

Esquimalt Lagoon Community Monitoring Program



TRAINING MODULE



Overview



- Introduction
- Community Monitoring Program
 - Procedures
 - Locations and Frequency
 - Schedule
 - Equipment
 - QA/QC
 - Data Analysis



- **What is ELSI?**

- A broad coalition of community and environmental groups, government agencies and First nations working to protect, enhance and restore Esquimalt Lagoon and Coburg Peninsula.

ELSI Partners:

- City of Colwood
- CRD Parks
- Department of National Defense
- Environment Canada
- Canadian Wildlife Service
- Esquimalt lagoon Enhancement Association
- Esquimalt Nation
- Fisheries and oceans
- Westshore Chamber of Commerce (Tourism)
- Habitat Acquisition Trust
- Local Residents
- Ministry of Environment
- Pacific Centre family Services
- Parks Canada
- Royal Roads University
- Songhees nation
- VEHEAP
- Victoria Natural History Society

Goals of the Monitoring Program:



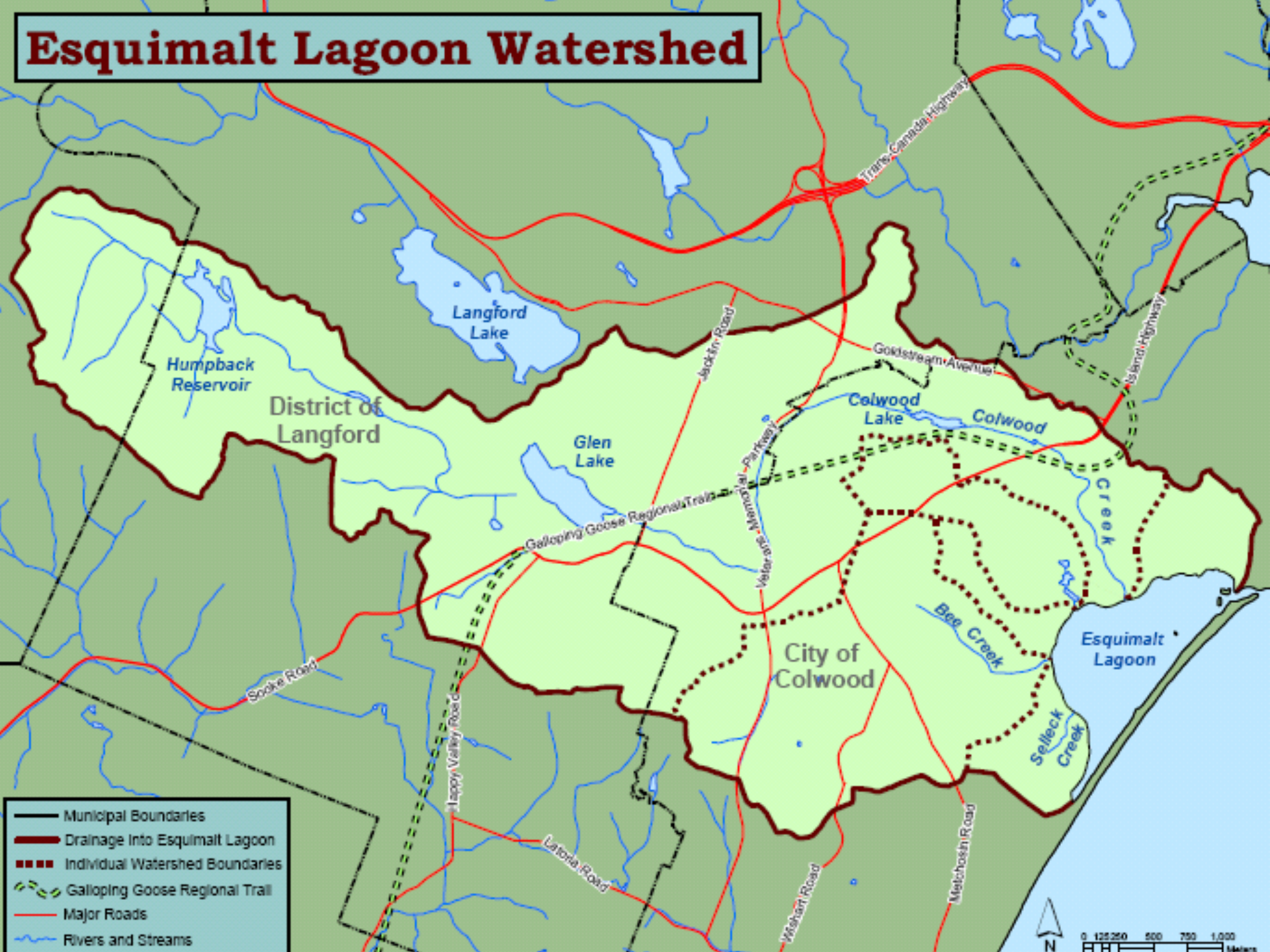
- Collect long-term data and observations
- Provide residents an opportunity to get involved in improving the quality of local waterways
- To educate residents about how contaminants are transported through the watershed and onto the lagoon
- Stimulate awareness and action to prevent non-source pollutants from entering the Esquimalt Lagoon
- For volunteers to be able to recognize the triggers that would warrant further government testing.

Watershed Concept: Questions raised



- What exactly is a watershed?
- How does the land use in a watershed impact water quality?
 - Green vs. impervious spaces
 - Contaminants; how do they enter?
 - EL watershed facts:
 - ✦ 1850 hectare watershed
 - ✦ 4 main waterways, and over 30 different emerging springs enter the lagoon

Esquimalt Lagoon Watershed



Problems within Esquimalt Lagoon: Is there Any?



- Result from baseline study (2002)
 - **Esquimalt Lagoon**
 - ✦ **Elevated levels of:**
 - Arsenic, copper, lead and zinc (sediment)
 - Copper and coliform bacteria (water)
 - **All 4 outfalls**
 - ✦ Elevated results of:
 - Fecal Coliforms
 - Nitrates
 - ✦ Algal Blooms = fish kills
 - ✦ Shell fish closures due to red-tide

Top 10 cause of River Pollution



1. Sediment (soil erosion)
2. Excessive nutrients (fertilizers)
3. Organic enrichment (sewage)
4. Pathogens (sewage)
5. Metals (industrial waste)
6. Salinity
7. Pesticides
8. Suspended solids
9. Habitat modification
10. Flow alteration

What type of solutions are improving water quality at the lagoon?



- Planting bushes and grasses which help to filter some of the contaminants in the water
- CRD completes storm water quality testing 2x/year to help monitor H₂O
- The installation of sewers in the area can help to reduce fecal and chemical contamination
- Residential stewardship = minimizing use of pollutants

Community Monitoring Program Rational



- Obtain long-term data on Nutrient inputs to lagoon
- Obtain information about factors contributing to or cause of roll-over events
- Monitor the water quality

Can anyone participate in the monitoring program?



- **Community members that:**
 - Have an interest in the chemistry of the environment
 - Are concerned about and want to monitor water quality in the area

- **Must be prepared for:**
 - Reading safety manual for sampling guidelines
 - Sample and analyze results to a certain level of quality
 - Meet the physical requirements of sampling
 - Get down and dirty with work in the rain

Beach and Shoreline Etiquette



- Behavior is needed- be respectful:
 - Park vehicles safely
 - Don't drive on the beach
 - Leave your dog at home
 - Leave no trace behind
 - ✦ If you dig a hole, fill it
 - ✦ Try to minimize trampling

Safety



- **Help protect yourself and the equipment- use proper analytical technique**
 1. Wash hands after performing experiments
 2. Avoid contact between reagents and skin, eyes, nose, and mouth
 3. Wear protective eyewear or glasses when handling reagents
 4. Use the test tube caps or stoppers, not your fingers to cover test tubes during shaking or mixing
 5. Thoroughly rinse test tubes before and after each test
 6. Tightly close all reagent containers immediately after use. Do not interchange caps from different containers

Monitoring program includes 3 parts:



1. Visual observation documentation
2. Salt water sampling
3. Fresh water sampling

1. Visual Observation documentation



- Responsible for sounding the alarm if a roll-over event has been detected
- Items to record on data sheet include:
 - Weather observations
 - Location of algal mats
 - Smells or unusual colors in the water

2. Salt water Sampling



- **Parameters**
 - Alkalinity
 - Ammonia Nitrate
 - Carbon Dioxide
 - Dissolved Oxygen
 - Water temperature
 - Nitrate Nitrogen
 - Nitrite Nitrogen
 - pH
 - Salinity
 - Turbidity

3. Fresh Water Sampling



- **Parameters:**
 - Coliform bacteria
 - Dissolved Oxygen (DO)
 - Biological oxygen demand (BOD)
 - Nitrate
 - pH
 - Phosphate
 - Temperature
 - Turbidity

Why Test for...



- **Fecal Coliforms? (fresh only)**

- Are naturally present in humans but not in unpolluted waters
- Should not be found in drinking water
- Indicator of sewage in fecal contamination
- Coliform test in this kit will indicate above or below 20 coliform colonies per 100 mL of river water (48 hr test)

- **Dissolved Oxygen? (DO)**

- Aquatic animals need oxygen to live
- An important measurement of water quality, cold water can hold more DO than warm water
- High levels of sewage or rotting plants can cause DO to decrease thereby affecting the ability of plants and animals to thrive
- DO Levels below 3 ppm are stressful to most aquatic organisms. DO levels below 2 ppm will not support fish. Levels 5-6 ppm are usually required for growth and activity.

Why Test for... contd



- **Biological Oxygen Demand (BOD) (fresh water only)**
 - Is a measure of the quantity of DO used by bacteria as they breakdown organic waste
 - In slowmoving and polluted waters ,DO is often taken up by bacteria and not by aquatic animals who need it to thrive
 - 5 day test
- **Nitrate (limiting nutrient in Esquimalt Lagoon)**
 - Nitrogen acts as a fertilizer for aquatic plants
 - The more fertilizer the more plants, the less oxygen
 - Nitrogen occurs in water as Nitrate, Nitrite and Ammonia
 - Nitrate levels < 4 ppm (unpolluted), > 40 ppm (unsafe for drinking)

Why Test for... contd



- **Phosphate/Phosphorus**

- Phosphorus acts as a fertilizer for aquatic plants yet appears in natural waters as phosphate (> 0.03 ppm = plant growth)
- Over half of the phosphate in lakes, streams and rivers comes from detergents

- **pH**

- Most common analyses in water testing
- Is a measure of the activity of hydrogen ions in a water sample
- pH scale is from 0-14 (>7 acidic, <7 basic)
- Optimum range for most organisms (6.5 – 8.2)
- Rapidly growing algae and vegetation remove carbon dioxide from the water during photosynthesis, resulting in a low pH

Why Test for... contd



- **Temperature**

- Key to water quality
- Affects:
 - ✦ Amount of DO present in water
 - ✦ Rate of photosynthesis by aquatic plants
 - ✦ Sensitivity of organisms to toxic waste and parasites
- Threat of thermal pollution to stream ecosystem

- **Turbidity**

- Measure of the relative clarity of the water
- May be the result of soil erosion, urban run-off, algal blooms and bottom sediment disturbances (bottom feeders, birds, boat traffic)

Why Test for... contd



- Alkalinity (Buffering capacity, salt water has the ability to “buffer acidic pollution” than fresh water)
- Carbon dioxide (fresh water can hold more oxygen than salt water)
- Salinity
- Ammonia Nitrate

Sampling procedure- talk about in last
slide



Sample Locations



1. **Visual Observation Documentation:**

- Random Locations

2. **Salt Water:**

- 4 locations
- SW₁ - SW₅

3. **Fresh Water:**

- 7 locations
- FW₁ – FW₇

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Sampling Schedule



- **Visual Observations:**
 - Once a week
- **Salt and Fresh Water:**
 - once a month and within one week of the previous month's sampling period
 - i.e. if you sample on the 5th , on the next month sample from the 5-10th

Fresh water and Salt water Sampling Method



Fresh Water

- Overview
- BOD (5 day procedure)
- Fecal Coliform (48 hr procedure)

Salt Water

- Overview
- Tides
- Complete observation sheet
- How to:
 - Titrate
 - Read octa-viewer

- These two sampling methods are presently being referred to the guide on sampling