

# Wastewater Problems in Cottage Country

## Wastewater Issues in the Whiteshell Area

- Lagoon overloading and leakage
- Nutrient loading
- Grey water disposal
- Recommendations

# Wastewater Primer

General wastewater parameters consist of:

- Biochemical Oxygen Demand (BOD), reduces oxygen in water, impact on fish
- Total Suspended Solids (TSS), unsightly and carries a lot of wastewater pollutants
- Ammonia, toxic to fish and also reduces oxygen in the water
- Nitrate, a nutrient which has potential negative impacts
- Phosphorus, limiting nutrient for algae growth,
  - Blue green algae is toxic to animals and humans
- Pathogens, health concern, cause illnesses and boil water orders

## Lagoon Treatment

- Lagoons reduce BOD, TSS, and pathogens through completely natural process of aeration, microbial action and sunlight
- Requires time and temperature to accomplish
- Minimal treatment for ammonia, particularly with a spring discharge
- Level of phosphorus treatment?
  - i. 50 to 70% reported in some reports. Effluent close to 1 mg/l
  - ii. Average effluent of 3.6 mg/l from study referenced in Manitoba Lagoon Workshop
- Minimal reduction in nitrates

## Lagoon Overloading – Emergency Discharges

- In 2005 a group of cottage owners met with government officials regarding emergency discharges
- In 2009, a cottage owner noticed and recorded an uncontrolled discharge from the Dorothy Lake lagoon, which ended up making headlines
- Difficult to access information on operation and results
- Numerous government departments involved, who is ultimately responsible



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# Lagoon Overflows – Impact on the Environment

Impact of these discharges are:

- i. Improperly treated wastewater
- ii. High levels of pathogens entering the lakes, particularly during high swimming and water usage times
- iii. High cost, pollution, and increased truck traffic in the park due to increased hauling
- iv. Damage to the environment and reduced quality of life for park users

# Lagoon Overflow –Regulation, and Enforcement

- Lagoons in Manitoba are designed to be discharged a maximum of twice per year, in the spring and fall
- This allows time for sun and wind acting with the naturally occurring microbiology to treat the wastewater
- By shortening this cycle the wastewater is not properly treated
- The province is in a position where it both operates and regulates the lagoons, which creates a potential for compromise

## Lagoon Overflow – Liner Leakage

- Lagoons are built with liners to contain the wastewater
- Big Whiteshell Lake lagoon secondary cell was dry for 10 years, the wastewater was leaking out the bottom
  - i. No treatment
  - ii. How did this continue?



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## Lagoon Overflow - Latest licenses

Westhawk Lake lagoon license dated October 15, 2007 provided the following:

- Continuous PVC liner, to prevent leakage into the ground
- Total phosphorus of 1 mg/l, start of phosphorus treatment requirements
- No discharge between Nov 1 and Sept 14, resulting in once a year discharge
- Comprehensive testing and reporting requirements are detailed



## Nutrient Issues - Phosphorus and Nitrogen

- The Manitoba Government has mandated that the City of Winnipeg implement a \$700 million biological nitrogen and phosphorus removal program
- The CEC has listed phosphorus as a leading wastewater issue in the province.
- Phosphorus is the principle cause for increased algae blooms in Manitoba Lakes



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## Nutrient Issues - Phosphorus Capacity

- Currently there are no substantive studies regarding the phosphorus loading capacity of lakes in the Whiteshell
- There is no scientific rationale for the 1 mg/l phosphorus limit in the Whiteshell area
- Shoal Lake Watershed Management Plan, April 2002, provides a picture of the potential impact
  - Model to assess long term damage to lakes caused by changes in phosphorus loading
  - A 500 kg per year increase in phosphorus loading to Crowduck Lake, 3 or 4 times the size of Big Whiteshell Lake, resulted in an average phosphorus concentration of 60 ug/l.
  - A level of 20 ug/l was the objective to prevent nuisance algal growth

## Nutrient Issues - Typical Phosphorus Loading

Based on the Shoal Lake study, let's assume 50kg/yr phosphorus would be detrimental to Big Whiteshell Lake. This would be caused by one of the following scenarios:

- 85 year round residents served by septic systems
- 840 residents served by a phosphorus removal lagoon
- Atmospheric deposition on 250 ha of lake
- Runoff from 900 ha of boreal forest
- Run off from 85 lots using chemically fertilized lawn

The lake is currently experiencing phosphorus loading from all these sources



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# Nutrient Issues - Phosphorus Removal

## Biological Removal

- Allows phosphorus to be released back into the environment
- If not properly managed this may release back into the water and cause environmental damage
- High levels of capital cost and operating effort

## Chemical Removal

- Permanently binds the phosphorus, so it is no longer biologically available.
- Simple to incorporate in a lagoon
- Adding filters can reduce phosphorus levels to 0.2 mg/l in lagoon effluent

We need to ask ourselves, what is our priority and capability at this time regarding phosphorus management.

# Nutrient Issues – Manitoba Phosphorus Removal

- Manitoba has adopted the approach that biological phosphorus removal is the preferred method
- For Whiteshell lagoons, the required treatment is longer residence time, providing algae time to grow, taking up phosphorus, and settling in the lagoon
- Doesn't remove phosphorus from the system, just delays the release
- For a small system like the Whiteshell, chemical phosphorus removal will likely be required to adequately reduce the impact of all the phosphorus being brought into the system

## Grey Water Disposal - Typical Water Usages in a Home/Cottage

- Bathing 20%
- Toilet 25%
- Sinks 15%
- Clothes washing 20%
- Kitchen 5%
- Other/leakage 15%

Grey water represents up to 75% of household water disposal

Source: Wastewater Engineering, Metcalf & Eddy

## Grey Water Disposal - Status

- Previous regulations allowed for the use of sullage pits and disposal fields to dispose of grey water
- Due to low impact on the environment caused by grey water, it was kept separate and treated separately in the past.
- Grey water typically has no impact on environment if low phosphorus soap is used
- Sewage was hauled to lagoons for further treatment

# Grey Water Disposal – Recent Requirements

- Upgrades to on-site wastewater systems or change in ownership results in the grey water systems being eliminated
- One of the stated concerns regarding grey water disposal is that the actual effluent quality is not known, therefore capture it in a holding tank and then treat it
- This grey water is hauled to a lagoon, contributing to lagoon overloading and phosphorus increase
- The Onsite Wastewater Management Systems Regulation allows the director to approve replacing, modifying, or expanding a disposal field
- Why not continue with the use of grey water disposal fields in the appropriate locations and relieve pressure on lagoons



# Grey Water Disposal – Grey Water Systems in Brisbane, Australia

- Brisbane has been experiencing severe water shortages for years
- Brisbane actively promotes use of grey water for watering plants
- Recommend low phosphorus, sodium, and nitrogen detergents
- Subject to inspection and closure if it creates a nuisance



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# Government Initiatives

- \$5.5. Million has been spent on increasing capacity in the Whiteshell area, specifics and the time lines are not provided
- Regulations are requiring greater treatment from the lagoons
- 700 inspections have been carried out under the Enhanced Inspection Program. Details are not provided



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# Recommendations

- Develop a Watershed Management Plan for the Whiteshell to identify specific nutrient targets
- As a priority, develop a comprehensive plan:
  - i. enlarge/upgrade lagoons
  - ii. consider aerated lagoons and effluent filters
- Require phosphorus reductions from all lagoons
- Revise the requirements regarding grey water hauling to reduce the lagoon hydraulic loading, at least for the interim
- Public education regarding phosphate detergents, fertilizer application, etc. and their impact on the lakes



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## More Recommendations

- Develop communication regarding lagoons effluent results, overflows and regulatory excursions to keep the public informed
- Increase wastewater system inspections, to ensure storage systems as well as lagoons don't leak and then enforce and inform the public
- With improved communication, an interested group could ensure that all involved parties are held accountable to preserve the environment



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**Thank you for your interest.**



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