Sustainable and Effective Disposal of Invasive Plant Material in Metro Vancouver

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Executive Summary

Globalization has brought about tourism, trade and transport of goods, all of which facilitate the introduction of new species to new spaces. In this paper, I will focus on the region of Metro Vancouver and the matters that lie around the disposal of invasive species. I have identified two potential problems that could be addressed to make invasive species disposal more effective and ecologically sustainable. Information was gathered through academic literature as well as speaking with various invasive species removal companies. I found that in order to ensure that every propagule from the removed invasive plants is destroyed; in depth research needs to be conducted, specifically on the invasive plants of concern in Metro Vancouver. This will help ensure that there aren’t any active seeds in the composted soil. I also found that having a simpler way of communicating the policies of various partners would make disposal more effective.

Introduction

The movement of humans, economic growth and land development has encouraged the spread of habitat range in many species far beyond their traditional habitat (Wittenberg et al., 2001). Biogeographic barriers that had, at one time, previously isolated the biodiversity of continents, since time before memory, have disintegrated (Mooney & Cleland, 2001). Globalization has brought about tourism, trade and transport of goods, all of which facilitate the introduction of new species to new spaces. This occurs both naturally, through seeds being carried, and intentionally, through planting non-native species our backyards (Brito et al., 2013).
The introduction of new species to an area can have extremely detrimental and irreversible effects on the local biodiversity, as new competition for resources can take resources from indigenous organisms and take over areas. Invasions by non-native species are one of the main threats to natural ecosystems (Clout et al., 2009).

Given the way in which the natural environment is so complex, dynamic, unpredictable and interconnected, matters to do with biodiversity can be complicated and controversial. Planet wide, there is a startling lack of policies that manage invasive species effectively (Dickinson et al., 2012). Unfortunately, given the complexity of the issue, it is a very difficult task to take on and some may affirm that it is completely impossible to rid areas of entire species successfully for a sustained period. A national strategy is necessary but beyond this scope of work. In this paper, I will focus on Metro Vancouver and the questions that lie around the disposal of invasive species. I have identified two prominent matters that could be addressed to make invasive species disposal more effective and ecologically sustainable in the Metro Vancouver region.

The management of invasive species seems like it could be simple by using a preventative approach rather than a reactive treatment. However, this becomes particularly difficult due to an absence of physical and ecological barriers when it comes to seed dispersal (Clout et al., 2009). Invasive species spread naturally, not acknowledging jurisdictional borders, and are also accidentally and deliberately introduced by humans. García-Llorente et al. focus on an important aspect of invasive species management, that “humans are involved in the entire invasive process” (2008, pg 2970). Humans introduce invasive species, suffer the
consequences that arise and possess the ability to take action and create policies to manage invading species (García-Llorente et al., 2008). Because the natural environment, and the economy are so intertwined, invasive species have numerous economic implications (Eiswerth & Johnson, 2002 and Ceddia et al., 2009).

Environment Canada estimates the annual cumulative revenue loss caused by just 16 invasive species is between $13 and $35 billion (http://www.bcinvasives.ca). Colautti et al. estimated the costs associated with only 10 key invasive species in Canada total around 187 million Canadian dollars per year (2006). This emphasizes the pressing need for a comprehensive program on a national level to assess and manage the impact of invasive species in Canada.

**Definitions**

Invasive species is defined by B.C.’s Invasive Plant Program Strategic Plan as a “non-native (alien) plants whose introduction into British Columbia cause, or are likely to cause, economic or environmental damage, or harm to human health” (http://www.bcinvasives.ca). The term propagule is defined in the Merriam-Webster Dictionary as “a structure (as a cutting, a seed, or a spore) that propagates a plant”. Propagate is defined as “to produce” (Merriam-Webster, 2016).

**Methods**

Most of my information came from scholarly sources, which were received from *UBC Library*. The majority of academic literature was on the composting of
plants and propagule viability. While no literature was found specifically on the key invasive species in Metro Vancouver, composting of other plants were used as an example of the temperatures that are required to deactivate the propagule. Other information was obtained through websites of invasive species disposal companies and organizations. Invasive flora removal companies were also contacted, anonymously, to determine whether information about disposal policies was properly being relayed. These interviews remained anonymous because companies were difficult to reach or were not interested in a formal interview.

**Results**

The majority of literature on invasive species management states that a strong legislative framework is critical for addressing the complex challenges of invasive species. Smith et al. emphasize that invasive species have gotten very little legislative attention in most countries and instead tend to be dealt with in a disjointed and reactive manner (2014). They also state that legislative frameworks can provide the foundation for clearly determining roles and responsibilities and are important tools for guiding and generating action (Smith et al., 2014). McDermott et al. use a bio economic model to explain how the management of invasive species needs to come from a place of collectivity (2013). They highlight how when managed independently, more invasive species can spread and the negative effects are easily ignored. In Clout et al.’s Invasive Species Management Handbook, education and awareness of the general public are very important. Other methods for management can be seen as bio control, herbicides and developing
incentives for taking action. Fischer & Young conducted a study on attitudes towards biodiversity management and found that a better understanding of biodiversity in the public body is essential for the design of biodiversity-related policies that have public support (2007). Citizen science is discussed by Dickinson et al. as an effective way of raising public knowledge about various issues (2012). They state that citizen science combines public education with research and uses a more holistic approach at addressing social impacts by engaging the public to gain support for science and environmental stewardship. This method could be very effective for dealing with invasive species in the Metro Vancouver region.

Disposal of British Columbia’s invasive species is not discussed in literature. There is, however, a lot of literature on temperatures necessary for propagule destruction. Brito et al. studied an Acacia species and found that temperatures need to exceed 60 degrees Celsius for several months for seed inactivation (2013). Tomkins et al. found that 4 weeks of composting at 55 degrees Celsius or higher are not only sufficient to kill the propagule of a variety of species, but also increases the quality of the soil produced (1998). A study by Egley on a wide range of plant species found varied results depending on the species. They did find correlations between higher temperatures, higher moisture content and longer time in the compost and more seeds dying for all the examined species.

Harvest Power accepts green waste containing invasive flora material and is located in Richmond, B.C. They are required to follow procedures outlined in the B.C. Organic Material Recycling Regulation for static aerated pile composting – no less than 55 degrees Celsius for at least three days (Forgie, Sasser, & Neger, 2004)
Harvest Power’s process can be seen in Figure 1. In the first mesophilic stage (A), easily degradable material is broken down. In the thermophilic stage (B), the compost pile reaches over 55 degrees Celsius. In the second mesophilic stage (C), the decomposition of complex compounds takes place. In the maturation stage (D), further decomposition occurs along with building up of new compounds. This entire process typically takes around 15 days and the compost is mixed at least 5 times to ensure that all the compost is exposed to the same amount of heat (Geesing, 2013). The pile is enclosed for insulation and to control odour. After, high quality compost is made and sold (Geesing, 2013).

![Figure 1. Composting Stages at Harvest Power (Geesing, 2013)](image)

Unfortunately some municipal staff have reported invasive plants growing in areas where compost from Harvest Power has been used in landscaping, but it has not been established whether these invasive plants have propagated from local
seed, plantings, contaminated trucks, the compost itself, or even other soil amendments.

Because most invasive plants in Metro Vancouver tend to spread furthest on public lands, I contacted various removal companies to find out whether they were aware of the disposal options. The removal professionals within companies were very difficult to get in contact with, so the results may not be detailed. However, what was found was that many of the front end staff weren’t conscious of where the plant material they removed was going. Some were not aware the material could be composted. Many of the communication officers of these companies did not seem to care where the removed invasive flora was going.

Discussion

The majority of the literature points to various measures such as public awareness, bio-control, herbicides, and early detection for the management of invasive species. There is generally a low amount public awareness around invasive species, aside from the engaged subset of organizations. It is also good that the invasive plant material is disposed of in a sustainable manner, rather than burning or requiring the material to be placed in plastic bags and thrown away in a landfill.

The first major concern in Metro Vancouver is that we can’t be sure that the composting method is successful at preventing invasive plants from further colonization. Harvest Power, a company that accepts green waste and invasive flora material for composting, assures that the propagules of invasive plants that are taken to the facility will be destroyed with their temperatures. Day et al. concluded
that a fully enclosed co-composting plant can kill vegetative parts of Japanese knotweed within 3 days (2009). However, research on the destruction of knotweed seed has been limited to date. Although *Acacia* does not grow in Metro Vancouver, several months of composting at temperatures greater than 60 degrees Celsius would be necessary for destruction of invasive *Acacia* seeds (Brito et al., 2013). Due to competitive advantages and high survival rates, the propagules of invasive plants may be able to survive harsher conditions than native plants. It should not be discounted that seeds could survive the composting process.

Unfortunately no studies have been published in academic literature specifically on the ability of a static aerated pile composting process to deactivate the key invasive species in Metro Vancouver. I suggest that measures be taken to perform research directly on the key invasive species in the Metro Vancouver region. A possible avenue for conducting this research could be UBC’s Compost Program, which states as a part of their mission to support compost related research. The facility can take up to 5 tonnes of organic waste, daily in its in-vessel composting system, which allows for optimal temperatures and moisture levels (http://www.buildingoperations.ubc.ca). The study could involve Giant Hogweed or Japanese/Bohemian Knotweed to find out the length of time and temperature of the compost that is required for the vegetative material and seeds to be deactivated. This is important data to retrieve because only then can we be sure that the composting process is entirely effective.

The second disposal related concern is making sure the companies and organizations that give information or perform the removal of invasive plants in
Metro Vancouver know where the removed flora should be taken and what happens to it. Metro Vancouver currently recommends the disposal options outlined in Table 1. Professionals should be hired to remove Giant Hogweed due to its toxic sap. Giant Hogweed should be double-bagged in paper or compostable bags and transported to a transfer station that accepts invasive plant material or to a landfill for deep burial (the most expensive disposal option). All other plants can be taken either to a transfer station that accepts invasive plant material, where it will eventually be taken to Harvest Power for composting, or large quantities (e.g., truckloads) should be taken directly to Harvest Power. Throughout my research, it was difficult to find synchronized messaging across all the invasive species organizations in B.C. During my research, speaking with invasive species removal companies I found that the removal companies are not taking responsibility for where the plant material goes after it’s removed. It is obvious how important it is for proper disposal of the propagule, or else the plant will further colonize. It is important for the company to know that once they remove the plant from the ground, it is not going to survive.

This goes along with my research that states that understanding biodiversity and policies surrounding biodiversity is crucial for the policies to be effective (Fischer & Young, 2007). It is essential that they know that the plant material is being disposed of in an effective and sustainable manner. In Figure 2 I have developed a mock-up of an info-graphic that can be sent to various organizations and removal companies so they are aware of current disposal options. The graphic can be easily updated, when changes to policies occur, and sent to companies and organizations. The graphic could include regional or municipal branding and could be available for download.
from various websites as well as be sent to the removal companies and organizations. Pairing this info-graphic with research into the necessary conditions for the destruction of local of invasive plants via composting, the region can have a more effective and more ecologically sustainable invasive plant disposal strategy.
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<tr>
<th>Invasive PLANT material</th>
<th>Invasive Species-contaminated SOIL</th>
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<tr>
<td><strong>Giant Hogweed</strong></td>
<td><strong>• Take up to 0.5 cubic metres of soil and similar fill material to any Metro Vancouver Transfer Station (North Shore, Maple Ridge, Langley, Coquitlam and Surrey) in the Garbage stream.</strong></td>
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<tr>
<td>- Due to its toxic sap, hire invasive species removal professionals to remove Giant Hogweed. It is accepted at:</td>
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<tr>
<td>1. <strong>All Metro Vancouver Transfer Stations</strong> (North Shore, Maple Ridge, Langley, Coquitlam and Surrey) in the Garbage stream as a maximum of 5% by weight or volume of plant material per load of mixed waste. Giant Hogweed must be double-bagged in paper or compostable bags for Occupational Health and Safety reasons.</td>
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<td>2. <strong>North Shore, Maple Ridge, Langley Transfer Stations</strong> ONLY as Green Waste, bagged or not. From there, the material will be transported to an industrial organics processing facility that can adequately destroy invasive plants.</td>
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<td>3. <strong>Vancouver Landfill</strong> for deep burial or redirect to an industrial organics processing facility. There is a burial charge, but it is waived for residents with 10 bags or less. A Waste Assessment Form must be completed. Giant Hogweed must be double-bagged in paper or compostable bags for Occupational Health and Safety reasons.</td>
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<td>- Large quantities (i.e. truckloads) of invasive plant material are accepted at industrial organics processing facilities (e.g., Harvest Power). Please contact the facility before delivering any loads of invasive plant material to confirm they can properly handle the material.</td>
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**Table 1. Disposal of Invasive Species and Invasive Species-Contaminated Soil in Metro Vancouver**
Practices for Invasive Species Disposal

Giant Hogweed
(Hire professional to remove)

All other invasive plants

Double Bagged
In paper or compostable bag

Take to Transfer Station

Take to Transfer Station

Transfered to Power

Rich Soil

Take to Landfill

Garbage

Green Waste

Green Waste

Figure 2. Example of info-graphic of invasive plant disposal options.
References

Retrieved from http://www.bcinvasives.ca


Metro Vancouver (2016). Disposal of Invasive Species and Invasive Species-Contaminated Soil in Metro Vancouver (see Table 1)

