
LABORATORY 5:

INVASIVE PLANT

SPECIES

GEOGRAPHY 103 - A03

Katie Pingree-Shippee

Team Members:

Jakob Roberts v00484900

Naegeen Noorani v00772866

1 Introduction and Objectives

The objective of this lab is to study some of the invasive plant species on and around the University of Victoria campus. Over a one week period, local invasive species were examined and photographed to determine their surrounding environmental factors. By examining both the invasive and indigenous plants, the relationship between the environments of the ecosystem can be examined.

The four invasive species that were examined are English Holly, Daphne, English Ivy, and Himalayan Blackberry. English Holly is considered an invasive species due to its quick growing nature in all conditions, its ability to spread by seed and vegetatively, and its massive consumption of surrounding water. Daphne is an invasive species because it can grow up to 1.5m to block sunlight to surrounding plants, it does not require disturbed soil to grow, it alters the soil chemistry to be more acidic which prevents other native species from growing, and it has toxic bark, sap, and berries to both humans and animals. English Ivy is invasive in British Columbia because it has such a rapid growth that can completely cover the ground in almost all forested and semi-forested areas, it has the unique ability to reach and climb surrounding plants very aggressively that essentially chokes native species by stealing their nutrients and sunlight, and it has no natural predators or diseases to control its growth. The Himalayan Blackberry's invasive qualities include the formation of large impenetrable thickets that create dense shade and limiting mammal movement to gain access to water and it has the ability to regenerate from sections of root stock and spread rapidly over disturbed areas such as logging operations.

English Holly got to North America by being physically planted and is spread through creatures attempting to consume its poisonous red berries. Daphne was first imported to British Columbia for ornamental reasons and can be purchased in nurseries, but it is spread by birds and other creatures attempting to eat its berries but dropping them upon realizing that they are poisonous. English Ivy arrived in Victoria through insects and birds consuming its seeds. Himalayan Blackberry was spread by humans who wanted to cultivate the crop and by birds and mammals eating the berries, it eventually spread by escaping and becoming naturalized across North America.

2 Data Presentation

2.1 English Holly

Holly first originated in the British Isles and Southern and Central Europe. It is a broadleaf evergreen shrub that can grow from 9-15 meters in height. It has dark green and waxy leaves that are spiny but become less spiny with maturity. English Holly has small white flowers and produces bundles of bright red berries of about 6mm in size. The following table contains environmental factors that were observed for some English Holly on the UVic campus:

Table 2.1.1 - English Holly Environmental Factors

Environmental Factors	Bowker Creek	South Woods
Slope:	Flat	Flat
Aspect:	North facing	South East facing
Geology or soils:	Organic matter	Organic matter
Surface Type or Leaf Litter:	Heavy dead leaf litter	Thick cover
Surface Moisture:	Dry	Moist/wet
Tree Canopy:	0%	10%
Surrounding Plants Species:	Fern, ivy	Cottonwood, fern, ivy
Human Activity:	Parking lot, pathway	Running/walking trail
Location:	N 48° 27' 56.89" W 123° 19' 3.27"	N 48° 27' 37.01" W 123° 18' 36.33"

2.2 Daphne Laureola

Daphne laureola is an evergreen with shiny leaves, fragrant yellow flowers and black berries originally from Southern Europe, North Africa or West Asia. Daphne prefers shady, moist areas but is tolerant to other conditions. The following table summarizes our observations of environmental factors for Daphne at Bowker creek and the South Woods:

Table 2.2.1 - Daphne Laureola Environmental Factors

Environmental Factors	Bowker Creek	South Woods
Slope:	5 degrees	Flat
Aspect:	South facing	East facing
Geology or soils:	Organic matter	Organic matter
Surface Type or Leaf Litter:	Moderate cover	Thick cover
Surface Moisture:	Moist	Moist
Tree Canopy:	30%	20%
Surrounding Plants Species:	Moss, ivy, birch	Fern, ivy, moss, douglas fir
Human Activity:	Near parking lot	Running/Walking Trail
Location:	N 48° 28' 0.11" W 123° 19' 6.51"	N 48° 27' 37.84" W 123° 18' 35.67"

2.3 English Ivy

English Ivy is an evergreen climbing vine that attaches itself to the bark of trees, brickwork and other surfaces to spread quickly. It has dark green, waxy, and leathery leaves that alternate along the stem which are commonly 3-lobed with a heart shaped base. Local environmental factors were observed for the English Ivy and are contained in the following table:

Table 2.3.1 - English Ivy Environmental Factors

Environmental Factors	Bowker Creek	South Woods
Slope:	Up tree	Ground cover
Aspect:	South facing	South facing
Geology or soils:	Organic matter	Organic matter
Surface Type or Leaf Litter:	Thick cover, decomposing material	Thick cover with branches and leaves
Surface Moisture:	Moist	Moist
Tree Canopy:	>5%	15%
Surrounding Plants Species:	Fern, himalayan blackberry	Oregon grape
Human Activity:	Near ditch, gravel path, storm drain	Pathway
Location:	N 48° 27' 48.46" W 123° 18' 39.88"	N 48° 27' 58.200" W 123° 19' 5.937"

2.4 Himalayan Blackberry

The Himalayan Blackberry (*Rubus armeniacus*) is a broadleaf evergreen that usually grows to approximately 3 meters in height. It has erect branches that arch and can trail out to 10 meters and are covered in thorns. The leaves on the branches alternate and are a toothed oval shape that look glossy from above with small white hairs on the underside. The blackberry bushes form large thickets that become impenetrable as they grow in size. The Himalayan Blackberry bushes/thickets could produce up to 7,000 to 13,000 seeds per square metre. The seeds are contained in the blackberries and ripen to a black colour during the summer months on stalks that are more than one year old. The following table illustrates the data collected about some sites where the Himalayan Blackberry is invading local plant species on the UVic campus:

Table 2.4.1 - Himalayan Blackberry Environmental Factors

Environmental Factors	Bowker Creek	South Woods
Slope:	Flat	Flat
Aspect:	North West facing	South facing
Geology or soils:	Organic matter	Organic matter
Surface Type or Leaf Litter:	Thick cover, lots of pine needles and ivy	Thick cover
Surface Moisture:	Moist	Moist
Tree Canopy:	<5%	40%
Surrounding Plants Species:	Ivy, douglas fir	Fern, ivy, moss, Indian plum
Human Activity:	Walking/running trail	Walking/running trail
Location:	N 48° 27' 58.94" W 123° 19' 5.53"	N 48° 27' 33.76" W 123° 18' 44.03"

3 Analysis

From the data collected about the various invasive species located on the University of Victoria's campus, we were able to make the following observations:

3.1 English Holly

Our group looked at two different locations where Holly was vibrant and plentiful; Bowker Creek and Southwoods at the University of Victoria's Campus. Holly is a beautiful looking plants with its colourful green leaves and red berries. It was noticeable in both locations that Holly grew along flat areas of land where reproduction is easily produced. As well in both locations, the surface type and leaf litter was relatively similar where it surrounded the Holly. Interestingly, Ivy was a dominant invasive species surrounding the Holly plant. The Holly seemed to try and grow around the Ivy, avoiding it's vast change of directions. It almost can be seen where the Holly has decided to change growing directions to avoid Ivy interrupting it's process. The Bowker Creek Holly was mostly surrounded by Ivy and Fern, where the Southwoods Holly was almost entirely surrounded by Ivy, Cottonwood and Fern. The two different locations were seen on two different days, the surface area for Bowker Creek was dry and the surface area for Southwoods was quite moist. Bowker Creek's Holly was growing in a north facing direction and Southwood's Holly was growing in a southeast facing. It was interesting to see how human activity affected the controlment of the holly plant. The southwoods location was in a common walking trail and biking pathway, where the Bowker Creek location was a heavy populated parking lot and pathway. The Bowker Creek location seemed to be more controlled, as it is in a controlled environment. The Southwoods location was more deserted and the Holly seems to have just been pushed back from the walking trail which makes it reproduce faster deeper into the forest.

Any surrounding indigenous plant around the Holly seems to be negatively affected. As said before, the Holly is known to be a notorious water hog which unables surrounding plants to support their nutrient needs. Holly grows fast because of it's quick reproduction, which means it fastly covers a large amount of land, and takes away resources from other plants. It is able to grow in either sun or shade and controls most of its surrounding resources.



Figure 3.1.1 - English Holly at Bowker Creek

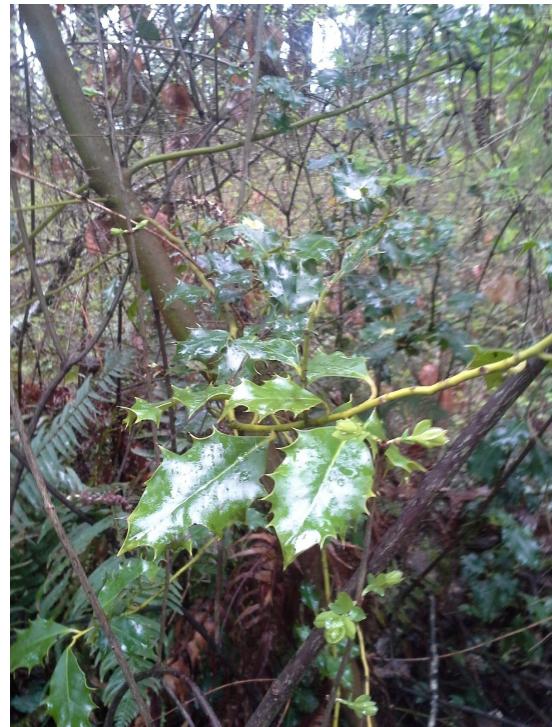


Figure 3.1.2 -English Holly in South Woods

3.2 Daphne Laureola

We documented environmental factors for daphne at Bowker creek as well as the South woods. At Bowker creek, the daphne was on a slight slope of moist soil right next to flowing water (Figure 3.21). Its ability to thrive in this location, regardless of the slope and nearby human activity, demonstrates its resiliency as an invasive specie. Although the daphne at the South woods wasn't right next to a creek, the soil was very moist. The daphne was more scattered in the South woods, and took up more space (Figure 3.22). In both locations, as seen in table 2.2, the daphne had around 20-30% canopy cover providing the perfect amount of shade for it to grow. The daphne was also close to human activity in both locations, but the severity differed as Bowker creek was close to a car park and the South woods had more foot traffic. Although the flowers were not yet blooming, we could analyze how effectively the daphne could spread. Birds and rodents are the main transporters of daphne's seeds. They pick up the seeds and once they realize they are poisonous, they drop them. Because both locations were surrounded by other species and in a dense growth area, there's a lot of nearby soil for the dropped seeds to grow in. This, as well as daphne's ability to tolerate many conditions, allow for its rapid spread and growth as an invasive specie. We noticed that the daphne blocked a lot of sunlight so the indigenous species below it, such as moss, could not successfully grow. After doing some research we learned that daphne also alters soil chemistry and acidity. This is a significant detriment to native species because it is something we can't see and deal with easily.



Figure 3.21 -
Daphne Laureola at Bowker Creek



Figure 3.22 - Daphne Laureola in South Woods

3.3 English Ivy

When searching for English Ivy on the campus; finding areas in which it was plentiful and noticeable was an easy task. The ivy could be seen flourishing in all conditions and environments which is a reason why it is considered to be an invasive specie. At each location we noticed ivy, a similar pattern was noticed. First of all, in the Bowker Creek area, ivy was seen attached and climbing indigenous oak, fir and evergreen trees. In all three examples the ivy was able to grow in an environment that allowed it to flourish. However, due to the aggressive nature of the ivy, the trees that were covered with ivy seemed to be significantly less healthy than those which were not. This is due to the nature of ivy and its ability to outcompete the tree for essential nutrients. In the location that we found ivy in the Bowker Creek area, there were also several other areas where ivy can be seen. In most cases, ivy thrived in areas with soil which was moist and covered with dead organic material. The areas where ivy was seen, had many other indigenous plants around it; plants such as ferns and blackberries were prominent neighbours to the ivy along with the indigenous trees. At the second location, we saw a different manner in which ivy grew and established itself. In the Southwoods area, ivy was seen growing up trees but also acted as a significant ground cover. The effects of ivy in this sense was slightly different than in Bowker Creek. The ivy was spreading itself instead of climbing to reach nutrients. However, in doing so, it often suffocated smaller plants or covered the ground to the extent where little water was enriching the soil underneath. This poses a threat to other plants such as the oregon grape which was seen around the ivy as the root system has little water to absorb from the ground.

While all plants around that the ivy covered, wrapped around or climbed seemed to be negatively affected. The aggressive nature of the ivy and its ability to reach nutrients and sunlight by any means makes it a threat to the native plants. As a result of ivy's ability to grow in all directions and it can grow very quickly and without competition and threat from animals and insects. Although ivy affects all plants in which surround it, local trees are noticeably at risk of harm as a result of ivy climbing it. Ivy absorbs and restricts water and sunlight absorption through the leaves and bark.



Figure 3.3.1 - English Ivy at Bowker Creek



**Figure 3.3.2 -
English Ivy near UVic's Center Field**

3.4 Himalayan Blackberry

Due to recent removal efforts, it was difficult to locate the Himalayan Blackberry in certain parts of the University of Victoria campus, but due to the stalk regenerative ability of this invasive plant, it has obviously started to return in the culled areas (Figure 3.4.3). It was found as a much larger thicket in the Bowker Creek area (Figure 3.4.2) compared to the small plant found in the South Woods location. In the South Woods location, the plant was able to re-grow and regenerate regardless of the hostile forest floor invasion happening by the English Ivy. As depicted in Table 2.4.1, both Blackberry plants were found on a flat slope. Each location was facing a different direction and from observation, it seems that it has no specific aspect direction

in which it grows. Due to the naturally wet climate of Victoria around this time of year, the ground was very moist dirt with very thick ground-cover in both locations. There was more of a variety of plants in the Bowker Creek location as the plant had not been cleared and managed to form a fairly large thicket. The Himalayan Blackberry seems to also be unaffected by the tree canopy cover as it varied drastically from almost none (Figure 3.4.1) to approximately 40%. Some recognizable surrounding plant species in the Bowker Creek area were English Ivy and the Douglas Fir, whereas there seemed to be more of a variety of surrounding plants in the South Woods location having Ferns, English Ivy, Moss, and Indian Plum. Both locations were directly adjacent to a walking/running trail and received a lot of human traffic but very little daily disturbance as they were off of the path.

Surrounding indigenous plants that were affected by the Himalayan Blackberry were not obvious as in the Bowker Creek location it was found in a dense and impenetrable thicket of Blackberry and other plants, whereas in South Woods it was a small plant that had just started to regrow from recent removal efforts.



Figure 3.4.1 - Himalayan Blackberry Leaves and Canopy in Bowker Creek Area



Figure 3.4.2 -
Himalayan Blackberry at Bowker Creek



Figure 3.4.3 -
Himalayan Blackberry in South Woods

3.5 Indigenous plants

Significant indigenous species in the area that are negatively impacted by these invasive species are Indian plum, trailing blackberry, Camas Lily (Figure 3.5.1) and Garry oak. Besides the Garry oak, these native species are food sources that can offer a lot to surrounding wildlife so their demise by invasive species is noteworthy and efforts should be made to protect them. The Indian plum is found all over UVic, especially in the South woods. It can grow up to 5 meters tall and is the first deciduous native shrub to flower in the spring. Difficult growing sites and polluted soils don't bother the Indian plum which make it valuable in restoration projects. Human development and invasive species, especially scotch broom, compete with Indian plum.

Trailing blackberry is another local food source that is being outcompeted, especially by the Himalayan blackberry. Trailing blackberries have a small stem and lay close to the ground which makes them susceptible to the negative effects of English ivy and Daphne Laureola. Common Camas is an indigenous lily with edible bulbs. The lily is a blue/purple color that grows around Uvic and in Beacon Hill park, parts of which used to be a large camas field. Once again English ivy and daphne are a threat to Camas because they block its sunlight. Garry oak ecosystems support the growth of Camas as well as many other species and many restoration groups are focusing on protecting these trees. UVic has many Garry oaks, and efforts are being made to keep them flourishing and unaffected by the surrounding dangers. These trees are very vulnerable to invasive species and pathogens, especially English ivy, daphne and Himalayan blackberry.



Figure 3.5.1 - Example of Camas Lily

4 Summary and Conclusion

The overall effects that the examined invasive species had on the local ecosystems on the University of Victoria's campus were mostly negative, although, they seemed to have had little visible impact except for the English Ivy. For instance, the Himalayan blackberry seemed to coexist with other species surrounding it and had little to no impact. During the summer months, the blackberry bush is able to supply fruit for many native animals and insects to eat and actually becomes a positive influence in the ecosystem. In the case of the English Holly and the Daphne Laureola, little harm was noticeable as the ground cover was sparse or the plants were too small. The Daphne was a solitary plant that grew in relatively open and wet areas. Even though they may not pose an obvious threat, the introduction of these non indigenous plants create competition for nutrients and water for the indigenous species. The English Ivy provided the best example of an invasive species as it was seen throughout campus climbing trees, acting as a thick ground cover, and essentially overrunning all locations on the campus. Due to Ivy's aggressive growth and its ability to climb, it easily pushes out the native species and provides a massively negative impact on the local ecosystem as it provides no benefits.

When examining Holly, Daphne, Blackberry and Ivy, we observed that some of these plants added to the ecosystem as they created berries and other food sources for insect and animals. In our opinion, the plants are able to coexist with the native species because they are able to grow independently. However, with plants such as the English Ivy, they thrive off of other plants like trees to attach to and grow or they spread like wildfire across the ground and prevent other things from growing. In doing so, Ivy is a negative component in the ecosystem because it harm surrounding plants in order to survive. Moreover, many of the plants that produce berries are a prominent components of manys animals' diets that have adapted to their consumption. However, as mentioned above, the ivy has no natural predators, and therefore are able to grow quickly without any threat. Without radical attempts to control the invasion of English Ivy, the campus will become even more overrun than it currently is.

5 References

- [1]http://www.ssisc.info/home/english_holly
- [2]http://www.worksafebc.com/publications/health_and_safety/bulletins/toxic_plants/assets/pdf/tp0601.pdf
- [3]<http://www.issg.org/database/species/ecology.asp?si=994&fr=1&sts=sss&lang=EN>
- [4]http://www.shim.bc.ca/invasivespecies/_private/englishivy.htm
- [5]<http://bcinvasives.ca/invasive-species/identify/invasive-species/invasive-plants/english-ivy>
- [6]http://www.nwplants.com/business/catalog/oem_cer.html
- [7]http://www.goert.ca/about/invasive_species.php
- [8]<http://www.firstnations.de/media/06-1-1-camas.pdf>
- [9]<http://biodiversityatlas.org/species/camas.php>

