



# **Swan Lake Water Quality Improvement & Parks Refresh Program and Parks Improvements Projects**

## **Community Meeting on Program Update**

### **Environmental Services & Operations Departments**

## **March 25, 2024**



# Background



# Lake Formation and Land Development

- Gravel pit in the 1960s and 1970s; construction waste dump in the early 1980s
- Lake formed when pumping for the gravel pit ceased operations
- Area draining to the Lake started as farmlands and rapidly changed to urban residential
- Drainage area fully developed.





## Water Flow

- Water flows into the Lake from:
  - Direct Precipitation
  - Urban development ponds and oil and grit separators/ sewer system
  - Shoreline runoff
- Water leaves the Lake through:
  - Evaporation
  - Lake outfall to sewer and then to Mt. Joy Creek
- Groundwater exchange complex and uncertain





# Natural Features

- Diverse community of terrestrial species
- Mute and trumpeter swans
- Small mammals and several bird species
- Snapping turtles
- Resident and migratory Geese
- Limited fish community
- Invasive species
- Designated as 'Other Greenway System Lands including naturalized stormwater management facilities'



Photo of birds and turtles courtesy of Donald and Cindy Fowler (through FOSLP)





## Community Interest

- Original objective set out by the developers in 1993
- A community feature within the Swan Lake Park. The Park is widely used by residents and visitors.
- Many avid bird-watchers and photographers.
- Survey conducted by the Friends of Swan Lake in 2020

*to transform the inactive gravel pit into a 'diverse natural habitat for aquatic and terrestrial wildlife... that incorporates passive use opportunities surrounding the Lake'.*

*residents "support a long-term plan that involves investment in sustainable solutions and restoration of the aquatic and land-based habitat".*



## Issues

- Phosphorus from sediment and geese resulting in algae growth
- Chloride from winter maintenance activities
- Limited flushing of contaminants in Lake



## Opportunities

- Swan Lake and park are well used amenities with strong community support for sustainable solutions
- Existing stormwater management infrastructure to treat most of runoff



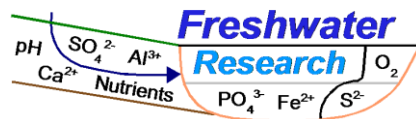
# Water Quality Improvement Plan





## Timeline 2011-2019

- 2011: Lake at Hyper-eutrophic level/ Monitoring started (external lake quality advisor hired)
- 2013: Phoslock application improved water quality
- 2014: Geese control initiated
- 2019: Water quality strategy study



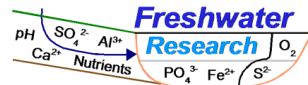


## Developing a Long-Term Plan

- Goal Statement
- Targets derived considering local conditions
- Several potential mitigation measures reviewed by lake experts
- TRCA was consulted on respective measures
- Stakeholders' extensive input was considered

To improve the **overall health** of Swan Lake, which will provide **opportunities** for no-contact activities for the enjoyment of the **community**

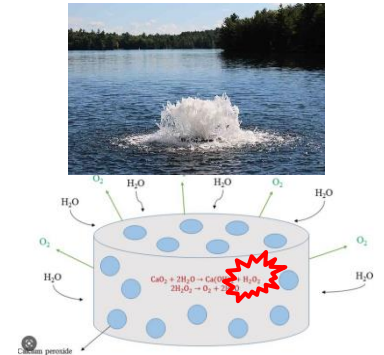
- Phosphorus: a low eutrophic condition in year 1 after treatment increasing in year 3
- Chloride: remain below acute guideline and close to 2013-2014 values
- Transparency: above 0.8 m





## Screening of Ideas

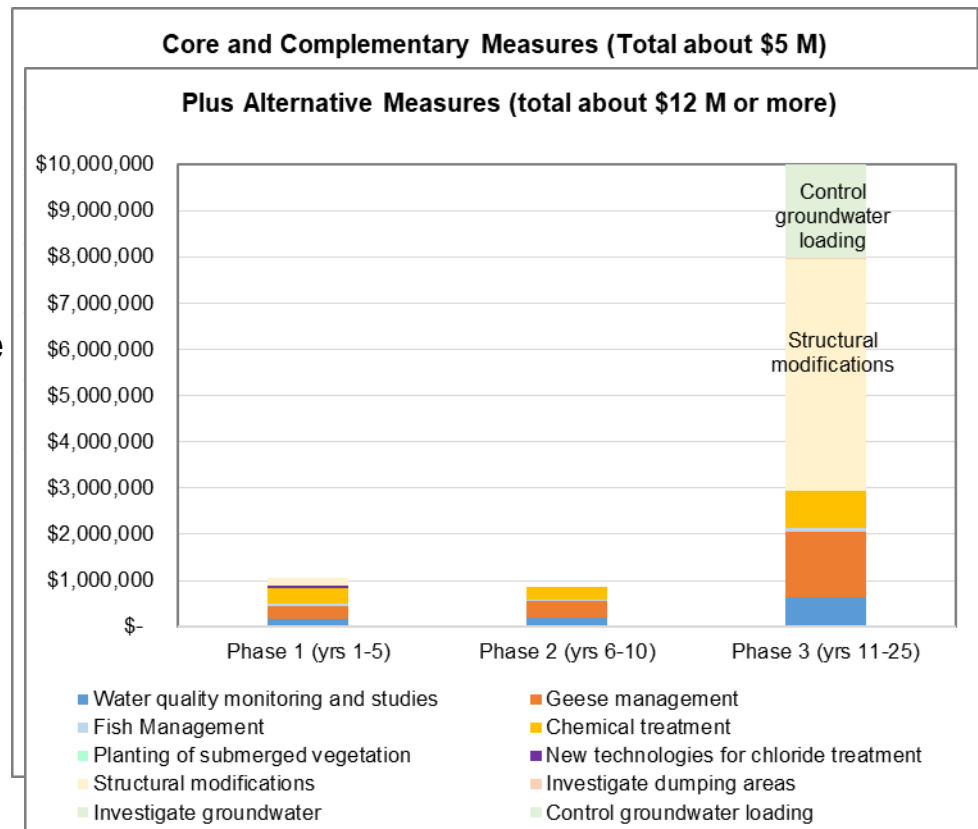
- ✓ Nutrient control focuses on governing contaminant (phosphorus)
- ✓ Chemical treatment most effective for nutrients from sediment
- ✓ Geese management most effective for nutrients from geese
- Mechanical aeration promotes release of nutrients from sediment
- Chemical oxygenation toxic for aquatic life
- Water circulation increases temperature and evaporation; costly and disruptive
- Sediment removal extremely costly and disruptive
- ✓ Stormwater re-direction and research into chloride removal technologies considered





## Adaptive Plan

- A Long-Term Management Plan was approved by Council in 2021 for the next 25 years
- In three Phases to allow for reviewing and updating the Plan to adapt to Lake conditions
  - Core Measures: All years
  - Complementary Measures: years 6-10 (brought forward)
  - Alternative Measures: years 11-25 (partially brought forward)





BUILDING MARKHAM'S FUTURE TOGETHER  
2020 – 2023 Strategic Plan



# Plan Implementation



## Monitoring, Inspections and Studies

- Important for understanding issues and planning mitigation measures and adapting the plan based on the results
- Includes chemistry and biology
- Water level logger and staff gauge
- Measurements and samples by City staff
- Analysis by accredited laboratories
- Regular site inspections and observations
- External experts hired for review and updates





# Water Treatment

- Most effective way to control release of nutrients from sediment
- Careful treatment planning and monitoring to avoid any adverse effect
- Repeated every three years or as needed based on review of monitoring results
- 2021 treatment very effective in reducing phosphorus and algae levels

$$ASP = P_{mob} \times SG \times SF \times TD \times \frac{g}{1000\ mg} \times \frac{10,000\ cm^2}{m^2}$$



August 3, 2021



August 5, 2021



August 19, 2021



# Geese Management

- Hazing/chasing
- Geese relocation and egg/nest management
- Public education and geese count (see QR code)
- Fenced open spaces to prevent geese from accessing the water
- Low cost alternatives (e.g., strobe lights were tested)



Swan Lake Geese Count Survey QR Code







## Fish Management / Aquatic Planting

- Removal of bottom-dwelling fish (to avoid disturbance of sediment)
- Fish management plan and fish stocking pending improved water quality
- Planting of submerged aquatic vegetation initiated as a pilot project in 2023 to improve transparency and promote aquatic habitat improvement





## Maintenance

- In November 2021 the East pond inlet was cleared
- In August 2023, the outlet from Swan Club OGS was cleared
- Assumption by the City for the two private ponds underway
- Best practices for winter maintenance followed by the City and the Village





# Stakeholder Engagement

- Annual reporting to Markham Subcommittee in May
- Consultation with TRCA and researchers
- Exchanges with FOSLP and other interested residents
- Swan Lake page on website
- Algae signs warn against contact with water
- Geese signs upgraded with info on geese impact
- An online application for public input into geese count
- Residents informed against releasing goldfish pets and poaching turtles

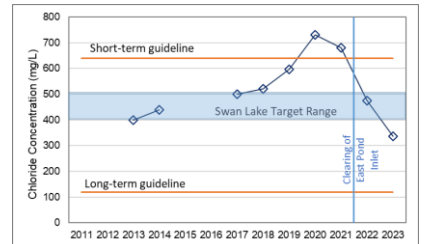
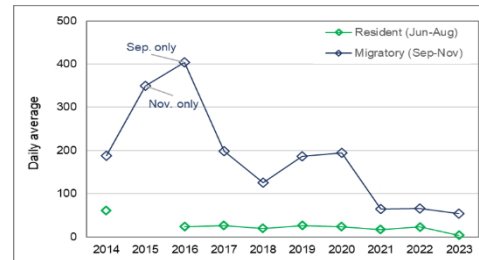
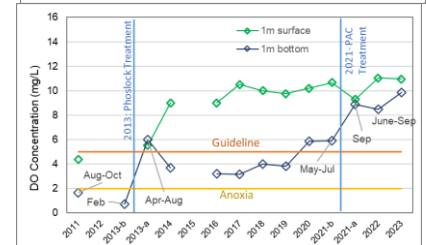
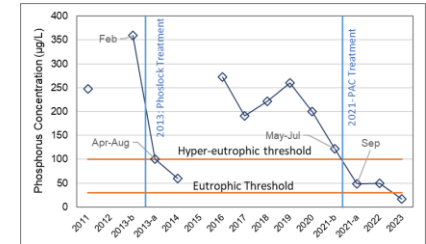
[www.markham.ca/swanlake](http://www.markham.ca/swanlake)





# Plan Accomplishments

- Controlling internal and external sources of nutrients reduced phosphorus and nitrogen to below targets
- Enhanced oxygen levels
- Maintenance activities reduced chloride to below targets
- Geese management reduced the number of migratory geese by half
- Aquatic vegetation planting initiated to improve clarity and promote healthier habitat







# Summary of Parks Refresh Program and Parks Improvements Projects (2021 to 2023)





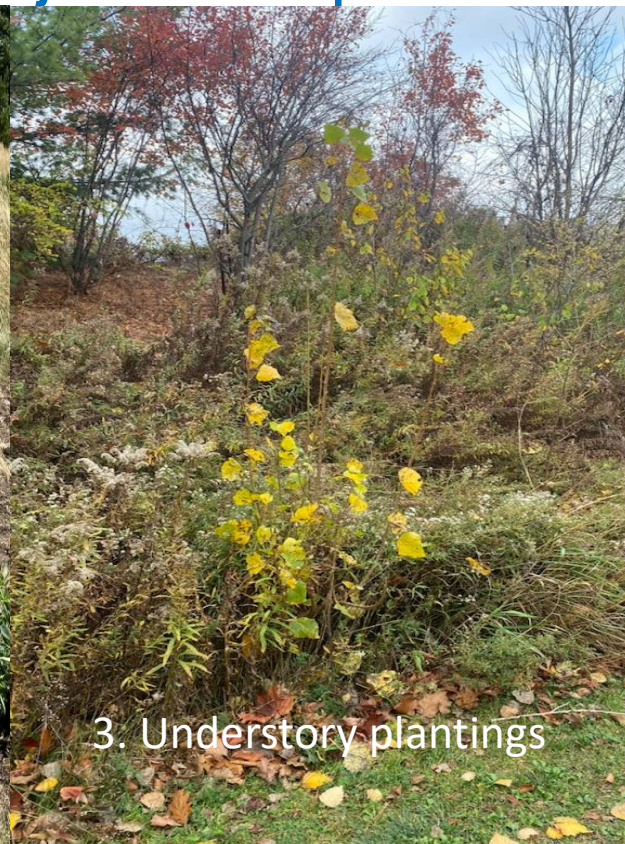
# Parks Refresh Program 2 Year Project Complete



1. Pollinator planting in place of rain garden



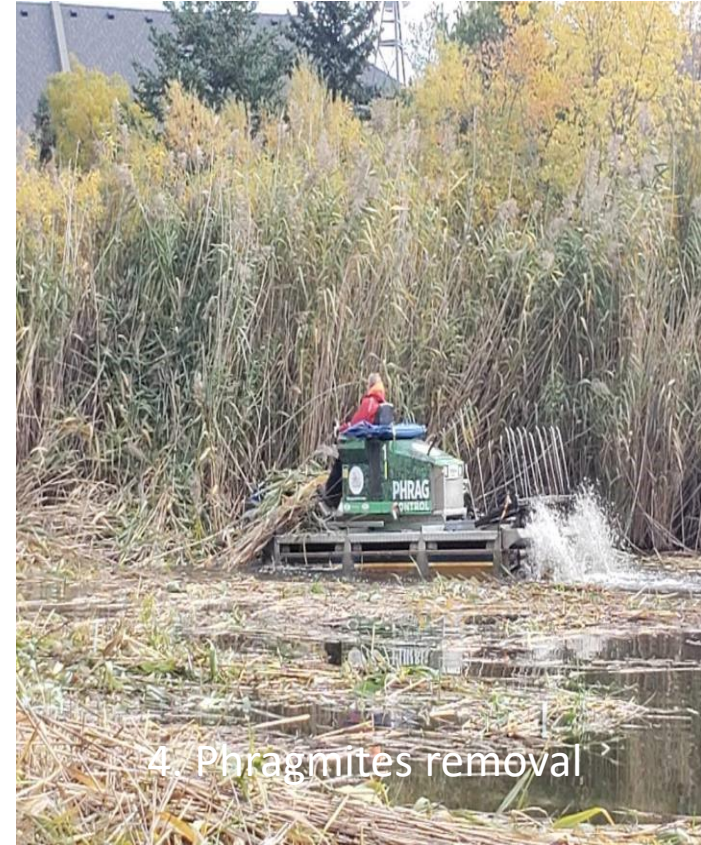
2. Pollinator Planting



3. Understory plantings



# Parks Refresh Program 2 Year Project Complete



4. Phragmites removal



5. Shoreline improvements



6. Educational outreach





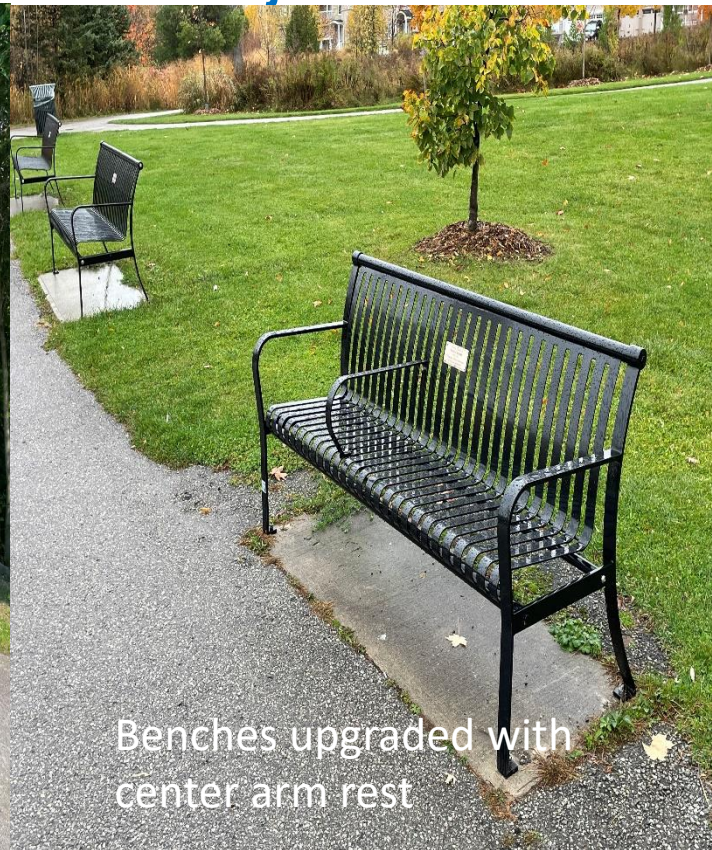
# Swan Lake Park Improvement Projects



Bank erosion project



Post and rail replacement



Benches upgraded with  
center arm rest



# Swan Lake Park Improvement Projects



Pathway surfacing

Pathway resurfacing



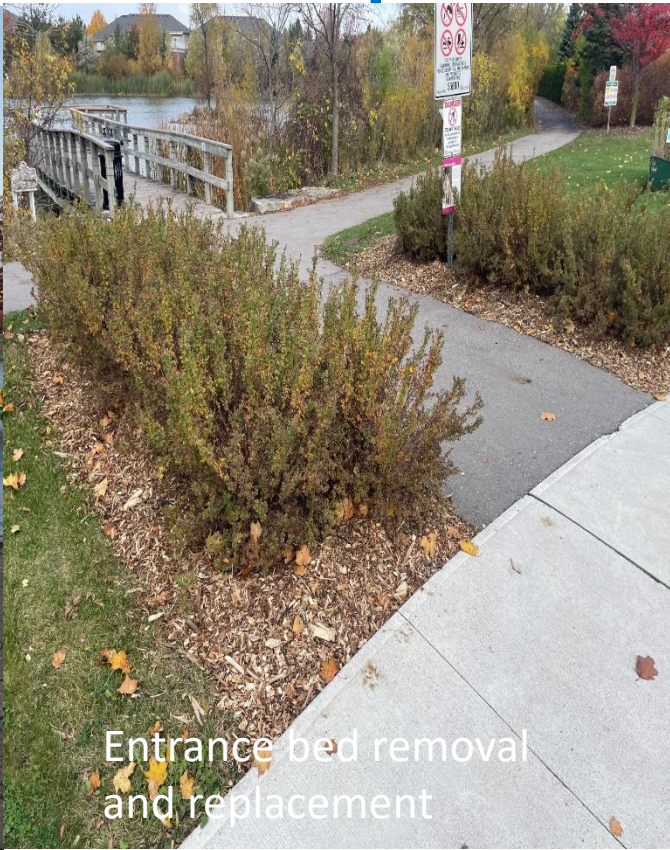
Mulch tree rings in



# Swan Lake Park Improvement Projects



Playground and  
Rubberized Surfacing  
replacement



Entrance bed removal  
and replacement



AMICA property trail  
connection





## Swan Lake Park Projects 2024

- Limestone pathway grading levelling
- Maintain plantings from previous years
- Maintain goose exclusion fencing until permanent fencing is erected
- Monitor Phragmites for reoccurrence and additional treatment
- Restoration of existing lake level viewing nodes on north shoreline, new viewing nodes are not being considered at this time

Operations has completed the Park Refresh and Shoreline Improvement consultation and will support Environmental Services on water quality improvement as the first priority. In 2024, staff will submit 2025 capital budget request to construct permanent goose exclusion fencing and plantings to further support water quality improvements



## References

- [www.markham.ca/swanlake](http://www.markham.ca/swanlake)
- Update on Swan Lake Water Quality (February, 2013)
- Swan Lake Water Quality Improvement Program (June, 2020)
- Geese Management at Swan Lake: Overview of Options and Path Forward (September, 2020)
- Swan Lake Long-Term Management Plan (November 2021)
- Swan Lake 2021 Water Quality Status and Updates (May 2022)
- Swan Lake 2022 Water Quality Status and Updates (May 2023)

### Contact information:

#### Swan Lake Water quality:

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# Questions?

