REED CANARY GRASS CONTROL AND RESTORATION OF WETLANDS ON CYPRESS MOUNTAIN

INTRODUCTION

Invasive, non-native species are quickly becoming an increasing biological and economical threat to overall biodiversity in many ecological areas worldwide. These species encroach on native habitats and threaten native plants and wildlife, while negatively impacting ecosystem functioning (Pimentel *et. al,* 2002).

Reed canary grass (*Phalaris arundinacea L*) is an extremely aggressive invasive species that plagues natural areas in the Pacific Northwest. Its rapid growth regime allows it to be a serious threat to ecological systems, as it quickly dominates a site and produces a monoculture. Replacing native plants with an invasive, monotypic colony can reduce site quality and overall biodiversity of an ecosystem (Seebacher, 2008). Urbanized areas that have been impacted with changes in hydrology, vegetation, and soil characteristics are predominantly susceptible to an reed canary grass assault (Naglich, 1994).

PROBLEM

Reed canary grass (RCG) is a perennial cool-season grass that grows up to 2m tall. This plant expands its range by creeping rhizomes, which can contain between 6-10 nodes each (Comes, 1971). RCG frequently excludes other plant species through aggressive competition. It successfully outcompetes other vegetation due to its high viability rate and lack of dormancy requirements. Its effective dispersal mechanisms allow it to spread quickly, as each plant can produce a large mat of rhizomes in one growing season (Apfelbaum and Sams, 1987). As RCG can grow to 2 meters in height, it can easily shade out slower growing native species.

In locations where reed canary grass has been introduced in North America, the species typically dominates between 50-100% of the total site area (Lavergne and Molofsky, 2004). This suggests that once a site is infested with RCG, the likelihood of it overtaking the entirety of the area is high.

Reed canary grass has been identified in several locations in Cypress Provincial Park in Vancouver, British Columbia. It was likely introduced to this site in 2012 when large amounts of hay was brought in for the winter Olympics. The largest area of infestation occurs surrounding the parking lots in the Cypress Bowl, and on the ski runs where hay was used in large quantities to facilitate the production of man-made snow (Cypress Provincial Park ◊ Reed Canary Grass (Phalaris arundinacea), 2013).

It is imperative that direct action is taken to manage this plant before its coverage of the provincial park increases. It is currently contained mainly to the lower areas of the park, but small patches have been found throughout the trail network. It left unchecked, RCG will expand its area of infestation and migrate into the backcountry, where control efforts would be difficult to implement.

This issue must be addressed quickly, and it will be necessary for the various stakeholders in and around Cypress National Park (MOT, West Van District, Parks etc) to work together to mitigate the problem before it gets out of hand.

CONTROL METHODS

Reed canary grass has been extensively studied for multiple years, and still no all-inclusive management strategy has been developed. Numerous removal techniques have been utilized in an attempt to control this species, with each displaying varying levels of success. Previously tested control methods include: mowing, burning, herbicide application, substrate excavation, Nitrogen management, water level manipulation and shading with black plastic/shade plants (Seebacher, 2008).

In an attempt to manage this species most effectively, multiple control methods must be used in conjunction, as previous research has shown that individual techniques produce lower levels of success (Lavergne and Molofsky, 2006).

Herbicide regimes have been the most common alternative for RCG management, regardless of the potentially negative ecological impacts. Despite their frequency of use, however, the results of herbicide treatment have not resulted in a sufficient way to control this species. Treatments have been noted to reduce RCG stands, but were unable to prevent germination in post-treatment years (Healy and Zedler, 2010). For herbicide to significantly impact RCG, multiple treatments over sequential years would be necessary, but such treatments would be both ecologically damaging and expensive.

Mechanical removal, though mowing and aeration of the soil, has shown to produce good results as a primary step in the RCG management process. Mowing removes the seed heads of the grass prior to maturation, which slows the monotypic takeover on an individual site (Naglich, 1994). As RCG is able to quickly re-establish itself from its rhizomal network, mechanical methods aimed at disturbing the below-ground system are imperative. Use of a cultipacker (fig.1) to disk the soil would allow for the rhizomal mat to be broken apart and aerated, thus limiting the appearance of new growth and allowing native plants in the seedbank a chance to grow.

Figure 1: ATV drawn cultipacker

Following the mechanical control methods, shading the impacted area has proven to be successful in many RCG trials (Hovick and Reinartz, 2007; Seebacher, 2008; Johnson, 2005). Both plastic shade fabrics as well as mixed canopy plants have been implemented to reduce light transmission and prevent RCG seed growth. Johnson (2005) found that solarization with black plastic sheets resulted in a 100% decrease in the number of RCG stems at the culmination of his study. Shade fabrics are not a long-term solution, as they break down over time but when used in combination with other methods, could be an important suppression method.

In addition to these techniques, reduction of the nitrogen availability in the soil layer through the addition of carbon sources has shown to successfully impede RGC growth (Seebacher, 2008). Using wood chips or sawdust in a mulch layer over the impacted area will reduce the soil's nitrogen content, giving the site's native species a competitive chance to grow. The native plant, salal (*Gaultheria shallon*) also has the ability to limit nitrogen in the soil. The tannins that are released from the flowers, leaves and roots of this plant bind to proteins in the soil, negatively effecting nitrogen availability (Seebacher, 2008). It would also be able to deliver year round shade over impacted areas, as it remains green all year.

The use of a fast growing cover crop, such as native clover species, over areas previously infested with RCG could suppress returning invasives as an additional safe-guard against the recurrence of the monotypic weed prevalence. Planting native species with varying canopy heights to provide shade area would be beneficial as the last stage of treatment. Willow staking at 0.6m intervals, when combined with cardboard mulching techniques, has been shown to be highly effective at reducing RCG biomass with success rates of 93-99% (Townsend, 2004). This method limits soil disturbance and soil compaction, while making use of nearby native shrubs of the appropriate genotype for the area. Willow also acts as a nurse crop and can help in the natural reestablishment of native species (Kim, Ewing, & Giblin, 206). Other species which can be planted as stakes, like red dogwood (*Cornus sericea*), may also work well, but have yet to be studied. Smallfruit bulrush (*Scirpus microcarpus*), salmonberry (*Rubus spectabilis*), black twinberry (*Lonicera involucrata*), and thimbleberry (*Rubus parviflorus*) would also be beneficial to include in plantings, as they leaf out earlier in the season than willows and will help shade out RCG.

Recommendations:

1. Mow grass and till soil in infected areas
2. Cover with a thick material to shade rhizomes for at least one year. Should be staked.
3. Cover with carbon source to deplete nitrogen availability (wood chips, hogfuel)
4. Plant a mixed array of native species with characteristics that will out-compete RCG

WORK PLAN

The initial phase of this project will focus on mapping the entire area to build upon previous mapping efforts (Appendix A). Volunteer groups who walk the trails will be asked to help map locations that are commonly visited by hikers. A paid crew of two individuals will conduct the mapping on more difficult and remote areas by foot or by ATV where appropriate. Each site recorded by the crew should include a size estimate, terrain conditions, access issues and recommended treatment type, in addition to GPS coordinates. All mapping efforts should occur as early as possible in the season, when snow has melted and identification of RCG is possible. Mapping the area will show how the RCG is spreading over time and also help with setting containment lines and prioritizing work efforts by breaking Cypress Mountain into different treatment areas.

Since the infestation of RCG is so extensive, the treatment areas will have to be ranked by priority. Small sites along trails leading into the backcountry and sites near, or in wetlands will have higher priority for

treatment. Large, well-established sites are lower priority, but still need to be considered, particularly if they are in locations where seeds can be spread easily by people or by water. Each area will have a treatment plan developed with control methods that are appropriate to the size, sensitivity and terrain conditions of the sites within that area. Some sites will also be chosen to act as trial plots for the development of new treatment methods. These sites will be more closely monitored in future years to determine their success.

Treatment will begin at the chosen sites this summer when the snow has melted and conditions are suitable; ideally from late June to early September. All treatments require at least one year to implement and several years to monitor and evaluate success. Some sites that are treated this summer will be planted in the fall, while others may be planted the following spring. For this project to be successful, the sites will need to be treated and monitored for a minimum of 3-5 years.

Treatment methods will be selected carefully to suit site conditions. Smaller sites may be hand dug and pulled, or weed whipped, covered and replanted depending on site sensitivity and ecosystem type. Larger sites will need to be machine mowed, plowed, mulched and re-planted. A crew of 4-5 people will be ideal for the smaller sites and a machine operator will be needed for the larger sites. The crew will carpool together in a work truck to locations near the site and will bring in the tools by hand or by ATV if available. The work will begin early in the day in order to avoid working in the hottest daylight hours. The crew will work 5 to 8 hour shifts depending on the discretion of the crew leader. Working shorter days is often beneficial in such laborious work, in order to avoid injury. Crew leaders will be trained in Level 1 first aid and will have appropriate first aid kits on hand at the work sites. In order to reduce potential spread of invasive plants from site to site, machine operators will be required to clean their machines before bringing them on site and should clean them between sites if possible. The work truck will be outfitted with a tank of water and the crew will rinse their boots and tools between sites to further reduce potential spread.

Volunteer groups will also play an important role in the treatment efforts. Volunteers from various groups including the Friends of Cypress, the Lower Mainland Green Team and school groups will be utilized in the mapping efforts and may be enlisted to help dig out RCG and plant native species.

OTHER CONSIDERATIONS

There are many factors to consider in a large scale endeavour such as this. In order for this project to be successful it will require the collaboration of many stakeholders and the help of the general public. Educating the public about RCG will help reduce the potential for its spread and may also assist in locating previously overlooked sites. This education plan should be multi-pronged in order to reach as many people as possible and should include, if feasible; signs, brochures, guided nature walks, and volunteer events, in addition to informing the various volunteer groups that are active within Cypress about RCG concerns.

Another concern that should be noted, is the presence of possible red or blue-listed species in the proposed treatment area. There has been a confirmed sighting of Least Moonwort (*Botrychium simplex*), a blue-listed species, in the Nordic ski area. It is possible that some of these plants, or other native species, may be found in the work sites. Despite this, most of the treatment areas are highly infested with RCG and it is outcompeting most other plants. If native plants are still currently present in these areas, they will soon be displaced if no attempts are made to control the RCG. Every effort will be made by the work crew to protect, preserve or relocate any native species on site that are discovered during the treatment phase. It is important to remember that the re-establishment of native species is critical to the long term shading out of RCG.

BUDGET

Table 1: Projected Costs for Year 1

Materials/Supplies/Wages	Costs
Truck Rental	
Hand tools and equipment	
Machine costs	
Materials (mulch, tarps)	
Plants	
Crew leaders/specialists	
Crew members/technicians	
Total cost:	

Table 2: Projected Costs for Future Years

Materials/Supplies/Wages	Costs
Truck Rental	
Hand tools and equipment	
Machine costs	
Materials (mulch, tarps)	
Plants	
Crew leaders/specialists	
Crew members/technicians	
Total cost:	

CONCLUSIONS

The presence of RCG in Cypress National Park is of specific ecological concern, as it is an extremely aggressive invasive species, which can rapidly form a monoculture, displacing native plants. Its high viability and rapid growth rate allow it to outcompete other vegetation, and its large rhizomal structure makes removal difficult. As RCG has been identified in numerous locations throughout the park, management must be initiated before this species begins infecting back-country areas. A 3-5 year removal and monitoring plan is necessary to ensure the lasting success of these efforts. If left unchecked, this species will continue to spread throughout Cypress National Park and containment and control will become impossible. The potential impacts of this could negatively affect the ecological diversity of the park, as well as its hydrology and drainage. RCG has been found to clog stream channels and block drainage ditches as a result of its rapid growth and dense rhizomal matting (Naglich, 1994). As a result of these concerns, it is advisable to begin treatment of the infected areas as soon as possible, so that the spread will not continue through another growing season.

APPENDIX A

Area 1: Around the lodge (Cypress Provincial Park ◊ Reed Canary Grass (Phalaris arundinacea), 2013)

Area 2 – Trail past the pump house and above Yew Lake (Cypress Provincial Park ◊ Reed Canary Grass (Phalaris arundinacea), 2013)

Area 3 – Trail alongside the ski run and above Yew Lake (Cypress Provincial Park ◊ Reed Canary Grass (Phalaris arundinacea), 2013)

Area 4 – Nordic Ski Area (Cypress Provincial Park ◊ Reed Canary Grass (Phalaris arundinacea), 2013)

APPENDIX B: SITE PHOTOS


Large patch in South project area


Large patches on either side of earthen bridge


Largest patch in 2012


Patch near head of Yew Lake trail


Patch near north side of Cypress Creek


South project area: small patches near creek


Small pacthes above Cypress Lodge


Small patches below resevior


RCG invading native plants


RCG overtaking purple monkey flower


Patch on trail edge


Large patches near the buildings


Patches along road


Multiple small patches in the field


Patches in tubing area


Patch between buildings


Patches along trail edge


Large patches under powerlines

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