



*Together let's take action to protect
Gatineau Park!*

Citizen Science in Gatineau Park

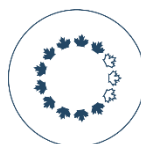
2018 Spring and Summer Report



Program carried out in collaboration
by the Friends of Gatineau Park and
the National Capital Commission (NCC)



Les
Amis
du parc de la Gatineau
Friends
of Gatineau Park



CCN
NCC

Parc de la Gatineau
Gatineau Park



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Citizen Science?

Citizen science is public participation to research using scientific methods. For the Friends of Gatineau Park, these initiatives not only contribute to research projects and natural areas management, but they also create a stronger connexion between the public and nature, thus stimulating a stronger desire for conservation.

Researchers and administrators can use citizen science to obtain more information than possible with their regular staff (or to obtain data on a more regular basis). These projects can even bring new research needs or needs for more in depth surveys to their attention.



As for the public, these initiatives can serve as gateways to better understand nature, develop new expertise, and increase interest for natural areas and their conservation. Many participants to these citizen science programs indicate that their appreciation for nature has been enhanced and that they perceive nature differently when they perform outdoor activities.

Citizen Science with the Friends of Gatineau Park

For many years now, the Friends of Gatineau Park has offered scientists doing research in the Park or about the Park, the possibility of relying on its volunteers for help with their research projects. In 2016, in collaboration with the National Capital Commission (NCC), we decided to go further and create a Citizen Science Program which was launched in the spring of 2018.

The objective of this program is to offer memorable learning experiences and involvement opportunities regarding Gatineau Park conservation, while contributing tangibly to the latter. The program encourages users and visitors of the Park to participate in surveillance programs, research projects and ecological restoration initiatives.

We hope participants will gain enhanced comprehension and appreciation of the diversity, vulnerability and resilience of the ecosystems and species found in the Park and its ecological corridors; and that they will become ambassadors for the conservation efforts that are implemented. We also hope to determine how and to what extent participating in programs of this sort stimulates a sense of attachment to nature.

It is expected that the surveys from the Citizen Science Program will provide important data for the NCC biologists regarding the health of the Park's ecosystems and the species found there. The program's ecological restoration activities will also help to restore the Park's ecological integrity.

For this first year, three surveys and one control activity of invasive species have been held.



Frog Watch



What is an anuran?

Anura is an order of amphibians. In Quebec, this order comprises 10 species of frogs and one species of toad.

Why a survey of anura?

The anurans were chosen for a survey because their presence is an indicator of the quality of wetland habitats. More precisely, since anurans are very sensitive to many types of environmental disturbances, their presence or their absence in some habitats, and changes to their abundance, may indicate the presence of stress factors and threats to biodiversity.

Moreover, the western chorus frog is threatened by the loss of its habitat due to urbanisation and the intensification of agriculture.

Methodology

Data collection

The participants to this part of the program visited a total of 21 stations divided between five sectors. For each station, they noted the species heard and the intensity of their songs, as well as the presence of factors that could diminish the number of anurans singing at that time or that could impede the listening (temperature, rain, wind, and noise).

The following scale was used to evaluate the abundance of each species heard:

- Level 0 : no sound heard
- Level 1 : individual songs that can be tallied separately;
- Level 2 : a few individual songs that can be tallied separately, with other overlapping croaking;
- Level 3: chorus with croaking that cannot be tallied.



Each station was visited between 3 to 5 times to reduce the effect of meteorological conditions potentially affecting the anurans' degree of activity.

Analysis

The following aspects were analysed: abundance of each species by sector, frequency of observation, and diversity.

Abundance by sector

We transformed the data collected by listening, into an abundance index for each sector. To do this, the highest song intensity of each species, at each station, was retained. Then, for each species and every level, the number of stations for which this level was the maximum intensity was calculated. We then obtained the abundance index by multiplying the results by the constants used in the NCC surveys. This essentially converts the recorded intensity to a more representative order of magnitude. The index must not be mistaken for the number of individuals.

List of sectors:

- 1 (PG3): Eardley Escarpment
- 2 (PG4): Meech Creek Valley
- 3 (PG5): Eardley Plateau (parkways)
- 4 (PG6): Dennison Dam
- 5 (PG7): Lac-des-Fées

Frequency of observation

The frequency of observation for each species was calculated by dividing the number of stations where each species was heard by the total number of stations (21) and multiplying all by 100.

Rate of observation = $(N \text{ obs.} / N \text{ tot.}) \times 100$

Where: N obs. = number of stations where the species was heard

N tot. = total number of stations for all sectors

Diversity

The modified Shannon-Weaver index was used to evaluate the diversity of the species present on the studied sites.

This index takes into account not only the number of species present, but also the relative abundance of these species. To illustrate the importance of this approach, imagine walking into a wooden area comprised of 5 species of trees in the following numbers: 100 sugar maples, 100 yellow birch, 75 silver birch, 75 American beech and 75 American basswood. Then, imagine walking in another wooden area with the same species but in the following numbers: 410 sugar maples, 5 yellow birch, 5 silver birch, 3 American beech and 2 American basswood. The two areas have the same number of species (5) and the same number of trees (425), but the first one has a far greater diversity.



Modified Shannon-Weaver index

The modified Shannon-Weaver index is expressed in the following way:

$$H = -\sum [(N_i/N) \times \ln(N_i/N)]$$

N_i = relative abundance score for the target species

N = overall index of abundance (sum of relative abundance scores for all species)

\ln = natural logarithm to the base e , Euler's constant = 2,71828

Σ = product of the multiplication $(N_i/N) \times \ln(N_i/N)$ repeated as many times as there are identified species

This index produces values between 0 and 3 and its superior limit indicates maximum biodiversity.

Results

Abundance by sector

Anura Table 1: Abundance index by sector*					
Species	1 (PG3)	2 (PG4)	3 (PG5)	4 (PG6)	5 (PG7)
American toad	0	5	6	0	15
Gray treefrog	1	1	0	1	1
Spring peeper	4	5	60	46	20
Western chorus frog	26	0	0	0	0
Bullfrog	0	1	1	0	0
Green frog	1	0	6	2	2
Pickerel frog	0	0	0	0	0
Leopard frog	0	0	0	1	0
Mink frog	0	0	0	0	0
Wood frog	0	0	0	1	0

*Note: the abundance index must not be mistaken for an estimate of the number of individuals.



Frequency of observation

Anura Table 2: Frequency of observation	
Species	Rate (%)
American toad	19.05
Gray treefrog	19.05
Spring peeper	71.43
Western chorus frog	19.05
Bullfrog	9.52
Green frog	33.33
Pickerel frog	0.00
Leopard frog	4.76
Mink frog	0.00
Wood frog	4.76

Diversity

With the abundance index by sector [Anura Table 1], we were able to calculate the relative abundance scores (Ni) by adding up the former [Anura Table 3], and the global abundance index (N) by adding up the relative scores [Anura Table 3].

Anura Table 3: Calculation of Ni and N							
Species	Abundance by sector					Ni	N
	1 (PG3)	2 (PG4)	3 (PG5)	4 (PG6)	5 (PG7)		
American toad	0	5	6	0	15	26	206
Gray treefrog	1	1	0	1	1	4	
Spring peeper	4	5	60	46	20	135	
Western chorus frog	26	0	0	0	0	26	
Bullfrog	0	1	1	0	0	2	
Green frog	1	0	6	2	2	11	
Pickerel frog	0	0	0	0	0	0	
Leopard frog	0	0	0	1	0	1	
Mink frog	0	0	0	0	0	0	
Wood frog	0	0	0	1	0	1	



Then, we calculated the Shannon-Weaver index for each species.

Modified Shannon-Weaver Index

$$H = -\sum [(N_i/N) \times \ln(N_i/N)]$$

Anura Table 4: Shannon-Weaver Index		
Species	ln(Ni/N)	Shannon-Weaver (H) Index
American toad	-0.26	1.13
Gray treefrog	-0.08	
Spring peeper	-0.28	
Western chorus frog	-0.26	
Bullfrog	-0.04	
Green frog	-0.16	
Pickerel frog	0.00	
Leopard frog	-0.03	
Mink frog	0.00	
Wood frog	-0.03	

The value of the Shannon-Weaver index obtained for all of the sites and species included in the survey is 1.13.

Discussion

The results above suggest the spring peeper is significantly more abundant than the other species of anurans at the stations we inventoried during the study. They also suggest that the American toad, the Western chorus frog, and the green frog are more abundant than the other anurans, except for the spring peeper frog.

Thanks to the inclusion of a known habitat of the Western chorus frog in the stations, this species comes to the same level as the American toad in the collected data. This does not indicate that it has a strong presence in the Park, but it confirms it is still present in the selected area.

Given the nature of the project, which is a study of variation in time, it is impossible to draw other conclusions at the moment. However, the difference in abundance between species grossly fits what was expected and the indices of abundance and diversity, as well as the frequency of observation are comparable to the results obtained by the NCC in the surveys between 2006 and 2016.



Since some stations had to be withdrawn because they were too remote, the obtained modified Shannon-Weaver index value cannot be directly compared to the NCC results. However, we will be able to compare the 2018 results with those of future Citizen Science Programme surveys and use them as complementary index.

Common Loon Survey



photo: Claire Banville

Why a survey of the common loon?

The common loon has been chosen because of its requirements in terms of habitat and its sensitivity to human activity on lakes. Its presence or absence can thus be an indicator of the impacts of aquatic recreational activities and pollution on the target lakes.

Methodology

The participants in the common loon survey visited Meech, Philippe and Taylor lakes for a total of 4 to 5 visits per lake. For each visit, the participants patrolled their lake in a canoe/kayak and noted the presence and location of adults and young. Factors that may have diminished the chances of seeing loons were also noted (e.g., wind, rain and temperature).

The collected data mainly allowed the use of these lakes for reproduction to be determined by the presence of couples.

To be able to follow the evolution of the presence of couples over time, the number of adults observed were converted into equivalent couples (1 adult observed = 1 couple, 2 adults observed = 1 couple, 3 adults observed = 2 couples). This accepted method takes into account the possibility that individuals observed alone during nesting season can form a couple with an individual not seen.

The highest number for equivalent couples observed on the same visit, for each lake, was retained. The data thus obtained for each lake was added up to obtain the indicator value.



Results

Common loon table : Equivalent couples				
Lake	Date of visit	Observations of adults	Equivalent couples	Total of equivalent couples
Meech	May 30	2	1	5
		2	1	
		2	1	
		1	1	
		2	1	
Philippe	May 23	2	1	3
		1	1	
		1	1	
Taylor	May 24	2	1	1
REFERENCE VALUE (2018)				9

The indicator value for the common loon is 9.



Discussion

The collected data allowed for calculation of a reference value of 9 equivalent couples for all three lakes: Meech, Philippe, and Taylor. This value will be used as comparative data for the subsequent years of the program.



With the collected data, we can already note that the common loon appears to still nest at Meech and Philippe Lake. But the results are less conclusive for Taylor Lake where one equivalent couple was observed on May 24 but was not seen on the three subsequent visits.

The results obtained during this survey are comparable to those obtained by the NCC surveys between 2013 and 2016. An increase in the number of equivalent couples at Meech Lake (5) in comparison to the preceding years (3) was noted. However, a greater effort in sampling could explain the higher number of equivalent couples observed on this lake.

Since the NCC surveys include La Pêche Lake, which was excluded from this program because of its large area, and replaced by Taylor Lake, the indicator value obtained for the three lakes cannot be directly compared to the value calculated by the NCC in 2013 and 2016. However, it will be compared to those of future Citizen Science program surveys and be used as a complementary index.

Monarch Mission



Why a survey of the monarch butterfly?

Who hasn't heard of the monarch? Each Fall, this butterfly migrates from our latitudes toward the south (those from our region migrate to Mexico while those from the West migrate to California). In those wintering areas, it is the degradation and fragmentation of the habitat that threatens it, while in the rest of the United States and Canada, it is the use of herbicides. Their use causes the decline of milkweed, the only source of nourishment for the monarch caterpillar, and of the nectariferous plants the adults rely on. The neonicotinoid pesticides are also an emerging threat, the importance of which is not yet well understood (COSEWIC, 2016).

In 1997, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) declared the monarch to be a species of special concern. In 2016, it was declared an endangered species.



In 2015 and 2016, the NCC evaluated potential monarch habitats in Gatineau Park and its urban lands in Quebec. This evaluation made it possible to identify the monarch's potential habitats, estimate the milkweed density, keep watch on the monarch population and identify the main threats. The data was later used to map the importance of open habitats for the monarch and formulate recommendations as to how to improve the habitat area and the quality of these habitats for the monarch on the Park's territory. The present survey made it possible to evaluate the monarch's density on two sites identified in Gatineau Park, for the first time since 2015.

Methodology

Since many generations of monarchs follow each other during the summer, the dates for the two group outings were chosen to coincide with an overlapping of generations. The first outing, in July, was conducted near the P3 parking lot (Gamelin sector), while the second one was done near the parking lot for the Luskville Falls trail. The sampling sites were chosen according to their milkweed density (moderate – high) as determined during the observations conducted by the NCC in 2015.

At each of these sites, the parcels of land were divided in sub-sectors, and teams of participants examined each milkweed plant individually noting the presence of eggs, caterpillars (and the caterpillars stages) and the *Aphis nerii* parasite. The presence of adults flying over the parcels was also noted.

The number of milkweed plants and the temperature in the shade were also recorded.





Results

Monarchs Table 1: Results for the July 29 outing (Gamelin sector)											
Sector	Temp. in the shade	Eggs	Caterpillar (by stage)					# Dead ¹	# Adults ²	# Milkweed plants	<i>Aphis nerii</i>
			1	2	3	4	5				
South-West	24 °C	15		2		1			1 (F) 1 (I)	1941	Yes
South-East	24 °C	1	4		1				3 (I)	1063	No
Total	24 °C	16	4	2	1	1	0	0	5	3004	Yes

Monarchs Table 2: Results for the August 12 outing (Luskville fall sector)											
Sector	Temp. in the shade	Eggs	Caterpillar (by stage)					# Dead ¹	# Adults ²	# Milkweed plants	<i>Aphis nerii</i>
			1	2	3	4	5				
A	24-27 °C	1						1 (egg)	1 (I)	42	Yes
B	24-27 °C	13	1						1 (I)	326	Yes
C	24-27 °C	4	1	2	1		1		2(F) 3(I)	795	Yes
D	24-27 °C	6	4						1(I)	127	Yes
Total	24-27 °C	24	6	2	1	0	1	1	8	1290	Yes

¹Number of dead eggs and larvae

²Number of adult monarchs (F= female, M = male, U = uncertain)



Discussion

Since most of the participants had never seen monarch eggs before (and few magnifying glasses were available for the first outing), they had trouble distinguishing between monarch eggs and the drops of dried sap often present under the milkweed leaves (which can easily be mistaken for the butterfly's eggs). It is thus very probable that the recorded number of eggs is higher than the actual number of eggs present. It must also be noted that the adult butterflies flying from one sector to the other might have been recorded more than once.

The anecdotal observations of monarchs over the year suggest that 2018 was a good year for them in the area. Which seems to be confirmed by other observations and reports regarding the monarch, which has, notably, doubled the surface area of its wintering colonies in Mexico (Comisión Nacional de Áreas Naturales Protegidas and Alliance WWF-Fundación Telmex Telcel, quoted by Radio-Canada, 2018). Under this light, our observations during the outings are relatively few but confirm that the monarch uses these locations for its reproduction.

As is the case for the other surveys, these results will serve as reference values for further editions.

It is also interesting to note that the observation rate, all stages confounded (number of observations divided by number of milkweed plants), is higher at the Luskville site (3,3%) than at the Gamelin site (0,1%), though the density of milkweed plants was higher at the latter. It could be of interest to determine if factors other than the higher density of milkweed plants at Gamelin (which requires the number of observations to be divided by a higher number of plants), could explain these results. For example, could the environment around the stations (rural in Luskville and urban in Gatineau), influence the number of eggs laid for a given quantity of milkweed?





Control of the lesser periwinkle



To respond to observed threats with concrete actions, we integrated an ecological restoration aspect to the Program. Since invasive species are an important threat in many areas of the Park, its managers identified a problem species that could be controlled by teams of volunteers: the lesser periwinkle.

This plant species weaves a carpet of individual plants where it takes root and stops the indigenous species from re-establishing themselves. By eliminating it with mechanical means (without using chemicals), and by replacing it with resistant indigenous species, we hope to effect a sustainable ecological restoration without harming the surrounding species. This method has been used successfully for similar initiatives. We may also conduct tests, in the future, to evaluate its efficiency in regard to the different types of propagation of the lesser periwinkle (rhizomes and seeds).

This part of the Program fits into the NCC's third area of action in the fight against invasive alien species¹: *Managing invasive alien plants that are already established or spreading.*

Methodology

Site selection: the site was chosen for its natural character and the proximity of vulnerable plants.

Once the site was chosen, a half-day group outing was organised for hand picking. The plants were placed in garden waste bags and eliminated outside the Park. Tarps will be installed in the beginning of spring 2019 to stop any regrowth of lesser periwinkle. The tarps will remain in place during the summer to make sure any residue will be dried out by solarization before indigenous species are planted.

Results

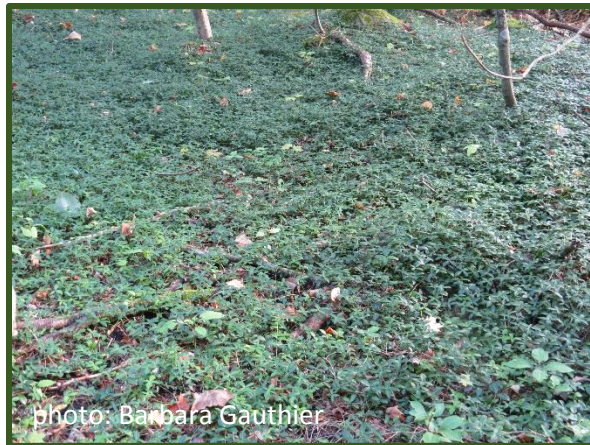
Area treated: 208 m²

¹ The NCC's three areas of action are :

1. Preventing the introduction of harmful plants on our lands
2. Detecting invasive alien plants and taking quick action
3. Managing invasive alien plants that are already established or spreading on our lands



Quantity of plants picked: 32 garden waste bags



Discussion

The team was able to pick the periwinkle from the majority of the identified area, which should result in a significant improvement of its ecological integrity. Given the large area covered by the plant, other outings may be organised to continue the restoration work. A survey in future years will reveal if the initiative was successful and to what degree of efficiency.

Conclusion

This 2018 season was the first edition of the Friends of Gatineau Park and NCC Citizen Science Program. As described above, some assessments regarding the anura, the common loon and the monarch have already been made. Beyond these conclusions, however, the importance of this program lies in the surveys that will be repeated in the following years. Thus, the data collected during the present edition provides the first reference values for the survey of anura, common loon and monarch populations.



Thanks to the work done by the participants, the program will be able to follow the trend of these populations and to complement the NCC surveys, which are conducted at longer intervals.

Participating in the control of the periwinkle has also allowed us to restore an area colonised by this invasive species and has laid the foundation for future threat-response projects.

The results of these four projects, as described in the present report, encourage us to pursue and to extend the program in the following years, and we would like to conclude this report by thanking all the participants.

Acknowledgements

We would like to thank all of the participants. Without you, this program would not exist. It is thanks to your involvement and your love of nature and the Park that this initiative can take flight and bear fruit. With you, it will go far and contribute to the health of Gatineau Park so it can remain a refuge for wildlife in a world that is becoming increasingly urban.

Photo credits

We would also like to thank our photographer-participants for their pictures. The photos in the present report were taken by (in alphabetical order):

- Barbara Gauthier;
- Claire Banville; and
- Estelle Rother.

The uncredited photos were taken by the Friends of Gatineau Park Coordinator, Simon Landry, or are part of the public domain.

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Annexe: Common loon survey tables

Common loon Table: Meech Lake				
Date	Observations		Couples-équivalents	TOTAL (couples-équivalents)
	Adults	Young		
May 30 2018	2		1	5
	2		1	
	2		1	
	1		1	
	2		1	
June 10 2018	NIL	NIL	NIL	NIL
June 22 2018	2		1	4
	1		1	
	1		1	
	2		1	
July 4 2018	1		1	4
	1		1	
	1		1	
	1		1	
July 20 2018	1		1	5
	1		1	
	2		1	
	2		1	
	1		1	



Common loon Table: Philippe Lake				
Date	Observations		Couples- équivalents	Total (couples- équivalents)
	Adults	Young		
May 23 2018	2		1	3
	1		1	
	1		1	
June 3 2018	2		1	1
June 11 2018	1		1	1
July 7 2018	1 (+ partner calling afar)		1	2
	2	2	1	
July 19 2018	2	2	1	3
	1		1	
	1 (may be the same as before)		1	

Common loon Table: Taylor Lake				
Date	Observations		Equivalent couples	Total (equivalent couples)
	Adults	Young		
May 24 2018	2		1	1
June 7 2018	NIL*	NIL	NIL	
June 11 2018	NIL**	NIL	NIL	
June 26 2018	NIL	NIL	NIL	

* Campers have seen a loon on June 3

** Campers have seen two loons on June 10