Otonabee Gravel Pits Restoration and Remediation Plan

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Introduction

The Otonabee Gravel Pit Conservation area is located on a **48.1 ha property** at **995 Crowley Line,** Otonabee South Monaghan township, in **Keene, Ontario**. The gravel pits serve a unique variety of ecosystem players, providing habitat for many residents and migrators in the Peterborough region.

This includes migratory bird species, reptiles, amphibians and various terrestrial and aquatic plant species. Otonabee Region Conservation Authority (ORCA) has made the property open to the public as one of their many Conservation Areas, and people can utilize the property for **outdoor recreation** while also knowing that protection for biotic and abiotic processes are ensured. The site is **partially re-naturalized** from natural succession, but it still holds **potential for even more biodiversity** if efforts to improve internal and surrounding ecosystems and landscapes are made.

Site Characteristics

-The property was **acquired in December 1977** by ORCA from Lauesen and Bourgard
-**Red and White Pine were planted north and south of the pit** to restore the 11-acre forest community once surrounding it
-**Sedge and grass species are common**, and the margins are home to patches of **Alder and Willow trees**.
-Soils are **sandy loam** with **gravel underlayment**
-**Aggregate extraction ceased in 2004**, and the site began to re-naturalize independently
-**White-tailed Deer** have been sighted on the property, and **Beaver sign** is also present
-1**95 total bird species** have been recorded, including migratory bird species like **Least Bittern and Virginia Rail**
-**Bullfrog and Map Turtle** are present, but **no fish** have been recorded.

Methods for Restoration

1. Gravel pits can become **valuable novel ecosystems** when rehabilitated properly, and the resulting habitats developed may offer a unique pocket for **rare species, species at risk** and even greater biodiversity than pre-impact conditions (Trimble & Seibert 2002).

2. Encouraging the health of aquatic ecosystems created from extraction operations (through vegetation communities, or connecting to larger water bodies nearby) as opposed to modifying them to achieve original land features may provide a unique opportunity for facilitating **bat foraging** by maximizing **flying insect abundance** (Kerbiriou et al. 2018)**.**

3. Adding **high organic matter substrates** to the bottom of gravel pit ponds can increase **carbon storage, denitrification, acid buffering, and plant growth.**

4. Woody riparian vegetation can be effectively propagated through **natural seed fall** from nearby wetlands and shoreline trees nearby. Combined with any **necessary slope modifications**, this is can encourage **bank stabilization and amphibian biodiversity.**

Factors to consider

1. Invasive species, like Common Reed, European Buckthorn, Dog-strangling Vine, Spongy Moth, Rusty Crayfish, and Banded Mystery Snail are of concern, and we must focus on **preventing their further spread** into the site

2. Prevention may be difficult for some established invasive species, but the area benefits from a l**ack of major roads** nearby and a forested border that may prevent wind-blown seeds from nearby areas. **Intensive removal strategies** can control some invasive plants, as well as encouraging further **native species establishment**

3. Maintaining a diverse community of **native plants** can also encourage **insect diversity** to compete with invasives. The pit is isolated from the nearby river, but **flooding may increase the chance of transportation of aquatic invasives**. Groundwater seepage or runoff from nearby agricultural fields may lead to nutrient overloads or eutrophication, which can be determined through water quality surveys.

Plans for Restoration

In order to understand the site's full potential and create the best restoration plan for biodiversity and species at risk, in-situ field surveys for all species (terrestrial and aquatic) will be crucial. These will help us understand what species are present, what components of the habitat should be improved or modified, and what we can expect going forward with a natural rehabilitation plan. We would wish to emphasize the following points:

1. Ensure that this already impacted site **receives as little stress as possible** going forward to maintain smooth restoration process.

2. P**revent the further ingression of invasive species** and encourage native species.

3. Implement **physical barriers** (artificial or natural, if needed) t**o buffer any outside stressors** such as flooding, erosion or nearby pesticide/fertilizer usage.

4. Determine the site's potential for **successful fish stocking programs or other native species introductions** to increase the site's recreational utility and biodiversity.

5. Develop an **annual monitoring program** to track progress obtained by assisted natural rehabilitation.

References

Trimble, K.D., & Seibert, M. 2002. An Evolution of Reclamation approaches through the life of a southern Ontario gravel pit. Proceedings of the American Society of Mining and Reclamation, pp 344-361 DOI: 10.21000/JASMR02010344.

Kerbiriou, C., Parisot-Laprun, M., & Julien, J.F. 2018. Potential of restoration of gravel-sand pits for Bats. Ecological Engineering 110: 137-145.

*All photos taken and provided by Kevin Gevaert

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