Overview

- Highlight CAWT activities
- Profile emerging wastewater technologies
Global Perspective

UN Secretary-General Bon Ki-moon recently described unsafe drinking water as a *Silent Crisis*

UN declared 2005 to 2015 as the “Water Decade” underscoring the magnitude of this crisis

Some Facts ......
➢ only 2.5% of global water is drinkable
➢ of this nearly ¾ is locked away in ice and snow
➢ only a small fraction if readily available for human use
➢ Water use growing twice as fast as population growth

➢ world’s 6 billion people are drawing from 54% of all water resources (rivers, lakes, aquifers)
Water withdrawals by 2025 expected to increase dramatically

- over 1.4 billion people currently live in areas where withdrawals exceed recharge
- 60% of European cities (> 100,000) withdrawal water faster than it is replenished
- by 2025, 1.8 billion people will not have enough water to meet daily needs, and 2/3 of the global population could be water stressed
1 of every 6 people do not have access to SAFE water

Globally, diarrhoea is the leading cause of illness and death

88% of diarrhoea is caused by lack of access to clean safe water
2.5 billion (~1 billion children) live without basic sanitation

every 20 seconds a child dies for lack of sanitation (1.5 million preventable deaths a year)
What is the Centre for Alternative Wastewater Treatment?
Wetland Performance

Cold Climate Applications

Mineral & Industrial Wastewaters

Enhancers of treatment processes

Real World Applications

CAWT

Education and Policy support
Centre for Alternative Wastewater Treatment

- Main areas of focus:
  - Small, remote or under-developed communities (not serviced by centralized WWTPs)
    - Northern Canada
    - Developing countries (e.g., Mexico, Kenya)
  - Mining / Industrial
    - Arsenic
    - Metaflo
  - Enhancement
    - SciCorp
    - BOCC
    - BlueFrog
  - Independent verification
    - Green turtle
    - Imbrium
  - Knowledge Transfer
Wetland Performance
Saturation zone is approx 147 cm above aeration grid (approx 17.6 m³). Aeration grid directly on granite.
Average growth of the aquaculture industry compared to capture fisheries and terrestrial farmed meat production since 1970 (FAO, 2007)
Low waste concentrations

- Solids (organic and inorganic)
- Nutrients (dissolved and particulate nitrogen and phosphorus)

A comparison of municipal wastewater and trout farm effluent

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<th>Parameter</th>
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<th>Trout Farm Effluent</th>
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Aquaculture industry requires a simple, low cost effluent treatment technology

Constructed wetlands
FRAME AND LINER
Haliburton Wetland
Sustainability house in Toronto
Cold Climate Applications
Assessing the Use of Constructed Wetlands for Wastewater Treatment in the Kivalliq Region of Nunavut

International Polar Year Research Project
Recent additions include communities in the NWT and Alert.
Motivation for the Research

While wetlands have been used to treat wastewater in Northern Canada for many years, there is still a lack of knowledge on how to best design treatment wetlands to:

(a) suit Arctic climate and geography, and
(b) meet changing community needs, especially as communities grow.

Understanding the limits and treatment potential of wetlands is important for protecting public health and preventing ecosystem contamination, as well as designing and meeting regulations.

This issue has become more urgent because Environment Canada is creating new federal wastewater regulations under the Fisheries Act. New effluent standards for the Arctic will be proposed by 2013.
IPY - outcomes

• A total of 14 communities have been surveyed

• have modeled cold climate subsurface horizontal flow - SubWet

• work has been expanded with funding from Environment Canada to study wetlands in western Arctic
CAWT’s involvement in this initiative

Focus:
- wastewater treatment with emphasis on the use of treatment wetlands

Goal:
- the development of capacity building tools

Pathway Forward:
- review and assess current capacity building indicatives
- determine how we can best augment existing activities
Arsenic – mining industry

• newly identified reducing bacteria causes “aqua ion” of As to complex with other minerals (e.g., sulfur) and fall out of solution

• an effective way to remove arsenic from tailing water
Phosphex

- use of steel slag as adsorptive medium for phosphorus
- pH, concretion, V, Al
Biochar

• a waste product of incomplete combustion in lack of oxygen

• Now being investigated for several uses including soil amendment, carbon sequestration, and waste water purification

• CAWT is investigating its use to remove trace metals and as a medium to neutralize high pH waters
Flocculants

Investigating the use of coagulants and polyacrylamide polymers to dewater wastewaters from the drilling and oil refinery industry
Enhancers of treatment processes
New Technologies

• CAWT is involved in several projects looking at new technologies

• primary aim is to investigate the efficacy of these new methods and to develop the scientific documentation that will evaluate / document performance and help bring them to market.

• projects include: carbon capture, vermiculture, grease traps, floating islands, bluefrog, wood leachates (metals),
Blue Frog™ (base unit) is an efficient mixer and passive aerator that provides up to 7 mm gallons per day flows and has the ability to layer the treated water.

- Total Weight: 520 lbs.
- Diameter: 8 ft
- Total height: 5’ 3”
- Standard Float Depth: 32”
- Gear Motor: 3 hp, 1720 rpm, 3 phase
- AMPS: 4.5 AMPS/460V, 9.0 AMPS/230V
Continuously Stirred Tank Reactor (CSTR)

The CSTR allows incoming wastewater to be gently mixed, maximizing the breakdown of organic material (*including sludge*)
CSTR selects for facultative and anaerobic organisms in the inlet CSTR
Hog Confinement

**Location:** Western Oklahoma

- Farrowing operation with 6,600 sows
- Total of 14 feet of sludge was remediated **in-situ** over a **one** year period
Enhancing agents for facultative bacteria in anaerobic digesters
Different modes of actions are being investigated

• enhancers of bacterial health
• catalytic agents
Effective For waste Waters Having High BOD High solids
Real World Applications
Mexico
(some of CAWTs earliest work)
Future Plans include

Kenya (UNU – INWEH)

China (Inteed)
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CAWT

Education and Policy support
Large Diameter Test Wells

Three enhanced large diameter test and one conventional test well were constructed Fleming College (info will be used to update regulations)
System Operation

Each day ~ 1000 L of water is pumped from each well.

System powered by solar array.

Automated.
Investigated Construction Materials and Methods

• study originally focussed on construction methods but has now advanced to cleaning methods

• investigations are underway to characterize the microbial flora of wells and to determine which clearing methods are most appropriate and effective
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Training

SubWet on the screen

wetland design

International Environmental Technology Centre

INVITATION TO NOMINATE
2006 STOCKHOLM WATER PRIZE

The Stockholm Water Foundation welcomes nominations from around the world for the 2006 Stockholm Water Prize.
CAWT – International Scope