

Netley-Libau Nutrient-Bioenergy Project

“Harvesting cattail provides a
‘Lake Friendly’ biomass source for
bioenergy production—to displace
fossil fuels and reduce greenhouse
gas emissions”

— Richard E. Grosshans, Research Scientist, Natural and Social Capital Program
and Water Innovation Centre, International Institute for Sustainable Development (IISD)





Did You Know?

- At 250 sq. km, Netley–Libau Marsh is one of the largest freshwater coastal wetlands in North America.
- Netley–Libau is the last line of defense against excessive nutrient loading to Lake Winnipeg, with the potential to absorb great amounts of nitrogen and phosphorus.
- Wetlands like Netley–Libau Marsh provide valuable ecosystem services—including carbon storage, nutrient filtration, wildlife habitat and recreation—while at the same time embodying cultural values rooted in the history of the ecosystem. Many changes over the last century, both natural and human-induced, have degraded the marsh, and it is no longer the healthy coastal wetland it once was. However, restoration could reverse much of this damage.
- Linking nutrient interception with bioenergy production has great potential for improving both the marsh ecosystem itself and the economic benefits it provides.

Netley–Libau Nutrient-Bioenergy Project

Reaping the Multiple Benefits

The Netley–Libau Nutrient-Bioenergy project proves that an innovation-focused bioeconomy can become a reality for Manitoba. The project showcases how Lake Winnipeg nutrient management is an opportunity that can create new value chains, producing environmentally-friendly products while also restoring wetlands. In the future, the approach demonstrated at Netley could be applied to restored and engineered wetlands, storm water ponds, and vegetated ditches across the entire Lake Winnipeg basin.

Since 2006, IISD, the University of Manitoba and Ducks Unlimited Canada have collaborated on a major research study at Netley–Libau Marsh to reduce nutrient loading to Lake Winnipeg. The study documented the impressive ability of a marsh plant known as cattail (*Typha spp.*) to intercept and store nutrients. The cattails were then harvested and turned into biomass for bioenergy, which not only provides a novel energy source but also permanently removes the nutrients from the ecosystem, preventing them from entering Lake Winnipeg.

The burning of cattails provides cleaner heat and electricity than fossil fuels, and also produces nutrient-rich ash that can later be used for fertilizer. Perhaps the most important contribution of the Netley–Libau Nutrient-Bioenergy project is that it demonstrates that reducing nutrient loads to Lake Winnipeg can be profitable while contributing new value streams to Manitoba's economy.

BACKGROUND: The Lake Winnipeg Basin

Lake Winnipeg is the 10th largest freshwater lake in the world and is integrated into Manitoba's economy, recreation and culture. Unfortunately, Lake Winnipeg has become one of the most eutrophic large lakes in the world. Excessive amounts of nutrients, mainly phosphorus, flow into the lake from its surrounding watershed. Human activities are largely to blame, including alterations to the natural landscape, urban wastewater, livestock, and agricultural runoff. As a result, the lake is increasingly afflicted by blue-green algal blooms that deprive the lake of oxygen.

Key Terms

Bioeconomy: An economy where the basic building blocks for industry and the raw materials for energy are derived from plant/crop-based (renewable) sources.

Biomass: Plant material or agricultural waste used as fuel.

Bioenergy: Energy produced from biological materials that can displace traditional, carbon-intensive fuel sources.





BACKGROUND: Netley–Libau Marsh

Netley–Libau Marsh is a freshwater coastal wetland consisting of shallow lakes, channels and wetland areas through which the Red River flows on its way to Lake Winnipeg. Netley–Libau is designated an Important Bird Area by Bird Studies Canada and the Canadian Nature Federation and provides spawning, nursery and feeding grounds for fish from Lake Winnipeg and the Red River.

The marsh provides an array of diverse ecosystem services such as wildlife habitat, nutrient filtration and nutrient storage through its plant community. Over 60 per cent of the phosphorus entering Lake Winnipeg does so through the Red River, much of which flows through Netley–Libau Marsh. Unfortunately, Netley–Libau’s ability to provide benefits has been severely compromised by drainage, dredging, flooding, and other landscape changes over the past century, resulting in a significant loss of wetland habitat. Now that we understand the remarkable value of this key wetland, it is time to reverse the damage. The economic and environmental benefits from Netley–Libau Marsh can be restored.

The Process

Cattails (*Typha spp.*) are tall marsh plants with long slender leaves that grow in wetland areas across North America. They can produce extraordinary amounts of plant material, or biomass, each growing season. As they grow in Netley–Libau Marsh, they absorb phosphorus from the litter and sediment layers, which are continuously fed by the nutrient-rich waters of the Red River and Lake Winnipeg. The phosphorus will eventually return to the sediment or waterways when the plants die and decompose. Harvesting the cattails prevents this release, permanently removing the phosphorus from the aquatic environment and reducing nutrient loads to Lake Winnipeg.

Step One: Cattails are harvested

The timing of cattail biomass harvesting is important: to protect wildlife habitat while maximizing nutrient removal and biomass quality (for bioenergy production), harvesting usually occurs in the late summer and fall. Currently, the cattail biomass is dried in swaths, and then baled. In order to increase efficiency, a larger pilot scale harvester is under development.

Step Two: Harvested cattails are compressed

Harvested cattails can be compressed into various fuel types such as pellets, cubes or logs for transportation and storage. These fuel products are a “Lake Friendly” renewable resource that is used in place of coal to produce heat energy.

Step Three: Biomass is burned for bioenergy

This cattail fuel can then be burned in biomass burners and pellet stoves to produce heat energy or combined heat and power generation. The remaining ash—which still contains very high levels of phosphorus—can be recovered and recycled for use as fertilizer.

The Benefits

The cattail harvesting approach used at Netley–Libau Marsh has many rewards and can benefit ecosystems and economies throughout the Lake Winnipeg Basin.

1) Nutrient removal

Harvesting the nutrient-laden cattails permanently removes stored phosphorus from the marsh, which will benefit Lake Winnipeg by decreasing nutrient loading and the effects of eutrophication.

2) Bioenergy production

The harvested cattails are a valuable “Lake Friendly” biomass source that can be turned into compressed fuel products (i.e. pellets and cubes), used for bioenergy production, a vital part of a future Manitoban bioeconomy.

3) Carbon credits

Cattail biomass can be burned in place of coal and other fossil fuels, resulting in fewer greenhouse gas emissions. Cattail bioenergy can also generate profitable carbon credits to be sold as offsets on the carbon market.

4) Phosphorus recovery

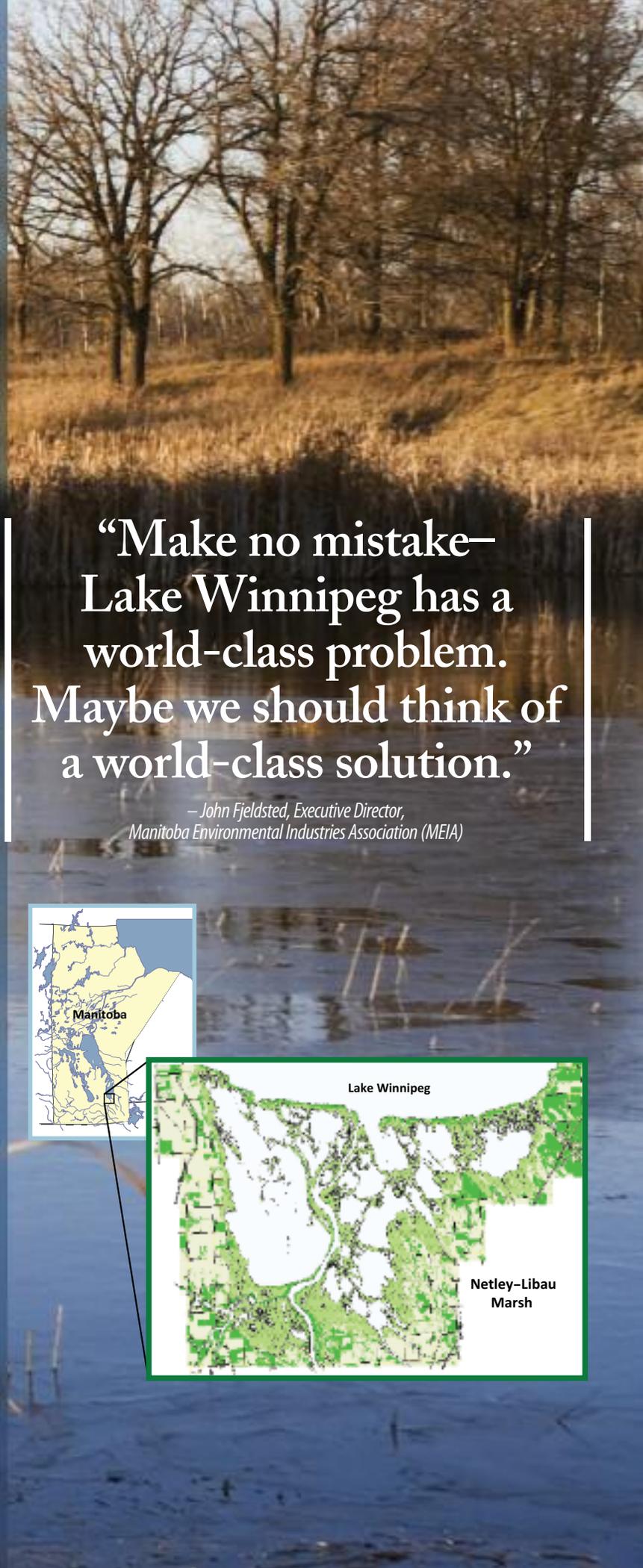
The remaining ash, which contains the phosphorus captured in the harvested biomass, can be collected and recycled for fertilizer. Phosphorus is a scarce and strategic natural resource that is critical to global food security.

5) Habitat improvement

Removing the dense accumulation of dead plants opens the marsh to sunlight, spurring new plant growth and renewing wildlife habitat.

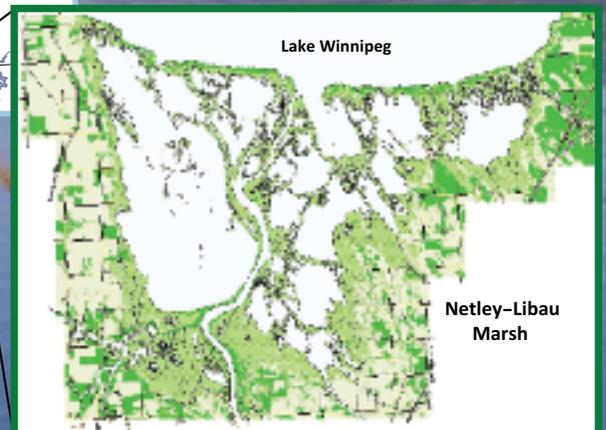
The Results

The Netley–Libau Nutrient-Bioenergy project demonstrates that cattail harvesting can deliver a host of benefits to Lake Winnipeg, the Manitoban economy, and the global environment. The underlying principles can be replicated in many other locations throughout the Lake Winnipeg Basin with co-benefits for water quality, wetland health and community economic development. The Netley–Libau Nutrient-Bioenergy concept represents sustainable development solutions in action.



“Make no mistake—
Lake Winnipeg has a
world-class problem.
Maybe we should think of
a world-class solution.”

— John Fjeldsted, Executive Director,
Manitoba Environmental Industries Association (MEIA)





“Society wants
to see two things:
prosperous farmers and
vibrant ecosystems.
There’s no reason why
we can’t have both.”

– Dr. Henry David Venema, Director,
Natural and Social Capital Program and
Water Innovation Centre, IISD

International Institute for Sustainable Development

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Water Innovation Centre

IISD established the Water Innovation Centre (WIC) as a new global knowledge hub for water management. It comprises a team of water experts from its staff, associates and networks. Located at IISD’s Head Office in Winnipeg, Manitoba, Canada, the Centre’s primary focus is the systematic evaluation of water management measures, costs and benefits. WIC’s integrated water management policy and practice innovations are designed to have relevance in North America and worldwide.

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