



MARKHAM SUBCOMMITTEE

AGENDA ITEM 4.1

Thursday April 30, 2026

SUBMISSION BY FRED PETERS
CHAIR, FRIENDS OF SWAN LAKE PARK

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Phase 2 Review Process

Phase 1 Results:

- Thank you to Markham and staff for the significant improvements resulting from the Phase 1 program

Phase 2 Review Process

- Acknowledge and thank FOSLP's technical advisors:
 - Natural Resource Solutions Inc.
 - Phil Anderson, Blair Baldwin, Stephen Burgin (aquatic biologists)
 - R.J. Burnside Associates
 - Christopher Pfohl, Mark Saunders (aquatic biologists)
 - Dr. Ali Asgary and Dr. Satinder Kaur Brar of York University
- Thank you to staff for organizing and managing a fulsome review of the Phase 1 results and in engaging in detailed discussions of the recommendations by FOSLP and its advisers.

FOSLP Requests that the Subcommittee:

Approve the staff's core recommendations for Phase 2 subject to the following amendments:

- 1) Redefine the Phase 2 goal to recognize “wetland” rehabilitation
- 2) Adopt three amendments to the Phase 2 Plan
 - a) Continue the 3-year cycle of chemical treatments to reduce phosphorus
 - b) Assess the “health” of the lake by including an annual study of the lower-level aquatic life in the lake (zooplankton, benthic invertebrate, etc.)
 - c) Undertake actions to minimize impact of road salt
- 3) Confirm the ongoing engagement with FOSLP

Rehabilitation of Swan Lake Wetlands

- Swan Lake Park one of Markham's most ecologically diverse natural areas
 - In large part due to Swan Lake
- Swan Lake recognized as a “wetland”
 - A “constructed wetland” - Dr. Kevin Erratt, U of Toronto
 - An “open wetland” – Dr. Tammy Karst-Riddoch
- Rehabilitation of the water a critical basic step
- Phase 2 rehabilitation actions should incorporate the impact on species and habitat
 - Already implicitly addresses some elements
 - Shoreline improvements should incorporate strengthening nesting habit for turtles, swans, herons etc. and enhance spanning habitat for aquatic life
- Goal for Phase 2 program should recognize broader scope

Recognize Importance of Sustaining Our Wetland

Current Goal Statement:

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

Proposed Revised Goal Statement

To improve the overall health of Swan Lake, with the objective of sustaining a naturalized wetland which will provide opportunities for no-contact activities for the enjoyment of the community.

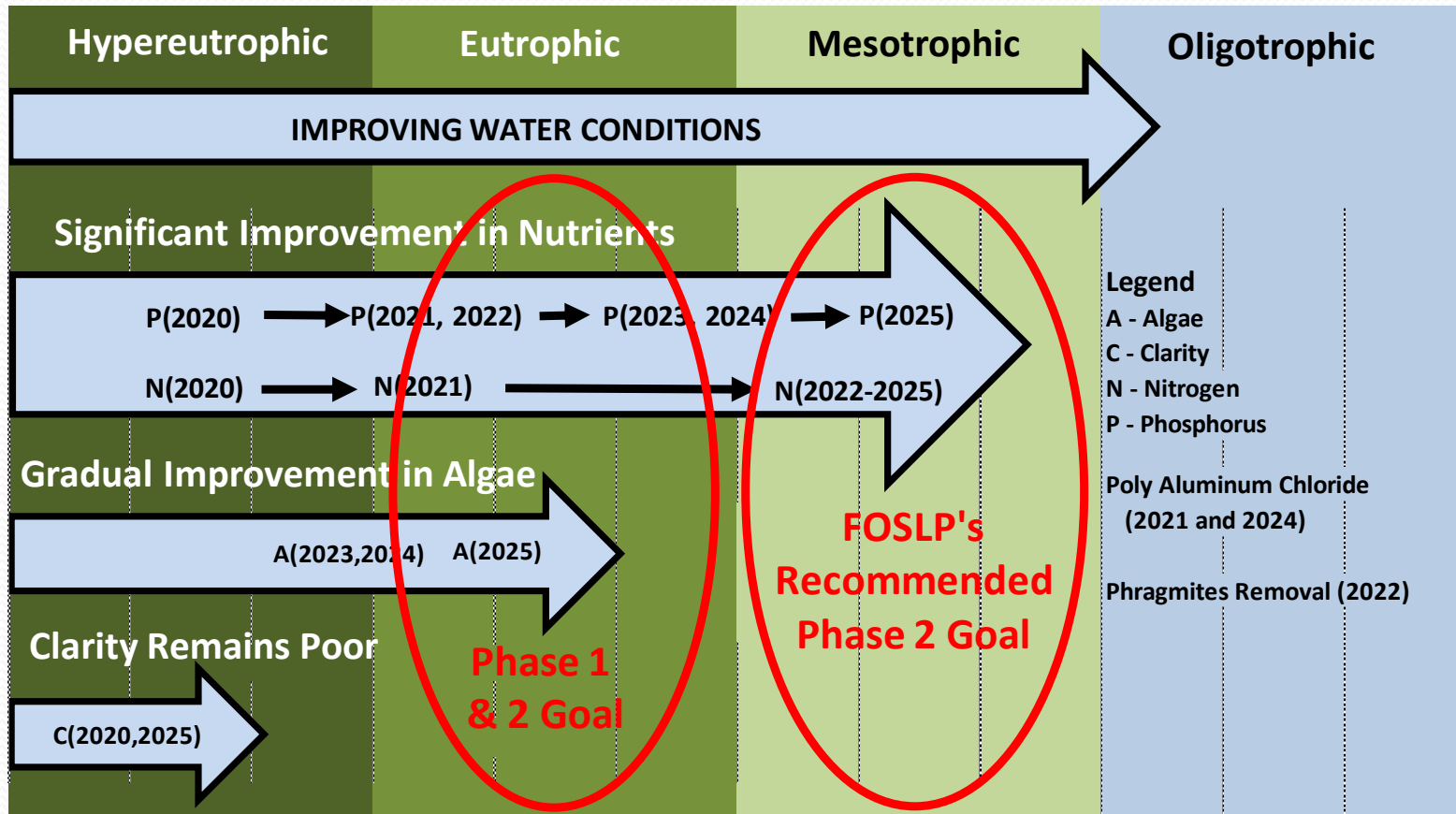
Lake Conditions and Community Options Associated With Trophic States

TROPHIC STATE	AQUATIC ENVIRONMENT	COMMUNITY OPTIONS
<i>Oligotrophic</i>	Lack of plant nutrients keep productivity low, lake contains oxygen at all depths, clear water.	Swimming, paddle sports, wide range of fish options.
<i>Mesotrophic</i>	Moderate plant productivity, lower levels may lack oxygen in summer, moderately clear water and warm water fisheries only.	Paddle sports, swimming possible if monitored, good range of fish options.
<i>Eutrophic</i>	Contains excess nutrients, blue-green algae dominate during summer, algae scums are probable at times, lower levels lack oxygen in summer, poor transparency, rooted aquatic plant problems may be evident.	No swimming, paddle sports possible, limited range of fish options.
<i>Hypereutrophic</i>	Algal scums dominate in summer, cyanobacteria, few aquatic plants, no oxygen in lower levels, fish kills possible in summer and under winter ice.	No human interaction, potential health risk for humans and small animals.

- Mesotrophic level represents more stable and sustainable aquatic environment, less intervention
- Dr. Nurnberg: an “aspirational” goal

Continue 3-Year Phosphorus Treatment Cycle

SWAN LAKE WATER QUALITY: PHASE 1 CHANGES 2020 - 2025



Schedule treatment for 2027: no triggers defined “adjusted frequency and dosage”

- Avoid risk of phosphorus backsliding (initial estimate was 2-year benefit)
- Determine whether Mesotrophic an attainable goal for algae

More Comprehensive Measure of “Health”

Stated Goal of Markham Long-term Plan:

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

- Current measures assess “trophic” state of water + fish inventory
- Aquatic “health” measures typically include assessing lower-level aquatic life such as zooplankton and benthic invertebrate, etc.
- Survey recommended by FOSLP’s advisors as important to understanding the ecological dynamics
- Staff state “***no evidence of ecological impairment due to chloride***” yet have not undertaken survey of lower-level aquatic life to support that statement

Proposed Amendment:

Undertake annual survey of lower-level aquatic elements to provide a benchmark for measuring Phase 2 success in improving aquatic “health”

Minimizing the Impact of Road Salt

Staff comments:

- ***“the lake remains sensitive to external inputs and ongoing watershed influences:”***
 - Primarily geese, stormwater inflows, groundwater
- Chloride concentrations ***“remain governed by external loading associated with road salt use and watershed processes”***
- ✓ Continued action proposed to reduce impact of geese
- ✓ Effort to better understand groundwater influence
- ✗ No direct actions proposed for Phase 2 to reduce inflows:
 - There are three low-cost actions possible during Phase 2 to minimize stormwater impact

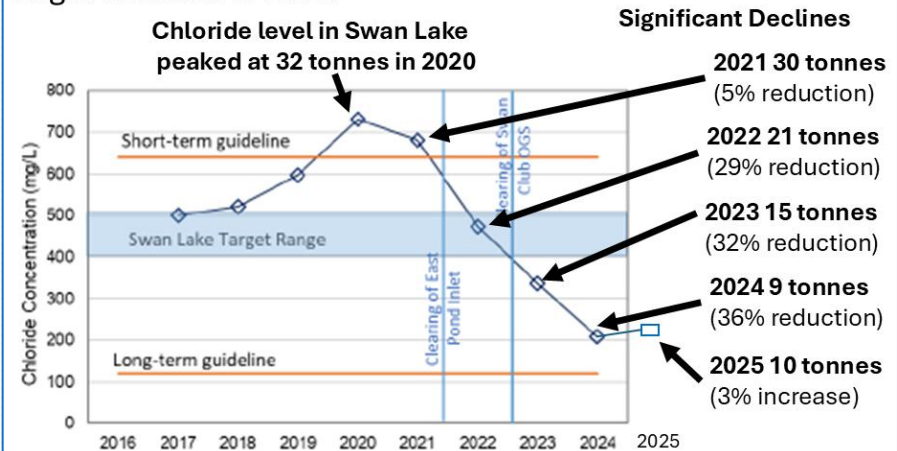
Further Efforts Needed to Reduce Road Salt

Each year, over 5 tonnes of road salt (3 tonnes of chloride) enter the lake

Significant declines but over 10 tonnes of chloride still active



Significant Decline in Chloride Levels 2021 - 2024
Slight Increase in 2025



Implement three low-cost solutions options:

- 1) Reduce chloride by 30% by redesigning Flow Splitters (\$125,000)
- 2) Plant “salt” absorbing plants along shoreline & at each inflow (6)
- 3) Pursue field-level Biochar research with York University

Integrate Two Phase 2 Actions: Plant Salt Absorbing Plants

Currently Two Proposed Phase 2 actions:

1. Shoreline plantings/ improvements (5 plants identified)
2. Evaluate chloride uptake by halophytes by monitoring Lake Wilcox program

Integrated plan: Replicate Lake Wilcox

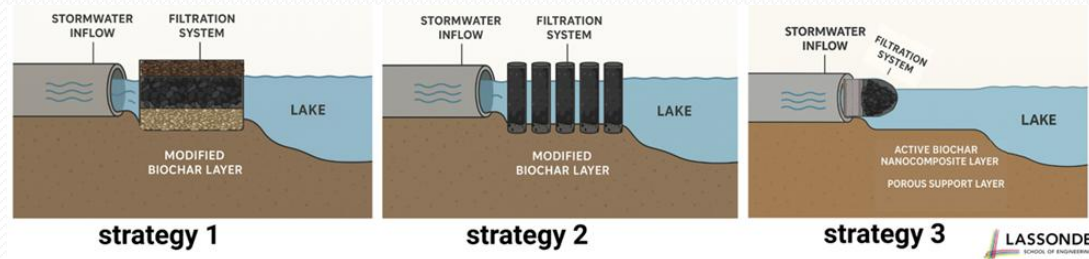
- **Work with TRCA & Lake Wilcox researchers (Dr. Barbara Zeeb)**
 - a) Plant salt absorbent plants along eastern shoreline and stormwater inlets
 - b) Harvest the plants after 2-3 years, leave roots intact
 - c) Quantify the benefit of harvesting (compare to benefit/cost of chemical treatment)
 - d) If harvesting beneficial then continue, otherwise leave plants intact
- Only additional effort/cost is the harvesting and analysis, undertaken by researchers and possibly funded by external sources.

If successful, may prove beneficial as a lower cost alternative to future chemical treatments.

Proposed Joint Effort: Nominal cost to Markham

- a) **Markham plants research approved halophytes**
- b) **FOSLP will organize research effort and pursue funding for harvesting and research**

York U. Biochar Research: Field Level Research Options



	STRATEGY 1	STRATEGY 2	STRATEGY 3
DESIGN	Modified Biochar Basin Filtration covered by sand layers	Modified Biochar Columns	Modified Biochar Nanocomposite Membrane
O&M	Low; periodic replacement of sand and top biochar layer	Moderate; requires periodic backwashing and inspection of columns	High; requires regular cleaning or regeneration to prevent fouling
COST	Low	Moderate	High
REMOVAL	Moderate removal of nutrients and salts (effective for sediment and large ions)	High removal efficiency for nutrients and salts due to increased contact surface area	Very high removal efficiency, including micro-contaminants and ions; selective adsorption and filtration
EASE OF USE	Easy to install and operate; suitable for large surface runoff	Moderate; modular but requires space for multiple columns	More complex; requires technical setup and monitoring of membrane performance

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FOSLP Recommendation:

Support continued research by providing access to park and financial support.

Proposed Amendments to the Phase 2 Program

FOSLP Requests that the Subcommittee support the core recommendations for Phase 2 subject to the following amendments:

- a) Continue the 3-year cycle of chemical treatments to reduce phosphorus and determine whether Mesotrophic level is attainable
- b) Assess the “health” of the lake by including an annual study of the lower-level aquatic life in the lake (zooplankton, benthic invertebrate, etc.)

Phase 2 Amendments (continued)

- c) That Phase 2 include four tasks to minimize the impact of stormwater inflows, namely:
 - i. Implement a redesign of flow splitters to reduce inflows by 30% once Markham assumes control of the two ponds (\$125,000)
 - ii. Use salt absorbing plants for the proposed shoreline planting
 - iii. Undertake harvesting of salt absorbent plants in 2-3 years to assess the benefits of continual harvesting
 - iv. Support York University's field level test into the feasibility of a Biochar-based solution

Phase 2 Amendments (continued)

- d) Amend the Goal statement to recognize the objective of sustaining our wetland

To improve the overall health of Swan Lake, with the objective of sustaining a naturalized wetland which will provide opportunities for no-contact activities for the enjoyment of the community.

- e) Acknowledge the mandate from the General Committee for staff engagement with Friends of Swan Lake Park

“That Staff report back annually on water quality results through the Markham Subcommittee with the participation of Friends of Swan Lake Park



FOCUSED ON REHABILITATION OF SWAN LAKE AND SWAN LAKE PARK

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CONNECTING THE PLANET

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