

The management of invasive alien plants on Mount Royal

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Tremblant.

Royal

by the Plant Dynamics Laboratory of the Plant Biology Research Institute

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Institut de recherche
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IRBV

**JARDIN BOTANIQUE
DE MONTRÉAL**

Université 
de Montréal

Contributors to this brief included

Jacques Brisson (PhD) laboratory director and professor, Université de Montréal

Patrick Boivin (MSc), research professional

Bastien fontaine (MSc), research assistant

Marie Lapointe (Bsc), ^{graduate} student Étienne

Paradis (Bsc), ^{graduate} student

Marie-Ève Tousignant (BSc), ^{graduate} student

Contact: jacques.brisson@umontreal.ca

Who are we?

The Institut de recherche en biologie végétale (IRBV, formerly the "Institut botanique"), brings together researchers from the Montreal Botanical Garden and plant biology professors from the Université de Montréal. The IRBV, of which the Plant Dynamics Laboratory is a part, has longstanding expertise in the ecology and management of Montreal's urban forests in general, and Mount Royal in particular. The impact of invasive plants on ecological integrity is also an issue that is central to our concerns:

- The interest of our researchers, notably Mr. André Bouchard, began in the late 1970s with the realization of several biophysical characterization studies and the evaluation of the ecological potentials and constraints of some of the last large natural ecosystems on the island of Montreal, such as those of the Cap Saint-Jacques¹, Bois-de-Saraguay² and Anse-à-l'Orme³ nature parks.
- Between 1991 and 1995, the IRBV developed various ecological evaluation criteria as part of the implementation of an ecosystem management program for the MUC⁴,^{5, 6} nature park network.
- The quantitative ecological study of Mount Royal's vegetation is carried out by Richard Boivin, at the BVI, as part of a master's degree study⁷.
- More recently, our laboratory carried out a characterization study of natural and semi-natural spaces on the territory of the Université de Montréal campus^{8, 9}.
- Since 2005, we have been conducting a study on the impact of the Norway maple, an invasive alien plant, on the ecological integrity of Mount Royal. A master's study on the subject has been completed and another is in the process of being completed¹⁰.

- Our laboratory provides scientific support to the Mountain Centre in the context of monitoring the progression of two invasive species (Norway maple, cathartic buckthorn) following control interventions.
- Finally, the problem of invasive plants is at the heart of several research projects of the laboratory, notably on the impact of common reed (*Phragmites australis*) in wetlands¹¹.

How are invasive alien plants a threat?

Globally, invasive plants are among the worst threats to biodiversity and the integrity of natural ecosystems. They can permanently alter the ecological conditions of the environment, occupy space to the detriment of native species and can sometimes even have a negative impact on human activities. For example, several species of floating aquatic plants such as the water chestnut can rapidly cover the surface and severely affect all forms of aquatic life by limiting light and oxygenation in the water column, in addition to preventing fishing and boating. In the marshes and swamps of the southern United States, millions of dollars are spent to control *Melaleuca*, an invasive tree that dries out the environment, eliminates other vegetation and alters the fire cycle. In terrestrial environments, certain vine species (e.g., kudzu) can rapidly climb shrubs and trees, forming a light-tight canopy that prevents the germination and growth of all species in the forest floor, including tree regeneration. There are many more examples of this because several hundred species are recognized worldwide by the scientific community and by various conservation organizations because of the significant impacts they have already caused on several

types of natural ecosystems. This is in addition to the impact of exotic plants in agricultural systems, where hundreds of millions of dollars are spent annually on chemical herbicides to prevent and control "weeds".

Urban forests, such as Mount Royal, are highly susceptible to invasive plants. These patches of nature are continually bombarded with seeds of new horticultural species from surrounding land or weeds from vacant lots. Their small size gives them a large ratio of "contact area to surrounding environment / natural area", which gives them little buffer zone to resist invasions and less resilience. As these species succeed in establishing themselves in the protected environment, they become new hotbeds of invasion that can provide new sources of seeds to colonize the entire environment. Not surprisingly, therefore, the ecological integrity of urban forests is particularly susceptible to invasive alien plants.

Why should we be concerned about the ecological integrity of Mount Royal?

The natural forest vegetation of Mount Royal is made up of a spectrum of communities all dominated by sugar maple, from the hickory maple grove at its base to the red oak maple grove at its summit. As such, the ecological value of this ecosystem is high, particularly that of the oak maple grove that dominates its summit, typical of the tops of the Monteregian hills, and which is becoming increasingly rare and threatened. Several rare species are also part of the cortege of plants colonizing Mount Royal. However, it is above all its location in the heart of the urban environment and, consequently, its number of visitors that makes Mount Royal a

cultural and natural gem to be protected and proudly displayed. No other sugar bush is more visited than the one on Mount Royal. The sugar bush is a unique ecosystem in the world. Its extraordinary procession of spring undergrowth plants is remarkable as much for its beauty as for its ephemeral nature: trilliums, erythrons, violets, uvulars, wild garlic, wild ginger and many others! In addition, the autumn colors of the sugar maple, with its yellows, oranges and reds of all shades, constitute an unequalled natural spectacle, among the most beautiful in the world in this field. In addition to its immense ecological value, the maple grove also represents one of the most important heritage and cultural values. It is in a maple grove landscape that the first European settlers came to settle in our regions. And what about maple syrup, which is a world-renowned product of which Quebec is the largest producer! Of course, there are other maple groves besides Mount Royal, but this one, with its millions of visitors per year, is the best way to bring this extraordinary ecosystem into contact with the urban population. With its easy access to the heart of the city, it is a privileged place to familiarize young people with our natural heritage. Mount Royal also represents our best window to show the world the uniqueness of our forests. In fact, for many foreign visitors, the only contact with nature in Québec and the only souvenir they will bring back will be their visit to Mount Royal. Shouldn't we offer them the spectacle of a healthy sugar bush? Unfortunately, this ecological integrity is greatly threatened by the growing presence of invasive exotic plants.

What is the extent of the invasive plant problem on Mount Royal?

The invasion of the forests of Mount Royal by the Norway maple illustrates the threat to the ecological integrity of its forest. This species, introduced from Europe, has been abundantly planted,

not only in the streets around the mountain, but also in the park itself, at a time when the damage done by invasive plants to the ecosystem was unknown. Over time, with its aggressive regeneration and tolerance to shade, the Norway maple has even come to supplant the sugar maple. Indeed: while the sugar maple dominates the tree stratum, it is the Norway maple that has the most seedlings and saplings in the undergrowth, three times more than the sugar maple¹⁰. It is these young trees that will make up the forest of tomorrow. It is easy to underestimate the problem because at first glance, the change is not very apparent since the two species are very similar. However, Norway maple does not have the autumn colors of the sugar maple and does not produce "maple syrup". Moreover, its dense foliage, which lets little light through, hinders the maintenance of the undergrowth flora, especially the rare species and spring flowers so characteristic of Mount Royal. What will the Mount Royal forest look like if nothing is done to control the invasion of Norway maple?

Unfortunately, the Norway maple is not the only horticultural species introduced to the mountain: it is also home to the cathartic buckthorn (*Rhamnus cathartica*), buckthorn (*Rhamnus frangula*), periwinkle minor (*Vinca minor*), white poplar (*Populus alba*), Siberian elm (*Ulmus pumila*) and the podagrarian egopod (*Aegopodium podagraria*). These species sometimes occupy considerable space on the mountain and their effects on the natural environment are considerable. Many establish themselves more easily in disturbed areas of the forest, such as along trails or open spaces, and then spread towards the interior of the forest. Some form monospecific stands, excluding native species by monopolizing resources (light, water or nutrients) or sometimes by producing allelopathic substances. For example, cathartic buckthorn and wood buckthorn.

Commonly known as "wild parsley" (*Anthriscus sylvestris*) present very dense pure communities that inhibit the presence of other species in the undergrowth. While most invasive species take advantage of disturbances to establish themselves, some are shade tolerant and can thus invade even undisturbed forests. Examples include Norway maple (*Acer platanoides*), garlic (*Alliaria petiolata*) and buckthorn. Finally, while the deleterious effects of the most obvious invasive plants are on flora, the very structure of the habitat and animal species can also be greatly affected.

How can invasive alien species be controlled?

The management of invasive plants is a complex problem, often requiring significant time and resources, and must be supported by a sound scientific basis. Some plants such as buckthorn, because of their important vegetative reproduction, are extremely difficult to eliminate without the controversial use of herbicides. Mechanical control methods (uprooting, cutting, scarification of the soil) can cause impacts on the environment by disturbing the soil and creating an opening in the tree stratum, which makes the site suitable for rapid reinvasion. Finally, to minimize the possible return of invasive species, it is often important to plant native species. This restoration of the environment accelerates the restoration of the natural balance of the site. Given the difficulty of managing a well-established invasive plant, identification of threats and early intervention become a priority. An example of this is the dog-strangling vine (*Cynanchum rossicum* and *C. nigrum*). This plant, which is toxic to humans, is only just beginning to establish itself on Mount Royal. It is therefore urgent to act early, before it succeeds in creating

dense populations that would supplant native vegetation and make it difficult to control. Finally, the best management of invasive plants is prevention, notably by limiting the introduction of new propagules. However, several invasive exotic species are horticultural species that are still present in the periphery or on the mountain. The management of invasive plants is therefore not limited to the very limits of the forest, and an effective control of these species implies an intervention that involves raising awareness among stakeholders outside Mount Royal Park.

Are we doing enough to control invasive plants on Mount Royal?

Since the end of the 1990s, the City of Montreal has addressed this problem by mapping the invasion of certain species. Subsequently, in the early 2000s, means of control were put forward for buckthorn, anthrisc and, later, Norway maple. In 2005, the Mountain Centre, with private financial support and the collaboration of the City of Montréal and the IRBV, carried out cutting and reforestation operations at four permanent stations, with the aim of better documenting the effectiveness and impact of the interventions on the flora. Despite all these efforts and the expertise developed by the stakeholders in the file, the financial and human resources allocated remain insufficient to ensure effective management that will restore the ecological integrity of Mount Royal.

Among the measures announced, let us mention a very relevant initiative included in the by-law modifying the Montreal Master Plan (04-047): point 10: The provision 6.1.3

entitled "Land Development", which prohibits the planting of nine invasive species within the territory of the Historic and Natural District of Mount Royal. While this provision will eventually help to reduce exogenous sources of propagules, no provision or policy addresses the issue of managing the invasive plants that already colonize Mount Royal.

In fact, the integration of the notion of invasive plants within the Mount Royal Protection and Enhancement Plan is an awareness of the City of Montreal regarding this issue. However, given the scope of the problem, we consider that the issue of invasive plants remains too little addressed in the Plan. In fact, there is no specific management plan proposed in the Plan, nor is there a willingness to allocate the necessary resources to effectively address this problem.

We recommend :

1. Recognize that invasive species are a major threat and that they must become a priority issue in safeguarding the ecological integrity of Mount Royal.
2. Create a management plan including an intervention and monitoring program. The main objectives of this program are the eradication of invasive species already established on Mount Royal and the restoration of its ecological integrity. It is imperative that sufficient resources be allocated to ensure its success.

3. Continue measures to prevent new introductions of exotic plants through regulation and awareness raising for institutions and residents near the mountain.
4. To develop a monitoring system that will allow us to act as quickly as possible to counter new introductions of invasive plants.
5. Restore the environment following control activities, including the planting of native species, in order to encourage the return of natural communities and prevent recolonization by invasive species.
6. Prioritize research on the scope of the problem, the effectiveness of interventions and the actions to be taken (investigate control methods).
7. Raise awareness of invasive plant issues among park users, particularly to prevent environmental disturbances (off-trail walking and cycling) that contribute to the establishment of invasive species.
8. Promote an action partnership with residents, institutions and organizations (e.g., create volunteer control or eradication days).
9. Disclose the results of the actions carried out and the research undertaken to promote the exchange of knowledge with the scientific community and other associations protecting woodlands invaded by the same species, notably the Parcs-Nature de Montréal and other protected woodlands in the greater metropolitan area.

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