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
Our program is founded on partnerships and collaboration

**Municipalities:**
- City of Parksville
- City of Nanaimo
- District of Lantzville

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

**Other governmental organizations:**
- British Columbia
- 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
1. DWWP Program Update
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

---

**Public Awareness and Involvement**

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

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**DWWP update: Program 1**

- Public Awareness and Involvement
  - Free Workshops
  - Websites
  - Community Booth
  - Home Visits
  - School Program

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**PRESENTATION**

- DWWP update
- Water Budget
- Watershed Management
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

1. DWWP update
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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
1. DWWP update
   → Program 1
   → Program 2
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   → How & Who

Water Resources Inventory & Monitoring: Highlights

Provincial Observation
Well Network Expansion

Groundwater monitoring

Volunteer Well Level Monitoring
1. DWWP update
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**DWWP update: Program 2**

**Water Resources Inventory & Monitoring: Highlights**

- Community Watershed Monitoring Network

**Surface water monitoring**

**Community Watershed Monitoring Network Stewardship Groups**

- Nanaimo & Area Land Trust
- Vancouver Island University
- Island Waters Fly Fishers
- Departure Creek Streamkeepers
- Mid-Vancouver Island Habitat Enhancement Society
- Friends of French Creek Conservation Society
- Parksville-Qualicum Fish & Game / QBS
- Qualicum Beach Streamkeepers (QBS)
- Nile Creek Enhancement Society
- Lantzville-NanOOSE Streamkeepers

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**Volunteer Sampling Schedule**

- 5 weeks → Summer low flow
- 5 weeks → Fall flush
1. DWWP update
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   - Program 6
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**Water Resources Inventory & Monitoring: Highlights**

**Community Watershed Monitoring Network**

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

www.dwwp.ca
1. DWWP update
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DWWP update: Program 3

Land Use Planning & Development

Agricultural Water Demand Model

Yellow Point Development Permit Area

Agriculture Land Reserve
1. DWWP update
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   - Program 4
   - Program 5
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   - Program 7

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**DWNP update: Program 5**

**Water Use Management**

- Water Conservation Plan
- Toilet Replacement Rebate
- Water Purveyor Working Group
- Water Use Reporting Centre
- Rainwater Harvesting Incentive & Guidebook
1. DWWP update
   - Program 1
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   - Program 6
   - Program 7

2. Water Budget
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   - Findings
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3. Watershed Management
   - What & Why
   - How & Who

DWWP update: Program 5

Water Use Management

- Rainwater Harvesting Incentive & Guidebook
- $750 rebate for > 1000 imperial gallons

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

1. DWWP update
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DWWP update: Program 6

Water Quality Management

2011 Volunteer Well Water Quality Survey

- 688 letters
- 120 volunteer properties
- 48 properties sampled

Rural Water Quality Stewardship Program

<table>
<thead>
<tr>
<th>No.</th>
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<tr>
<td>1</td>
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<td>2</td>
<td>Surface Seal</td>
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<tr>
<td>3</td>
<td>Well Casing Stick-up</td>
</tr>
<tr>
<td>4</td>
<td>Well deactivation</td>
</tr>
<tr>
<td>5</td>
<td>Water Quality Testing</td>
</tr>
</tbody>
</table>

Map by Pam Newton

Well sampling sites - Phases 1 & 2
South Wellington

Legend:
- Phase 1 well sites
- Phase 2 well sites

New!
Adapting to Climate Change

1. **Sustainability** - ensure sustainable aquatic ecosystems with intact riparian vegetation and adequate instream flows.

2. **Adaptability** - find ways to do more in-season management of water that is based on real time data.

3. **Collaboration** - public processes at the watershed level that develop information and inform decision-making in a public way.

4. **Efficiency** - conservation of water and more efficient use.
2. Water Budget Study
Water Budget Study

1. DWWP update
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   → Program 6
   → Program 7

2. Water Budget
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7 Water Regions within the RDN:

Vancouver Island: WR1-6

Gulf Islands: WR7
Water Budget Study

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• Gabriola, Mudge, & Decourcey Water Budget Project Report

• Vancouver Island Water Budget Project Report

Prepared by:

srk consulting

Prepared by:

Waterline Resources Inc.
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]
Water Budget Study: Project overview

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   - Program 4
   - Program 5
   - Program 6
   - Program 7

2. Water Budget
   - Background
   - Overview
   - Methodology
   - Findings
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3. Watershed Management
   - What & Why
   - How & Who
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
   \[ \text{Supply} - \text{Demand} \]
   (Recharge) (Abstraction)

5. Stress assessment
   - Low Stress: \(<50\%\)
   - Moderate Stress: \(>50\%\)
   - High Stress: \(>100\%\)
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Conceptual model development

Example.....

Groundwater flow

Photo Credit: Natural Resources Canada
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Geological Logging
- Thickness of strata
- Hydraulic characteristics
  - Fractures: low porosity, high Ks
  - Matrix: high porosity/low Ks
- Orientation of fractures

- Thick layer, visible cliff tops
- Visible cliff bottoms
- Thick layer, lower elevations
- Visible along shores/sea bed
- Deep below Gabriola
- Visible on Mudge
Cross Section
1. DWWP update
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2. Water Budget
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   - What & Why
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**Water Budget: VI Conceptual model development**

- Gabriola Island
- Gabriola (AQUIFER)
- Spray (AQUITARD)
- Geoffrey (AQUIFER)
- Northumberland (AQUIFER with confining units)
- Fault fracture zones (preferential flow paths)
- de Courcy Fm. (AQUIFER)
- Gabriola sandstone
- Spray mudstone
- Geoffrey sandstone
- Northumberland sandstone
- Clay aquitards and mudstone aquifer layers
- Fresh water
- Sea water

~ Brackish old water at depth ~
~ Old sea water at large depth ~
Water Budget Study

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Water Budget Calculations

Accounting.....

for water.....

(Accounting for water: rainfall, evaporation)

(REGIONAL DISTRICT OF NANAIMO)
**Water Budget Study**

**Stress Assessment Calculation**

**Input:** Supply  
**Output:** Demand

**Recharge**

- Residential
- Commercial
- Agricultural

**STRESS LEVEL**
- LOW: <50%
- MOD: >50%
- HIGH: >100%

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   - How & Who
Water Budget Study

Stress Assessment Calculation

**Input:**

<table>
<thead>
<tr>
<th>Recharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% of rainfall – lower limit</td>
</tr>
<tr>
<td>25% of rainfall – upper limit</td>
</tr>
</tbody>
</table>

*Recharge is highly spatially variable and dependent on:*

- **Rainfall**
- **Soil type & soil zone thickness**
- **Rock type**

---

2. Water Budget
   - **Background**
   - **Overview**
   - **Methodology**
   - **Findings**
   - **Conclusion**

3. Watershed Management
   - **What & Why**
   - **How & Who**
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**Water Budget Study**

**Stress Assessment Calculation**

**Output:**

- **Residential Demand**
  - survey respondents (10.8%)

- **Commercial Demand**
  - Survey respondents
  - Daily max industrial water demands

- **Agricultural Demand**
  - Survey respondents
  - Max licensed allocation (farm type)
Seasonal Water Use

Residential Water Use Type

- Summer
- Winter

- Toilets
- Faucets
- Showers
- Dish washer
- Clothes washer
- Garden
Findings: Water Stress Assessment

10% recharge scenario: lower limit

→ 4 deficit regions July - Aug
  Sands, West Degnen Bay, False Narrows & Mudge
→ 1 deficit region Apr - Sept
  North Degnen Bay

25% recharge scenario: upper limit

→ 1 deficit region Jun - Aug
  North Degnen Bay
Water Deficit: Demand > Recharge

Average Monthly Water Surplus and Water Stress in Sub-regions (1000s m³/month)

Chart Symbols:
- 25% recharge scenario
- 10% recharge scenario
- Red dot (water taken from storage)

Month: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

Regions:
- Sands region
- Lock Bay region
- Gabriola region
- Silva Bay region
- North Degnen Bay region
- West Degnen Bay region
- Northumberland Channel region
- False Narrows region
- De Courcy Island region
- Mudge Island region
- Hoggan Lake region
- South Descanso Bay region
- North Descanso Bay region
- Vancouver Island

Legend:
- Demand > Recharge
- Water deficit (water taken from storage)
<table>
<thead>
<tr>
<th>Sub-regions</th>
<th>Monthly Pumping Water Stress (Groundwater Demand / Recharge) %</th>
<th>Annual (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan</td>
<td>Feb</td>
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<tr>
<td>Sands</td>
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<td>14</td>
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<td>Lock Bay</td>
<td>6</td>
<td>8</td>
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<td>Gabriola</td>
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<td>Silva Bay Region</td>
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<td>5</td>
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<tr>
<td>West Degnen Bay</td>
<td>4</td>
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<td>South Descanso Bay</td>
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<td>Mudge Island</td>
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<td>DeCourcy Island</td>
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</tbody>
</table>

**STRESS LEVEL**

- LOW: <50%
- MOD: >50%
- HIGH: >100%

**Recharge Scenarios**

- 10% recharge scenario
- 25% recharge scenario

- Residential 37% increase
- Commercial increase
- Agricultural increase
How reliable are the stress assessments?

Example: North Degnen Bay

- Assumes ~85% of water use in North Degnen is agricultural
- High agricultural demand April-Sept (irrigation period)
- Agricultural demand values assume maximum licensed volume of water across the entire irrigation period
- Low total demand/km$^2$ compared to other sub-regions
- % recharge assumed uniform year round
Water Budget Study: Conclusion

Author recommendations:

✓ Improved estimates of **hydraulic parameters** (pump tests)

✓ Increased **water level monitoring** (Mudge & DeCourcy)

✓ Monitoring of **rainfall and water level rise**

✓ Increased monitoring of coastal wells for **Saline intrusion**

✓ Water budget calculation **parameters need improved accuracy**
  (survey #s, commercial & agricultural use is unknown, surface water!)
Findings: data gaps

Study 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**
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
now what?
yesterday
tomorrow
3. Integrated Watershed Management Planning
Integrated Watershed Management Planning

WHAT is a Integrated Watershed Management Plan?

Phase One
- Drought Management
- Surface Water Quantity
- Groundwater Quantity

Phase Two & Three
- Biodiversity
- Ecological
- Watershed Sustainability

Phase Three
- Non-point Source Pollution Management
- Point Source Pollution Management
- Ground, surface and source water protection

It considers all human and environmental aspects of a watershed.
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
Integrated Watershed Management Planning

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**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
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?
Thank You!