



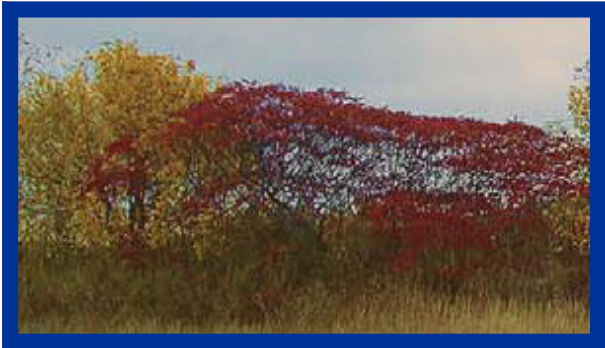
Niagara Community Observatory

Niagara’s Natural Park: The Restoration of the Glenridge Quarry into a Naturalization Site

Quarries and landfill sites are usually viewed as blights on the countryside, and some attempts at reclaiming these sites are small improvements. However, there can be exceptions. The Glenridge Quarry Naturalization Site located on the Niagara Escarpment is a place where nature flourishes, wildlife is sustained in a biodiverse habitat, and people with various



interests have opportunities for environmental education and recreation. Brock University’s relationship with the site has led to extensive research in the area. The Naturalization Site which opened to the public on September 28, 2004 has evolved from open pit quarry, to municipal landfill, to the Glenridge Quarry Naturalization Site.



With input from local residents and support from the Niagara Region, the landfill was transformed into Niagara’s natural park. The site is one of the most significant environmentally based initiatives undertaken in Niagara. The art and science behind this landscape architecture reflects the End Use Plan of green development and demonstrates a commitment to the 3 R’s – reduce, reuse, and recycle. The redevelopment of the site shows that safe, usable, and productive public places can be recycled from distressed lands. Such a biodiverse area provides a natural laboratory for an ecologist like Miriam Richards, professor at Brock University, and her students.

August 2010
Prepared by
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■ In the Beginning...

For many years, municipal waste from St. Catharines, Thorold, and Niagara-on-the-Lake was deposited in the landfill.

Landfills are never attractive landscape features, but in this case, issues arose due to the proximity of the landfill site to the residential community and agencies such as the Niagara Region Headquarters, Brock University, Shaver Hospital, Niagara Peninsula Children's Centre, and Four Points Sheraton. A Citizens' Committee was formed as a response to problems attributed to the landfill site. This Committee brought the Ministry of the Environment, NEC (Niagara Escarpment Commission) the community, and stakeholders together to work on addressing the issues of the landfill.

Their concerns included:

- Sewer surcharging during major storms;
- Gas odours;
- Degradation of groundwater and surface water; and
- Migration of contaminated groundwater and subsurface gas on to adjacent property.

This produced a "made in St. Catharines" Certificate of Approval that served to protect the environment by guiding future development, operation, and ultimate closure of the Glenridge Quarry Landfill Site.



Along with the City of St. Catharines, the Citizens' Committee regularly assessed the results of the ongoing environmental monitoring process and design from a landfill to a naturalization site. For example, the Citizens' Committee had input into the types of local flora that would be planted in this new environment.

Not only was the site esthetically pleasing and biodiverse, it was also designed to be used for recreational and educational purposes. The trail system was built to accommodate people with disabilities through the development of accessible walking trails. It was also created to be an off-site classroom for students studying nature. In addition, a supplementary children's activity book that met curriculum expectations was produced in consultation with the Niagara school boards.

With its multi-purpose and environmentally conscious focus, the design resulted in Niagara Region being internationally recognized. It won the Environmentally Sustainable Project Award for Liveable Communities. With community support, a troublesome landfill was turned into a useable asset. Let's discuss how this site moved from an operating landfill to an attractive natural park.

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■ The Operation of a Landfill

Landfills are not exactly pleasant elements in the landscape, but there are stringent controls in place to minimize their environmental impact. There are four potential problems that must be controlled in the management of a landfill—blowing garbage, liquid leachate, gas and vermin.

The first two issues are the easiest to handle. At the end of every work day, the waste is compacted, then covered with a layer of soil to reduce odours and blowing garbage, and to limit the attractiveness of the site to vermin and birds. The soil layer is scraped off the next morning and waste placement continues.

Liquid leachate is a combination of percolating water and decomposing garbage that can migrate from the landfill site to adjacent lands. To prevent this, a leachate collection system is put in place, consisting of plastic pipes placed within a gravel drainage layer at the base of the clay liner. The collected leachate is then transported by the sanitary sewer and treated at the local wastewater treatment plant.



Clean storm water from the area of the landfill is collected and retained in storm water ponds. The storm water is also discharged to the sanitary sewer.

Landfill gas is a natural by product of bacteria decomposing the waste in the landfill. It mainly consists of methane and carbon dioxide,



with small amounts of odourous gas. It is controlled by a collection system consisting of extraction wells connected by buried pipes to a flare where the gas is burned off. Landfill sites are baited and inspected to ensure vermin are not an issue.

The landfill infrastructure is inspected and maintained to ensure that it functions as designed and to protect public health and the environment. A landfill environmental program involves monitoring and sampling of the groundwater, surface water, leachate, and landfill gas.



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■ Monitoring a Landfill

The environmental monitoring program is divided into five components: groundwater, surface water, leachate, landfill gas, and forest sensitivity monitoring.

To ensure that the landfill's infrastructure operates as designed, a maintenance protocol is implemented that has a schedule for inspection, monitoring and equipment replacement. For example, maintenance of the leachate collection system includes pipe flushing, closed circuit television inspection, and field inspections.

The monitoring and maintenance of the landfill site are on-going for the "contaminating lifespan" of the landfill, which may be from several dozen to several hundred years after the site is closed until the waste becomes non-reactive and non-harmful to people or to the environment.



■ Closing a Landfill

The Final Closure Plan was prepared by Niagara Region in 2000 to ensure that the landfill site was properly closed. Regular monitoring and maintenance were put into place to guarantee the long-term protection of the environment.

The health and safety of the community were also central to the Final Closure Plan. On-site storm water management was designed to accommodate two consecutive 100-year storm events. Additionally, in the leachate collection system, a perforated pipe was installed in a granular layer on top of a compacted clay liner to ensure that leachate is collected. The gas collection system reduces odour and includes gas extraction wells, a vacuum blower, and a flare stack to enclose the flare completely.

The final cover system includes a compacted clay layer, topsoil, and vegetation.

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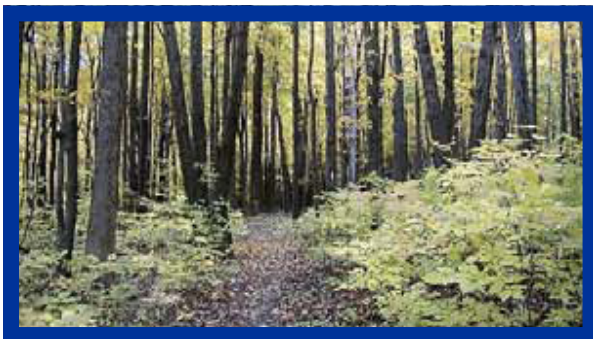
■ Rebirth of a Landfill

The Glenridge Quarry Naturalization Site represents a groundbreaking method in environmental



rehabilitation. Niagara Region describes this as “the very essence of the site...a fundamental recycling of land”. Ordinarily, landfill closure would involve the application of protective seed covering and planting of a few small trees. The area would then be fenced and restricted to the public. This approach is safe and protects the environment, but is not particularly esthetically pleasing and limits public use of a relatively large area of land.

Those responsible for the Glenridge Quarry landfill chose a different route. The site demonstrates the practice of environmental accountability. The planning, design, and construction included the Niagara Escarpment, lookouts, wildflower meadows, pedestrian circulation systems, and educational centers.



The vision for the site was to create a place where nature would be able to flourish, sustain wildlife, provide habitat, and be a part of the urban landscape.

Some of the techniques developed and integrated into the rehabilitation of the site itself include:

- Recycled construction materials;
- Vegetation removed from the construction zone used to construct brush structures for habitat creation;
- Target species identified and habitat measures employed;
- Native plant species planted;
- Storm water ditching;
- Use of gravel on roads; and
- A comprehensive educational program with a number of panels and displays located throughout the site.

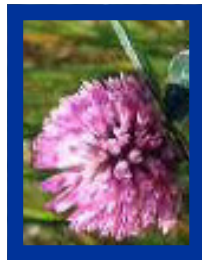
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The Glenridge Quarry Naturalization Site is an example of



environmental design that has enhanced the region's heritage resources. The visitors' pavilion boasts interpretive panels tracing the evolution of the site from geological formation to the present day. The Bruce Trail is a hiking trail that generally follows the Niagara Escarpment linking southern Ontario with Georgian Bay. Where the trail goes through the Glenridge site, there are interpretive panels that tell the story of the Glenridge site.

Restoration of the site as a park with Carolinian vegetation began in 2003, creating a pollinator habitat where none had existed for decades. Bees play an important ecological role in both natural and urban environments because they pollinate flowering plants – as bees disappear, not only flowers disappear, but agricultural production, especially of fruits and vegetables, also declines.



In Niagara and other areas, the disappearance of natural landscapes and spread of urban areas has led to significant declines in bee populations. But at the Glenridge Quarry Site, restoration of natural vegetation has encouraged at least 125 species of bees to return to the area and seek refuge at the site.

Miriam Richards, a biology professor at Brock University, has been studying bee populations at the



quarry site since 2003 in order to learn how bees respond to habitat restoration, in terms of both biodiversity (the number and types of species) and abundance (population sizes). These studies include the first detailed survey of bee diversity in the Niagara region, one of only a handful of such studies in Canada. The variety of bees now living at the quarry site is astonishing. They include species that excavate nesting burrows in the soil, and species that nest in burrows in twigs and branches and even in the lumber used to build the Interpretive Centre. There are solitary bees that live alone and social bees that live in colonies. There are even some new species, including a North American *Osmia* bee that nests in snail shells and which had previously not been recorded in Canada. Even more surprising, the quarry is now also home to several non-native species of *Megachile* bees from Europe and Asia, which nest in cavities and crevices, often in wood. At least one of these immigrants may have been accidentally introduced when lumber containing bee nests was brought to the landfill.



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One goal of Prof. Richards' research is to monitor the spread of non-native species into the region.



The arrival at the naturalization site of bee species new to the region and to North America is both an important finding and cause for concern. Any time a new species establishes itself in an environment, and becomes sufficiently numerous, it may become a competitor with native species for food or nesting resources or it can introduce novel diseases or parasites. Fortunately, there is no evidence of negative consequences here in the region.

The Glenridge Quarry Naturalization Site, together with contiguous areas of Brock University, has become a valuable refuge for bees, an island in an increasingly urbanized environment. As their populations grow, bees will likely move into the surrounding areas, helping bee populations there to recover as well, and in the process, helping to pollinate flower and vegetable gardens in the local area. Currently, the recovery has been greatest around the perimeter of the site, because these areas have been experiencing intermediate levels of human disturbance with wide open spaces being maintained.



Since many bee species prefer open habitats, ongoing human activity that maintains the site as meadow habitat rather than as woodland is preferable. Along the wooded edges of the site, the mix of meadow and woodland habitat encourages the highest density and diversity of bees at the site. The increasing biodiversity of bees, plants and other animals at the site provides an inspiring example of environmental restoration and its impacts.

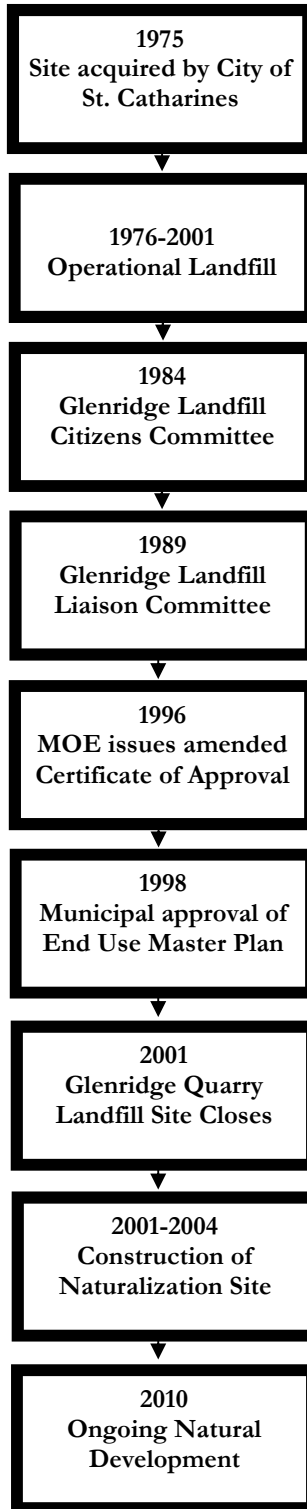


Participating in leisure, cultural and educational activities at the site develops appreciation and respect for biodiversity in the natural world. Continual consultation with the residents of Niagara has generated a solution to the negative environmental impacts of the landfill site. The site promotes methods of rehabilitating waste disposal sites, while innovative environmental practices and principles have remained at the forefront. The naturalization site as a natural park promotes understanding and demonstrates the future health and connective spirit of biodiversity.



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■ Timeline from Landfill to Naturalization Site



Photographs provided courtesy of the Region of Niagara and Professor Miriam Richards.

Note: References are available electronically at www.brocku.ca/nco/pb04