



Royal Botanical Gardens

Hamilton Ontario

July 10, 2008

The Secretary, Canadian Section  
International Joint Commission

Ottawa ON

Re: Plan 2007 review.

The Royal Botanical Gardens is shoreline property owner, overseeing approximately 30km of shoreline, and 300 hectares of wetlands, within a protected bay at the western tip of Lake Ontario. A review of the conditions outlined in Plan 2007 indicates that this Plan will be detrimental to the future sustainability of our property holdings. The enclosed submission details our assessment of the potential candidate Plans, including proposed Plan 2007, preferred Plan B+, Plan 1958D, and an unregulated Lake Ontario. We would ask that the IJC adopt Plan B+.

Sincerely,

/signature on file/

Ben Porchuk  
Head of Conservation  
Royal Botanical Gardens

**Subject:** Royal Botanical Gardens' submission regarding proposed new water regulation plan for Lake Ontario & the St. Lawrence River - Plan 2007

**Area of Interest:** Shoreline wetland vegetation, ecosystem function & shoreline stability

**Definition:** *Shoreline wetland vegetation includes emergents, meadow marsh, and riparian shrub land.*

#### **CONTENTS:**

- Who is the Royal Botanical Gardens (RBG)
- What we have put forward in the past
- Living examples of various regulation scenarios
- Maps - Potential marsh vegetation communities.
- Upland Shoreline Stability
- Fall water levels and averaging
- Compensation
- Conclusion

#### **INTRODUCTION:**

- It is the mission of the Gardens *"To be a living museum which serves local, regional and global communities while developing and promoting public understanding of the relationship between the plant world, humanity and the rest of nature."*
- RBG Ontario owns and stewards 2700 acres (1100 hectares), at the western tip of Lake. The property contains cultivated gardens and the most remarkable natural areas you will encounter around the lake. The property includes extensive water lots, a network of ravine slopes and creeks and expansive wetlands, all nestled in the shelter of the Niagara Escarpment. The founding portion of the property is known as Cootes Paradise marsh. This forms the westernmost point of water on Lake Ontario, lying just behind a remnant glacial barrier beach that stands high above the current lake levels. Cootes Paradise was established as a formal Nature Preserve in 1927 and transferred to Gardens upon its foundation in 1942. The property represents a transition zone between the lake and the adjacent uplands, and under different water levels over the past century has been nearly entirely above lake level or significantly flooded. These dynamic water levels give rise to a range of plant and animal communities which shift and change their success with the changing seasons and water levels.
- Since the formation of RBG we have been engaged more in the restoration of Cootes Paradise, rather than stewardship, due to a variety of environmental stresses. These stresses are ultimately caused by impaired water quality and quantity cycles, which over time have translated into the collapse of the shoreline zone and all the interrelated processes that occurred there. These stresses also gave rise to the dominance of a few introduced species adapted to these water-based conditions. The effects are most visible directly in the shoreline zone and can be measured in losses of plants, fish, birds and

amphibians and actually extend far out into both Lake Ontario and into the associated upland forests.

- Review of the current Lake Ontario regulation plan was an exciting and much needed occurrence for our property, as it deals with the fundamental issue of how water cycles in and out of our sanctuary transition zones. RBG independently submitted two documents to the Study Board process and attended many stakeholder meetings. We have always maintained the same position, that while extreme water levels that occur, were not critical to the function of our properties, the timing of how the water cycled, both annually and from year to year, was, as it affects the basic processes of life. Timing is the issue.

### **History of submissions**

- During the initial exposure to the range of candidate plans, RBG quickly ruled out, and stated as clearly as possible in our initial report, that timing of high and low water is the most critical element. It was in fact a great shock to see Plan D reach the next level of Plan review as it clearly stood out as a plan in conflict with the basic processes of life. The water rises during the spring flooding, covering the previous year's dead vegetation allowing the fish and wildlife to reproduce, and it then recedes over the summer allowing the shoreline vegetation to regenerate. As such we independently reviewed the three candidate plans, A, B, and D, again submitting a report to the study board. The first line of the second paragraph of the executive summary states, and I quote, "Overall it was found that Plan D is in conflict with the basic water level timing principles that govern the functioning of a Lake Ontario marsh and as such is in no way desirable". Plan D has water levels that rise later in the spring, peaking in mid-summer and then falling below existing shoreline vegetation for the winter. Plan 2007 is a subtle modification of plan D, with the modifications not targeting the timing principles of the basic annual water cycle.
- We are very concerned that we have arrived at this point after having completed such a satisfactory process, and watched stakeholders, including ourselves, chose plan B+. Given the complicated and dynamic nature of lake water cycles, we perhaps should not be surprised, as I have read responses to the plan that have ranged from praise to criticism when speaking of the very same aspects – confusion is more common than understanding when it comes to dynamic processes. We believe that if the modeling results properly captured the basic process of which we speak, we are quite certain that the Commission would not be considering sending us down the road of Plan 2007. I believe that the modeling used in the decision-making process clearly has produced misleading results, particularly on the environmental/ riparian elements. We can only speculate that this is based in the vegetation modeling of the shoreline zone, the element that underpins all other aspects of shoreline processes in the wind-sheltered areas of the lake. We can also understand that modeling for Plan D+/ Plan 2007 would be most difficult in relation to the biotic world as it is most unnatural. Because this plan proposes reaching a high water mark in the summer rather than the spring, where would you get examples from which to model when such water levels do not naturally occur?
- The essence of the plan differences is in the annual draw down and subsequent filling up of the lake. Pre-regulation, the lake fluctuated on an average about 60cm annually. Plan

B+ utilizes a similar 60cm annual fluctuation, while Plan 2007 incorporates a 90cm fluctuation. As a result of the extra 30cm of water required under Plan 2007, the timing of the peak spring water level is delayed until summer as it requires an extra month to accumulate the water in the lake. This difference fundamentally changes the functioning of the shoreline zone, while Plan B+ facilitates the natural shoreline processes. The current regulation plan, Plan1958D, has a similar effect to Plan 2007 although not as severe, as the annual fluctuation has been increased to 70cm. All regulation plans eliminate naturally occurring extreme water levels.

### What we have observed

- Plan 1958D with deviations has resulted in water cycles in recent years which have annual cycles and timing scenarios similar to Plan 2007 (2006) and to Plan B+ (2007). Both years had high water marks within a few centimetres of each other and were representative of respective plan average cycles. Below is a summary of the predictable consequences of what we observed under these scenarios - real living examples of what the different plans represent.
- In 2006, **the Plan 2007 type cycle**, a year with slightly below average spring water levels relative to Plan 1958D, water levels resulted in exposed mudflats during the spring (i.e. water levels that did not reach shoreline vegetation) a typical future characteristic of Plan 2007. As a result, seedlings of **shoreline vegetation germinated** on the mudflats; however fish and wildlife **reproduction largely failed** due to a lack of vegetation flooding during the spring reproductive period. Later in the season, due to plan deviations, the water continued to rise through June, peaking in late July, typical of Plan D. As a result of this essentially all germinated **plant seedlings were lost** - uprooted by wave action on the small plants (the principle identified factor), and the plants were further crushed under debris and by spawning (destructive non-native carp were prominent in the plants' demise). Further, the existing shoreline vegetation that did manage to grow would have normally thrived under receding water levels but water levels did not recede in July and these plants were not able to emerge from the water. So, under an average Plan 2007-type scenario, most of the significant biotic processes were suppressed and one non-native fish species was heavily favoured.
- In 2007 water levels peaked in mid-May, **Plan B+ style**, and then proceeded to decline through the remainder of the season, a result of significantly below average precipitation over the spring and summer. Flooding of the shoreline vegetation occurred during the reproductive season and water levels receded allowing the plants to thrive over the course of the summer. Significant wildlife **reproductive success occurred across many taxa**...using fish as an example, roughly 10 times more fish were produced in 2007. When considering this on the scale of Cootes Paradise marsh, this represent a difference of millions of fish raised in the shallows, with these ultimately becoming the fish of Lake Ontario. In addition in 2007 **all shoreline plant communities grew well**, recovering from the damage of 2006. Things worked the way they had evolved to work.
- The above examples demonstrate the significance of timing that we are concerned with, the feature that is suppressed in Plan 2007. To add further evidence, within a given year

the group of species most favoured are those coincidentally using the shoreline vegetation for reproduction when water is at its highest – thereby giving that group the most area to work with. Biodiversity is maintained by variability in timing of maximum flooding from year to year, giving various groups of organisms the opportunity to be most successful. Under Plan 2007, early to mid-spring species are eliminated, and only those in July have the opportunity of maximum flooding - a limited group. This opens the door wide for colonization by new non-native species, and further favours the most destructive of the current nearshore introduced species, the common carp.

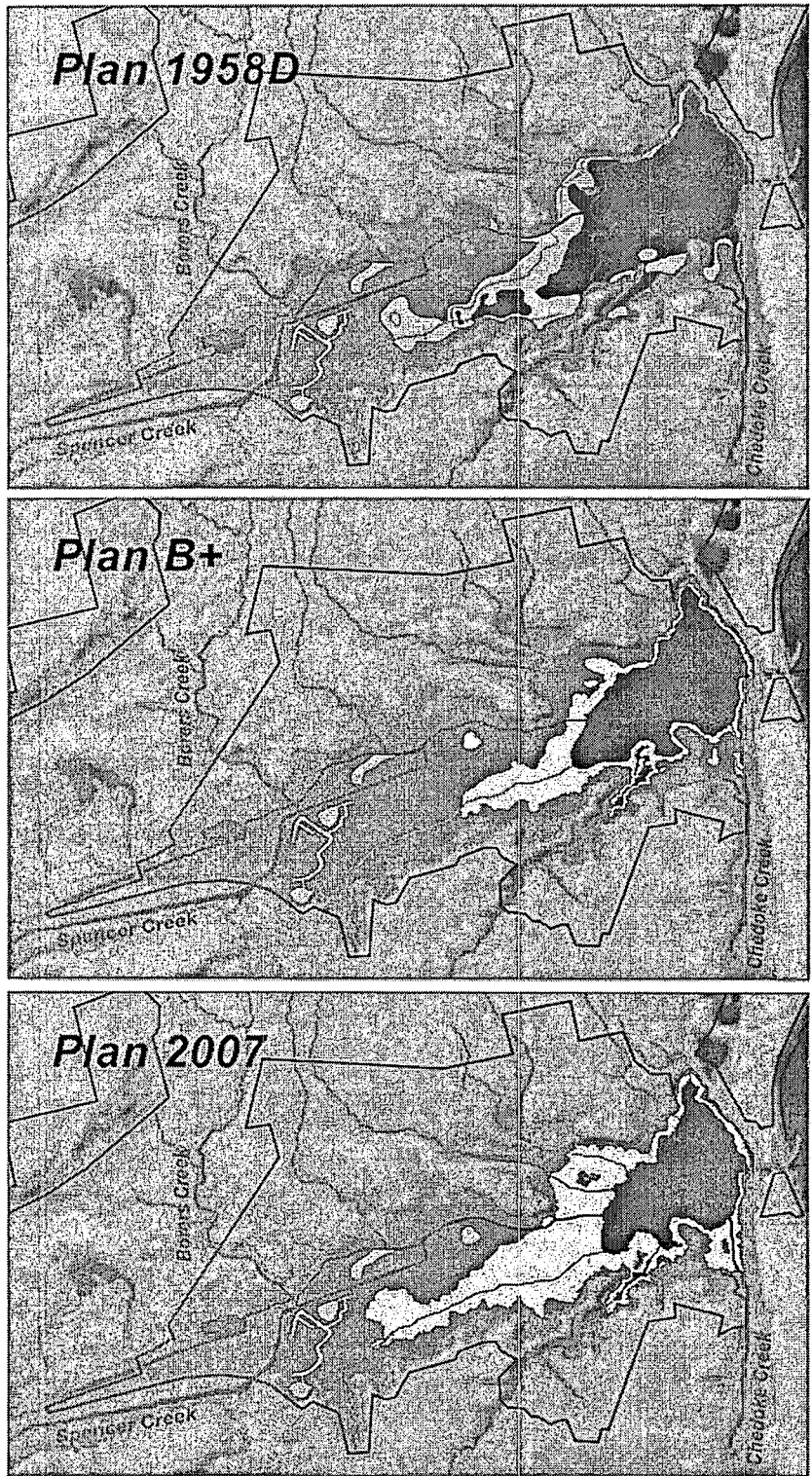
Table 1. Statistics of on how Lake Ontario water level scenarios perform relative to the Cootes Paradise shoreline zone (Total area potentially involved, approximately 250ha.)

	<i>Unregulated</i>	<i>Plan 1958</i>	<i>Plan 2007</i>	<i>Plan B+</i>
Shoreline plant Community	175 ha	130 ha	100 ha	150ha
Area of vegetation flooded during the typical winter	40	0	0	0-20ha <i>(Variable)</i>
Area incapable of maintaining vegetation (zone between emergents and submergents)	12 ha	75 ha	112 ha	37ha
Frequency of years when April or May reproducing species are favoured	~50%	~35%	~5%	~50%

In essence under Plan 2007 a very small percentage of native flora and fauna are favoured.

### **Upland shoreline stability**

The Cootes Paradise sanctuary contains approximately 25km of shoreline under typical summer water levels. Approximately 12km of this shoreline is high gradient shoreline (land rising 10 to 50m within 10m of the shoreline) susceptible to erosion if wetland shoreline vegetation is lost. Currently 99% of this shoreline is lacking wetland shoreline vegetation and experiencing severe erosion and collapse into the adjacent woodlands and nature trail network. This shoreline collapse only began in the 1960's following the loss of wetland vegetation, a result of a variety of factors, one of which is the lack of low water years to regenerate the wetland shoreline vegetation community. Restoration of much this vegetation will require a low water cycle with a peak of at most 74.6msl during the spring season to overcome the shading effect of the adjacent overhanging woodland vegetation. Lower water levels further enhance wetland vegetation development recreating the lost wave buffer zone thereby restabilising the shoreline. Any future plan must include low water years.



**Figure 1. Vegetation Patterns of Cootes Paradise Marsh under different regulation plans. Historically virtually the entire marsh was periodically shoreline vegetation.**

## Fall water levels

- A further example of ecological problems produced under Plan 2007 is it does not allow for the overwintering of a critical nearshore species, the muskrat. The muskrat is a key nearshore environmental engineer on par with the beaver promoting wetland succession and creating habitat for other species. This consequence is also true of 1958D. Muskrats will not be able to persist for the simple fact that in most years during the winter season **none** of the near shore vegetation will be flooded. Average low water under plan 2007 is about 74.35msl while the maximum depth extent of nearshore vegetation is about 74.6msl. Muskrat lodges are nesting sites for many bird species including the Black Tern, a protected species under **both the provincial and federal** endangered species acts. Muskrats also facilitate shoreline plant community succession and habitat diversity as they are the species that eats the cattails. Plan B+ allows only very limited muskrat wintering habitat, as the plan reduces the potential extent of shoreline vegetation by eliminating lower water cycles when compared to unregulated conditions. Determining the possible extent of shoreline vegetation is very simple, as it is a result of the lowest annual water cycle.
- A significant detail that gets lost when displaying dynamic water cycles as an average water cycle – which is also one of the major flaws of plan 1958 D - relates to fall and winter water levels. In essence Plan B+ is much more in tune with the natural weather processes that drive lake water levels and so the time in the fall/winter when the water is lowest is much more variable. When you average all the water levels of, for example, November, together it appears that Plan B+ does not go as low as the others, when in fact it comes very close. This fact disappears in the averaging as some years it may be October or December or January when the B+ produces the lowest water level for the year and so the higher levels that occur as the water cycles down in other years drags up the appearance of the low water mark through the overall averaging. This appearance of a higher fall/winter water level is more an artefact of averaging.

## Compensation to regulate levels within the RBG near shore areas.

- If Plan 2007 was adopted the RBG would be requesting compensation from the IJC to allow us to regulate water levels independent of Lake Ontario, thereby facilitating the natural abiotic and biotic shoreline processes that our sanctuaries are set aside to support. The monetary value of this is difficult to state at this point, however a preliminary consideration of the issues indicates that to counterregulate water levels in our properties and maintain system/ecosystem connectivity would require an extremely complex and labour intensive operation, with a very large initial capital investment. This would also run counter to the HHRAP philosophy of restoring native conditions to the region, thereby allowing the complex interrelated environmental process that we otherwise take for granted and that underpin more of society than we care to admit, to occur.

**Conclusion**

Timing is everything in life; timing is the most fundamental element that Plan 1958D changes for the processes of life along the shorelines of Lake Ontario, basically unhooking them. We have watched the successes when timing was right, and we have seen the failures when the timing was wrong. We have also seen certain introduced species rise to prominence as a result of it. We are asking that the IJC not adopt Plan 2007, the one option that fundamentally changes the timing of the annual high water mark dramatically beyond that of 1958D. Timing is everything in life - for plants, for animals and for people.

Ben Porchuk  
Head of Conservation

Tys Theysmeyer  
Aquatic Ecologist

Mark Runciman  
Executive Director