



Battling the Alien Invasion! An overview of invasive plant species impacts in the Georgia Basin.

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There is a new challenge to conservation biology in British Columbia, one which goes hand in hand with intensifying efforts to save species at risk and restore natural ecosystems. Its an “alien” invasion, and though its been going on for decades its implications to restoration and recovery efforts throughout the province are profound.

Invasive non-native plant species (also called alien, introduced, or exotic) grow quickly and aggressively. These unwelcome plants disrupt the ecology of natural ecosystems by displacing native plants and the animal species that depend upon them reducing native biodiversity. In this century the greatest threat to our native plants and wildlife may well come from invasive species. This is not just a problem unique to BC, next to habitat loss over 50% of the loss of native biodiversity globally has been attributed to introduced species, and nearly half of the species listed as threatened or endangered under the Endangered Species Act in the U.S. are at risk due to competition with alien or introduced rivals.

Some Background on the Invasion:

While there is still a large gap in our knowledge of the processes and relationships that drive many of the biological invasions we are dealing with, typically they follow three main routes:

- Direct intentional introductions (purposeful planting, replacing native species through producing or growing).
- Unintentionally as a by-product of dumping, or spreading through progressive colonization from an adjacent area (compost piles, waste sites).
- Natural dispersal from a ground zero area to distant areas through vectors such as wildlife (fur or droppings), artificial transportation (car tires, railway cars) or wind (blown in).

Impacts:

Though the socio-economic impacts are just beginning to be understood, examples from south of the border are telling. in the U.S. alone the assessed annual damage costs from introduced plants and animals for the year 2000 was set at \$137 billion, and this is considered to be an underestimate (Perrings et al 2002). We have not even begun to effectively determine the costs locally, and are now beginning to recognize the scope and potential resources that will need to be invested to deal with the issue. For those working to restore and conserve native species and ecosystems the costs of dealing with the alien invaders may completely swallow up resources once traditionally allocated towards enhancement or education. The longer that invasives are

allowed to spread, the greater the problem and the exponential increase in likely costs to treat them. And that's just for starters, it doesn't include the costs to re-establish native plant and animal communities, maintain and monitor them.

Generally these impacts include:

- Reduced light, moisture, nutrients and space available to native species
- Loss of natural habitat for native insects, birds, and other wildlife
- Reduced forage potential for insects, birds, and other wildlife
- Competition with and replacement of native species
- Reduced integrity and stability of slopes, hillsides and flowing water shorelines
- Changes to soil chemistry
- Requirement of significant costs and resources to treat

Many of the species which have become part of the hit list have been in Canada or BC for decades, some even for centuries. Wetland invaders like purple loosestrife came to North America from Europe over 200 hundred years ago in the bilge water of ships. Since that time and even though they have become a scourge to wetlands everywhere the plant continues to be available commercially as an ornamental for local flower gardens. Other species such as Scotch broom an exotic/invasive perennial plant that was introduced to the West Coast of BC in 1850 readily invades natural meadows, thickets and old-field grasslands. Many of these plants are still actively propagated or allowed to spread because they have anthropogenic values that eclipse our ability to perceive their danger to native ecosystems.

Who hasn't enjoyed picking Himalayan blackberries? Some people go even so far as to raise concerns over its removal due to the loss of what they see as a free source of fruit with many culinary uses. Originally from Eurasia it is now commonly found all over the Georgia Basin. Typically it impacts riparian areas and wetland margins, spreading through openings in forests and significantly reducing diversity in hedgerow and old-field areas. Making great pies and jellies and providing food for a few species of birds doesn't mask the fact that this plant species is an aggressive problem.

These species all exemplify the invader profile - they grow on a variety of habitat and soil types and readily out compete other plant species for resources. These plants act on systems in much the same way that a virus invades a host cell. The end result is the creation of vast monocultures to the exclusion of any other plant species, thus decreasing biodiversity to a point where ecosystem health is severely compromised. Frequently complete eradication is impossible and once established they require extensive clearing and replanting efforts coupled with perpetual control and monitoring.

Priority Ecosystems Effected:

In the province of BC as with other areas across Canada the invasion has effected some of our most diverse native ecosystems. Of these there are two - wetlands and forests (including riparian forests) in the Georgia Basin that are becoming increasingly imperiled.

Wetlands:

With over 90% of historic wetlands in the Lower Fraser area already lost, the Greater Vancouver Regional District in partnership with senior agencies and local conservation groups have begun to invest substantially in dealing with the impacts of species such as purple loosestrife. Priority areas which contain remaining significant wetlands such as Burnaby Lake, Boundary Bay, the

Fraser Estuary, Colony Farm and the Pitt Addington marshes have become part of intensifying efforts in research and implementation of natural and mechanical controls (fortunately with some success). Other species that are just beginning to be addressed are reed canary grass and jewel weed. Next to the need for increased acquisition and protection of wetlands from agricultural use and urban development, invasive control will be a major resource challenge for wetland conservation.

Forests:

From corner woodlots of rare Garry Oak ecosystems to streamside areas to regional and provincial parks the remaining forested areas in the Basin represent a mere echo of the vast forest cover described by early surveyors in the 1890's. Historic logging and now increased fragmentation and encroachment due to population growth, over-recreating and fire hazard control have contributed to reduced resiliency and increased vulnerability to invasive species. As forested areas lose the necessary buffering needed to maintain their interior integrity, both the canopy and understory are infiltrated by species such as blackberry, morning glory, English ivy, silver nettle, hops and knotweed. Through direct strangulation and chemical warfare these invasives literally can smother forests and diverse shrub understories into wastelands. Streams and riparian areas can become choked, obliterating necessary sunlight infiltration that drives benthic invertebrates and freshwater food chains.

It should also be noted that in the Georgia Basin (and globally) wetlands and forests provide some of the most significant values through ecological services of any ecosystem communities. Assessments done through the Provincial Wetland Stewardship Partnership coordinated by Duck Unlimited Canada (BC) identified cost benefits in the order of tens of millions of dollars for the direct and indirect benefits that wetlands provide. Forests and tree cover have been estimated in Greater Vancouver at providing similar cost savings for surface water management, air quality and greenhouse gas control.

This isn't just about impacts to species at risk either, common species too are becoming increasingly effected. Similarly the capacity to undertake effective restoration is undermined as resources get diverted into ongoing management and control efforts.

Cost Accounting Locally - The Como Creek watershed in Coquitlam:

The Como watershed and the adjacent Nelson Creek watershed are tributaries to the Lower Fraser encompassing over 10 km² of both remnant coastal western hemlock forested upland and lowland floodplain habitat with associated old-field and wetlands. This area represents significant natural capital to Coquitlam as well as providing a critical ecological pathway to important municipal, regional and provincial protected areas in Port Moody, Port Coquitlam and Burnaby. Since 1996 the Como Watershed Group Society had typically been securing and allocating approximately \$5,000.00 per year for plant purchases and aquatic habitat restoration, mainly for native salmon and trout populations. The City regularly matched that amount through in-kind contributions of materials, equipment or staff support. Cumulatively efforts cover 8 sites or about 20% of the two watersheds and have been ongoing since 1997. Including a few large scale projects such as the restoration of the headwater wetlands at Como Lake and considering volunteer time and effort, the investment to date has been close to \$500,000.00. Its important to remember that's only for 20% of the planning area.

Unfortunately as local conservation actions began showing results aliens were beginning to invade. Work to reintroduce and reestablish riparian and wetland habitat was becoming seriously hampered by the spread of increasing numbers of invasive plant species.

It's not apparent why certain plants became a problem so quickly. Direct issues of development, local population growth and the associated non-native plant introductions that come with it likely combined with climate change, air and water quality issues to reduce the resistance of already weakened native ecosystems. Others such as purple loosestrife and hops could be directly traced to outbreaks in nearby regional parks and the Fraser Valley.

Rehabilitation efforts have now almost exclusively switched to dealing with introduced plants and native ecosystem recovery. Admittedly this shift is not necessarily a negative one. It exemplifies what may be a needed transition to landscape level conservation that focuses on biodiversity and ecosystems as a whole rather than single species management.

Regardless the results have been that the Society, and now more broadly the City of Coquitlam have had to re-focus their management strategies just keep up. Since 2002 the Como Watershed Group has directed its restoration budget and volunteer efforts almost exclusively to invasive plant control, native plant community recovery and ongoing maintenance and monitoring of previous restoration projects. The Society has recognized that unless it invests in dealing with this problem now through direct control and indirectly through education, traditional habitat restoration activities will be a waste of time and dollars.

The implications though are far reaching, if the cost locally could reach tens of thousands of dollars for one watershed, we could be looking at millions to deal with the dilemma faced by hundreds of urban and urbanizing coastal watersheds found throughout the Georgia Basin. That doesn't even begin to include the other resources needed to deal with the many species at risk, or their recovery. This may make things seem insurmountable but it's important to recognize that addressing the problems now will significantly reduce the long-term costs of restoration activities in the future.

Site Control and Treatment:

There are several ways that invasive plants can be dealt with:

- Direct physical removal of the entire plant (i.e. stripping, grubbing or pulling)
- Indirect eradication through a combination of cutting, pruning and use of fast growing native plants to outcompete target species
- Use of chemicals (herbicides, pesticides)
- Natural biological controls

In taking the direct "frontal" attack, time of year, growth patterns and characteristics of the plants have to be taken into account. Many species must be removed entirely (roots, leaves etc.) to reduce the risk of regrowth. Others have toxins or skin irritants that make them hazardous to remove by hand. As well some herbaceous plants (e.g. dead nettle) are hard to see during the winter after frost kill, but removal in the summer can be highly disturbing to nesting birds, small mammals and herptiles. Undertaking this method works well in areas where the activity is not going to create a long-term disturbance to people or wildlife and access is available for machinery (e.g. mowers, brushcutters, or backhoes for large areas). The resulting debris must be removed from the site and disposed of appropriately.

Use of the invaders natural weaknesses (e.g. shade or nitrogen intolerant) is a less intrusive but effective way to deal with some species. Target sites can be treated by initial cutting, brushing or pruning, then dependent on conditions and surrounding land use can be planted with fast growing aggressive species such as alder, willow, hardhack, red osier, snowberry and cottonwood.

Preferably a combination of several of these plants will help to jumpstart the system and provide some short term diversity and cover. However this strategy only works where the target species are shade intolerant, or don't like high nitrogen soils (alder creates these conditions). As well regular maintenance will be required to keep the invasives in check while the native plants take hold. Often this takes years.

The use of chemical control methods is a contentious one, and often considered by many as a last resort. Of course the flipside is they are very effective but pesticides and herbicides have associated health risks and can be highly destructive to more than just target species. Their constituent compounds and molecular compositions can read like some horrific cocktail. There are long-term impacts to the receiving environment and health issues to be considered. However there are newer more ecologically friendly alternatives to man-made commercial compounds. Many nurseries and commercial operators or wholesalers are now marketing natural treatments which use ingredients like vinegar or citric acids. In this way you are employing treatments that use naturally occurring herbicide properties. It is still important to remember though that using any treatment approach is best handled by those with experience, and should only be employed under strict supervision. Even natural treatments can have negative effects if applied or used improperly.

Biological control or the use of natural predators or other organisms to control certain species is not a new approach. This technique has probably been exploited by humans for as long as agricultural practices have been in existence. It is however something new in the realm of large scale pest control here in the Georgia Basin. It is a simple method by which a plant's natural enemy, parasite or predator is used like a hired gun to treat an area. Whether it be using a fungus or virus, or in the case of Greater Vancouver a beetle to control purple loosestrife the results can be overwhelming. In regional parks such as Colony Farm and Burnaby Lake there has been success in using the Galerucella beetle, a predator imported from the loosestrife's home territory in Europe. The beetle's entire life cycle is tied in with the plant, in which it is born, shelters, overwinters, mates, and deposits its eggs. Most important, at all stages of its life it eats loosestrife, voraciously. Tests have shown it also dines on a native version of loosestrife, but no other plants.

That last point is key to use of biological controls; the great unknown is often what happens to them after they do their job. The fear being that they start wreaking havoc amongst native flora and fauna becoming a pest themselves in need of management.

For all of these approaches it is critical that after treatment has been done the site be rapidly colonized with a combination of ground cover (such as a legume grass mix) and hardy native shrubs and trees. Species selection is dependent on what the restoration objectives are and habitat type represented. Then of course there is the maintenance. One of the greatest impediments to success of ecological restoration is lack of monitoring and follow up. Undertaking invasive removal and the subsequent recovery action is a long-term commitment requiring constant vigil and often re-treatment.

Entering the next “100 Years War”:

In reviewing the methods and approaches available to deal with the increasing threat and challenge invasive species are having in the Georgia Basin it is important to recognize that there are options. But there is also what Perrings et al referred to as an issue of the “weakest link”.

Biological invasions and related problems of non-native species introductions are for the most part a “human problem, with human causes and consequences”. In hindsight it would be easy to say “if we knew they were going to be this much of a problem we wouldn’t have let them in”. However its obvious they are here, and here they are likely to stay. There will be no easy out.

Whatever the management direction or approach it will require a long-term investment in physical and financial resources to stem the tide. Given the reality of present resource constraints we also need to be strategic about priorities, identifying which species need immediate attention while dealing with lack of public awareness on the true nature of the threat.

The recent Invasive Plant Strategy for BC developed through the Fraser Basin Council in partnership with senior governments and regional districts is an important step in this direction. To be effective however the scientific community, government and local conservation and stewardship organizations must work collaboratively to share knowledge and expertise if efforts are to make any difference. Locally its only taken a generation to reach this critical state, which is a very short time as far as natural processes are concerned. The responsibility is ours to develop the necessary tools, actions and incentives to reverse the problem, and hopefully soon.

Tips on stopping the invasion:

- Properly dispose of hanging baskets and other yard waste 9check with your local municipality for options, many have yard waste pik up programs. Dumping of yard waste not only smothers natural vegetation and introduces invasive plants and other weeds but also rots the roots of trees, destabilizes slopes and causes erosion and attracts pests.
- Prevent the escape of invasive plants from your garden
- Better yet, plant native plants – they’ll provide better habitat, attract wildlife and require less maintenance.
- Get involved locally in invasive plant removal and native species recovery.
- Request and support local bylaws or legislation to restrict problem species such as English ivy, dead nettle and purple loosestrife from being sold in nurseries and hanging baskets.
- Work with commerical horticultural organizations and landscaping associations towards integration and education of the values of native plant use and reducing dependency on non-native plants.

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Common and Scientific Names of Relevant plant species discussed in this article:

Purple Loosestrife – *Lythrum salicaria*

Himalayan Blackberry – *Rubus discolor*

Evergreen Blackberry – *Rubus laciniatus*

Policeman's Helmet (Jewelweed, Touch me not, Himalayan Balsam) – *Impatiens glandulifera*

Hops – *Humulus lupulus*

Giant Knotweed (Japanese bamboo, Buckbrush) – *Fallopia japonica*

English Ivy – *Hedera helix*

Silver Nettle (Dead nettle, Yellow archangel, Lamium) – *Lamium galeobdolon*

Reed Canary Grass – *Phalaris arundinacea*

Scotch Broom – *Cytisus scoparius*

For a complete list of species of management concern please refer to the Invasive Plant Strategy for British Columbia. <http://www.invasiveplantcouncilbc.ca/publications/invasive-plant-strategy.pdf>