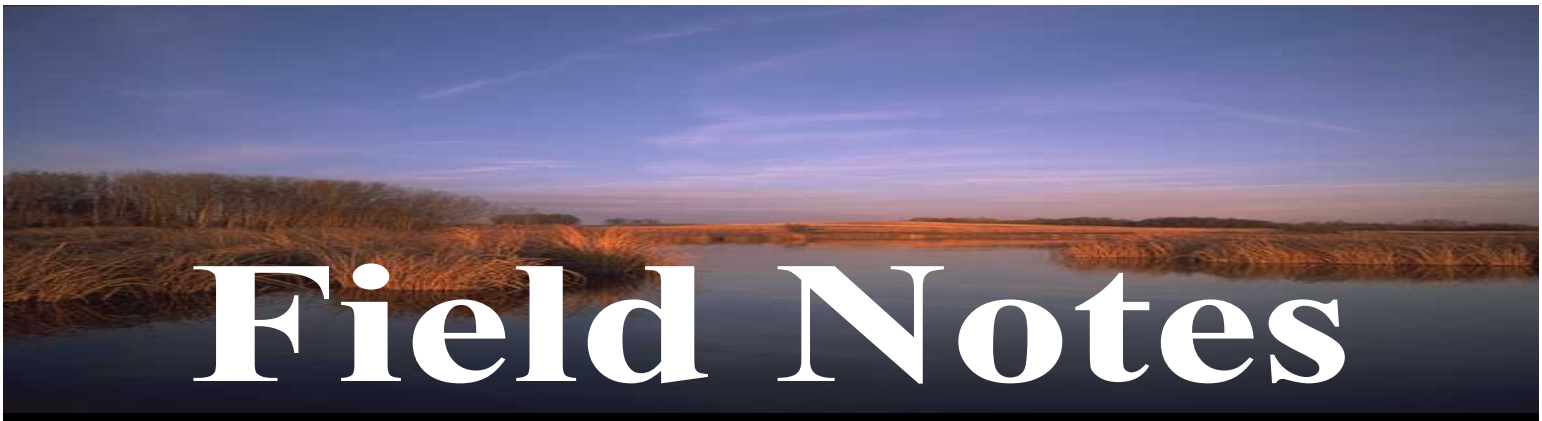

Field Notes

Oak Hammock Marsh Interpretive Centre

Natural Wastewater Treatment

Wetlands are important for clean water and a healthy environment. Wetlands slow the passage of water and encourage the deposition of nutrients and sediments carried by water. The nutrients, mainly nitrogen and phosphorus are from agricultural sources, human wastes and industrial discharges. They may accumulate in the sub-soil, be transformed by chemical and biological processes or be taken up by wetland vegetation which can then be harvested and effectively removed from the system. Wetland plants can also remove toxic substances and heavy metals.

Natural wetlands should not be used for wastewater treatment; only constructed, artificial wetlands should be used for this purpose.

Ducks Unlimited Canada built an artificial wetland that cleans the 8,637,900 litres (1,900,600 gallons) of wastewater from the Conservation Centre per year.

How lagoons work in general

- Lagoons are shallow, man-made ponds that are built to maximise natural treatment processes.
- In a lagoon, bacteria break the sewage down to gases and other simple materials that dissolve in the water.
- The bacteria are able to perform their task by using oxygen that is produced by algae which grows in the water.
- Algae are one celled microscopic plants that grow in water. They need sunlight to live, as they convert carbon dioxide into oxygen.
- The algae also require some of the simple compounds produced by the bacteria as they break the sewage down.
- Sunlight can penetrate the water to a depth of 1.2 metres (4 feet).
- This depth means that the bottom layer of the lagoon receives no sunlight and no algae will grow. This leads to an anaerobic zone (no oxygen), if its depth is too great then the lagoon starts to smell.
- Most lagoons are 1.52 metres deep (5 feet) so that they don't freeze to the bottom.
- The bottom of the lagoon therefore receives materials that have settled out and is oxygen free.

Summer vs. winter

- Algae can not function during the winter (sunlight is blocked) and all treatment of wastewater stops.
- The system stores wastewater between November 1 and July 15 in the primary and secondary cells.

Smell

- During the winter no sunlight can enter the lagoon because of snow and ice formation.
- This means that the oxygen loving bacteria are soon replaced with bacteria that require no oxygen.
- These bacteria produce a smelly gas.
- This gas is released in the spring when the ice melts as it takes several days for the algae to start growing again.
- Here at OHM the algae start growing again by mid-May.

Field Notes

Oak Hammock Marsh Interpretive Centre

How does the wastewater get to the ponds?

- The wastewater flows from the Centre to the pump station (at junction of Mallard Bay and Jackrabbit Trail) using gravity.
- It is then pumped 1100 metres (3,600 feet) to the primary cell using a 100mm (4 inch) pipe. This distance exceeds the minimum buffer zone between habitable dwellings and sewage lagoon of 450 metres (1,500 feet).
- Transfer between cells is done using gravity of interconnecting pipes under the dykes. There is a control valve for each pipe to control the flow.

Primary cell

- Size: 4330 m^2 or 0.433 hectares (1.07 acres)
- All the cells are lined with clay (minimum 1m thick) to seal the bottom so that the wastewater percolates through at an acceptable rate.
- Receives untreated wastewater and provides treatment through a "settling out" of the larger particles and biological breakdown of the remaining wastewater.
- This cell often has large quantities of algae growing on it.
- The wastewater will sit in this cell for 3 to 4 months during the summer, longer in winter because of no activity.

Secondary cell

- Size: 4330 m^2 or 0.433 hectares (1.07 acres)
- Receives overflow and provides additional treatment and storage through the winter months when no effluent is discharged.
- At this point the water would be ready to be discharged (biochemical oxygen demand, suspended solids and coliform levels would all be within provincial and federal lagoon effluent guidelines).
- The effluent is tested before released into the artificial marsh cell to ensure the standards are met. Testing has shown that our system exceeds government standards and is safe.

Secondary cell cont.'

- This cell has fewer nutrients and so less algae grows, this is desirable because this protects marshes, lakes and rivers from receiving water with high levels of algae or bacteria.
- The wastewater may sit in this cell receiving treatment for up to one year.
- Cell 2 is flushed completely in one year.

Artificial marsh cell

- Size: 4440 m^2 or 0.444 hectares (1.10 acres)
- This third cell is to further safeguard against impacting the environment.
- This cell is a gravel-bottom marsh that has been planted with cattails. The cattails remove phosphates, nitrates and further reduces the biochemical oxygen demand of the already treated sewage.
- The gravel bottom increases the exposure of the root system to the effluent.
- It also provides additional wetland habitat.
- This system was chosen to act as a demonstration model that will hopefully encourage municipalities to incorporate an artificial wetland in future lagoon developments.
- Once approximately every 50 years the sludge at the bottom of the cells will be removed and taken to a dump.

Release into marsh

- The effluent is discharged into the marsh from the 3rd cell between July 15th and November 1st.
- It stays in the 3rd cell for 2 to 3 weeks and then into marsh, the effluent is released in small portions.

In addition to water purification, these wetlands provide habitat for a wide variety of organisms, including, fish, birds, mammals, amphibians, reptiles and insects. As wetlands continue to be altered and deteriorate, artificial wetlands become increasingly important.