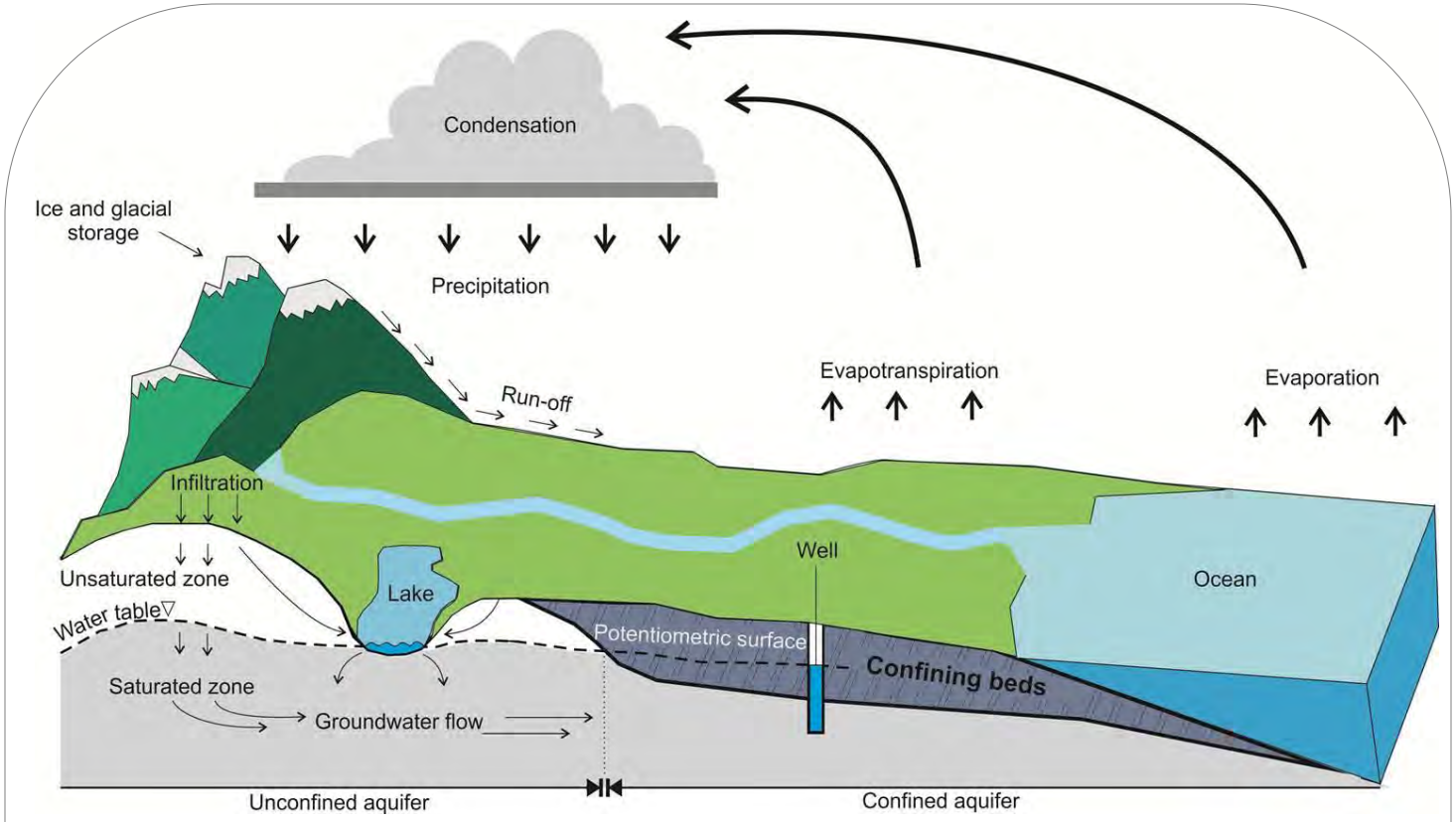
Water Budget Study



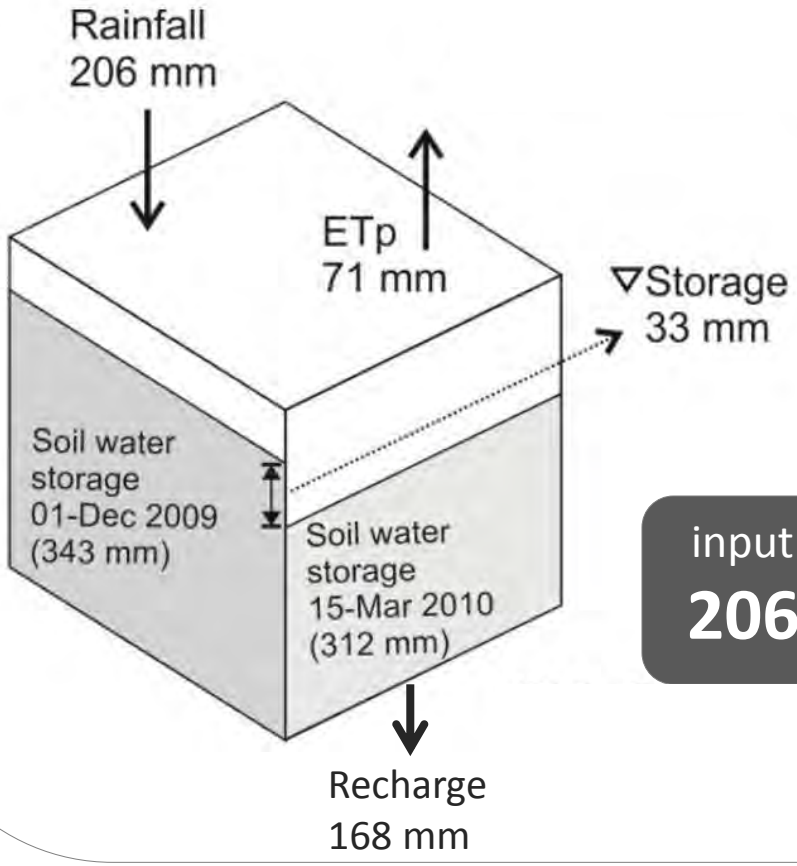
+ Inputs	- Outputs	▽ Change in storage
rainfall	Evaporation & transpiration	Snowpack
surface water inflow	Surface water outflow	Soil zone
groundwater inflow	Groundwater outflow	Streams, rivers, reservoirs
imported water	Exported water	Aquifers

REGIONAL DISTRICT OF NANAIMO

Water Budget Study

Example.....

RECHARGE calculation



input	output	loss	balance

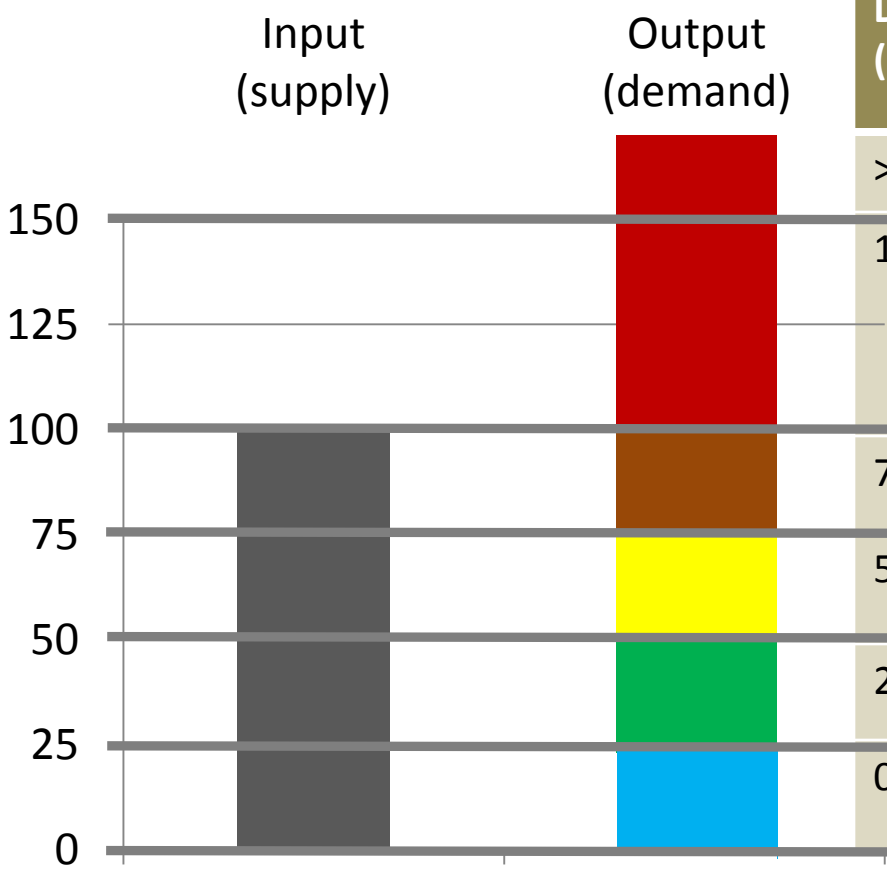
206 – 71 + 33 = 168

Water Budget Study

Stress Assessments: VI

Calculation of the **% of supply** that is **demand**ed

(Based on Summer Conditions)



Demand (% supply)	Stress Ranking
>150%	Very high
100-150%	High
75-100%	Moderate-high
50-75%	Moderate
25-50%	Low-moderate
0-25%	Low

Stress Assessments: VI

Surface Water

$$\text{Surface Water Stress (\%)} = \frac{\text{Consumptive Demand (Outputs)} + \text{Minimum Conservation Flow}}{\text{Natural Water Supply (Inputs)} + \text{Storage}} \times 100$$

IN: estimated river flow

IN: Licensed storage for managed reservoirs & Average water level variation on lakes and wetlands

Watershed	Average Natural River Flow Supply (million m^3)	Storage (million m^3)	Conservation Flow (10% of MAD) (million m^3)	Licensed Demand (million m^3)	Allocation Stress	Stress Level
Nanoose Creek	0.6	0.0	0.7	0.02	**120%**	**High**

OUT: 10% of average annual discharge (flow)

OUT: industrial, municipal, domestic, agricultural

Stress Assessments: VI

Groundwater

$$\text{Aquifer Stress (\%)} = \frac{\text{GWout}}{\text{GWin}} \text{ x } 100$$

(Outputs)

(Inputs)

IN: recharge from rainfall + seepage from overlaying aquifer + lateral recharge

Aquifer Tag No.	Aquifer Lithology	Potential Groundwater-Surface water or Aquifer to Aquifer Interaction	MOE Obs Well	Seas. Fluc.	Long Term Fluc.	WL Trend (up or down)	Total Est. AQ. Rec. (TRin) (Rp/I + Rmb)	Est. Ann. Disch to Cr. & Down Grad Aquifer (Tc out) +	Ground Water Use Estimate (ANTHout) =	Total Out [TcOut + $ANTH_{out}$]	Stress Anal. % GW Use of the avail. AQ. Rec.	Relative Stress Assess.
			ID	(m)	(m)	U/D	(m^3/yr)		(m^3/yr)	(m^3/yr)	(%)	Lo, Mod, Hi
219	Quadra	Nanoose Creek, Ocean	392, 393	?	?	L	1.6E+08	1.56E+07	2.8E+06	1.83E+07	11	Lo

OUT: loss to downstream creek or aquifer + human demand (abstractions)

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REGIONAL DISTRICT OF NANAIMO

Findings: Water Stress Assessment

GI: 13 Sub-regions

5 deficit regions

→ **(July – Aug)**

1 deficit region

→ **(Apr – Sept)**

(demand > supply)

VI: 43 Sub-regions

23
- 10 Low stress
- 7 Low/Mod stress
- 6 Mod stress

20
- 11 Mod/High stress
- 6 High stress
- 3 V.High stress

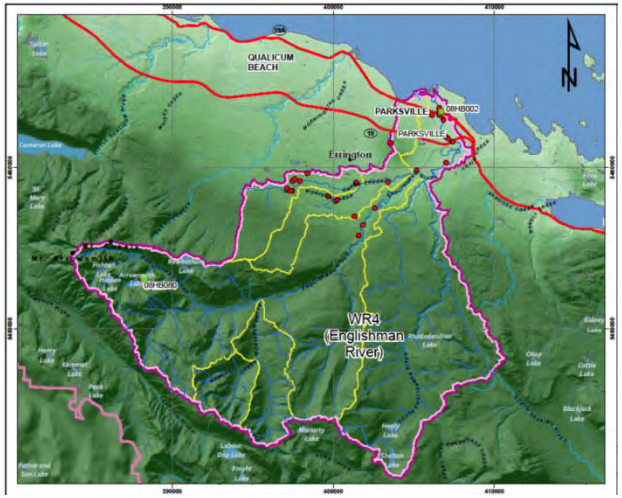
REGIONAL DISTRICT OF NANAIMO

Findings: Vancouver Island

WR3: French Creek

- One of the smallest water regions
- area of approximately 121 km^2
- Two hydrometric stations
- five climate stations
- ~68 surface water diversion licenses
- ~895 wells

WR4: Englishman River



- Second largest water region
- area is approximately 322 km^2
- One hydrometric station
- two climate stations
- ~52 surface water diversion licenses
- ~245 wells

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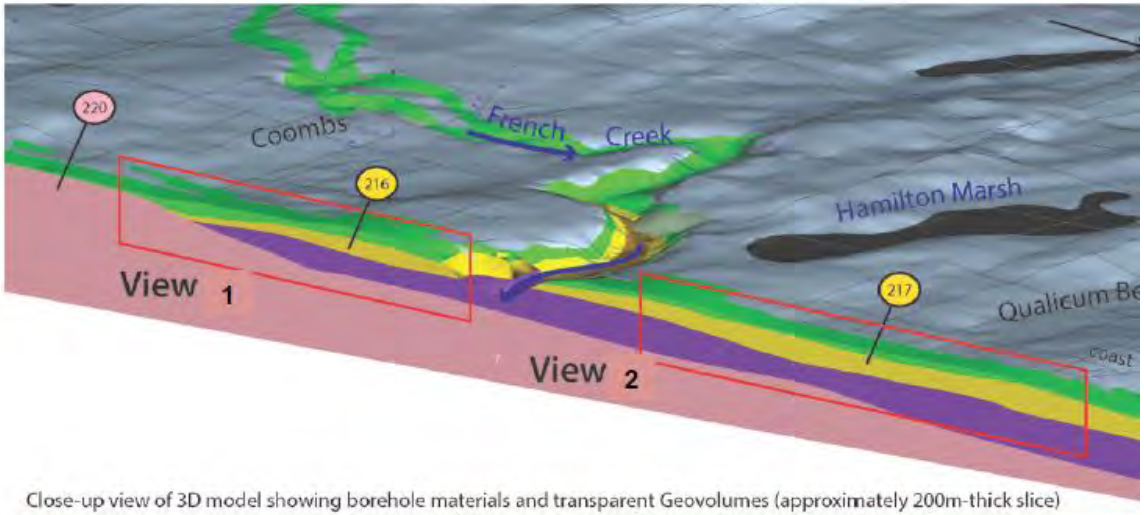
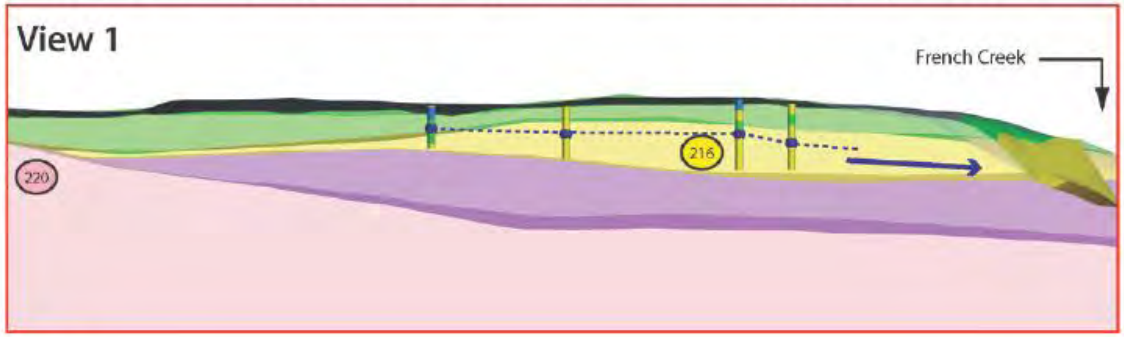
Findings: Vancouver Island

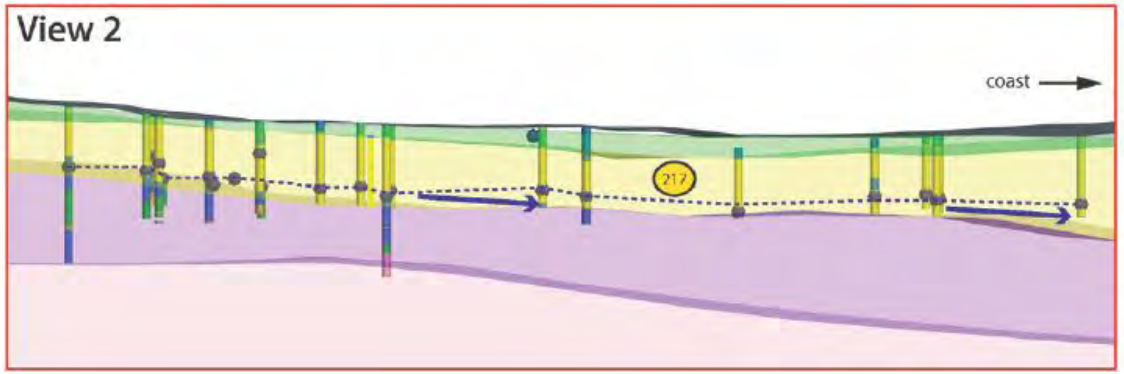
3D Geomodel section from the Coombs area to Qualicum Beach and the coast (looking southwest).



WR3: French Creek

Close-up view of 3D model showing borehole materials and transparent Geovolumes (approximately 200m-thick slice)





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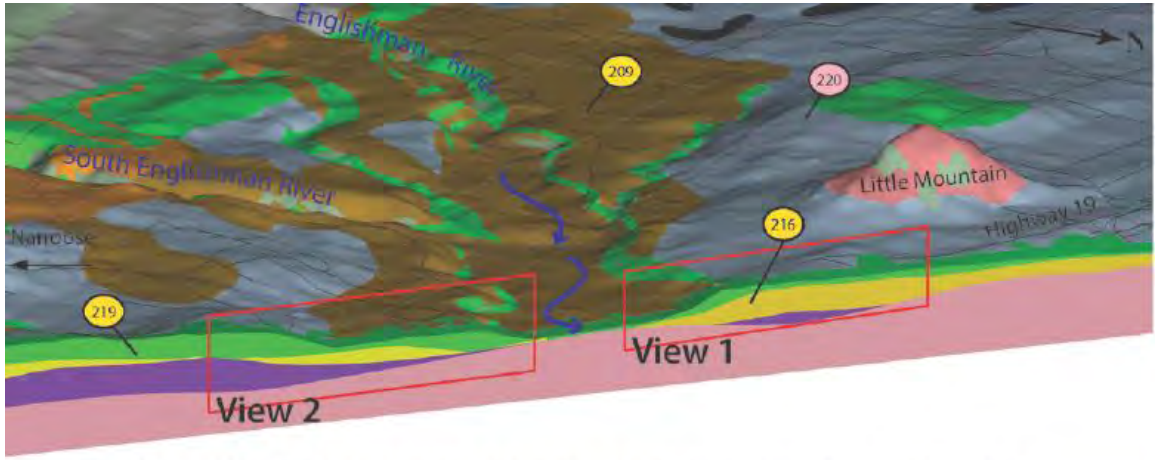
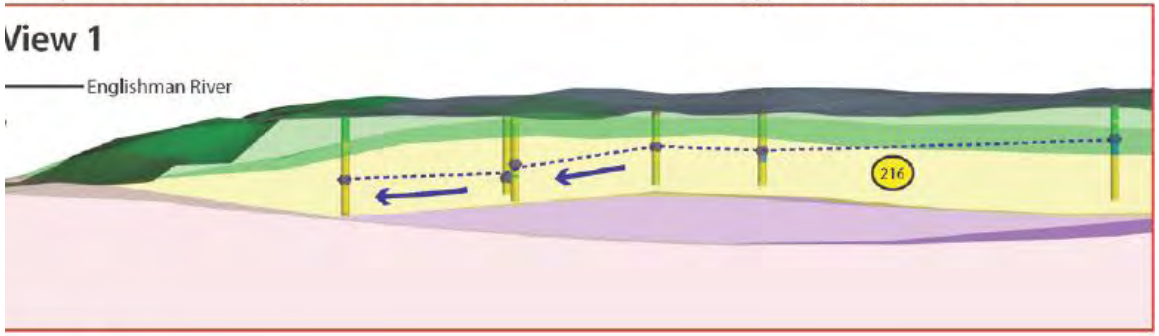
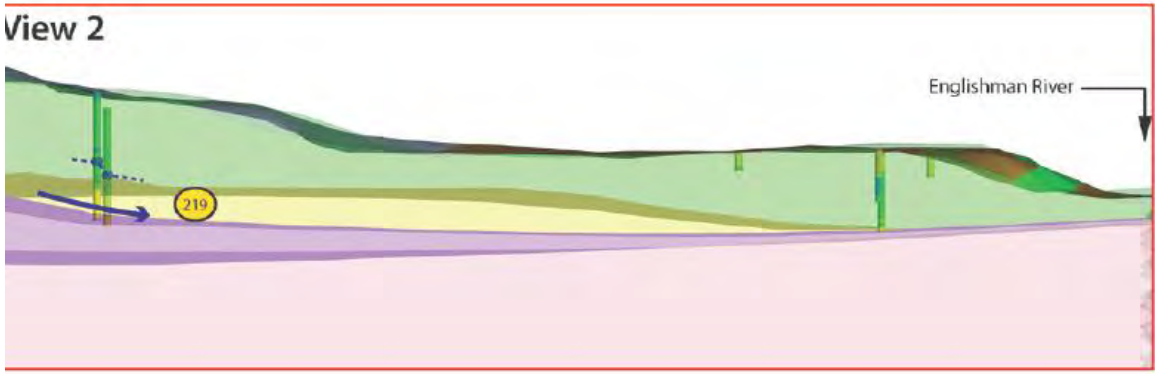
REGIONAL DISTRICT OF NANAIMO

Findings: Vancouver Island



lose-up view of 3D model showing borehole materials and transparent Geovolumes (approximately 200m-thick slice)





WR4: English-man River

REGIONAL DISTRICT OF NANAIMO

Findings: Vancouver Island

WR3: French Creek

Table 26: WR3 (FC) – Relative Surface Water Stress Assessment Results

Watershed	Average Natural River Flow Supply (million m^3)	Storage (million m^3)	Conservation Flow (10% of MAD) (million m^3)	Licensed Demand (million m^3)	Allocation Stress	Stress Level
French Creek	1.40	0.11	1.75	0.10	123%	High

Surface water: high stress, French Creek

Table 30: Summary of Water Budget and Stress Analysis – WR3 (FC)

Aquifer Tag No.	Aquifer Lithology	Potential Ground Water-Surface water or Aquifer to Aquifer Interaction	MOE Obs Well	Seas. Fluc.	Long Term Fluc.	WL Trend (up or down)	Total Est. AQ. Rec. (TRin) (Rp/l + Rmb)	Est. Ann. Disch to Cr. & Down Grad Aquifer (Tc out)	Ground Water Use Estimate (ANTHout)	Total Out [TcOut + $ANTH_{out}$]	Stress Anal. % GW Use of the avail. AQ. Rec.	Relative Stress Assess.
			ID	(m)	(m)	U/D	(m^3/yr)		(m^3/yr)	(m^3/yr)	(%)	Lo, Mod, Hi
220	Haslam	FC	287		9.1	D	6.4E+06	5.1E+05	2.2E+06	2.7E+06	42	Lo-Mod
216	Quadra	FC	314	1.60	3.60	D/L	4.5E+07	3.8E+07	4.1E+06	4.5E+07	100	Hi
217	Quadra	FC and Ocean	321, 325, 303	5	12	D/L	8.3E+06	2.5E+06	4.7E+06	1.1E+07	133	Hi
212	NG	Ocean	NA	NA	NA	NA	8.8E+05	0.0E+00	5.0E+05	5.0E+05	58	Mod

Groundwater: 1 low-moderate stress, 1 moderate & 2 high stress

REGIONAL DISTRICT OF NANAIMO

Findings: Vancouver Island

WR4: Englishman River

Table 36: WR4(ER) – Relative Surface Water Stress Assessment Results

Watershed	Average Natural River Flow Supply (million m^3)	Storage (million m^3)	Conservation Flow (10% of MAD) (million m^3)	Licensed Demand (million m^3)	Allocation Stress	Stress Level	Actual Demand (million m^3)	Actual Stress
Englishman River	14.4	9.2	13.2	2.7	68%	Moderate	0.6	8%

Surface water: moderate stress, Englishman River

Table 40: Summary of Aquifer Stress Analysis – WR4 (ER)

Aquifer Tag No.	Aquifer Lithology	Potential Ground Water-Surface water or Aquifer to Aquifer Interaction	MOE Obs Well	Seas. Fluc.	Long Term Fluc.	WL Trend (up or down)	Total Est. AQ. Rec. (TRin) (Rp/I + Rmb)	Est. Ann. Disch to Cr. & Down Grad Aquifer (Tc out)	Ground Water Use Estimate (ANTHout)	Total Out [TcOut + $ANTH_{out}$]	Stress Anal. % GW Use of the avail. AQ. Rec.	Relative Stress Assess.
			ID	(m)	(m)	U/D	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(%)	Lo, Mod, Hi
209	Quadra	Haslam	NA	NA	NA	NA	2.15E+07	8.67E+06	9.77E+06	9.77E+06	45	Lo-Mod
220	Haslam	ER	287	2.5	9.1	D	9.73E+05	1.72E+04	1.22E+06	1.22E+06	125	Hi
216	Quadra	ER	314	1.60	3.60	D/L	6.04E+06	4.00E+06	4.76E+06	4.76E+06	79	Mod. Hi
219	Quadra	Ocean, ER	NA	NA	NA	NA	1.83E+07	6.04E+06	6.05E+06	6.05E+06	33	Lo-Mod
214	NG	Ocean	NA	NA	NA	NA	6.18E+05	0.00E+00	1.40E+05	1.40E+05	23	Lo
221	Salish	Ocean, ER	NA	NA	NA	NA	2.87E+05	0.00E+00	1.75E+05	1.75E+05	61	Mod

Groundwater: 1 low, 2 lo-mod, 1 mod, 1 mod-high, 1 high stress

REGIONAL DISTRICT OF NANAIMO

Findings: Vancouver Island

WR3: French Creek recommendations:

- Observation well in aquifer 212
- Summer surface flow measurements at Morning Star Creek, Grandon Creek & Carrey Creek

WR4: Englishman River recommendations

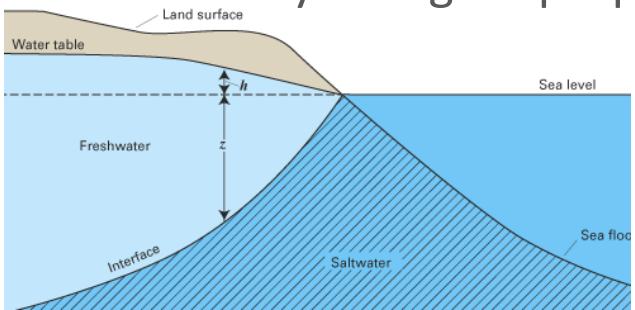
- Observation wells in aquifers 209, 219 & 214 & 221
- Further study of surface – groundwater interaction (EM River)
- Summer surface flow measurements at Morrison Creek & Swane Creek

REGIONAL DISTRICT OF NANAIMO

Findings: data gaps

Author recommendations:

1. Mandatory **well log** submission
2. Standardization of **aquifer testing**
3. Increase **well observation** network
4. Reactivation of **stream gauging** (WSC)
5. Increase **saline intrusion monitoring**
6. Improve Water Budget **calculation parameters**
   - Gabriola→ water use data from survey
   - Hydrological properties

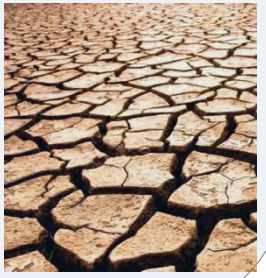


REGIONAL DISTRICT OF NANAIMO

Conclusion

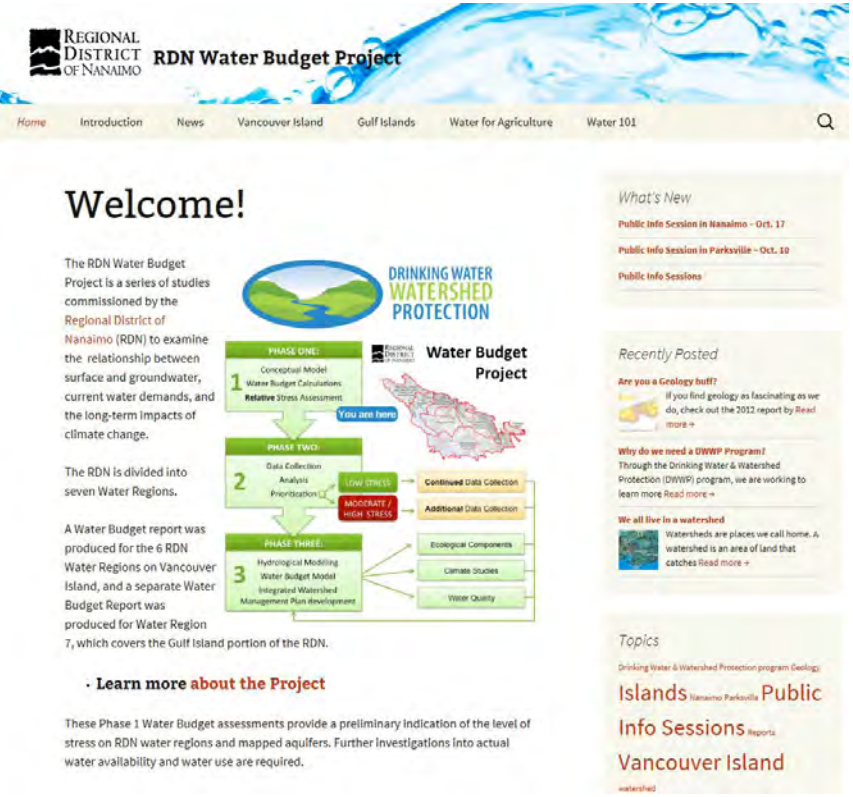
The Phase One Water Budgets provide the most comprehensive collation of information on the region's water resources that has been made available to date

- Results are **purely conceptual** and not intended for water management decision making or policy development
- Large degree of **uncertainty** due to lack of data
- Highlights data gaps and need for **increased monitoring**
- Stepping stone for the future!

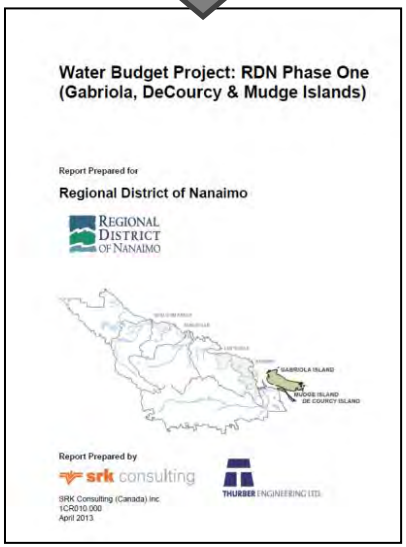


For more details
and to
download the complete reports
VISIT:

www.rdnwaterbudget.ca



Report Download




now
what?
tomorrow
yesterday

3. Integrated Watershed Management Planning

DRINKING WATER
WATERSHED
PROTECTION

REGIONAL DISTRICT OF NANAIMO

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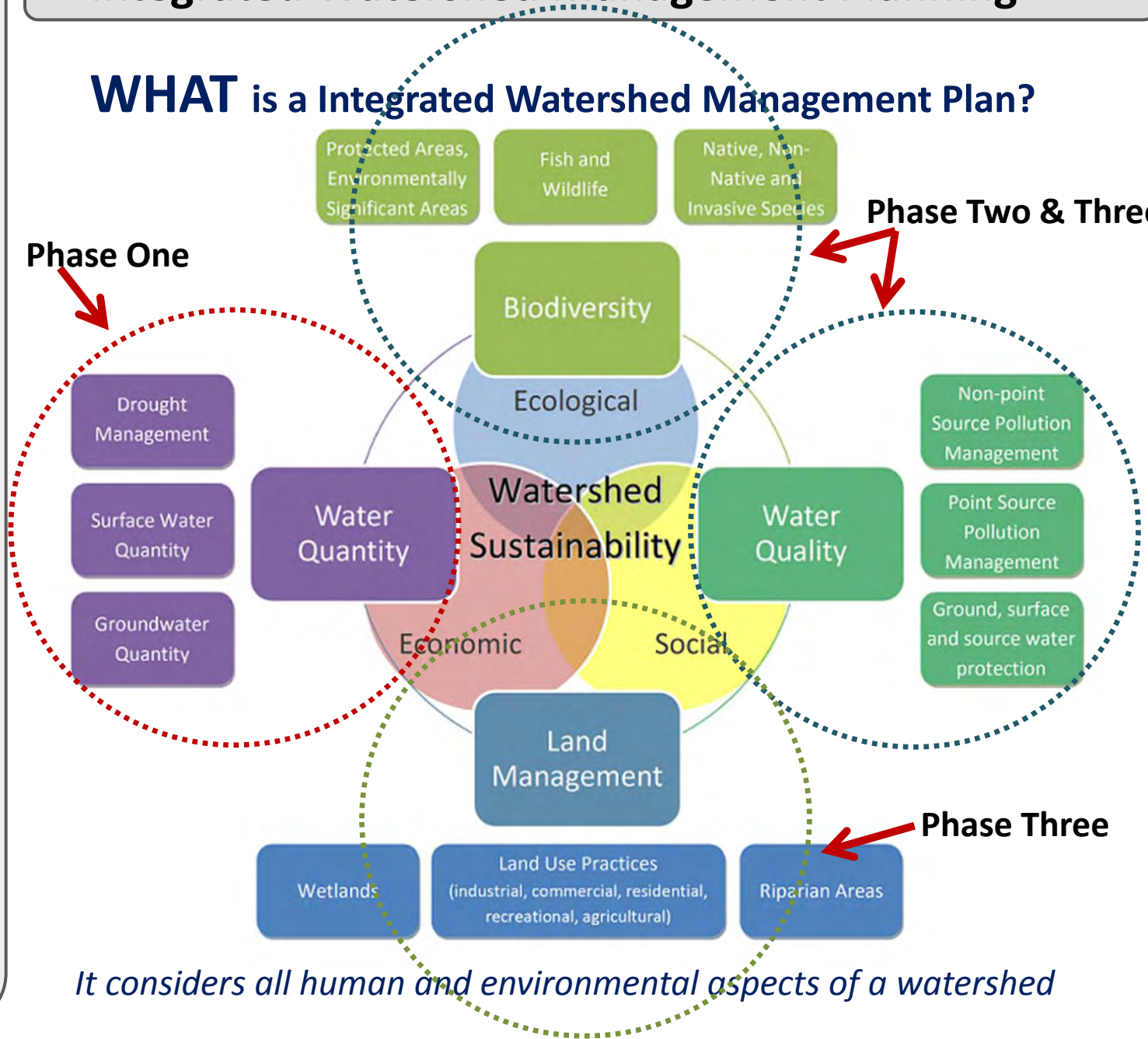
Integrated Watershed Management Planning

WHAT is a Integrated Watershed Management Plan?



It considers all human and environmental aspects of a watershed

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Integrated Watershed Management Planning

WHY is it needed?

- Land use activities such as forestry, mining, agriculture, urbanization, fisheries and recreation all impact water resources



- Water resource problems are reaching global proportions; how we manage our water and how our neighbors manage theirs has an impact on all of us



- There is a wide variety of processes that affect the hydrological cycle; only managing one aspect is mismanagement. A holistic approach is the only way forward

PRESENTATION

REGIONAL DISTRICT OF NANAIMO

Integrated Watershed Management Planning

HOW? *What does a planning framework include?*

1. *Identification of **river basin areas** (water regions)* ☑
2. *Identification of **water resources** (surface and ground water)* ☑
3. *Identification of **measurement** parameters (chemical/ecological/social)*
4. *Identification of **protected areas** (forests, parks, fisheries)*
5. *Assess **current state** (i.e. poor, good, high)* → ***WHAT***
6. *Reasons for **not achieving** good status* → ***WHY***
7. ***Action plan** to achieve good status/improve* → ***HOW***

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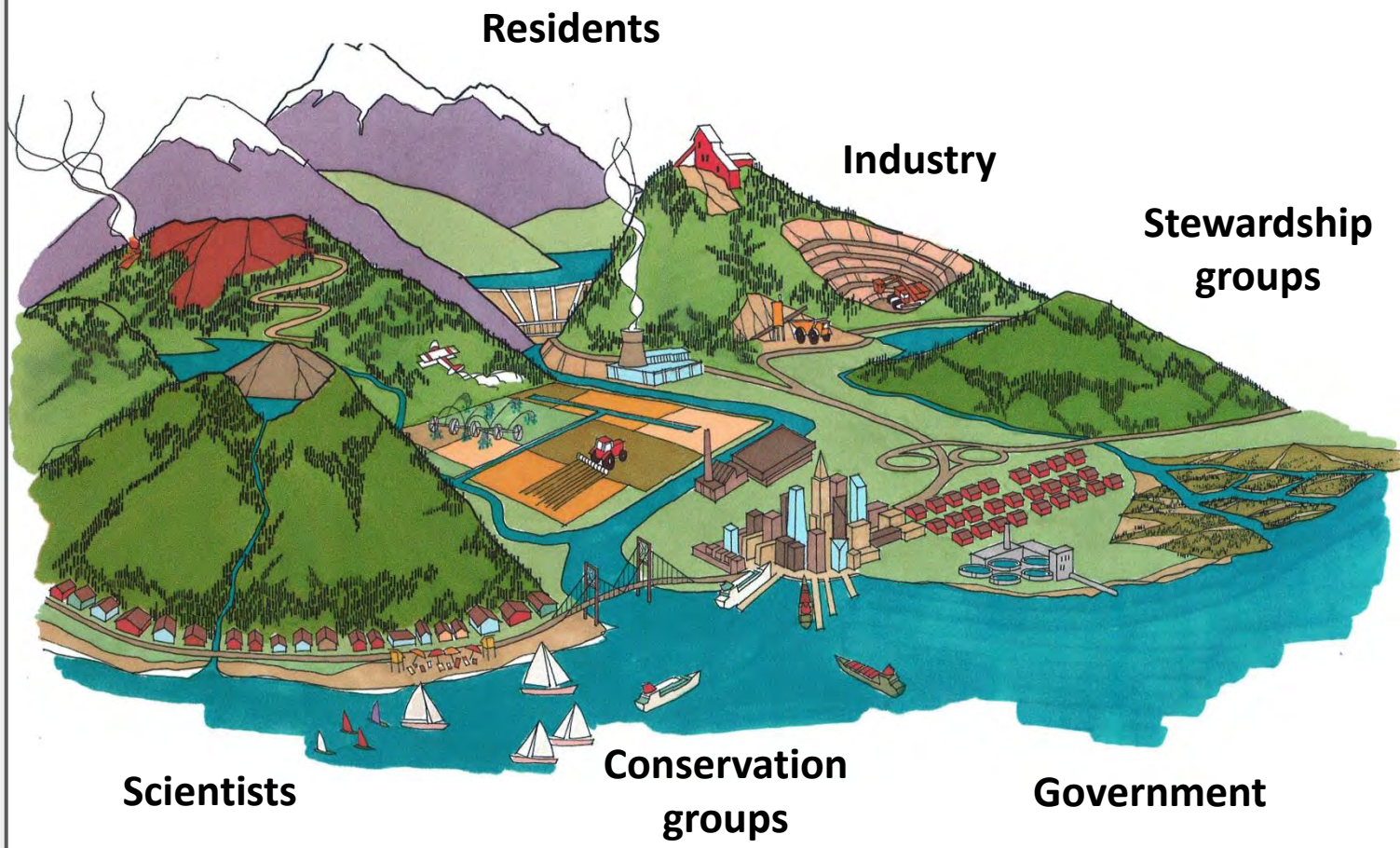
Integrated Watershed Management Planning

WHO?



A key component to the success of these plans is public input…you live in the watershed! You know it best

Where do we go from here?

In your opinion:

- what are the priority watershed issues?
- who is responsible for watershed management?
- what do you think the DWWP program should focus on?

DRINKING WATER WATERSHED PROTECTION

DRINKING WATER
WATERSHED
PROTECTION

Thank You!