Non-Vascular Plant Inventory

In Langley BC, Canada:
Glen Valley Blaauw ECO Forest

Beth Guirr
April 23, 2015
Dr. Clements
Directed Study

Abstract

This project examined the pattern of nonvascular plant diversity, with more attention to bryophytes, within Blaauw Eco Forest, Glen Valley, British Columbia, Canada. The study provides a better understanding of the inner distribution ecology of bryophytes, and the relationship between sensitive species and their habitat specifications; which may offer insight that can be used to minimize the impact of forestry and peat mining operations on micro-biological diversity. Patterns of non-vascular species were observed according to different locations within the forest. It was observed that many factors affected the pattern growth within the varying areas of Blaauw Eco Forest. At a small scale, the type and number of microhabitats were an important predictor for the type of species present. The detailed examination of bryophyte identification and habitat observation represent an ecosystem health at a microscopic level. The evaluation of water quality, habitat species, and bark pH throughout different sects of the forest showed the importance of microhabitat requirements for nonvascular diversity. This project complemented previous work of Curtis Abney in identifying vascular plants in the Blaauw Eco Forest, and continues to contribute towards a knowledge of the forests flora and fauna distribution. By also observing and identifying vascular plants, animal species, and mapping coordinates, this project provides a new insight into the basic ecology of Blaauw Eco Forest. With the already observed findings, this forest has already been saved from peat mining, and Northern Red Legged frog (*Rana aurora)* protection; and hopefully will assist future research.

Table of Contents

Introduction

The Coastal Western Hemlock Zone (CWH) stretches along the coastal mountains of British Columbia, all the way from Alaska to Washington, Oregon; and eastward into the valleys of the inner coastline (Pojar *et al.,* 1991). British Columbia has over 850 species of mosses and hepatics, thereby making it one of the greatest range of bryoflora in North America (Arsenault, 2000). Its vast diversity in non-vascular plants makes it the richest in endemic species and genera; with some only found in these areas of the world (Arsenault, 2000). The CWH zone of British Columbia, is generally the rainiest biogeoclimatic zone in the province (Pojar *et al.,* 1991). The climate ranges through cool summers (with periodic hot and dry spells), and mild winters (Pojar *et al.,* 1991). The average yearly temperature for the entire CWH zone is 8°C, with annual precipitation at 2.23m (Pojar *et al.,* 1991). These climate characteristics provide the preferred ecosystem for western hemlock, sparse undergrowth and herbs, and a large variety of moss species (Pojar *et al.,* 1991).

With climate changes comes the change of chemical and biological differences in biota (Turetsky, 2003). Plants are critical as regulators within our biosphere; they are primary producers of which control the exchange and absorption of gases, and further affect the distribution of energy to higher levels of trophic organisms (Turetsky, 2003). Non-vascular plants are a very important aspect of a forests biodiversity. Bryophytes may appear to be small in significance when compared to vascular plants, but in actuality they are roughly equal; in any ecoystems the biomass of non-vascular plants may be equivalent to, or even exceed that of vascular plants (Reader and Steward, 1972; Epstein *et al.,* 2008). As a result of their unique

physiology and ecology requirements, bryophytes are separated from vascular plants due to their processing cycles for energy and water (Turetsky, 2003). Bryophytes lack a vascularized system, which ultimately influences their ability to handle water stress- where they can rehydrate and dry out faster than vascular plants (Turetsky, 2003). The entire plant surface therefore absorbs solutes and water with ease. This ultimately allows bryophytes to act as an effective trap for water and nutrients, but makes them incredibly sensitive to a change in atmosphere and environment (Turetsky, 2003). Further, they have the ability to tolerate a range of temperatures in both terrestrial and aquatic locations (Fogg, 1998; Seppelt 1995). They lack a root system, which allows them to colonize a variety of habitats, such that of rock and wood (Turetsky, 2003). The ability to colonize on relatively any surface enables them to stabilize soil deposits and further prevent erosion (Martinez & Maun, 1999). This ability to grow within an extensive range of habitats, makes non-vascular plant presence critical within every ecosystem.

Non-vascular plants partake in an important role for terrestrial and aquatic habitats (Belnap and Lange, 2001; Eldridge *et al.,* 2003). They frequently act as pioneering species, where they help protect and strengthen the integrity of soil- particularly after disturbances such as flooding or fires (Eldridge *et al.,* 2003). Bryophytes and liverworts are significant for fixing atmospheric and soil compounds, such that of nitrogen, carbon and phosphorus (Eldridge *et al.,* 2003). Non-vascular plants moderate the levels of ground moisture, and thus influence the potentiality of germination and vascular plant establishment (Eldridge, *et al.,* 2003). This ability to balance soil moisture and chemical component creates and establishes desirable habitats for a range of invertebrates (Eldridge *et al.,* 2003).

While bryophytes and liverworts maintain the structure and moisture levels of soil, fungi are important for processing and decomposing organic matter. Forest management is very dependent on the fungal community because they largely influence soil nutrients (Tanesaka *et al.,* 1993). Fungi recycle carbon in the process of decomposing wood, tree litter, or through a mycorhizal symbiont (Tanesaka *et al.,* 1993). The role of fungi are essential for ecosystem maintenance; within the soil, they promote water infiltration, nutrient exchange, nitrogen fixation, increase water-holding capacity, and create a habitat for mycorrhizae relationships (Tanesaka *et al.,* 1993).

Despite the evident importance of non-vascular plants, there has been little to no attempts of surveying their population and species when monitoring environmental ecosystems (Eldridge *et al.,* 2003). Unfortunately the reason for this is due to plant size; identifying them requires taxonomic microscopy and chemical tests (Eldridge *et al.,* 2003). The purpose of this study is to examine the diversity and any relevant patterns in the non-vascular community in at Blaauw Eco Forest.

This forest runs along the Fraser River in Glen Valley from Langley British Columbia, Canada. Blaauw Eco Forest is a thirty acre parcel donated from the Blaauw family in memory of Mr. Thomas Blaauw to Trinity Western University. It is a mixed coniferous and deciduous forest, with ponds, springs and a bog. Trinity Western University research within the forest began in 2013 when Abney (2014) and Loubser (2014) completed undergraduate thesis projects. Abney (2014) focussed on vertebrate animals and vascular plants, and only inventoried select non-vascular plants; Loubser (2014) studied two species blue-listed in British Columbia, the Northern Red Legged Frog (*Rana aurora)* and Pacific sideband snail (*Monadenia fidelis).* While

the bio inventory of the forest by Abney (2014) encompassed some of the biodiversity, it is critical to also study non-vascular plants including bryophytes, liverworts, slime molds, and fungal species. In the present study, these different divisions of non-vascular species were observed for different substrates (rocks, trees, ground, etc.) and different areas within the forest. Special attention will focus on the bog, as the environment is different with the variance in pH, plant species, and nutrient availability. Within this project, the goal is to identify as many non-vascular plants (with more focus to bryophytes) as possible. The study will examine nonvascular plant habitat; and specific ecosystem requirements of various nonvascular plants to determine how well the Blaauw Eco Forest is providing for these specific niches. This study will also develop insight into human impact upon forests, and methods of decreasing potential future human invasion.

General Objectives:

1. Develop non-vascular species inventory list within the forest, according to different macro and microhabitats.
2. Observe the patterns flora and fauna diversity (with more focus on nonvascular plants), throughout the different regions of the forest.
3. Compare flora composition and affinity for species-habitat relationships

Materials and Methods

Field Experiment:

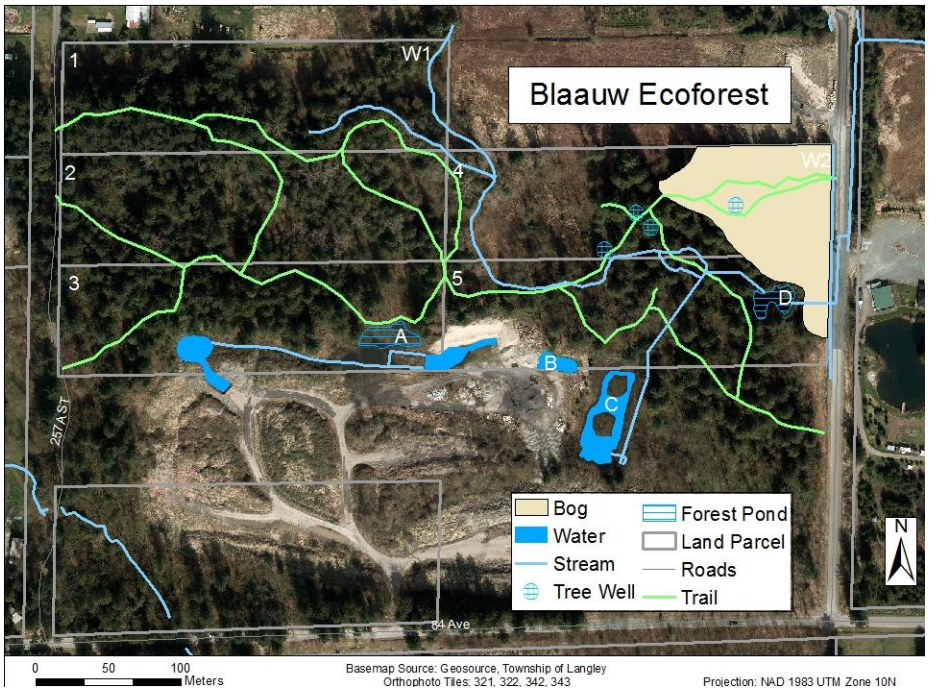

Figure 1- Map of the Blaauw Eco Forest, including trail systems and water ways.

This experiment ran for the duration of three consecutive semesters and three months of the summer (2014-2015); with at least five hours a week spent on the research. The field experiment consists of qualitative analysis and in the future, quantitative analysis. The focus is on the non-vascular plant inventory throughout the entirety of Blaauw ECO forest. Samples of moss and liverwort have been collected into brown paper bags; and the surrounding micro and macrohabitat are noted, along with where in the forest it was found, date, temperature, canopy coverage, and general surrounding environment. These samples will then be taken to lab to dry out and package into a mini herbarium, and later identified. Samples will be taken from both ground and trees, and as extensive as possible. A photo of the sample will be taken so it can be compiled into a document later, so it can be seen in its natural habitat.

Fungal samples were taken from the forest, wrapped in parchment paper, and placed into a paper bag (procedure in appendix). The habitat, location within the forest, date, and

temperature were noted, along with any key species nearby. These were immediately taken to lab where they can be further analysed.

Slime molds were also observed as extensively as possible through qualitative observations, along with photos for further identifications. If possible, samples will be taken to lab for spore observation.

Further animal observation were studied through the use of animal trap cameras set up weekly throughout different places in the forest. As well, non-invasive forest maintenance proceeded throughout the journey of this research. This is a public forest, for the community to walk about and enjoy. Therefore, basic trail clearing, invasive species removal, and trash removal was a mandatory phase in the research.

Water quality tests were observed with specifics to pH, turbidity, dissolved oxygen, nitrate and phosphates tests, and temperature. Five samples were taken per location, which provided a standard error bar. Water pH was tested in the summer of 2014, winter of 2014 and spring of 2015.

The YSI Model 55 Handheld Dissolved Oxygen System measured the amount of gaseous oxygen that is dissolved in the water. Oxygen concentration can be increased through plant photosynthetic processes where they produce oxygen during the day, but retain and consume oxygen during the night to breathe (Bainard *et al.* 2012). In order to test oxygen content in water the meter has a probe that is immersed in the water and produces an electric current that reacts with oxygen. The oxygen diffuses into the probe and allows readings to be taken for concentration in that given area.

Turbidity is the amount of suspended particles that are found in the water; whether these particles are sediments, microscopic organisms, or pollutants. When there is a large amount of turbidity, the light penetration through water lessens and can affect photosynthetic organisms; which constitutes water quality (Bainard *et al.* 2012). To calculate turbidity, water samples were taken in a vile and placed in a Hach Model 2100P Turbidity Meter. When the water sample is measured, light passes through the sample and calculates how much light scatters and is absorbed by the floating materials.

When determining what a healthy stream qualifies for, pH is a large factor and can express what organisms can be supported in the area. Typically a pH between 6.0 and 8.5 is a range where aquatic organisms prefer (Bainard *et al.* 2012). The pH in a stream can be affected by agricultural surroundings, mineral content, vegetation, algal blooms and precipitation (Bainard *et al.* 2012). The instrument used to collect pH samples was Hach HQ30D pH meter and a PHC101 pH probe. Connected to the meter is a probe that is held in the water, and uses an electrical current to determine the hydrogen ion activity in the sample (Bainard *et al.* 2012). There is a bulb at the end of the probe that is rinsed with deionized water before taking a sample, as to ensure accurate results.

Lab Work:

The moss and liverwort that has been dried out, were rehydrated by using a beaker filled with tap water and a hot plate to heat the water. The sample was placed into the beaker and rehydrated for approximately fifteen seconds. After it has been removed from the beaker it will be placed onto a glass slide where it can be viewed under a stereoscope. Distinctive

features were noted. Then a single leaflet (frond/blade) is removed from the sample, placed onto a second slide with water, and a coverslip placed on top. Then utilizing a compound microscope, the sample is observed for distinctive features to help identify. A photo is taken, to be used for reference for its identification. Using dichotomous keys and several identification guides, the sample is identified through its appearance. See appendix for further details of identification.

Fungal identification will begin with basic morphology, size, and smell analysis. Then the cap is placed on a glass slide, with the gills faced down. This will allow the spores to fall out in a pattern that can be observed for colour, size and further microscopic details. Using a dichotomous key (with specifics to http://s158336089.onlinehome.us/Ian/) to finalize the identified species. See appendix for further details for taxonomizing and collecting.

Further water quality was tested using nitrate and phosphate tests. Nitrate is an inorganic form of nitrogen and is found in decaying biomass, calcareous sedimentary landforms, human sewage and fertilizers (Bainard *et al.* 2012). Typically nitrogen cycles are influenced by bacterial, fungal and microbial metabolism (Bainard *et al.* 2012). This study used a cadmium-reduction method of determining the nitrate water quality. Samples were taken from the water bed and brought back to the laboratory. Using a Hach DR/2400 spectrophotometer, light passes through the samples at specific wavelengths and calculates the proportional absorption to the colored reaction products that are pre measured and given. Before testing the sample, shaking the liquids together is important to make sure that they emulsify into one complete mixture. After mixing the sample is to sit for five minutes, while the

spectrophotometer calculates a control vial. As the control is calculated the nitrate sample is recorded and calculated by subtracting any colour or turbidity from the test reading.

Phosphate is a dissolved inorganic component of phosphorus called orthophosphate which is found in organic matter like bogs, vertebrate waste, and phosphatic rock (Bainard *et al.* 2012). It is unnaturally found in urban and industrial areas through fertilizers, sewage and cleaning detergents (Bainard *et al.* 2012). To calculate phosphate levels, a Hach DR/2400 Spectrophotometer was used by an ascorbic acid-molybdate method. Similar to nitrate testing, water samples were taken and returned to the laboratory and mixed with a prepared reagent packet, within a 10mL of water sample in a glass vial; which provided phosphate levels.

Analysis:

Using a template created for identifications, details of each sample will be noted and compiled. A dropbox account will be made so that all information can be placed into files that can be accessible to any computer or individual working on this project. Photos will be added to these documents for future reference of species identification, and as a comparison for other samples in the future. A document will be formed at the end with all the species identified. The template for identification is found in the appendix.

Results:

Table 1: The total number of different species representing each taxonomic group of nonvascular plants, along with the total number of nonvascular flora discovered to date

Non-Vascular Plant/Organism	Number of Species Identified
True Moss	41
Liverwort	12
Lichen	5
Fungi	22
Slime Mold	6
TOTAL COUNT:	86

Table 2: List of bryophyte species documented in the Blaauw ECO Forest, according to their respective taxa

True Moss: Genus, species	
1. *Antrichum selwynii*	2. *Leucolepis acanthoneuron*
3. *Antrichum undulatum*	4. *Metaneckera menziesii*
5. *Atrichum undulatum*	6. *Mnium rostratum*
7. *Buckiella undulate (Abney, 2014)*	8. *Neckera douglasii*
9. *Brachythecium asperrimum*	10. *Orthotrichum lyellii*
11. *Calypogeia muelleriana*	12. *Plagiochila porelloides*
13. *Claopodium crispifolium*	14. *Plagiothecium undulatum*
15. *Dichodontium pellucidum (Abney, 2014)*	16. *Plagomnium insigne*
17. *Dicranum scoparium*	18. *Platydictya jungermannioides*
19. *Dicranum tauricum*	20. *Rhizomnium glabrscens*
21. *Ditrichum heteromalla*	22. *Rhizomnium gracile*
23. *Eurhynchium praelonga*	24. *Rhizomnium magnifolium*
25. *Eurhynchium oreganum*	26. *Rhytidiadelphus loreus*
27. *Hookeria lucens*	28. *Rhytidiadelphus triquetrus*
29. *Hylocomnium splendens*	30. *Sphagnum palustre*
31. *Hypnum cupressiforme*	32. *Sphagnum squarrosum*
33. *Hypnum revolutum*	34. *Sphagnum tenellum*
35. *Hypnum subimponens*	36. *Sphagnum fuscum*
37. *Isothecium stolonifera*	38. *Sphagnum capillifolium*
39. *Kindbergia praelonga*	40. *Sphagnum angustifolium*
41. *Aulacomnium androgynum*	42. *Isothecium myosuroides*

Figure 2: *Sphagnum squarrosum*

Figure 3: *Rhizomnium gracile*

Table 3: List of liverwort species documented in the Blaauw ECO Forest, according to their respective taxa

Liverwort: Genus, species	
1. *Bazzania* Gray	2. *Pellia neesiana*
3. *Bazzania trilobata*	4. *Plagiochila porelloides*
5. *Calyogeia sphagnicola*	6. *Porella navicularis*
7. *Conocephalum conicum*	8. *Preissia quadrata*
9. *Calypogeia muelleroama*	10. *Pseudotaxiphyllum elegans*
11. *Lepidozia reptans*	12. *Scapania bolendari*

Figure 4: *Porella navicularis*

Figure 5*: Porella navicularis*

Table 4: List of lichen species documented in the Blaauw ECO Forest, according to their respective taxa

Lichen: Genus, species	
1. *Cetrelia cetrarioides*	2. *Parmelia flaventior*
3. *Cladonia chlorophaea*	4. *Parmelia sulcata*
5. *Leparia incana*	

Figure 6*: Leparia incana*

Figure 7*: Cladonia chlorophaea*

Table 5: List of slime mould species documented in the Blaauw ECO Forest, according to their respective taxa

Slime Mould: Genus, species	
1. *Fuligo septica*	2. *Ceratiomyxa fruticulosa*
3. *Stemonitis fuscka*	4. *Physarum polycephalum*
5. *Arcyris denudata*	6. *Metatrichia sp.*

Figure 8: *Stemontitis fuscka*

Figure 9: *Metatrichia sp.*

Table 6: List of fungi species documented in the Blaauw ECO Forest, according to their respective taxa

Fungi: Genus, species	
1. *Basidioradulum radula*	12. *Lycoperdon pyriforme*
2. *Chlorociboria aeruginascens*	13. *Morchella esculenta*
3. *Clavicorona pyxidata*	14. *Nidula candida*
4. *Clavuina cristata*	15. *Pholiota Squarrosoides*
5. *Clitocybe fragrans*	16. *Pleurocybella porrigens*
6. *Cyathus striatus*	17. *Pseudohydnum gelatinosum*
7. *Dacrymyces palmatus*	18. *Ramaria formosa*
8. *Daldinia concentrica*	19. *Trametes versicolor*
9. *Exidia recisa*	20. *Tremella mesenterica*
10. *Fomes fomentarius*	21. *Tremiscus helvelloides*
11. *Galerina pumila*	22. *Xylaria hypoxylon*

Figure 10*: Exidia recisa*

Figure 11*: Nidula candida*

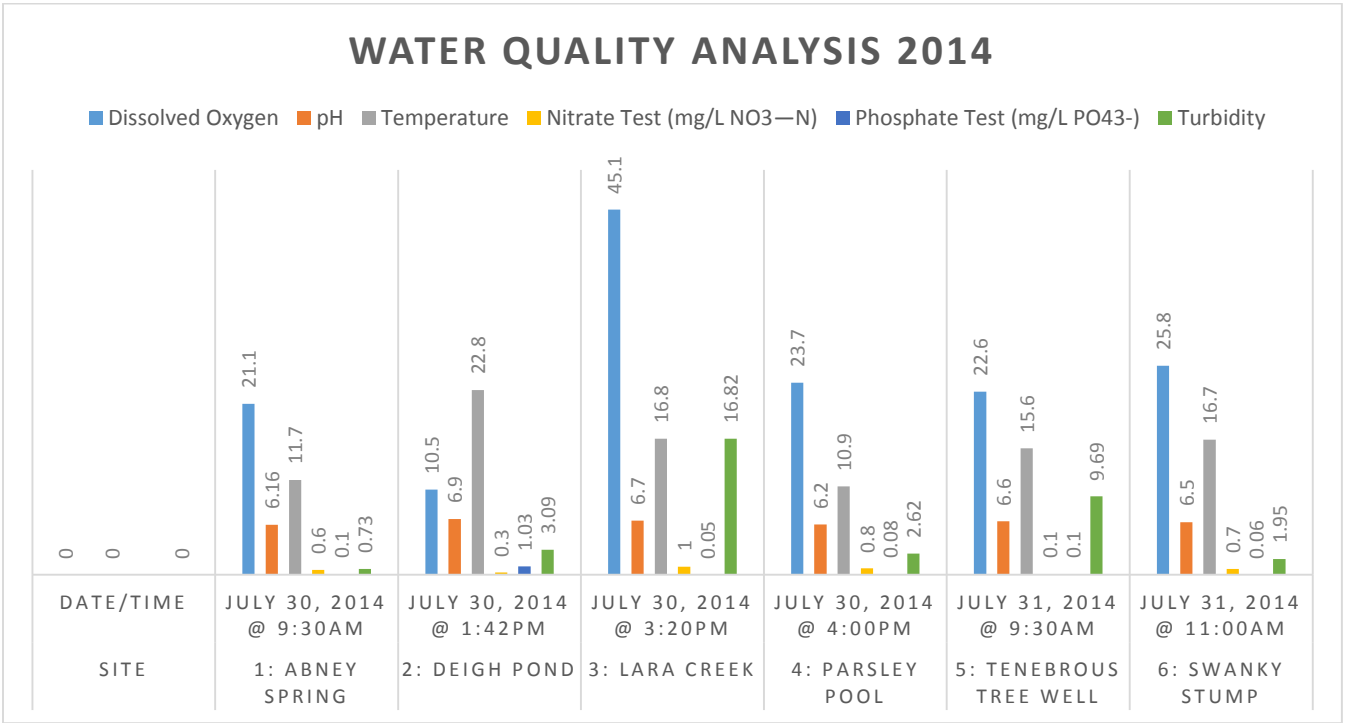

Figure 12: Water quality analysis of the Blaauw ECO Forest in late summer.

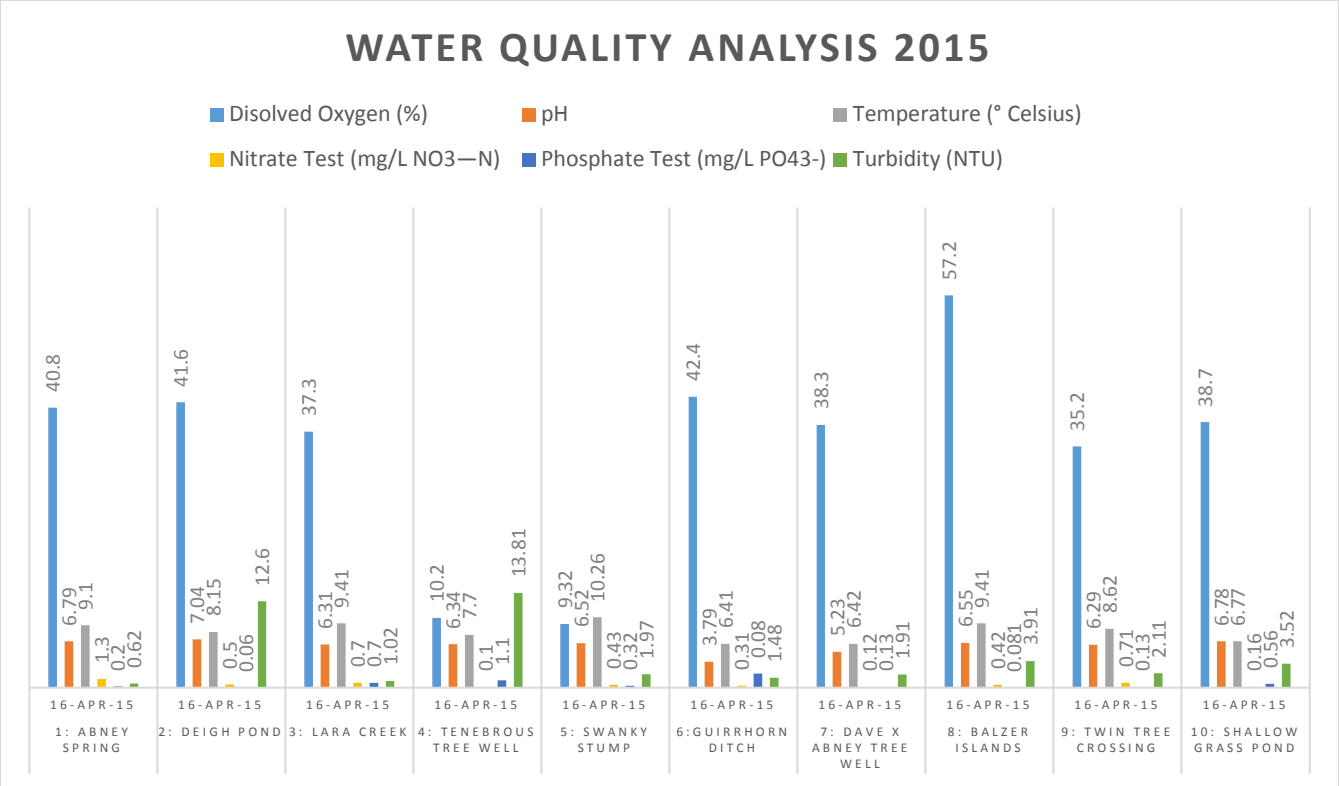

Figure 13: Water quality analysis of the Blaauw ECO Forest in early spring.

Discussion:

This study has shown that Blaauw ECO Forest sustains a large variety of non-vascular plants. Totalling 86 species of non-vascular plants for 35 acres of land. This is quite substantial for the size and region of this forest. Including past research for vascular plant, vertebrates, and macroinvertebrates by Abney (2014) the total inventory sits at 337 species. This is comparable to the forest inventory of Vancouver's Stanley Park, where a 2-day excursion of specialists observed 395 species (BioBlitz Summary Report 2011). A more extensive inventory of Stanley Park would no doubt yield more species than the 2-day BioBlitz, but this points out that the number of species at the Blaauw ECO Forest is substantial. The Blaauw ECO Forest inventory list

continues to fill up over time as different species are observed. Micro-invertebrates have yet to be taxonomized and added to the inventory, along with algae, migratory animals, and more fungal species.

The high diversity in species types suggests that Blaauw ECO Forest houses a healthy ecosystem, which allows a variety of different organisms to grow and flourish. Blaauw ECO Forest contains several ecosystem types within a relatively small area. The front of the forest is mixed coniferous and deciduous trees; while the back near the bog is all coniferous. Coniferous forests are composed of evergreen trees that bear cones, such as hemlocks, cedars, pines, and firs. These tree types eventually shed their needles, which develops a springy mat on the forest floor. Pine needles do not decompose easily, so fungi help break down the needles which provides nutrients back to the trees roots (Anonymous 2014; WWF 2015). Due to the slow process of decomposing pine needles, the soils in coniferous forests become acidic and poor in minerals, organic material, and number of invertebrate species, which influences the depth tree roots (WWF 2015). Mixed forests contain tree types such as maple, birch, oak, and etcetera. This kind of forest contains four layers: a canopy, shrub layer, grasses, and other herbaceous plants (WWF 2015). These forests are the richest because of the biodiversity patterns that reflect different ecoregions that may harbour special and exotic flora and fauna species (WWF 2015). Within these varying habitats of the Blaauw Eco Forest, there are swamps, bogs, ponds, springs, decaying logs, and other habitat features that allow organisms to grow and flourish (Tamme *et al.,* 2010).

With this vast diversity in microhabitat, a range of non-vascular plants were identified as seen in Tables 2-6. While the current total of 40 bryophyte species seems low when comparing

to all of Canada at 965 species, this forest is vastly rich in species types (Ireland *et al.,* 1987). Though the Blaauw ECO Forest is only 35 acres it contains 1/20 of all the moss species found in over 9 million square kilometres of Canada (Schofield 1990). While the identified moss species (table 2) are large in variety, they are also large in population density. British Columbia has the largest bryoflora in North America, including rare and endangered species (Schofield 1972). Though none of the identified species in this study appeared to be at risk or endangered, there is a possibility that the Blaauw ECO forest has some.

While the Blaauw Eco Forest seems healthy, it has experieced major ecological disturbances that could eventually risk the biodiversity. The property is surrounded by residential roads and houses, a liquid dumping site, a recovering peat mining plot, and continuous land development. The human impact from these areas effect the forest via chemical and noise pollutants. Therefore studying the quality of water provides small insight into the levels of pollution that have entered the waterways of the forest. While being limited to five different tests (dissolved oxygen, nutrient tests, pH, temperature, and turbidity), the different bodies of water seemed relatively normal in test results. The bog showed relatively low numbers of nutrient tests (N: 0.031mg/L; P: 0.08mg/L), which coincides with the slow process of decomposing organics due to a low pH (3.79). Slightly higher nutrient values (N: 0.7mg/L; P: 0.7mg/L) were obtained in the more deciduous/coniferous mixed forest area of Lara Creek. This indicates that the forests ability to decompose and recycle organic and/or inorganic compounds hasn't been negatively impacted. With human impact being a concern, it appears that the forest continues to thrive.

Study Limitations

While this study has undergone extensive work in identifying non-vascular plants, there still is so much to be done. Despite the effort put into classifying the non-vascular plants according to accepted techniques for identifications, looking at microscopic structures, the lack of expertise made identifying taxa more difficult. Therefore, some species may have been identified incorrectly.

Future Studies

For future studies, the continuation of identifications for non-vascular is highly recommended. More extensive collection of fungal and lichen taxa would further improve the biological inventory. During the warmer time of the year, algae should be identified and analysed in the different bodies of water throughout the Blaauw ECO Forest. Verification of the species identified by experts in the various taxonomic groupings is recommended. In terms of fauna, it is important to focus on invertebrate species identification at this point, while continuing to look for additional vertebrate species.

To protect non-vascular plants that grow near trail edges, it is imperative that the forest trails are maintained. A forest is always chaotic with trees falling and changing the micro-ecosystems, and with a public forest, it is important that trails remain accessible. Due to the bog encroaching into the forest, trees are losing their root holding, and have completely blocked a trail at present. Continued upkeep in these areas is important so that people don't start to make their own trails and accidentally damage a sensitive species.

Conclusion

While the Blaauw ECO Forest is surrounded by a mixture of human development and agriculture, the diverse flora and fauna makes it clear the forest is a reservoir of native species amidst in the increasingly depauperate surrounding landscape. With the total count of 86 non-vascular plants in the forest, including bryophytes, liverworts, fungi, lichen, and slime molds, the supports a substantial level of biological diversity even in the context of British Columbia as a whole. The 40 were identified in an 11-month span, comprises 1/20th of all of Canadian identified bryophytes. In order to continue protecting the biological diversity of the Blaauw ECO Forest, continued conservation work is strongly encouraged.

Acknowledgments:

Gratitude and appreciation to the Blaauw family for the land donation to Trinity Western University. Special thanks to the following students for contributing to the total inventory collection and identification of non-vascular plant research: Karen Eenkhoorn, Curtis Abney, Lara Loubser, and Kristina Gerk. Additionally, thanks to Chris Hall and Darcy Kehler for providing lab space for identifications and water quality equipment. Thanks to WOLF for continuous preservation and protection of the forest. Thank you to Dr. Clements for guidance and suggestions in this project. Thank you to Stan Olsen for helping the process of identifications. Lastly, thank you to the community around the Blaauw ECO Forest, for treating the forest as an extension of your homes.

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Appendix:

Table Appendix 1: Summer 2014 Water Quality Analysis

Site	Date/Time	Dissolved Oxygen (%)	pH	Temperature (° Celsius)	Nitrate Test (mg/L NO_3^- N)	Phosphate Test (mg/L PO_4^{3-})	Turbidity (NTU)
1: Abney Spring	July 30, 2014 @ 9:30am	21.1	6.16	11.7	0.6	0.10	0.73
2: Deigh Pond	July 30, 2014 @ 1:42pm	10.5	6.9	22.8	0.3	1.03	3.09
3: Lara Creek	July 30, 2014 @ 3:20pm	45.1	6.7	16.8	1.0	0.05	16.82

4: Parsley Pool	July 30, 2014 @ 4:00pm	23.7	6.2	10.9	0.8	0.08	2.62
5: Tenebrous Tree Well	July 31, 2014 @ 9:30am	22.6	6.6	15.6	0.1	0.10	9.69
6: Swanky Stump	July 31, 2014 @ 11:00am	25.8	6.5	16.7	0.7	0.06	1.95

Table Appendix 2: Spring 2015 Water Quality Analysis

Site	Date/Time	Disolved Oxygen (%)	pH	Temperature (° Celsius)	Nitrate Test (mg/L NO_3—N)	Phosphate Test (mg/L PO_4^{3-})	Turbidity (NTU)
1: Abney Spring	April 16, 2015	40.8	6.79	9.10	1.30	0.20	0.62
2: Deigh Pond	April 16, 2015	41.6	7.04	8.15	0.50	0.06	12.6
3: Lara Creek	April 16, 2015	37.3	6.31	9.41	0.70	0.70	1.02
4: Tenebrous Tree Well	April 16, 2015	10.2	6.34	7.70	0.10	1.10	13.81
5: Swanky Stump	April 16, 2015	9.32	6.52	10.26	0.43	0.32	1.97
6:Guirrhorn Ditch	April 16, 2015	42.4	3.79	6.41	0.31	2.08	1.48
7: Dave x Abney Tree Well	April 16, 2015	38.3	5.23	6.42	0.12	0.13	1.91
8: Balzer Islands	April 16, 2015	57.2	6.55	9.41	0.42	0.081	3.91
9: Twin Tree Crossing	April 16, 2015	35.2	6.29	8.62	0.71	0.13	2.11
10: Shallow Grass Pond	April 16, 2015	38.7	6.78	6.77	0.16	0.56	3.52

Specimen Nº: 000

DATE COLLECTED:	**DATE IDENTIFIED**:

DESCRIPTION:
IDENTITY:
LOCATION AND HABITAT:
PICTURES:

Collected and Identified by:

PROCEDURE FOR MOSS IDENTIFICATION

1. Sign in to dropbox. The email is _____ and the password is _____
2. Heat the water to just below boiling and add a small branch of the sample of the moss to be rehydrated. Leave in water for 30 – 60 seconds.
3. Examine under stereoscope and confirm whether it is a bryophyte or a hepatophyte
    a. The "leaves" of bryophytes have pointed ends whereas the hepatophyes are rounded
4. Take a picture to be uploaded to dropbox into the file "stereoscope pictures"
    a. Name file as: preliminary identification sample# mm.dd.yy.jpg for example bryophyte 0001 01.29.14**.jpg**
5. Use a scalpel to remove several leaves by scraping tip→stem (against the direction of growth), it may also work to cut the leaves off
6. Make a wet mount and view under the compound microscope (and camera)
    a. View under the different magnifications
7. Take a picture with the camera
    a. Plug it in, press "snap" (screen will blink) on the remote and the picture will save to the camera's SD card
8. Begin the identification process using the book: *Some common mosses of British Columbia*
    a. At the beginning of the book is a dichotomous key, follow the questioning process until you reach an identification and then double check by googling a picture
9. After identification please highlight the sample in the lab notebook (big blue book we recorded everything in) to indicate that it has been identified

Specimen N°: 0002

DATE COLLECTED: 06/11/12	DATE IDENTIFIED: 30/1/14
DESCRIPTION: Green/yellow, transparent, central vein on leaflets, large leaflets, visible hexagonal cells in even straight patterns; outer ridge is pointed, lancelet shaped, radial growth at irregular intervals, long individual growth strands; brown stem; huge leaflets; leaflet shot is using 3x; serrated edging	
IDENTITY: cinclidium stygium (rare)	
LOCATION AND HABITAT: Glen Valley, surrounded by lots of ferns open canopy	
PICTURES:	
	

Collected by: Christina, Jasmine, Karen
Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0003

DATE COLLECTED: 06/11/13	DATE IDENTIFIED: 01/30/14
DESCRIPTION: leaflets are in rows of two; bright yellow/green; large; flattened; undulating edges; smooth edges; cells are elongated at 10x; multiple cells thick; double veined/ribbed; directional cells; photo taken of leaflet at 3x	
IDENTITY: *Plagiothecium undulatum*	
LOCATION AND HABITAT: Growing on a dead tree branch, mixed forest Glen Valley at the base of a tree.	
PICTURES:	

Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr

Specimen N°: 0004

DATE COLLECTED: 06/11/13	DATE IDENTIFIED: 30/01/14
DESCRIPTION: rounded dark to bright green leaflets with one midrib of a red/brown colour, sporophyte is red with a green narrow, slightly cupped sporangium angled downwards; growth directly from midrib to branch	
IDENTITY: *Rhizomnium gracile*	
LOCATION AND HABITAT: found growing on a dead branch in a mixed forest in Glen Valley at the base of a dead tree	
PICTURES:	
	

Collected by: Christina, Karen, Jasmine

Identified by: Karen Fenkhoorn and Beth Guirr

Specimen N°: 0005

DATE COLLECTED: 06/11/13	DATE IDENTIFIED: 31/01/14
DESCRIPTION: Green/yellow; long stranded branches; leaflets are spaced; leaflets grow radially from stem; very small; width of leaflet is equal to thickness of stem; very sparse branching; fine tipped leaflets; minor jagged edging; organized cells in an offset manner; large green midrib reaching halfway up the leaflet; cells are elongated	
IDENTITY: *Isothecium stoloniferum?*	
LOCATION AND HABITAT: hanging off the branch of a salmon berry tree, mixed forest, glen valley open canopy.	
PICTURES:	
	

Collected by: Christina, Jasmine, Karen Identified by: Karen Fenkhoorn and Beth Guirr

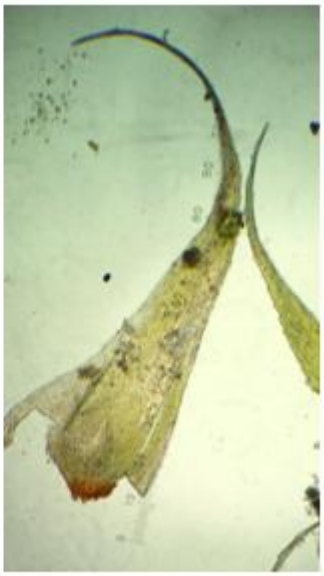
Specimen N°: 0012

DATE COLLECTED: 11/06/13	DATE IDENTIFIED: 02/06/14
DESCRIPTION: large leaflets; green; hepatophyte; red midrib; smooth edging of leaflet; flowered end (five leaflets); umbrella shaped; large cells with clear centers; curved leaflets; clustered leaflets with large gaps of non-growth in between branching	
IDENTITY: *Rhizomnium glabrescens*	
LOCATION AND HABITAT: Glen Valley, mixed forest; growing on dead tree found on ground	
PICTURES:	

Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr and Karen Lenkhoorn

Specimen N°: 0014

DATE COLLECTED: 06/11/13	DATE IDENTIFIED: 02/06/14
DESCRIPTION: Bushy; long strands; bryophyte; radial growth from stem; sporangium is tubular and trumpeted (red); light green leaflets; red stem; elongate leaflet that curls; completely basal attachment of leaflet to stem; no midrib; elongated cellular structure	
IDENTITY: *Hypnum revolutum ??* *Hypnum subimponens??*	
LOCATION AND HABITAT: Glen Valley, mixed forest; growing on live cedar tree; medium lighting	
PICTURES:	
	

Collected by: Chris, Karen, Jasmine Identified by: Beth Guirr and Karen Eenkhoorn

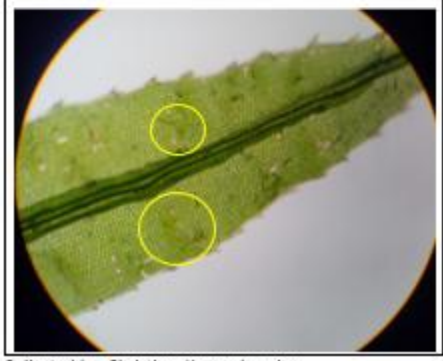
Specimen N°: 0026

DATE COLLECTED: 06/11/2013	DATE IDENTIFIED: 02/06/14
DESCRIPTION: light green; flattened; branches off main vein; very bushy; major branch appears hairy (see picture), probably should shave its legs; curly ended leaflets; pinnate branches; two midribs	
IDENTITY: *Hylocomium splendens*	
LOCATION AND HABITAT: Glen Valley, mixed forest, under a tree on the ground	
PICTURES:	

Collected by: Christina, Karen, Jasmine Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0027

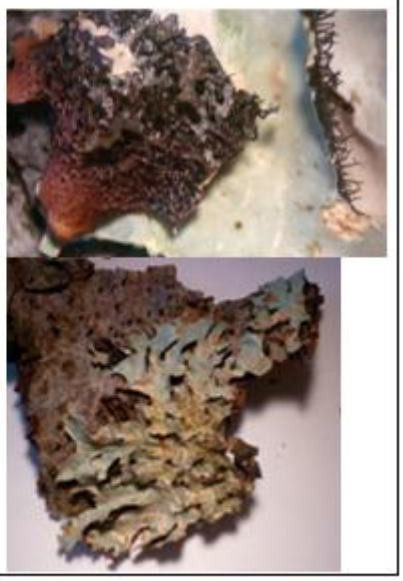
DATE COLLECTED: 06/11/2013	DATE IDENTIFIED: 02/06/14
DESCRIPTION: bryophyte; dark green; long narrow stranded leaflets; leaflets grow radially from stem; serrated edges; brown stem; distinct midrib; clustered growth at ends of stem; undulating leaflets near the end; direct attachment to main stem; mamilose cells (cellular pothole)	
IDENTITY: *Dichodontium pellucidium*	
LOCATION AND HABITAT: Glen Valley, mixed forest, on the ground with medium light	
PICTURES:	



Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0031

DATE COLLECTED: 06/11/2013	DATE IDENTIFIED: 03/25/14
DESCRIPTION: Light green/grey; foliose; sheeted layers; irregular foldings; undulate; hairy black rhizines on the backside; smooth topside; thin thallus;	
IDENTITY: *Parmelia sulcata*	
LOCATION AND HABITAT: Glen Valley, mixed forest. On a branch on the ground, with bracket fungus.	
PICTURES:	
	

Collected by: Chris, Karen and Carson

Identified by: Beth Guirr

Specimen N°: 0035

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 02/12/14
DESCRIPTION: Bryophyte; yellow/green; long spindly growth; many branches; bunched growth; random branching patterns; brownish/red stem; pleated leaflets; lacking midrib; very opaque; small; slender leaflet point; cells are elongated	
IDENTITY: *Rhytidiodelphus loreus*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly coniferous trees; growing on soil, near sword ferns, in a moist area that is partially shaded	
PICTURES:	
	

Collected by: Christina, Elizabeth

Identified by: Beth Guirr and Karen Fenkhoorn

Specimen N°: 0034

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 02/12/14
DESCRIPTION: Bryophyte; green/yellow; midrib to the end of leaflet; leaflet is curved backwards in the shape of an umbrella; rounded leaves until the end point; single toothed jagged edging; radial growth from stem; large leaflets; prominent spike at the tip of leaflet; elongated egg-shaped leaflets; new sprouting leaflets look like hepatophytes	
IDENTITY: *Plagiomnium insigne?*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly coniferous. Moss was in the ground growing out of soil, kind of shaded among sword ferns.	
PICTURES:	
	Total mis-coloration in the middle. Ignore that. 

Collected by: Chris Hall, Christina

Identified by: Beth Guirr

Specimen N°: 0036

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 02/12/14
DESCRIPTION: Bryophyte; green stem; yellow/green; appears flattened as if pressed; stem is directly in contact with base of leaf; long and sparse branching; lacking midrib; undulating leaflets; teeth at the tip	
IDENTITY: *Neckera douglasii*	
LOCATION AND HABITAT: Glen Valley, mixed forest with more coniferous; growing on a small branch, wet condition	
PICTURES:	
	

Collected by: Christina, Elizabeth

Identified by: Beth Guirr and Karen Eenkhoorn

Specimen Nº: 0037

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 02/13/14
DESCRIPTION: Bryophyte; little to zero branching; green/yellow; appears flattened; radial growth; small leaflets; extremely faint/obscure double midrib; slightly curled tips; curled upwards to end of stem; elongated cell patterns; smooth edging	
IDENTITY: *Plagiothecium undulatum*	
LOCATION AND HABITAT: Glen valley, mixed forest with mostly coniferous. Growing on moist soil, near trees and sword ferns, in a partially shaded location.	
PICTURES:	
	

Collected by: Christina and Elizabeth

Identified by: Beth Guirr

Specimen N°: 0038

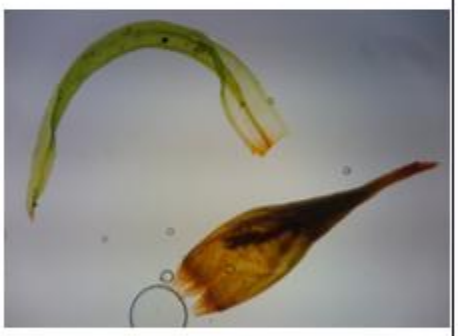
DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 03/25/14
DESCRIPTION: Dark green and very crinkled when dry; brown/red stem; easily can see cellular definitions at 1x; midrib to the end; boardered leaflet; rounded leaflet; large; leaflets grow radially from stem; rhizoids are visible.	
IDENTITY: *Rhizomnium magnifolium*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. Growing on moist soil, near trees and sword ferns; partially shaded among moss.	
PICTURES:	
	

Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr and Karen Fenkhoorn

Specimen N°: 0039

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 02/13/14
DESCRIPTION: Bryophyte; dark green; branches grow radially from central stem; short branching system; oblong-ovate capsuled sporangium WITHIN the moss with peristome teeth, not growing outwardly; red stem; radial growth from stem; large midrib; curled and long leaflets; undulating leaflets; large leaflets	
IDENTITY: *Orthotrichum lyellii*	
LOCATION AND HABITAT: Glen Valley, mixed forest dominantly with conifers. Growing on a broken branch, moist conditions in partially shaded environment	
PICTURES:	



Collected by: Christina, Elizabeth

Identified by: Beth Guirr

Specimen N°: 0040

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 03/25/14
DESCRIPTION: Clumped growth into a very tight knit cluster; very small; leaflets look like bear claws (3 protrusions); stems have the same leaflets as the individual ones on the branch; base of leaflet directly attached to the stem; pale green	
IDENTITY: Lepidozia reptans	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers; growing on a red cedar (potentially dead cedar?), moist conditions, in a partially shaded location.	
PICTURES:	
	

Collected by: Elizabeth

Identified by: Beth Guirr

Specimen N°: 0041

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 02/06/14
DESCRIPTION: Bushy; brown stem; thick radially growing leaflets from stem; leaflets are long and pointed; light green; curly leaflets; long midrib all the way up; smooth edges; elongated cells; kind or resembles eyelashes; leaflets fold in half at the midrib; jagged edging on the tip	
IDENTITY: Dicranum scoparium	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. Growing on a dead red cedar, moist conditions, partially shaded area, among other moss and lichen	
PICTURES:	
 	 Collected by: Elizabeth Identified by: Beth Guirr

Specimen N°: 0042

DATE COLLECTED: 08/11/2013	DATE IDENTIFIED: 03/25/14
DESCRIPTION: Light green; clumpy growth; really soft and squishy like cotton; underneath is soft and white; looks like cauliflower; crustose; spongy	
IDENTITY: *Lepraia incana*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. Growing on a dead red cedar, in moist conditions and partially shaded	
PICTURES:	
	

Collected by: Elizabeth

Identified by: Beth Guirr

Specimen N°: 0044

DATE COLLECTED: 14/11/2013	DATE IDENTIFIED: 02/13/14
DESCRIPTION: Bryophyte; branched; small leaflets; green stem; appears pressed as if flattened; toothed edged leaflets; midrib reaches ⅔ up of leaflet;	
IDENTITY: *Isothecium stoloniferum*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. Growing on a rock near sword ferns, partially shaded and moist conditions	
PICTURES:	

Collected by: Elizabeth and Karston

Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0049

DATE COLLECTED: 14/11/2013	DATE IDENTIFIED: 03/26/14
DESCRIPTION: extremely small; very frail when dry; yellow/green; appears flattened as if pressed; three spikes on leaflets (mickey mouse paw); branched; green stem	
IDENTITY: *Lepidozia reptans*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. Growing on a red cedar stump, partially shaded, near sword ferns and in moist conditions.	
PICTURES:	
	

Collected by: Elizabeth and Karston

Identified by: Beth Guirr

Specimen N°: 0063

DATE COLLECTED: 22/11/2013	DATE IDENTIFIED: 06/03/2014
DESCRIPTION: long branching from the main stem; brown/red stem; radial growth of leaflets, but appears flattened; fluffy when dry; alternate pinnate branching; branches have multiple branches off them too; leaflets are serrated (teeth) approximately ¾ down the leaf; full length midrib; pointed end of leaflet (lancelet); very interspersed leaflets near the end of the branch, and clustered near the base	
IDENTITY: *isothecium stoloniferum*	
LOCATION AND HABITAT: Glen valley, mixed forest on a cedar tree	
PICTURES:	
	

Collected by: Christina, Karen, Elizabeth

Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0071

DATE COLLECTED: 22/11/2013	DATE IDENTIFIED: 11/03/14
DESCRIPTION: when dry it is really dark green and shrunk; appears flattened as if pressed; leaflets on the branch; leaves grow in pairs perpendicular to branch; when rehydrated it appears a green/brown tinge; stem is brown; leaflet lacks midrib; irregular oval shape of leaflet; cells visible at 10x; cells are rounded and ovoid; base of leaflet directly fuses with stem; along the stem only on one side appears to have irregular shaped leaflets covering it	
IDENTITY: *Calyptogeia muelleriana*	
LOCATION AND HABITAT: Glen Valley, mixed forest. On a rusty freezer in an open space (open to the sky)	
PICTURES:	

Collected by: Christina, Karen, Elizabeth

Identified by: Beth Guirr

Specimen N°: 0072

DATE COLLECTED: 22/11/2013	DATE IDENTIFIED: 11/03/14
DESCRIPTION: When dried it is greeny/yellow and stringy; thick branching; brown stem; leaflets are curly and undulate; midrib is about ¾ the way up the leaflet; very thin pointy end of leaflet; twice pinnate; serrations on edge	
IDENTITY: *Chenopodium crispifolium*	
LOCATION AND HABITAT: Glen Valley, mixed forest. On the base of cottonwood tree (with the door).	
PICTURES:	

Collected by: Carston, Karen, Jasmine

Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0073

DATE COLLECTED: 22/11/2013	DATE IDENTIFIED: 11/03/14

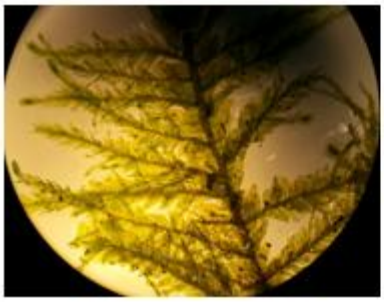
DESCRIPTION:
Dark to bright green, branched, dense leaves arranged radially and flattened, leaves rounded at the top with a single faint midrib/costa, undulations across the leaves, edges curling inwards (appear darker), minor serrations

IDENTITY:
Neckra menziesii

LOCATION AND HABITAT:
Glen Valley mixed forest (Blauw property), on the trunk of a big leaf maple? Cottonwood? (the tree with the door)

PICTURES:

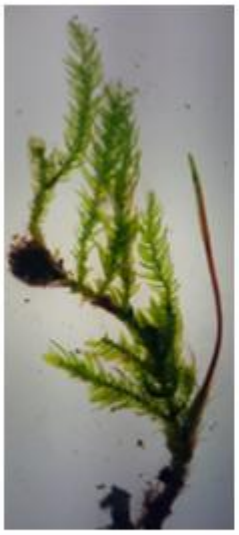





Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0074

DATE COLLECTED: 22/11/2013	DATE IDENTIFIED: 03/19/14
DESCRIPTION: pinnate branching; yellow/green leaves; green stem; radial leaflet growth; leaflets curled up towards the end of stem; leaflets are sharp points; single midrib nearly the entire length of leaflet; serrated edging; cells are elongated and rectangular; visible rhizoids on moss; clustered growth; when dry it appears fluffy and soft	
IDENTITY: *Aulacomnium androgynum*	
LOCATION AND HABITAT: Glen Valley, Mixed forest. On a maple tree (the one with the door)	
PICTURES:	
	

Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr

Specimen N°: 0075

DATE COLLECTED: 22/11/2013	DATE IDENTIFIED: 03/19/14
DESCRIPTION: pale green when dry; fluffy; feathery; green stem; weird brown/red spots on leaflets (could be seeds?); radial growth on stem; midrib midway up leaflet; serrated edging; elongated cells; pointed end; not many branching at the end of stem	
IDENTITY: *Isothecium stoloniferum*	
LOCATION AND HABITAT: Glen valley, mixed forest; big maple tree (with the door)	
PICTURES:	
	

Collected by: Christina, Karen, Jasmine

Identified by: Beth Guirr and Jasmine Reppel

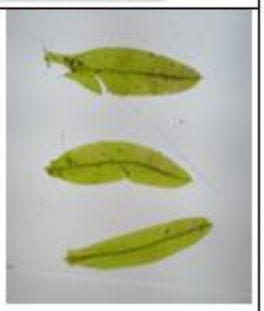
Specimen N°: 0087

DATE COLLECTED: 03/27/14	**DATE IDENTIFIED:** 04/04/14
DESCRIPTION: Very large and fluffy; looks feathery; light green; grown in abundance (not slim pickings); twice pinnate; leaflets also on main stem; brown/red stem; stem looks hairy; small leaflets; serrated edges about 2/3 down the leaflet; elongated/rectangular cells; two midribs reaching mid-leaflet; curly end of leaflet; pointed end of leaflet;	
IDENTITY: *Hylocomium splendins*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. In a small clearing on the ground. Some shading from the canopy; the ground was wet and damp, and this sample was found among other moss.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0088

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 08/04/14
DESCRIPTION: When dry its very shriveled and dark green; when rehydrated the leaflets are huge; very clustered leaflet growth; radial leaflet growth around stem; long shoots of stem; serrated edging around entire leaflet; approximately 11mm average; large midrib reaches end-to-end of leaflet; ovoid cells, easily seen at 1x; looks like a mixed species of *plagomnium* and *dichodontium*	
IDENTITY: *Plagomnium undulatum*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. Blaauw ecoforest. On a rotten log in a small clearing, among other moss. Some shaded area due to the partial covering canopy, and very wet.	
PICTURES:	
	
	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

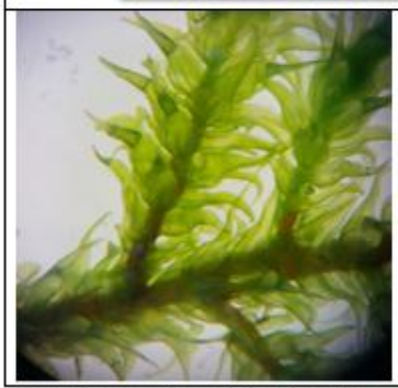
Specimen N°: 0089

DATE COLLECTED: 27/03/14	DATE IDENTIFIED: 08/04/14
DESCRIPTION: When dry it is dark green and shriveled leaflets; when hydrated the leaflets are rounded with a large red midrib; at the point of the leaflet there is a little spike; red stem; radial growth around stem; cells easily seen at 1x; Tylenol pill used for scale (didn't have a dime…)	
IDENTITY: *Rhizomnium gracile*	
LOCATION AND HABITAT: Glen valley, mixed forest with mostly conifers → Blaauw property. On a rotten log in a partial clearing, with some shade due to canopy. Plenty of decaying matter around, lots of ferns, damp conditions	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0090

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 08/04/14
DESCRIPTION: When dry it is light green and feels fuzzy; pinnate branching; red/brown stem; radial leaflet growth from stem; irregular branching; very dense leaflet growth; Tylenol pill for scale (didn't have a dime); undulate base of leaflet; curled tip of leaflet; lacking midrib; elongated cellular structures; minor/no serrated edges;	
IDENTITY: *rhytidiadelphus loreus*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers. On a rotten log surrounded by ferns and other moss, partially shaded and in a low clearing.	
PICTURES:	
	
	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0091

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 08.04.14
DESCRIPTION: Light green; fluffy; minor branching; appears flattened; dense growth; Tylenol pill for size reference (didn't have a dime); green stem; double connected midrib; undulated tip of leaflet; pointed end of leaflet;	
IDENTITY: *Plagiothecium undulatum*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers → Blaauw forest. On a rotten cedar log, in a low clearing surrounded by ferns and conifers. Very wet and damp!!!	
PICTURES:	
	
	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0092

DATE COLLECTED: 27/03/14	DATE IDENTIFIED: 08/04/14
DESCRIPTION: Thin moss; sparse leaflet growth; long stranded ends of stems; stems are green; leaflets grow radially from stem; very small; pointed end of leaflet; single midrib reaching 2/3 up the leaflet; elongated cells; twice pinnate branching; Tylenol for size reference (didn't have a dime); serrated edging	
IDENTITY: *Isothecium stoloniferum*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers → Blaauw ecoforest, on a rotten cedar in a low clearing surrounded by ferns and conifers. Partially shaded due to the open canopy. Moist conditions.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0093

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 08/04/14
DESCRIPTION: Dark green leaflets; green stem; leaflets are fully attached to them stem; no branching; rounded leaflets; appears flattened as if pressed; small branched growth; lacking midrib; irregular serrated edges; abundant growth	
IDENTITY: *Plagiochila porelloides*	
LOCATION AND HABITAT: Glen Valley, mixed forest with mostly conifers → Blaauw ecoforest. On a large cedar tree next to a small clearing, surrounded by ferns. Partial sunlight due to canopy and damp conditions. Around *Isothecium stoloniferum*.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0094

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 16/04/14
DESCRIPTION: small; dark green; pinnate branching; radial leaflet growth; very dense; lacks midrib; very sharp and curly ends; elongated cell structure; leaflets directly attached to branch; Tylenol for size reference	
IDENTITY: *Hypnum subimponens*	
LOCATION AND HABITAT: Glen Valley, mixed forest- Blaauw. At the base of a cedar right next to the ground, near a clearing, wet, shaded conditions.	
PICTURES:	
	
	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0095

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED:** 16/04/14
DESCRIPTION: fluffy; small; Tylenol for size reference; appears flattened as if pressed; twice pinnate; lacks midrib (or looks faint); elongated cellular structures; smooth edges; pointed end of leaflet	
IDENTITY: *Pseudotaxiphyllum elegans (?)*	
LOCATION AND HABITAT: Glen Valley, Blaauw ecoforest. Mixed forest with mostly conifers. At the very base of a large cedar next to a clearing, many ferns, much damp, partial shade, very moss. Wow.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0096

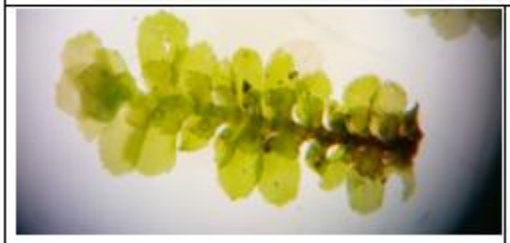
DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 16/14/14
DESCRIPTION: small; dense growth; Tylenol for size reference; long branching growth; stem is red/brown; pinnate; curly ended leaflet points; lacks midrib; long leaflets;	
IDENTITY: *Hypnum cupressiforme*	
LOCATION AND HABITAT: Glen Valley, Blaauw ecoforest. Mixed forest with mostly conifers. Partially up a large cedar tree trunk, with plenty of other moss, next to a clearing and lots of ferns.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0097

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 17/04/14
DESCRIPTION: Dark green on the base of the stem of liverwort; light green at the tip (new growth?); clustered/rounded growth; Tylenol for size reference; very small amount of growth, only what is seen in the photo; lobe leaves; no midrib; overlapping leaflets; red/brown stem at the base; spiked leaflets; rounded cellular structure; parianth is spade-shaped; left picture of the microscope is the parianth, and the right is the leaflet	
IDENTITY: *scapania bolanderi*	
LOCATION AND HABITAT: Glen Valley, Blaauw ecoforest. Near the base of a large cedar tree, wet and shaded area among lots of moss. Not an abundant growth, very secluded liverwort.	
PICTURES:	



Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0098a

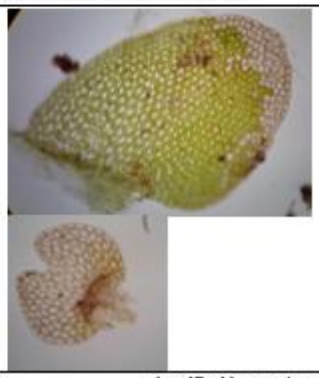
DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 17/04/14
DESCRIPTION: Long; spindley; very small; branching; in conjunction with another liverwort; small and slender branching; 3-pointed leaflets; rounded cells; very abundant growth; green stem;	
IDENTITY: *Lepidozia reptans*	
LOCATION AND HABITAT: Glen Valley, mixed forest- Blaauw. On a fallen cedar tree branch, rotting material and ferns are nearby, very wet, partial shade.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 0098b

DATE COLLECTED: 27/03/14	DATE IDENTIFIED: 17/04/14
DESCRIPTION: medium sized liverwort; in conjunction with another liverwort; overlapping lobes; appears flattened as if pressed; cow-hoof appearing parianth; green stem; not a lot of growth	
IDENTITY: *Calypogeia muelleroana*	
LOCATION AND HABITAT: Glen Valley, mixed forest- Blaauw. On a fallen cedar tree branch, rotting material and ferns are nearby, very wet, partial shade.	
PICTURES:	



Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr

Specimen N°: 099

DATE COLLECTED: 27/03/14	**DATE IDENTIFIED**: 08/07/14
DESCRIPTION: large glossy leaflets; dark green; midrib to the end of leaflet; cells can be seen at 10x; radial growth around the stem; brown stem; leaves get smaller at the tip of the stem; (~8cm tall); pointy end of the leaflet; rounded/oval shaped leaflet; serrated edges all around the leaflet	
IDENTITY: *Plagiomnium insigne*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. Among Salmon Berry. Lots of light, rotting frond/matter.	
PICTURES:	

Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0102

DATE COLLECTED: 22/04/14	DATE IDENTIFIED: 07/07/14
DESCRIPTION: Very fluffy at the top of the stem; resembles a palm tree; radial growth of branching from main stem; twice pinnate; serrated edges around the leaf; serrated midrib; midrib is thick and reaches ¾ up the leaflet; pointed leaflet; leaves grow in threes radially from the stem; brown stem;	
IDENTITY: *Leucolepis acanthoneuron*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. On an old stump covered in moss. With lots of light, next to the path. It was surrounded by lots of trillium.	
PICTURES:	
	
	

Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0103

DATE COLLECTED: 22/04/14	DATE IDENTIFIED: 08/07/14
DESCRIPTION: Very small; looks fluffy; grows along a brown stem and branches at the top; brown stem; green branched stem; radial growth from stem; strong midrib reaching the middle of leaflet; serrated edges all along the edge of the leaflet	
IDENTITY: *Leucolepis acanthoneuron*	
LOCATION AND HABITAT: Glen Valley, Mixed forest, Blaauw Ecoforest. On an old dead stump covered in moss. Lots of light, and right next to a path with tons of trillium.	
PICTURES:	

Collected and Identified by: Beth Guirr and Karen Fenkhoorn

Specimen N°: 0104

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: cells are easily seen at 10x; leaves are only growing on two sides of the stem; green stem; approximately 2cm tall; serrated edges; midrib reaches to the end of the leaflet; midrib extends out of the leaflet to form a point at the end; smaller base of leaflet, and fatter top; tear-drop shaped; short and stumpy looking; leaflet wraps around the stem; border of leaflet is approximately 1.5 cells thick	
IDENTITY: *Plagomnium cilare? Or medium?*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. On an old stump covered in moss, very little of this specific moss in the area. There is patches of sunlight through the canopy and its near the path with tons of trillium.	
PICTURES:	
	
	

Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0105

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: light green; matte appearance in color; wrinkly looking from eye-view; pinnate; elongated leaflet; branches appear pressed as if flattened; stem is green; undulate leaflets; irregular curves on the border of leaflet; faint midrib	
IDENTITY: *Metaneckera menziesii*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. On a small branch on the path; lots of light with plenty of litter	
PICTURES:	
	
	

Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0106

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: round overlapping leaves; on the underside there are smaller sides; the top side the leaves are larger; stem is brown, leaves are dull green and blends to brown down the stem; overlapping leaves at the end of branches (looks like armor)	
IDENTITY: *Porella navicularis*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. On a small branch, next to the path, with lots of light coming from the canopy. There are tons of trillium and leaf litter surrounding this sample.	
PICTURES:	

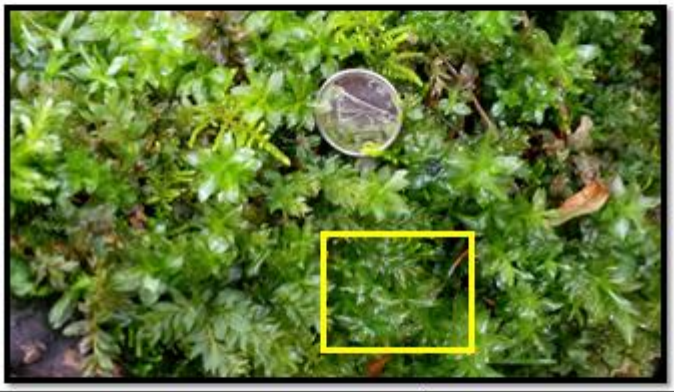
Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0107

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: bright green; red stem; fluffy leaflets; growing radially around the stem; clustered growth on this branch; long leaves; no branching; leaves are curled upward and inward; leaflets border appears undulate; smooth edges of leaves; orange alar cells	
IDENTITY: *Ditrichum heteromallum*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. On a fallen branch next to the path, with lots of light and leaf litter. A lot of trillium and bleeding heart growing near the path.	
PICTURES:	

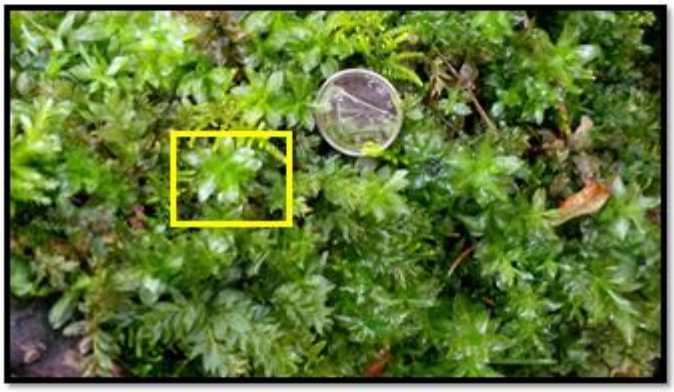
Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0108a

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: flowering leaflets from birds eye view; leaflets curl out and down; midrib extends all the way to the end and then beyond the border of the leaflet causing a point; radial growth around the stem; brown stem; dark green; thinner leaf, but long	
IDENTITY: *Plagiomnium insigne?*	
LOCATION AND HABITAT: Glen Valley, mixed forest, Blaauw Ecoforest. On a very rotten log/stump that's covered in moss. There are sword ferns and lady ferns around the area. Base of a sloping hill.	
PICTURES:	
	
	

Collected and Identified by: Beth Guirr and Karen Fenkhoorn

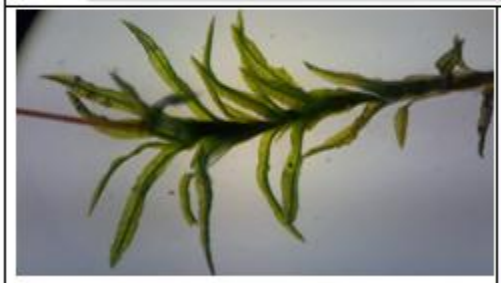
Specimen N°: 0108b

DATE COLLECTED: 22/04/14	DATE IDENTIFIED: 09/07/14
DESCRIPTION: light green; brown stem; leaves curl upward and in; sharper and more up-pointed serrations; wider leaflet; midrib reaches the end of the leaflet and out to make a point; shorter leaflet; flowering from birds eye view; radial growth of leaflets around the stem	
IDENTITY: *Mnium Rostratum? Or Plagomnium?*	
LOCATION AND HABITAT: Glen Valley, mixed forest, Blaauw Ecoforest. On a very rotten log/stump that's covered in moss. There are sword ferns and lady ferns around the area. Base of a sloping hill.	
PICTURES:	
	
	

Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0109

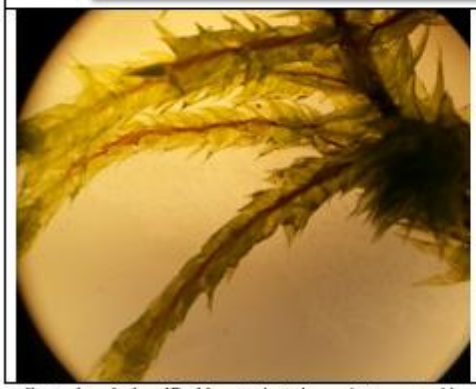
DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: Orange sporophytes; dark green leaflets; radial growth around the stem; no branching; leaves are translucent; sporophyte has a twisted end before the head; tubular head; very long leaves; serrated edges; midrib to the end; pointed end of leaflet; leaves grow radially from stem; undulate leaves	
IDENTITY: *Atrichum undulatum*	
LOCATION AND HABITAT: Glen Valley, Mixed forest, Blaauw Ecoforest. On a very rotten log/ground with lots of light due to partially open canopy. On a slope of a hill with lots of leaf litter.	
PICTURES:	



Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0110

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 09/07/14
DESCRIPTION: stem is red at the top and brown and the bottom; light green/yellow leaflets; radial growth around the stem; once pinnate; irregular branching; double midrib; narrow heart-shaped leaflet; slightly wrinkled; edges are wavy; tip is pointy	
IDENTITY: *Rhytidiadelphus triquetrus*	
LOCATION AND HABITAT: Glen Valley, Mixed forest, Blaauw Ecoforest. On the ground next to the path with plenty of light due to partial opened canopy. Trillium, bleeding heart and salmon berry are abundant.	
PICTURES:	



Collected and Identified by: Beth Guirr and Karen Eenkhoorn

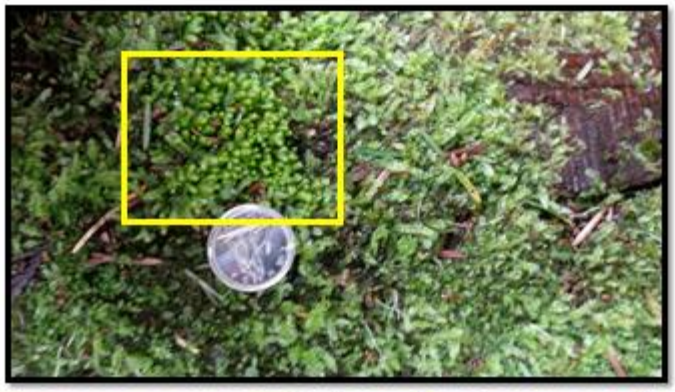
Specimen N°: 0112

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 10/06/14
DESCRIPTION: Light green and brown and the base; very fluffy; shallow root systems; very thin stem; bowled shaped leaflets; curved upward; pointed end; short and stumpy; fat and clustered at the end (looks like a rose); growth is in small hummocks which are not connected (various groups).	
IDENTITY: *Sphagnum tenellum?*	
LOCATION AND HABITAT: Glen Valley, mixed forest in the Blaauw ecoforest. In a boggy area at the back of the property. The ground was bouncy and moist. It's a shaded area with little-to-no canopy openings. There is other moss around this one, and a lot of pine needles.	
PICTURES:	
	
	 

Collected by: Beth Guirr and Karen Eenkhoorn **Identified by**: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0113b

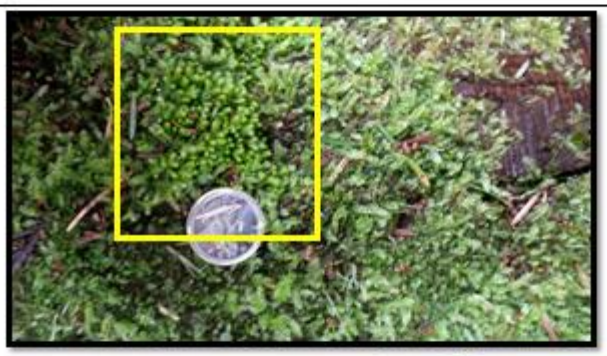
DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 23/07/14
DESCRIPTION: Light green tip; dark green at base; evenly fork3ed; overlapping in a neat pattern; lateral leaves curl their tips downward and in; edges of leaves are sometimes jagged; underleaf appears shredded as if torn; cluster of leaves at the tip of the branchesamong other moss;	
IDENTITY: *Bazzania Gray*	
LOCATION AND HABITAT: Glen Valley, mixed forest; Blaauw Ecoforest. On a fallen tree near the base in the shade, but partial open canopy with trillium and ferns around.	
PICTURES:	

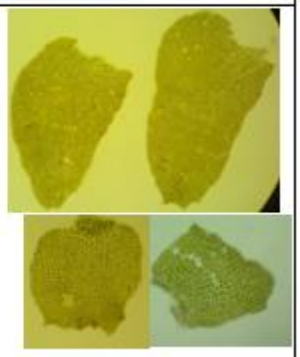


Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0113d

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 29/07/14
DESCRIPTION: light green tips, darker at the base; clustered growth on the bark; perpendicular root system branching right off the stem; green stem; overlapping leaflets; leaflets only grow laterally from the stem; appears pressed as if flattened; the top of the stem diverges into 2+ branches of new growth; underleaf is quite small and grows perpendicular to stem; mass of growth at the end of stem; top leaflet is irregularly shaped and curves slightly (like a fat banana); undereaf is small and very irregular; underleaf doesn't have a common shape; both leaflets generally have pointed and irregular cuts in the tip	
IDENTITY: *Bazzania trilobata*	
LOCATION AND HABITAT: Blaauw Ecoforest, Glen Valley. On a fallen tree (near the base) in the shade, but partially open canopy. Trillium and lady fern are around the tree.	
PICTURES:	





Collected and Identified by: Beth Guirr and Karen Eenkhoorn

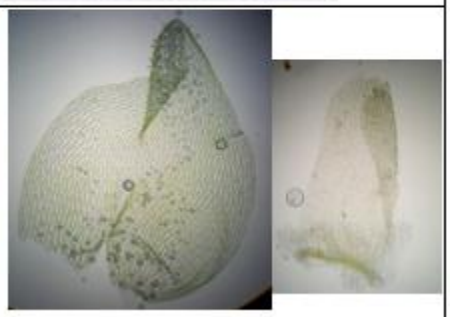
Specimen Nº: 0114

DATE COLLECTED: 22/04/14	**DATE IDENTIFIED**: 29/07/14
DESCRIPTION: short, spikey; clustered growth; branch is red/brown; leaflets are dark green and appear cut off blunt at the end; thick midrib reaches the end; leaflet curves inwards; radial growth around stem;	
IDENTITY: *Dicranum tauricum*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest. On a fallen cedar tree (near the base), shaded area but with a partial open canopy. Surrounded by trillium, lady fern and other moss.	
PICTURES:	
	
	

Collected and Identified by: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0148

DATE COLLECTED: 16/06/14	DATE IDENTIFIED: 16/06/14
DESCRIPTION: Long stemmed; spikey leaves; pale and dull green; branching is spaced out; branching fasicles is either paired or single; alternating branching; capitulum has 2+2 fasicles in radial and even symmetry, stem leaf is rounded whereas branch leaves are bent outwards sharply (squarrose), stem/branches are fragile	
IDENTITY: *Sphagnum squarrosum* Crome	
LOCATION AND HABITAT: Blaauw ECO forest, Guirrhoorn Bog. In a boggy area at the back of the forest, moist area and partially shaded, substantial amount of conifers.	
PICTURES:	

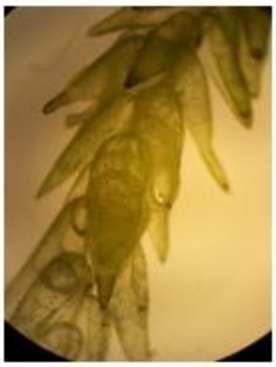


Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Karen Eenkhoorn and Beth Guirr

Specimen N°: 0149

DATE COLLECTED: 16/06/14	**DATE IDENTIFIED**: 30/06/14
DESCRIPTION: Long stemmed; some branching; loosely imbricate leaves; capitulum is star-shaped; dull green; fat fascicles; leaves are bent inwards, curved like a cup; pointed leaves; stem leaves have flat tops, and rounded (fatter); extremely earthy smell; fasciles are 2+3; brown stem	
IDENTITY: *Sphagnum palustre*	
LOCATION AND HABITAT: Glen Valley, Blaauw Ecoforest, Guirrhoorn Bog. Boggy area at the back of the property, very moist, bouncy ground, ferns are around and plentiful, conifers, partly shaded with very little open canopy.	
PICTURES:	



Collected by: Beth Guirr and Karen Eenkhoorn **Identified by**: Beth Guirr and Karen Eenkhoorn

Specimen N°: 0150

DATE COLLECTED: 16/06/14	**DATE IDENTIFIED**: 30/06/14
DESCRIPTION: Spikey and thick leaves; loosely imbricate leaves; small capitule; fat brown stem; 2+2 fasicles; leaves are curved inward like a cup; rounded with a mild point; dull green leaves; long stems; abundant growth; dense.	
IDENTITY: *Sphagnum palustre*	
LOCATION AND HABITAT: Glen Valley mixed forest, Blaauw. Guirrhoorn Bog. Boggy area at the back of the forest, moist and partially shaded. Lots of conifers.	
PICTURES:	

Collected by: Beth Guirr and Karen Eenkhoorn

Identified by: Beth Guirr and Karen Eenkhoorn

Fungi Identification Procedure Guide

Trinity Western University

Supervisor: Chris Hall

Table of Contents:

Purpose: This outline provides as a procedural guideline as to the process of collecting, testing and identifying the various fungi species that exist in the Blaauw Forest.

Tools for Mushroom Collection:

- Pocket Knife
- Roll of wax paper/wax bags
- Label paper
- Twist ties
- Permanent Marker
- Measuring Tape
- Zip-lock bags
- Collection Basket (prevents mushrooms from getting squished from a backpack)

Identification Tools:

- 90% Alcohol
- Melzer's reagent
- Stain (Safranin, Congo Red or Lactophenol cotton blue)
- Cover Slips
- Slides
- Oil (for oil immersion)
- Lens paper

Optional Chemical's for Tests:

- KOH
- Ammonia
- Iron Salts

How to Collect Mushrooms:

1) Find Mushroom
2) Identify observable characteristics
    a. Habitat & Environment
    b. Was it growing from a tree?
    c. What are the surrounding plants?
3) Be careful – we want to maintain key characteristics of the mushroom, so use caution
4) Take Picture
    a. It is key to take numerous pictures
        i. 1 from a distance taking in the surrounding botany
        ii. 1 with a full view of the mushroom
        iii. 1 with a view of the underside of the cap (checks to see the pores or gills)
        iv. 1 aireal view of the mushroom cap
5) Dig the mushroom out, the whole stem (a key characteristic is found at the base of the stem)
6) Wrap the mushroom up (not tightly) in wax paper for preservation and twist ends

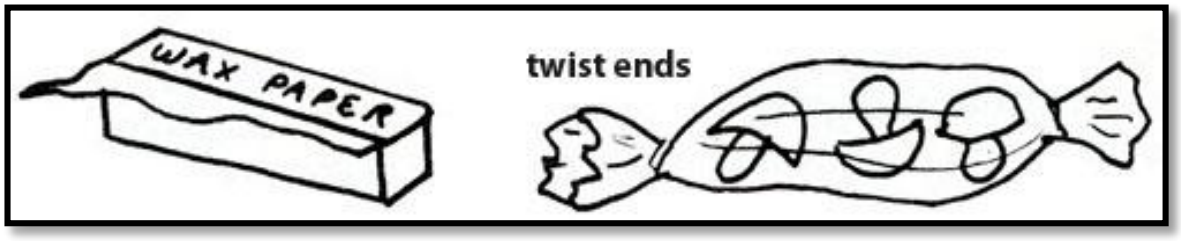


Figure 1: Process of collecting fungi

Image from http://urbanmushrooms.com/index.php?id=69

7) Make further notes:
    a. Where the mushroom was found?
    b. Was it shaded?
    c. Was it growing from grass?
    d. What was the formation it was growing in?

* Write these notes on the template posted

PHYSICAL IDENTIFICATION:

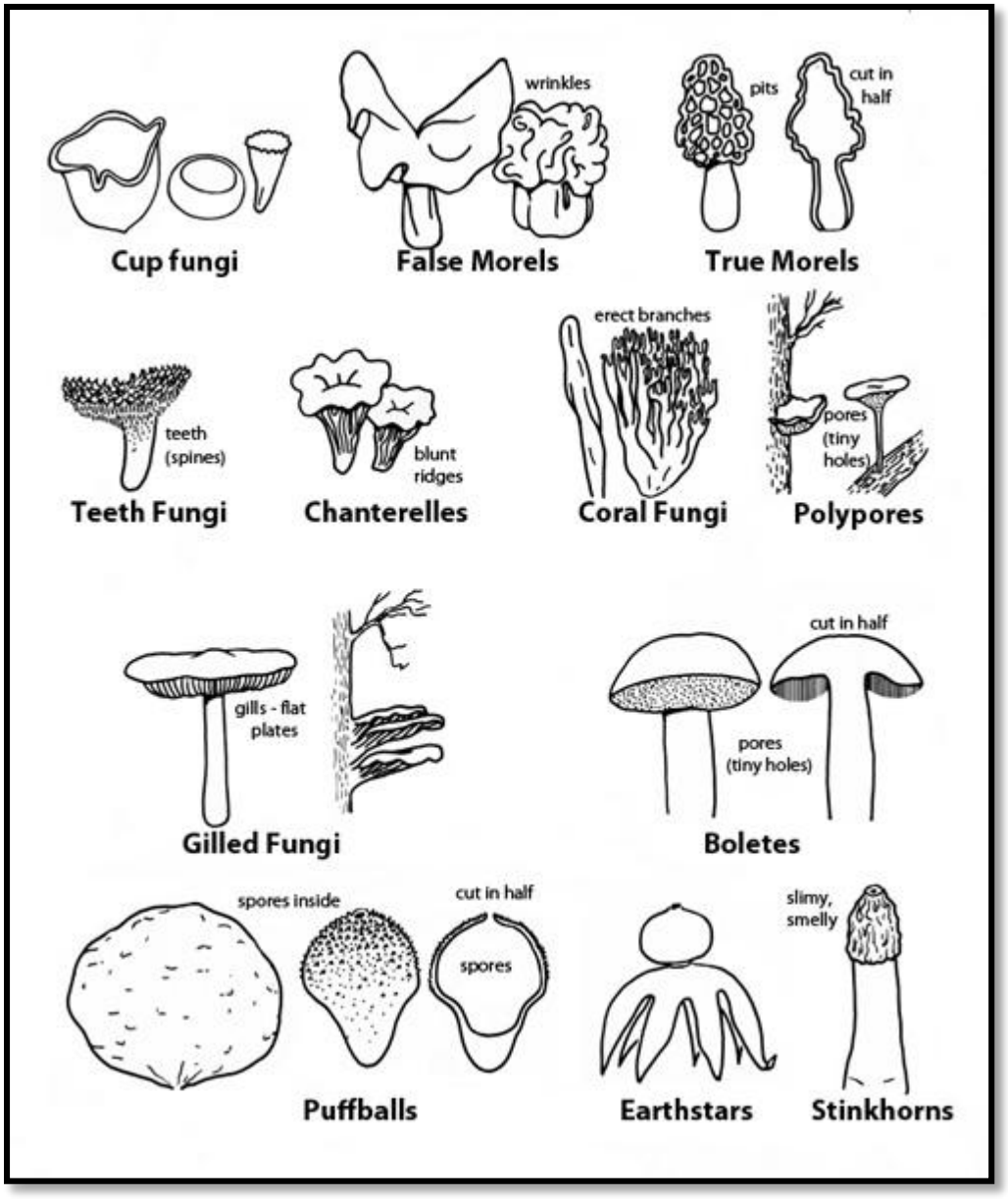


Figure 2: Basic fungi outline to identify the easiest mushrooms (not all fungi will fit into these categories)

Image from http://urbanmushrooms.com/index.php?id=69

Physical Components of Mushroom:

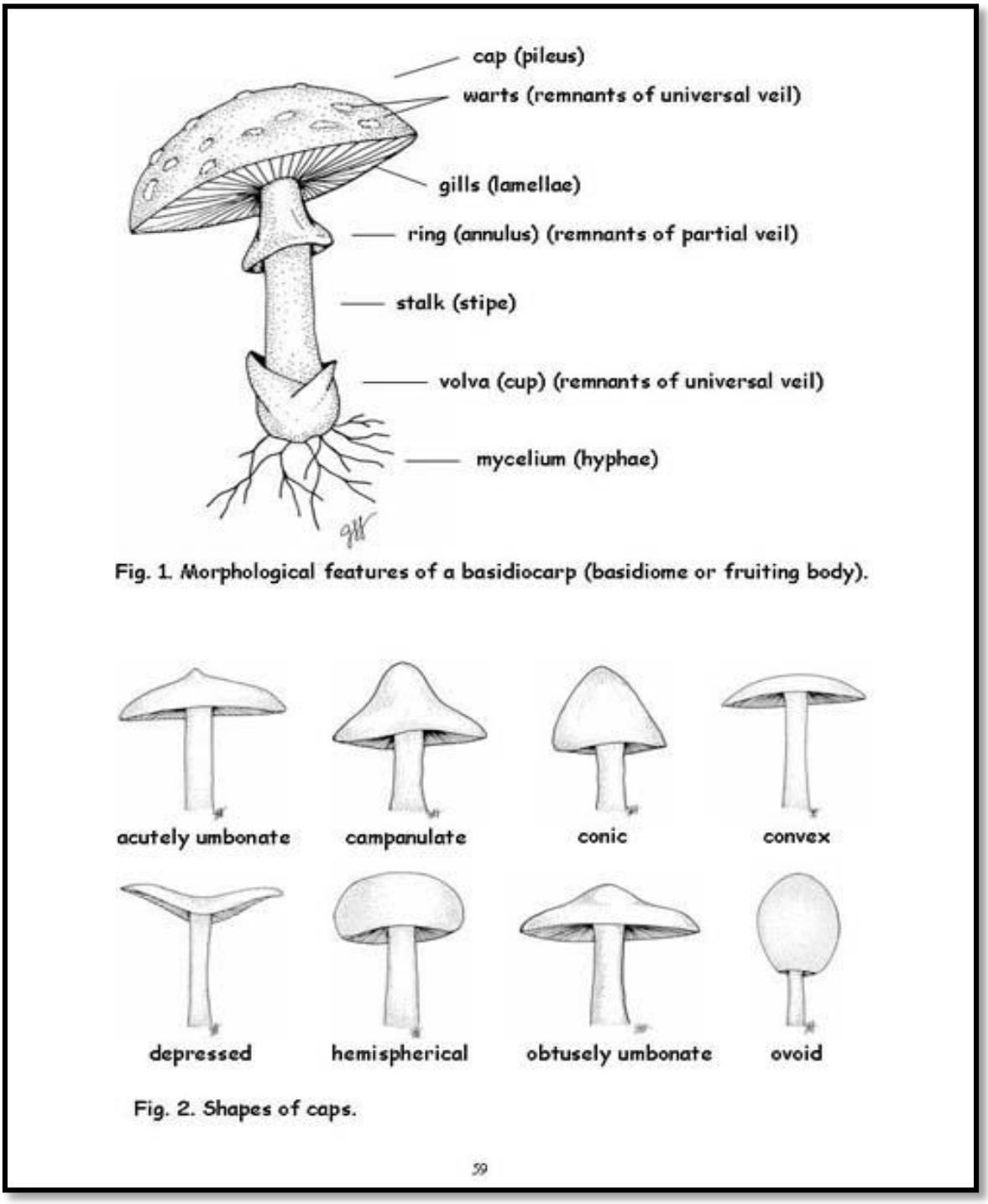


Figure 3: Basic physical fungi characteristics to describe the mushroom (not all features are presented in this image and descriptions vary per identifier)

Image from http://urbanmushrooms.com/index.php?id=69

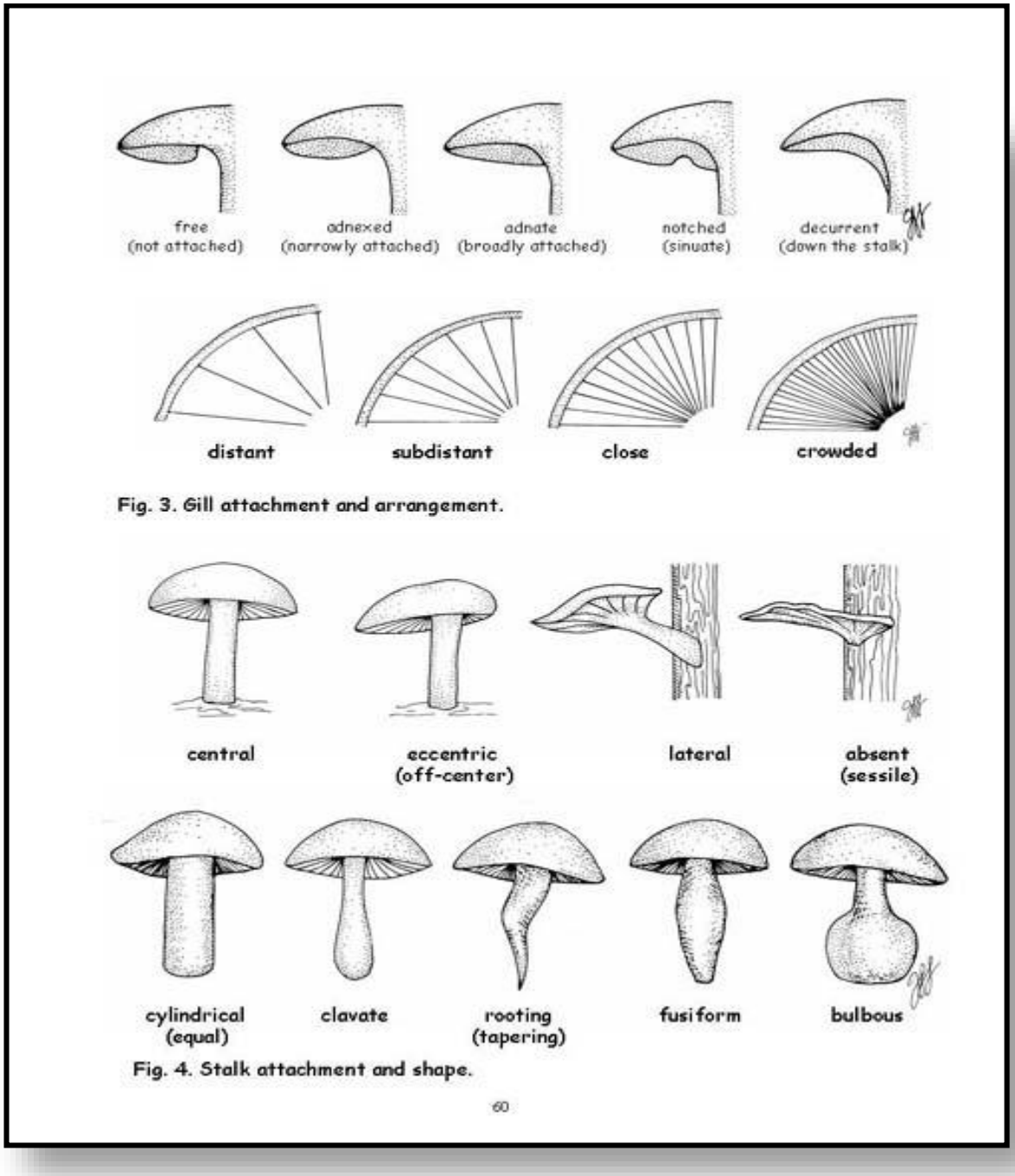


Figure 4: Basic physical stalk and gill attachment characteristics to describe the fungi (not all features are presented in this image and descriptions vary per identifier)

Image from http://urbanmushrooms.com/index.php?id=69

CHEMICAL TESTS:

Important Information:

- All tests must be conducted on fresh mushrooms
- It is only necessary to add a single drop onto the mushroom

A. Ammonia Test (Identifies boletes)

1) Place a drop of ammonia on a fresh cap, stem, sliced flesh and pore surface
2) Identify any color change (some change into multiple colors and others only one)

B. Potassium Hydroxide Test (KOH) (2-5% aqueous solution) (Identifies boletes, polypores and gilled mushrooms)

- This will have to be purchased online

Boletes:

1) For boletes, place a drop of KOH on the cap, stem, sliced flesh, and pore surface
2) Note color changes (if any)

Polypores:

1) For polypores, apply the KOH to the flesh and the cap surface
2) Note color changes (if any)

Gilled mushrooms:

1) For gilled mushrooms, place a drop on the cap surface
2) Note color changes (if any)

C. Iron Salts ($FeSO_4$) (Identifies boletes and russulas)

Boletes:

1) For boletes, place a drop on the cap, stem, sliced flesh, and pore surface

Russulas:

1) For russulas, place a drop on the stem surface

D. Melzer's Reagent (Safety Procedures)

Melzer Reagent is a highly dangerous substance due to the addition of the chloral hydrate, which is a medically controlled sedative and hypnotic (Leonard 2006).

Hazards:

Melzer Reagent is toxic is swallow and can potentially cause skin irritation and serious eye irritation.

Preventative Measures:

- Wash hands thoroughly after handling
- Avoid consumption at all costs
- Wear protective gloves and safety glasses at all times during chemical usage

1) Extract spores from either a spore print or from asci
    a. Extract spores from the asci via slicing a very thin surface piece. If…
        i. Morel, extract from surface of pit
2) Place spores on slide
3) Add a single drop of Melzer's reagent
4) Place cover slip over spores/Melzer's reagent
    a. If extracting spores from asci apply slight pressure to flatten specimen
5) Remove excess stain with tissue and wait a few minutes for stain to permeate the specimen
6) Observe color change and associate with reaction type. Certain reactions can take up to 20 minutes.
7) Observe and record color, shape and size of spores

Table 1.1: Color change associated with Reaction Name

Color Change	Reaction Name
Blue to Black	Amyloid or Melzer's-positive reaction
Brown to Reddish-Brown	Pseudoamyloid or Dextrinoid reaction
No Color Change or faintly Yellow to Brown	Inamyloid or Melzer's-negative

The Amyloid reaction can be further isolated into two additional reactions upon addition of KOH.

Table 1.2: Further Definition of Possible Amyloid Reactions

KOH Present	Color Change	Reaction Name
No	Blue	Euamyloid Reaction
Yes	Blue	Hemiamyloid Reaction*

*No reaction with just Melzer's reagent and turns red in Lugol's solution

SPORE PRINT:

A spore print can only be completed on mature mushrooms and is completed to determine spore color.

1) Remove stock from smaller mushrooms and place cap, gills or pores downward on a piece of paper. The best paper utilized for a spore print has two colors (so as to prevent color misinterpretation)
   - For larger mushrooms slice off a section of the cap

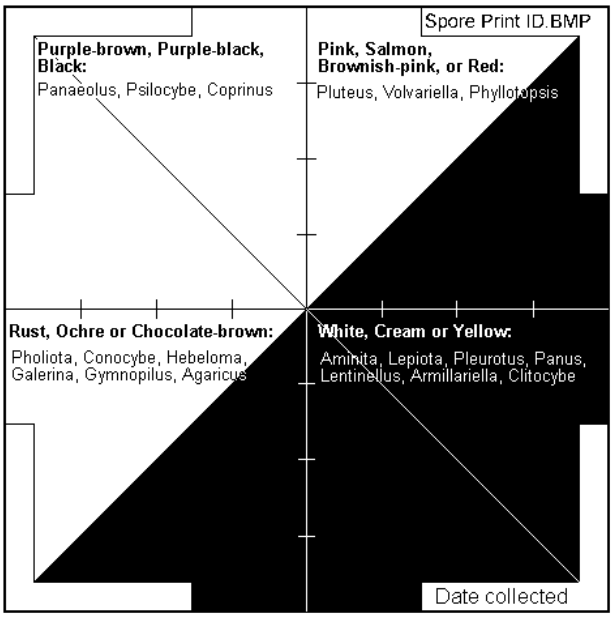


Figure 5: Ideal paper for spore print (Extracted from http://en.wikipedia.org/wiki/File:Spore_Print_ID.gif)

2) Place cup or **glass** upside down on top of mushroom to keep air currents away
3) Leave spore sprints overnight (approx. 24 hours) and do not move
4) Identify color of spore print

If Ascomycetes (morels & false morels)

5) Place piece of cap on glass or paper
6) Spores will show up around mushroom section

Note: Color

SPORE COLLECTION:

A spore collection is conducted on a mature mushroom on a slide for analysis of shape.

1. Place cap of mushroom downward onto the slide (fertile side down) and wait 1-2 hours until spore dust is present on the slide
2. Add a single drop of…
    a. Colored spore = DI water or soapy water
    b. White/clear spore = Melzer's reagent
3. Place cover slip over the spore/aqueous mixture
4. Identify key characteristics of spore
    a. Shape
    b. Size
    c. Spore surface

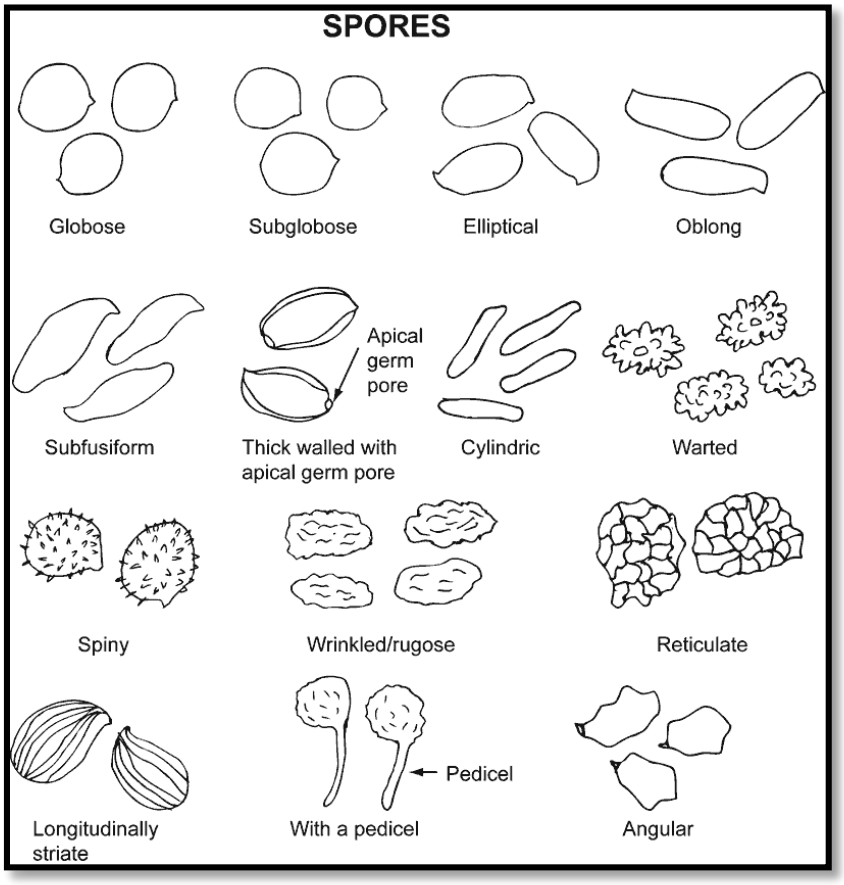


Figure 6: Potential spore shapes from spore collection (Extracted from http://www.toxinology.com/generic_static_files/images_generic/MD-spores1.gif)

*** Not exhaustive**

KEY SPORE TERMS:

1. Amyloid if they turn a blue-black colour.
2. Dextrinoid if they turn a reddish-brown colour.
3. Inamyloid (or negative) if they merely turn yellowish or do not change at all.

FUNGAL TISSUE COLLECTION:

A fungal tissue collected is conducted to determine key characteristics of the hyphae. Proper collections are difficult to extract because the tissue tends to be too thin. The hypha analysis tends to be conducted on the gills (or pores).

1. Cut a thin sliver of the gill or other portion from the fungi using a sharp razorblade
2. Place specimen on slide, add a few drops of stain and place cover slip on top and apply pressure to flatten the tissue

3. Remove excess stain using absorbent tissue and wait 5 minutes to ensure the stain has properly permeated tissue specimen
4. Observe tissue structure!

MICROSCOPIC IDENTIFICATION OF DRY SPECIMEN:

- Completed after drying to reuse specimen

1) Break off small piece of dried specimen's cap
2) Let specimen soak in 90% alcohol for a few minutes
3) Transfer specimen to tap-water dish & let it soak (few minutes)
4) Blot specimen with paper towel
5) Roll up specimen tightly so gills run lengthwise
6) With sharp razor blade slice very thin cross-section
7) Transfer cross-section to slide and add medium (usually 2% KOH with Phloxine stain)

SAVE MUSHROOMS (DRYING THEM OUT):

- Drying can take up to two days or longer depending on the size of the mushroom

1) Food Dehydrator

OR

2) Pinned in a Paper Towel
    a. Place mushrooms in paper towel loosely
    b. Fold paper towel over
    c. Pin paper towel to a wall near lamp (dried within one or two days)

OR

3) Over a Lamp
    a. Put a wire mesh over a lamp
    b. Place paper towel over wire mesh
    c. Place mushroom on top of paper towel

STORE MUSHROOMS:

1) Place mushrooms in sturdy plastic zip-lock bags or acid-free paper

2) Place identification note in/attached to bag
   Note:
   - Identified Species:
   - Identification ID:
   - Location:
   - Date of Collection:
   - Name of Identifier:

3) Place in cardboard box

4) Place cardboard box in a dry location

FINAL IDENTIFICATION PROCESS:

- Collect all of the spore, tissue, and identification images collected throughout procedure and use characteristcs to identify fungi via Dichotomous key (Mushrooms Demystified or *MushroomExpert.Com* website recommended).

Major Sources for Procedure Guide and Species Identification:

Arora, David. 1986. Mushrooms Demystified. Ten Speed Press. Berkeley, California.

Kuo, M. (2006, February). Studying Mushrooms. Retrieved on October 1, 2014 from the *MushroomExpert.Com* Web site: http://www.mushroomexpert.com/microscope.html.

O'Reilly, Pat. 2014. Fascinated by Fungi. Retrieved on November 13, 2014 from http://www.first-nature.com/fungi/facts/microscopy.php.