



The Educational Geocache Adventure Game



By Katie Abbott,
Janine Lauder &
Christina Schulz

ES 441/ER 411: Advanced
Ecological Restoration
University of Victoria
Professor: Dr. Eric Higgs
TA: Kristen Walsh
Summer 2015

Introduction:

The following quote from John Lubbock, noted archeologist and student of Charles Darwin, captures the spirit and intention of our project. “Earth and sky, woods and fields, lakes and rivers, the mountain and the sea, are excellent schoolmasters, and teach some of us more than we can ever learn from books” (Lubbock, 1895, p. 70). These words are still true today, especially in view of our technological advances and shrinking green spaces.

Presently, the use of technology by children and young adults has isolated them from the outdoors. Other factors contributing to this disconnect with nature are parents fears of letting their children play unattended outdoors, and the urbanization of forested or “wild” areas. This has lead to a phenomenon known as nature-deficit disorder, a term coined by journalist Richard Louv, which describes a lack of relationship to the environment (Louv, 2005).

Our project addresses this phenomenon through the development of an educational geocache adventure game. This game was conceived by the GCA and is part of a pilot program that teaches orienteering skills to youth that includes the use of a GPS. The game taps into the “technological fascination and proficiencies of young people to connect them to the natural world” (Appendix A). Through this connection, we hope to spark an awareness of human interdependence with nature to encourage pro-environmental attitudes and behaviours.

The educational geocache adventure game will take place on Galiano Island at the Learning Centre property acquired by the GCA; therefore, a history of the GCA and the property is included in our project. Also incorporated will be a discussion about how the geocache game and similar educational oppportunities are an integral part of ecological restoration.

Our Mission:

To assist in the development of an educational geocache nature game:

- To promote public awareness regarding the Galiano Conservancy Association's (GCA) vision about the purpose and practice of ecological restoration;
- To establish a viable source of revenue for restoration projects throughout the (GCA) Learning Centre Land (DL 57) and other properties owned by them;
- To provide an opportunity to connect youth, young adults, and adults to nature using technology (GPS, compass); and
- To instill a holistic view of the world to create an awareness that humans are not more important than nature, thus planting the seeds of pro-environmental attitudes and behaviours.

Background:

The Galiano Conservancy Association (GCA) was formed in 1989 with the purpose of community-based purchasing, managing, and restoring of land and habitat on Galiano Island (Figure 1). The three main pillars in their mission statement are land and marine conservation, stewardship and restoration, and environmental education and public awareness. The GCA board and membership have created partnerships to work cooperatively with local landowners and residents to promote these pillars. As well, they have received grants and donations from governments, industry and private individuals to carry out their public awareness, environmental and educational goals ("Our Mission," 2015).

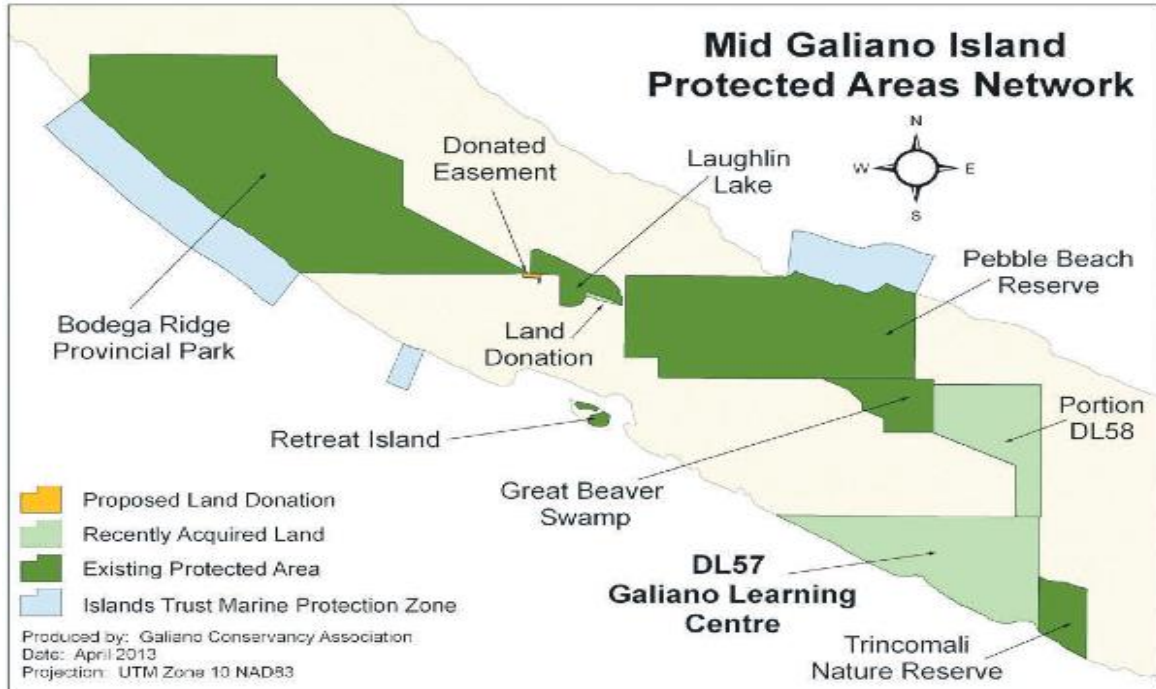


Fig. 1: GCA land acquisitions and protected areas (Fournier, 2013, p. 1).

One of the GCA land acquisitions was the Learning Centre Land, which presently has a stewardship endowment of approximately \$350,000. The property is 76.1 hectares (188 acres) and has a varied landscape, including two kilometres of waterfront, agricultural land, and an intact old growth forest. The land is located on the southwest shore of Galiano Island, in southwestern British Columbia, Canada (“Learning Centre: History,” 2015) (Figures 2 & 3).



Fig. 2: Location of Galiano Island in Southwestern British Columbia. (“Learning Centre: History,” 2015)

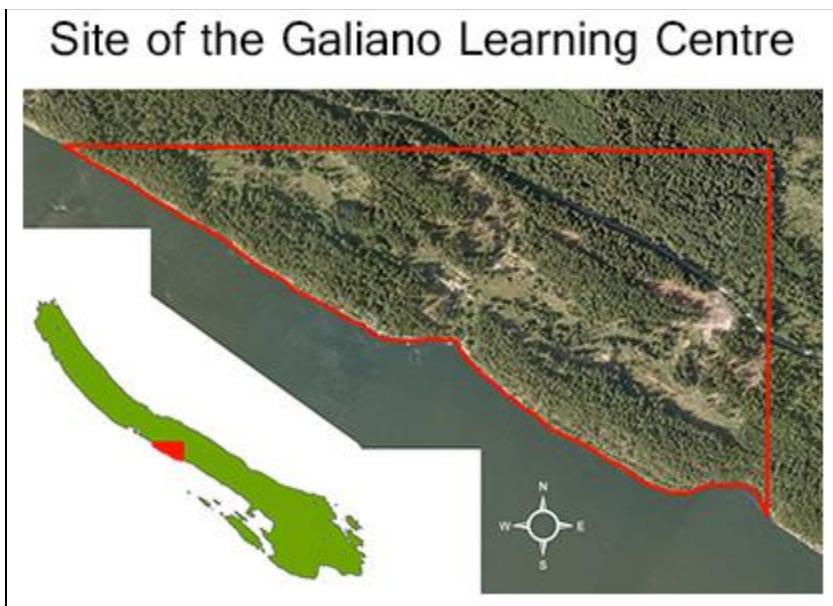


Fig. 3: GCA Learning Centre Land (DL 57) (“Learning Centre: History,” 2015).

The Learning Centre land is where the geocache courses were conceived and laid out by GCA staff. Funding for the development of the geocache game was provided through a grant of approximately \$17,000 from Telus.

As a result of the grant, the GCA was able to put together a skeleton geocache course that was tested in a trial run by us and our classmates. Feedback from this experience and suggestions from GCA staff have been incorporated into the enhancements we have made to the game. The GCA Telus proposal explains that the geocache game is part of a program designed to teach youth “the use of technology ‘through the ages’ starting with simple land marking through map and compass orienteering and finally using hand held GPS technology” (Appendix A). This style of education, called place-based learning, takes learning outside the classroom and into the real world with the following questions: “Where am I? What is the natural and social history of this place? How does this place fit into the larger world?” (“Teach Place-based Learning,” 2015). Students undertake projects in the community and in nature, and their learning is then integrated with school learning outcomes. The geocache game focuses on science, mathematics, and geography, but there are many other curriculum based benefits such as reading, history, physical exercise, and team work (social and reasoning skills). To be sure, it is important to focus on learning, but just as important is the reconnection with nature; “Research shows that people who are allowed to explore outdoors are socially and emotionally happier and healthier” (“Geocaching with School Age Children,” n.d.).

In fact, outdoor exploration is a key element in providing youth with the necessary emotional experiences in order to stimulate pro-environmental behaviour. Van den Noortgaete & De Tavernier (2014) report there has been an increase in environmental awareness conveyed to the population in general, creating a widespread concern for the environment but there is a

“widely observed phenomenon that this concern often does not translate into associated behavior. This apparent discrepancy is known as the ‘value-action gap’...” (p. 572). Further, they suggest that this discrepancy does not relate to situational constraints such as “a lack of recycling provisions or facilities...In a recent Canadian study, researchers found respondents experiencing few if any situational barriers to pro-environmental behavior, yet 72 percent of them reported a gap between their intentions and their actions” (p. 573). So, how is knowledge transformed into action? This is a conundrum that has environmental researchers searching for the answer. What is known is that the earlier children have positive connections with nature the more these experiences remain part of their psyche (Van den Noortgaete & De Tavernier, 2014). “Research indicates that time spent within ‘wild nature’ in a participative way such as walking, playing, or camping during childhood, has a significant positive correlation with both adult environmental attitudes and behavior” (Van den Noortgaete & De Tavernier, 2014, p. 576).

As restorationists, we want children to develop pro-environmental attitudes and behaviour through contact with nature, but there is a fine line between a connection with nature and nature as a commodity. For example, for our project, the geocache game uses a GPS to locate the cache, but unlike a video game, the participants are actually in nature and have to look for the cache by finding a certain plant, tree or other feature. Through this process they are observing, smelling and touching the natural environment. They feel the uneven ground under their feet, experience the smells of an old growth forest or a rotting stump, or take the time to watch ants travel up and down the sap of an infected Douglas fir tree. We want them experience nature for what it is and not as a theme park. Although the geocache game is designed to be enjoyable, our intention is to nurture an appreciation for natural land as a place to be respected and not as a commodity to be used for the purpose of running the geocache game. Rather, the

game facilitates positive connections and attitudes around nature which is critical for the development of proenvironmental behaviour. It has been said, “The proof is in the pudding,” so to this end, we want to share the following quote from a grade 6 student who attended one of the outdoor education programs through the GCA:

"The transformation of school kids in nature is an amazing thing. You think you know someone at school. Then you see them in nature, and they're totally a new person. That happened to me when we were on Galiano, my friends turned into different people. They were not only asking me about nature, but they really cared." Hillary, Grade 6, David Lloyd George Elementary (“Learning Centre: History,” 2015).

Hillary’s last words, “they really cared,” speaks volumes in terms of the affect of nature on her friends. Perhaps she, or some of her friends, may become restorationists, but we can be assured that all of them had a positive experience in wild nature through place-based learning. Playing in nature is one way the value-action gap can be transformed from proenvironmental attitude to proenvironmental behaviour. This is the kind of behaviour that gives rise to grassroots or focal restoration. “Focal restoration leads to one of four keystone concepts of good ecological restoration: focal practice” (Higgs, 2003, p. 4). Additionally, Higgs (2003) describes focal practice as “practices that create a stronger relationship between people and natural process, a bond reinforced by communal experience” (p. 242). For example, focal practice connects people with nature in meaningful ways such as volunteering to help remove invasive plants or planting native species in their yards to provide habitat and food for birds and pollinators. Focal restoration starts with ideas “deeply rooted in communities” and gives impetus to projects such as urban creek or Garry oak habitat restorations (Higgs, 2003, p. 4). This is people power, and it

begins with planting the seeds of focal restoration and practice early in a child's life to nurture informed stakeholders of the future.

The GCA grew from a grassroots initiative “whose primary purpose is ‘To preserve, protect and enhance the quality of the human and natural environment’ on Galiano Island” (“Our Mission,” 2015). They certainly have fulfilled their mission, and they continue to do so. Through the acquisition of local land, the GCA has been able to develop many nature education programs that, since 2000, have hosted over 7000 youth aged 4–18 (“Learning Centre: History,” 2105). Our group was privileged to be able to spend eight days immersed in nature on the Learning Centre Land while participating in a University of Victoria field course. Through our various assignments, we became engaged with the land and our temporary community, which had a profound, positive effect on our commitment to restoration. Childhood memories surfaced and new ones were created. Such is the power of nature!

Findings and Rationale:

Upon receiving funding for the Educational Geocache Adventure Game from Telus, the GCA educational staff laid out the geocache course that consists of four clusters, and each cluster consists of geocaches that contain clues about the next geocache as well as information about cardinal directions, plants and animals. Some caches are referred to as multicaches because they require the participants to stay in the same GPS location to find other caches, ultimately locating the one with the next clue and GPS coordinates. The clusters can be played individually or all together (depending on time). These clusters were then tested on our class to determine the viability and enjoyment of the game. The general feedback was positive but the game needed to be rounded out by adding more information about ecology and more engagement with the

caches. In order to achieve these goals, our group interviewed classmates to determine ways in which the game could be improved to be more engaging and educational. As well, we interviewed Eric Jacobsen, GCA Educational Coordinator, to determine the target participants. He explained that the participants are meant to be grade 10–12 students as well as young adults, but should be able to be enjoyed by both younger and older people. We hiked the four clusters once with Jacobsen to get an overview of the whole course, plot two new GPS points, and propose our ideas to him. Additionally, we completed two more in-depth runs of all four clusters to test our ideas and make corrections. We analyzed the information provided on the initial instruction sheet for each cluster and each information sheet in all twenty-three caches and added two more caches. From there we decided to improve upon the existing clusters by adding games, colour, pictures and even actual natural “artifacts” to the caches and clues. Though there is plenty of information and pictures on the clipboards given to participants, only the most keen of participants is likely to read over such information as it is not absolutely vital to the game. Through the test pilot of the game, we found that most people merely skimmed the clues in the geocaches without getting an in-depth look at all the educational information. Making the clues and geocaches more colourful and adding key educational information within them may help participants better engage with the information. We added two additional geocaches to two of the clusters that represent a good opportunity to teach about invasive species as well as natural resource extraction. These topics were not represented previously but are important to ecological restoration. The following section will discuss additions made to each cluster and the rationales behind doing so.

Additions to All Clusters

Throughout each of the four clusters we created a word scramble game to add an additional overarching activity to the game. Letters are scattered throughout the geocaches which the participants are to unscramble at the end of the course. The word relates to something they learned during the cluster with the idea that repetition should better instill what they have learned. The word scramble words we chose, in order of cluster, are ‘tafoni’, ‘arbutus’, ‘salal’ and ‘oceanspray.’ The word scramble activity is optional, though through feedback from a few classmates, we discovered that such mind activities are fairly enjoyable to certain people, like the cipher activity already included in one cluster of the pilot game. If the word scramble is completed the team could earn extra “points” or another prize that can be determined by the GCA.

We also created a GIS map of all of the geocaches from each cluster with the help of Julia Braun from the GCA (Figure 4). With this map we created hand-drawn maps of each cluster to be incorporated as a bonus activity at or near the end of each cluster (see Appendices B,C,D, & E). The map will correspond to the next cluster of the game. The idea behind this is to create an additional “prize”, particularly for younger participants who may enjoy finding a map in nature. Additionally, the maps will help participants better visualize the course and enhance spatial awareness and learning. While the GPS is incredibly useful, it directs users towards coordinates via the closest straight line distance and thus does not consider the real-life barriers like cliffs or dense forest. Encouraging use of the paper map may decrease reliance on the GPS for navigating/orienteering as well as help to keep participants on the designated pathways.

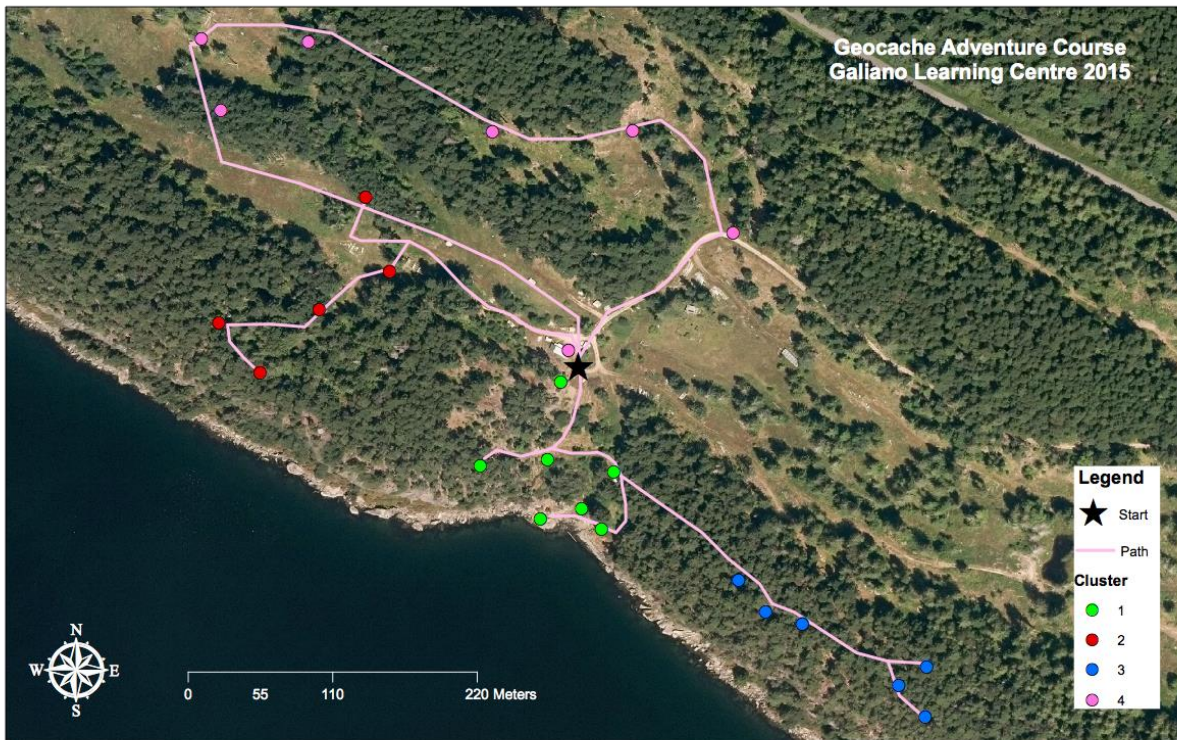


Fig. 4: Map of Geocache Course.

Cluster 1

For most of the geocaches in Cluster 1 we added coloured fonts and photos of the species being described to better engage participants with the educational information (see Appendix B).

- Shorepine Cache: We added additional educational information regarding fire and the shorepine (*Pinus contorta*). Plus, we suggest an actual sample of a periwinkle plant be added to this geocache to introduce the next plant to be located. We believe that if participants actually touch and/or smell plant/tree species, they will be more likely to connect with them and be able to identify them in the future.
- Periwinkle Cache: We added this geocache to teach participants that periwinkle (*Vinca major*) is invasive thus introduce one of the concepts of ecological restoration: managing invasive

species. The GCA is currently attempting to smother a section of the periwinkle with linoleum, though their efforts appear futile in the extensive landscape of periwinkle. Having a geocache in this location gets participants to think about the possible impacts of invasive species and efforts to eradicate or manage them. We also suggest an actual broad-leaf maple leaf be added to this cache to introduce the tree to be located (see rationale above).

- Ninebark Cache: We added information to this cache with regard to the water needs and wildlife that ninebark (*Physocarpus capitatus*) trees attract.
- Tafoni Multicache: The bonus map we created is placed near the end of this cluster.

Cluster 2

We added colour and species photos to many of the geocaches in this cluster, as well (see Appendix C). An additional hint was added to the first clue about the Evergreen Huckleberry Cache because the pilot run proved this cache to be particularly difficult to find.

- Evergreen Huckleberry Cache: We suggest adding the leaves or bark of an arbutus tree as a hint to them to find the next cache (at an arbutus tree), as well as to encourage a greater connection with the species through touch (see rationale above in Shorepine Cache).
- Archbutus Cache: Additional educational information regarding the uniqueness of arbutus trees (*Arbutus menzeisii*) was added. Plus, we created a new multicache cipher activity wherein the participants must find two nearby stumps “sprouting new life with salal” where the numbers for the next coordinates can be found. This activity introduces both another species salal (*Gaultheria shallon*) as well as another fun mini-game to the cluster.

- Gnarly Doug Multicache: Here we added a “Stages of Decay Info Sheet” to locate a class 4 decomposing log. From here they are instructed to use a compass to complete the multi cache correctly. We compiled the decay information sheet using a model and graph by Maser *et al.* (1979) that will be attached to the clipboard of each geocache team to use in certain clusters (Appendix F). This activity educates participants about orienteering (via the compass) as well as the importance of decay and decomposition for forest ecosystems.
- English Hawthorn Multicache: We added information regarding the invasive capability of the English Hawthorn (*Crataegus laevigata*). Plus, we made this cache into a multicache, so participants can locate the bonus map. The map can be located near an alder grove and amongst salal, introducing participants to another species alder tree (*Alnus*), as well as reiterating a species that they already came across in the cluster (salal).

Cluster 3

We added colour, photos and humour to this cluster to better engage participants in the educational information (see Appendix D).

- Oregon Grape Cache: We added the traditional uses of Oregon grape (*Mahonia aquifolium*) by BC First Nations.
- Wild Life (Tree) Multicache: We expanded upon this cache via the addition of a third cache in the Stages of Decay activity. Again, participants use the compass and their knowledge of level of decay to complete the cache.
- Ol’ Doug Cache: We placed the bonus map at the end of this cache and nestled it amongst two other Douglas firs (*Pseudotsuga menziesii*) to reiterate identification of the species.

- *Cluster 4*

We also added colour, photos and humour to this cluster (see Appendix E).

- Alder Cache: Additional information about the short life-span of alder trees (*Alnus*) was added to this cache.
- Oceanspray Cache: Information about deer and their preferred food source, oceanspray (*Holodiscus discolor*) was added.
- Cedar Cache: Traditional uses of Western red cedar (*Thuja plicata*) as well as the impacts of climate change were added. (Gray, Russell, Yanchuk & Hawkins, 2013). All of this information facilitates knowledge of species either ecologically, culturally, or as part of a broader process (i.e. climate change).
- Plantation Multicache: This cache was added by us to educate participants about the difference between a “natural” and a man-made forest for harvesting purposes. The bonus map is placed at the end of the cluster next to the plantation forest. Participants are asked to find an alder tree with the help of the compass to encourage their orienteering and species identification skills. They are also introduced to stinging nettle (*Urtica dioica*), a native yet hyper-abundant species, by being told to avoid it during the activity. The map is then found in an old feeding pen, paying homage to the history of the GCA property.

Conclusion

The benefits of connecting youth with nature are evident from the above discussion. With the widespread use of technology in the everyday lives of young people becoming increasingly prevalent, it is better to utilize technology as a bridge rather than a barrier to connect people to

nature. As a result we have enhanced the Educational Geocache Adventure Game to be more engaging and educationally informative through the addition of colours, pictures, games and humour. We have also provided suggestions for improving the game such as including actual nature artifacts into the geocaches, an experience not available through video games.

We hope that our efforts will help to promote public awareness about the GCA; provide a viable source of revenue for restoration and other project; and enhance the experience of geocaching participants and connect them to nature and place.

Acknowledgements

We would like to thank Eric Jacobsen, Education Coordinator for the Galiano Conservancy Association and creator of the Educational Geocache Adventure Game, for his support and encouragement throughout our project. We would also like to thank Julia Braun, GCA Summer Intern from Germany, for her expertise and help in creating the GIS map. And finally, we thank our professor and mentor, Dr. Eric Higgs, for his knowledge and passion for ecological restoration.

References

- Fournier, S. (2013, August 13). Galiano's land for re-creating and learning. *Island Tides*. Retrieved August 10, 2015 from http://islandtides.com/assets/reprint/parks_20130815.pdf
- Geocaching with school age children: Let the treasure hunting begin! (n.d.). Retrieved July 7, 2015 from <http://www.google.com/url?q=http%3A%2F>
- Gray, L. K., Russell, J. H., Yanchuk, A. D., & Hawkins, B. J. (2013). Predicting the risk of cedar leaf blight (*didymascella thujina*) in british columbia under future climate change. *Agricultural and Forest Meteorology*, 180, 152. doi:10.1016/j.agrformet.2013.04.023
- Higgs, E. s. (2003). *Nature by design: People, natural process, and ecological restoration*. Cambridge: MA: The MIT Press.
- Learning Centre: History. (2015). Retrieved July 17, 2015 from <http://galianoconservancy.ca/history>
- Louv, R. (2005). *Last child in the woods: Saving our children from nature deficit disorder*. New York, NY: Workman Publishing Company.
- Lubbock, J. (1895). *The use of life*. New York, NY: MacMillan and Co. Retrieved August 10, 2015 from <https://archive.org/details/uselife02lubbgoog>
- Maser, C., R.G. Anderson, K. Cromack Jr., J.T. Williams and R.E. Martin. 1979. Dead and down woody material. In J.W. Thomas (technical editor). *Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington*. USDA Forest Service Agricultural Handbook No. 553. pp.78-95.
- Our Mission. (2015). Retrieved July 17, 2015 from <http://galianoconservancy.ca/about-us>
- Teach Place-based Learning. (2015). Retrieved July 20, 2015 from <http://www.ecoliteracy.org/strategies/place-based-learning>
- Van den Noortgaete F. & De Tavernier, J. (2014). Affected by nature: A hermeneutical transformation of environmental ethics. *Journal of Religion & Science*, 49(3), 572–592. doi: 10.1111/zygo.12103

Appendices

Appendix A

Telus Finals Grant Application

Tell us how your program is innovative, i.e. how it is a new approach to an existing or emerging issue.

The use of technology by young people can be either an isolating or connective experience. This project uses the technological fascination and proficiencies of young people to connect them in meaningful ways to their environment through developing and delivering an educational navigation and geocaching adventure game for grade 3-12 students. Integrating the use of geospatial technologies with environmental education and sustainable technology content will introduce participants to options for using their technological proficiencies in real world contexts. Whether it be to share experiences of nature or pursue an interest in sustainable technology, GIS mapping and other careers that involve the intersection of technology and the environment. This program encourages participants to get outside, into nature, to build confidence around being outdoors and engage with community around sharing their experience with the potential to create lasting change in behavior, health and well being.

Program details

Please describe your program -- briefly tell us about your plans.

Please note that the requested written answer to this question is limited to a maximum of 2,000 characters (w spaces!)

The program will teach the use of technology “through the ages” starting with simple land-marking through map and compass orienteering and finally to using hand-held GPS technology. Along the way participants will find caches containing environmental education activities and sustainable technology based challenges that will serve as clues leading to increasingly sophisticated technology.

For example: map and compass orienteering teaches us about the cardinal directions, and how we represent large-scale areas on maps. Along the way participants have an opportunity to learn about the earth's electromagnetic field and are introduced to the idea of global scale systems. Orienteering leads the gamers to a cache of upgraded technology but even after being found, the GPS units need to be charged; a clue about photosynthesis leads them to find

a solar charging station. With knowledge of earth based technologies under their belts, they now are able to be guided by space-based information systems. With the help of modern technology they can move faster and further across the map leading finally to an expansive ridge overlooking the mountains and islands surrounding us. Here the students will play out the final challenges of the game, share their maps and discoveries, photos and videos and tell the stories of their experience.

In this project we will:

- Design, build and implement the geocache course
 - Develop detailed programming and logistics for both a single-day and a three-day program.
 - Deliver one three-day pilot program with an off-island youth group, who will camp at the Galiano Conservancy's Learning Centre
 - Deliver three one-day pilot programs: one with local school children, one with local families and one with an off island school group from Vancouver or Victoria
 - Conduct outreach to local youth organizations, as well as youth groups from surrounding Vancouver and Victoria.
 - Create an updated evaluation and feedback for or this program
-

Appendix B

Cluster 1 Geocache Sheets

Cluster 1-4: Mission Briefing Dossier

Welcome to Cluster 1.

The following are things you need to know:

Space is really far away.

Depending on how many SpAcE r0b0t friends (satellites) we have at any given time the coordinates will be more or less accurate. The GPS will get you in the vicinity but your knowledge of nature will find you the Cache!

All the coordinates of the points are on the species ID cards

This Cluster has a WayPoint that you will discover, this is a reference place that you will use more than once to guide you on your way.

Even if the GPS tells you it's up a cliff, you don't need to take a straight line, take the path, go around. Everything is accessible from near some kind of reasonable path.

Sometimes you just need to start over: put the coordinates in again and see if it makes more sense.

Your adventure begins at the...

SHORE PINE!!

E 0465156

N 4419833

WORD SCRAMBLE

— — — — —

Remember to collect a letter(s) at each cache location for your word scramble, it will be a word you learned on your journey! IF YOU DECIPHER THE WORD YOU WIN TOATALLY AWESOME STATUS!!!

Take note of your start time, like a real note, write it down.

Annnnnnnd Go!

Wow! You found the Shore Pine

WORD SCRAMBLE LETTER(S):

O

Did you know that the Shore pine cannot reproduce without a **fire** to open and release their seeds?! That is why there are so few here. Cool eh??!

Your next mission is to tackle a species invasion that the authorities are attempting to keep under control!

Rather than scrambling down the cliff, find the waypoint **COVESTONE** and then put in your coordinate for **PERRIWINKLE**. Keep heading down the hill and look for an overly abundant species.

COVESTONE

0465146 E

5419776 N

PERRIWINKLE

0465196 E

5419764 N



Wow! You found the **Pesky Periwinkle!**

WORD SCRAMBLE LETTER(S):

I

This species latin name is *Vinca Major*, MORE LIKE VINCA MAJOR PAIN IN THE BUTT!!!!

Restoration involves attempting to control or get rid of invasive species like this.

The authorities are attempting to **smother** and **kill** the periwinkle with these sheets of linoleum.

Your next mission is the Broadleaf Maple! Just keep heading down the hill and it should lead you right there! (If you start walking along the rocky shore, you've missed it!)



Look at those beautiful big leaves, lets go find them!!!

Boom! Broadleaf Maple

WORD SCRAMBLE LETTER(S):

T

Also Called Bigleaf Maple by those who take pleasure in being slightly more vague. Did you know that, like the **sugar maple of Eastern Canada, you can make maple syrup from this tree**, YUM!!! You just need more sap and it'll be a different syrup but the point is you can!

Your next mission is the Ninebark!!!!!!!!!!

NINEBARK!!

0465172 E

5419728 N



You might need to do some crawling for this one....



WORD SCRAMBLE LETTER(S):

N

Ahhhh, you crawled into this cave of vegetation and found the **Ninebark Cache!** When this drought-tolerant tree is in bloom it attracts birds, bees and butterflies!

Now pull your head out of the tree, silly! Its time for the Cove Multi Cache!

Ok, so how this works: there are 2 more caches hidden in the Cove area. You don't have to climb or go around the point even, though you should take a peek as its epic! Just Go West (W) young people and seek your treasure in tiny caves! The Clue is Tafoni... and the device known as a compass...



Tafoni Cache, the First!

WORD SCRAMBLE LETTER(S):

A

“Welcome to my humble cave abode. I, the hermit of the rock, live here by the rolling sea and will answer for you one question...”

There is one more Tafoni Cache out there, it is an optional bonus cache but I hear it has a special item in it.. Just saying.

Your next mission is Forest Fire Flame Brazed Douglas Fir. Please don't scramble up the cliff... go back the way you came and find it from the COVESTONE WayPoint. Take a minute to admire the view while your there.



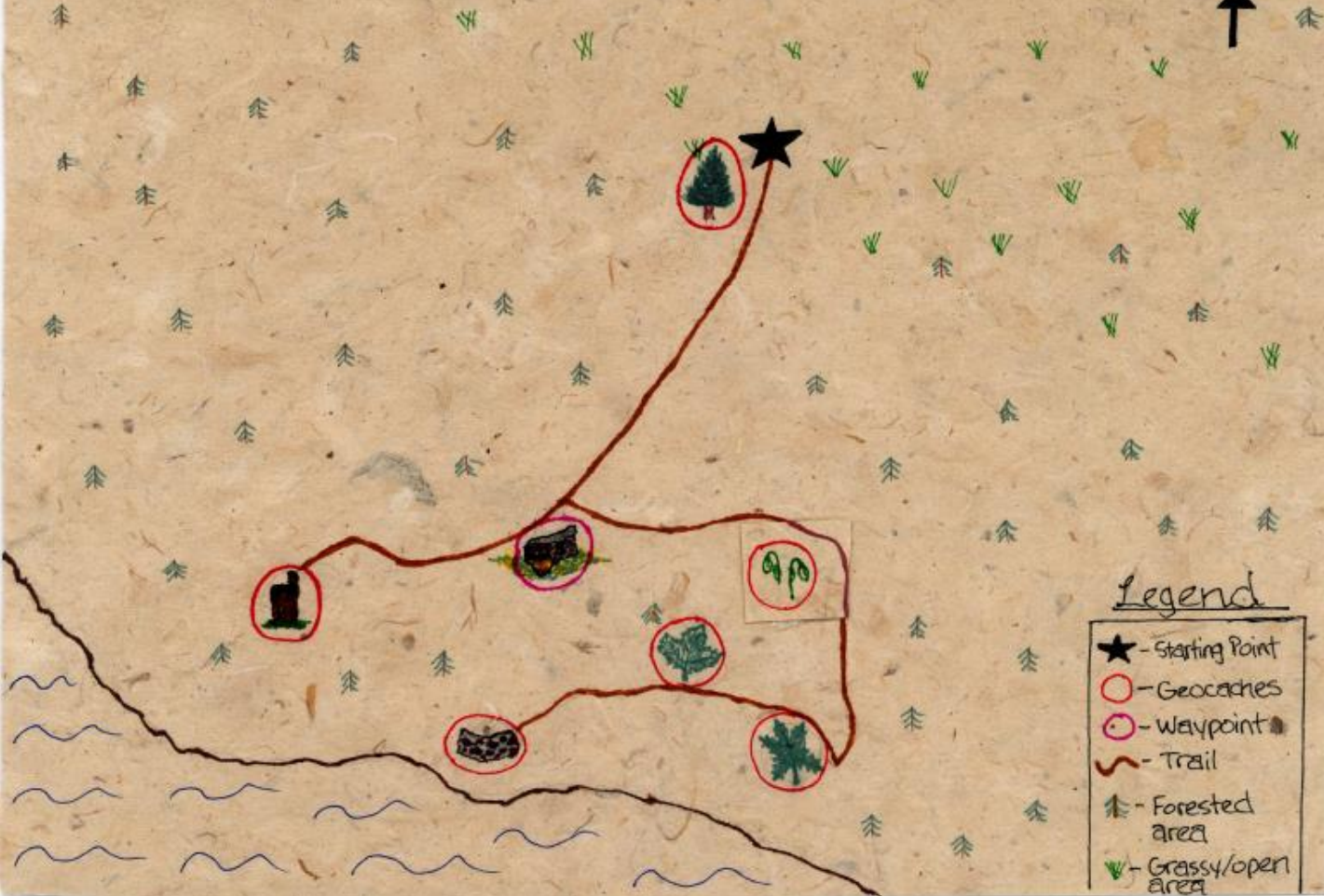
Fire Scorched Douglas Fir

E 0465095

N 5419769



Map of Cluster One



Legend

- ★ - Starting Point
- - Geocaches
- - Waypoint
- - Trail
- 🌲 - Forested area
- 🌱 - Grassy/open area

The Fire scorched Douglas Fir!

Lightly seared in a brush fire and served for your viewing pleasure on this beautiful cliff-side old-growth grove. COOL FACT, the thick bark on these trees protects them from low intensity fires!

This is your final cache....but before you get too excited you'll need to complete the multi cache!

GET OUT YOUR STAGES OF DECAY INFO SHEET



Now, walk to the twin scorched douglas firs and follow the “rocky road” (no not the ice-cream) to find the stage 7 decomposed stump.

Good Job, you found the first cache in this series!

Now with your back to the stump look out at the ocean and find the tree with this type of bark!



Appendix C

Cluster 2 Geocache Sheets

Cluster 2-3: Mission Briefing Dossier

Welcome to Cluster 2.

WORD SCRAMBLE

The following are things you need to know:

Space is really far away.

Depending on how many SpAcE RoBoT friends (satellites) we have at any given time (beep boop) the coordinates will be more or less accurate. The GPS will get you in the vicinity but your knowledge of nature will find you the Cache!

All the coordinates of the points are on the species ID cards or on in the caches. Write them down! Use the back of this paper if you like. Don't steal the papers from the Cache or trust the GPS, you may need to enter the coordinates again, and then you'd have to walk all the way back..This Cluster has a WayPoint that you will discover, this is a reference place that you will use more than once to guide you on your way.

Even if the GPS tells you it's up a cliff, you don't need to take a straight line, take the path, go around. Everything is accessible from near some kind of reasonable path.

Sometimes you just need to start over: put the coordinates in again and see if it makes more sense.

Remember to collect a letter(s) at each cache location for your word scramble! IF YOU DECIPHER THE WORD YOU WIN TOATALLY AWESOME STATUS!!!

Your adventure begins at:

EVERGREEN HUCKLEBERRY

E 0464972

N 5419887

Hint:

If you start heading downhill you've gone to far!!!!

WORD SCRAMBLE LETTER(S):

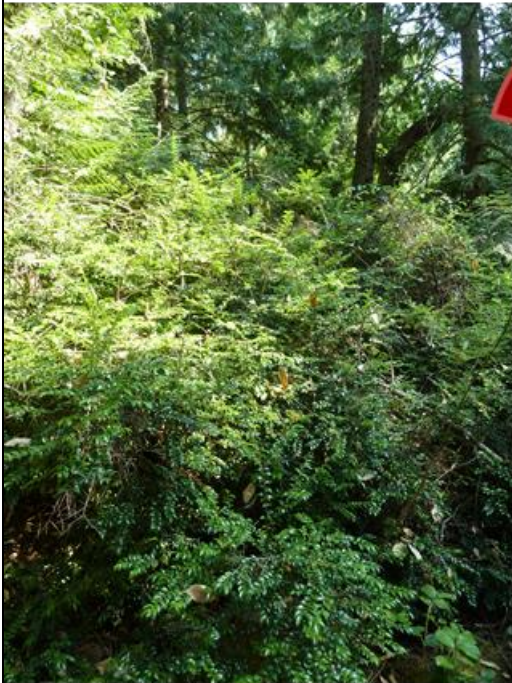
Oh Hi there,

B S

You have found the **Evergreen Huckleberry!** This delicious berry is ripe late in the season (Oct – Nov) when little else is around making it a great plant to know! It is easy to find as it keeps its leaves all year round. The best spots for berries are where the shrub gets lots of sun.

Your Next Mission, should you choose to accept it, is the Arbutus tree known as Archbutus! (fun fact: when you stick the start of one word onto the end of another it's called a portmanteau: "Port-man-toe")

Take a look at this bark/
leaves to help you identify
ArchButus



ArchButus
E 0464896
N 5419878

Is it a tree? Or a portal to another world? Need we choose?



WORD SCRAMBLE LETTER(S):

T R

Step through the Arch(butus) if you dare...
make a noise like your travelling through time...
(I like "wawawwawawaawaaaa")

Does the world seem a little different. Is there a strange new sheen on things as if we are looking through an instagram filter? Maybe the laws of physics as we knew them don't quite apply... (but do be careful, gravity still seems quite strong)

Did you know that the **Arbutus tree is the only native broadleaf evergreen tree in Canada!?**

But time to stop fooling around! This is the ArchButus Multi Cache!

To find the rest of your coordinates look for two stumps sprouting new life with Salal!



Gnarly Douglas Fir

0464927 E

54198YZ N

$$Y = 3$$

$$Z = 7$$

Gnarly Dude! Look at this Old-Growth Doug Fir!

WORD SCRAMBLE LETTER(S):

A

It's seen a thing or two... or at least evapo-transpired while said things transpired.

What's that Doug... You've got a multi-cache for us?! It involves using the compass to find caches each of which will give us the directions to find other caches for a total of 2? And every direction should be taken standing with our back to you while looking toward the ocean? The first one is a **class 4 decomposing log** to the **South West**? What did you say? Oh.. Stay away from the Cliff?

Was that really the tree talking or just the wind?

Good job, you found the class 4 decomposing log!

Now Go back to Doug the Gnarly

And find the stage 6 decaying stump to the **West!**

**And you Found it! Amazing! So next move
is to the Last Cache of the cluster!**

**Hawthorn!
E 0465008
N 5419973**



Hey You,

WORD SCRAMBLE LETTER(S):

U U

Did you know, that the English Hawthorn tree is an up and coming invasive tree species! It takes over open grassland habitats and blocks out native species... But not to be a downer, this is your last cache! You did it!

Now if you're feeling ambitious, find the bonus cache (map of next cluster)! To do this get out your **compass** and head **SW** to the Alder trees amongst the salal....good luck!

What is your scrambled word in your word scramble?

How long did this cluster take you??

Name(s)	Date	Cluster Time (mins)

Find your Way, brave soul back to the

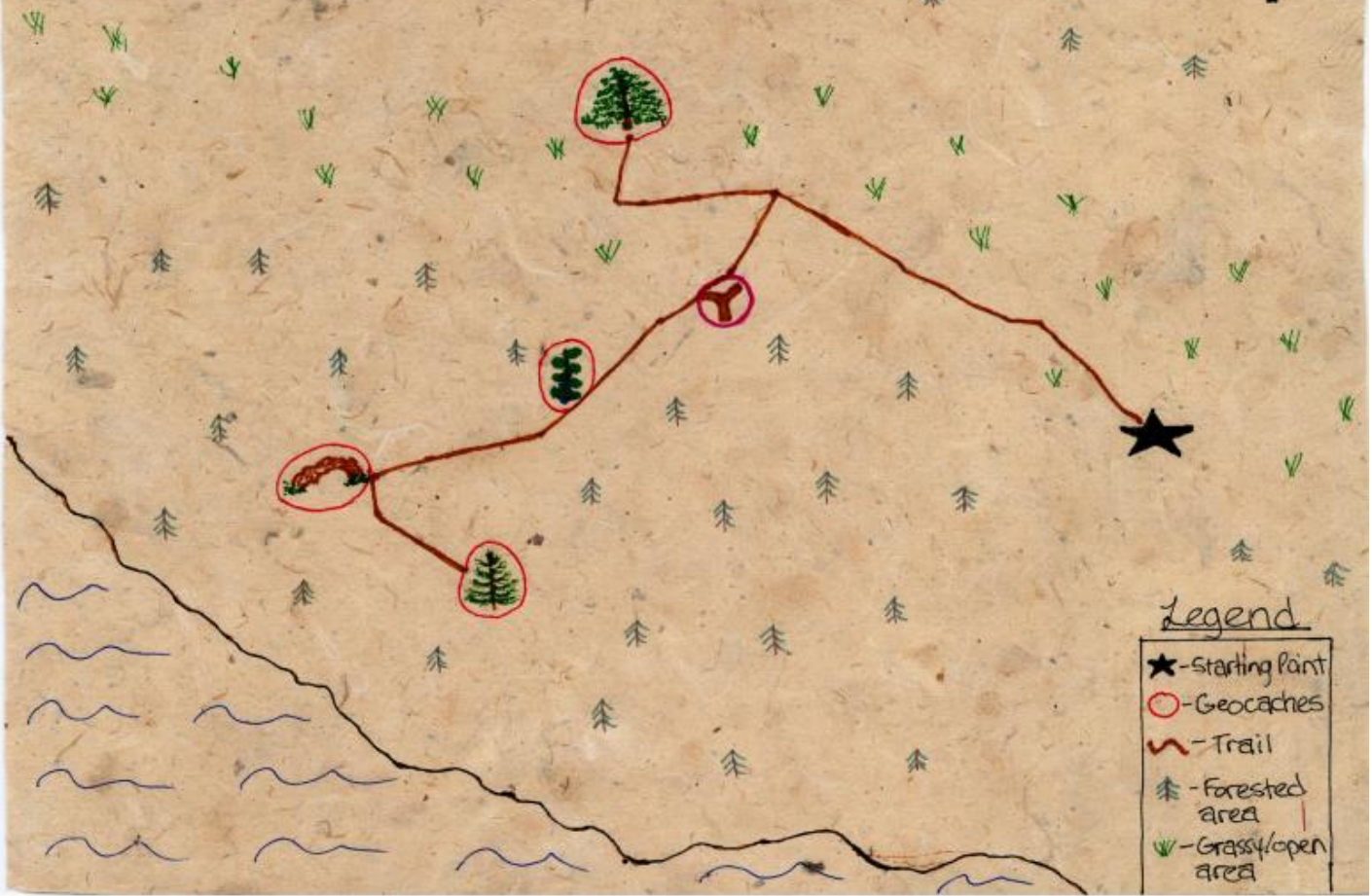
THE JUNCTION WayPoint

0465025 E

5419916 N

Start your next cluster or just walk back to where we started if your done!

Map of cluster Two



Appendix D

Cluster 3 Geocache Sheets

Cluster 3-4: Mission Briefing Dossier

Welcome to Cluster 3.

The following are things you need to know:

WORD SCRAMBLE

— — — — —

Space is really far away.

Depending on how many SpAcE r0b0t friends (satellites) we have at any given time the coordinates will be more or less accurate. The GPS will get you in the vicinity but your knowledge of nature will find you the Cache!

All the coordinates of the points are on the species ID cards or on in the caches.

This Cluster has a WayPoint that you will discover, this is a reference place that you will use more than once to guide you on your way.

Even if the GPS tells you it's up a cliff, you don't need to take a straight line, take the path, go around. Everything is accessible from near some kind of reasonable path. Sometimes you just need to start over: put the coordinates in again and see if it makes more sense.

Remember to collect a letter(s) at each cache location for your word scramble; it will be a word you learned on your journey! If you decipher the word you win totally awesome status!!

Your adventure begins at the Oregon Grape Patch!! (with a few bald hip roses). You will find the patch near a rock wall...

Hit WayPoint COVESTONE, follow the trail but don't go down into the cove; look for a path on your left instead.

COVESTONE

0465146 E

5419776 N

Oregon Grape Patch

E 0465341

N 5419649

Well that's pretty neat!

WORD SCRAMBLE LETTER(S):

A

You found the Oregon Grape Patch Cache! First of cluster 3...

Oregon grape was a traditional food source for a number of BC First Nations, though the berries are quite tart! The bark, wood and roots were (and still are) also used for medicinal purposes.

You are on a good start to a grand adventure! You are a team now and now you need a catch phrase, but don't think too much about it, just go with what comes out..

Name(s)	Date	Team Catch Phrase

Your next Cache is

The plant known as SALAL!

SALAL
E 0465435
N 5419616



It's so common, and yet so beautiful, like so much of life if you look at it the right way..

This is it, the Salal Patch!!

WORD SCRAMBLE LETTER(S):

L

Did you know that Salal thrives so well because the deer can't digest it? If it weren't for deer, there would be much more diversity and probably a lot less Salal...



So let's just keep this going! Your next mission is a stump near..

Ridge WayPoint 1

E 0465341

N 5419649

Write this one down.. You may need it again..

You Found the Stump!



WORD SCRAMBLE LETTER(S):

A

If you are reading this, I'm already transformed into a vine... I have probably been a honeysuckle vine for some years now. Ack, I can feel the transformation happening even as I write, the urge to climb things, my thoughts becoming strangely elongated, wandering, winding, climbing...

Find me, see what I have become..

Honey Suckle!

E 0465413

N 5419606

Well Hello,

WORD SCRAMBLE LETTER(S):

L

I am now a vine and it's actually a pretty sweet life. Really, it's very relaxing.

Did you know that you can suck the ends of my flowers for a little sweet treat? That I'm a favorite stopping point for humming birds and that I can be used to make cordage like rope and stuff?



If you could be a plant, what plant would you be? Go on, write it down!

Name	Plant you would be

Your Next Mission is:

It's a Wild Life! (tree)
E 0465435
N 5419577

It's a Wild Life (tree) Indeed! I mean from birds, to insects to fungi, I am a hotspot of diversity!

I'm also a Multi Cache!

Bonus Level Unlocked! *Dramatic unlocking sounds*

<<< ___ **----The Stages of Decay!----**** ___ >>>**

Ok, once we have regained our composure, use the adrenaline rush to figure this out!

Take a look at the stages of decay info. With your back to the cache tree and your face looking at the ocean (no fancy yoga moves now), get out your compass and find a **Class 3 Decomposing Log in the Direction of South East! It wont be that far away.**

Well would you just look at that?!

You found the class 3 decomposing log!

Onwards and upwards! Head back to the Wild Life tree, and with your back still to the tree, find the **Class 5 Decomposing Log to the North!**

Hey you found it!

Now for your final Stage of Decay challenge, go back to the Wild Life Tree and find the **Class 2 Decomposing Log to the East!**

Well done! You can tell it's a **Class 2 Decomposing Log** because of the way that it is!



(But seriously though, you can see that some of the bark is loose on this log and the texture starting to soften, differentiating it from a Class 1 decomposing log).

Your next mission is **Ol' Doug...** a heritage fellow of a Douglas Fir.

Ol' Doug
E 0465292
N 5419683

**Look at this majestic
giant,**

WORD SCRAMBLE LETTER(S):

S

wind torn and fire scorched, rotting away from the inside. This is the great-grandparent of many of the trees around. Hundreds of years old, a true old growth tree.

How long did this cluster take you??

Name(s)	Date	Cluster Time (mins)



Did you figure out the word scramble?

Now if you're feeling ambitious, find the bonus cache (map of next cluster) nestled amongst two healthy Douglas firs and some mossy rocks!

Or simply head back to the COVESTONE WayPoint and then either go to your next cluster or just go to the End..

EndPoint!

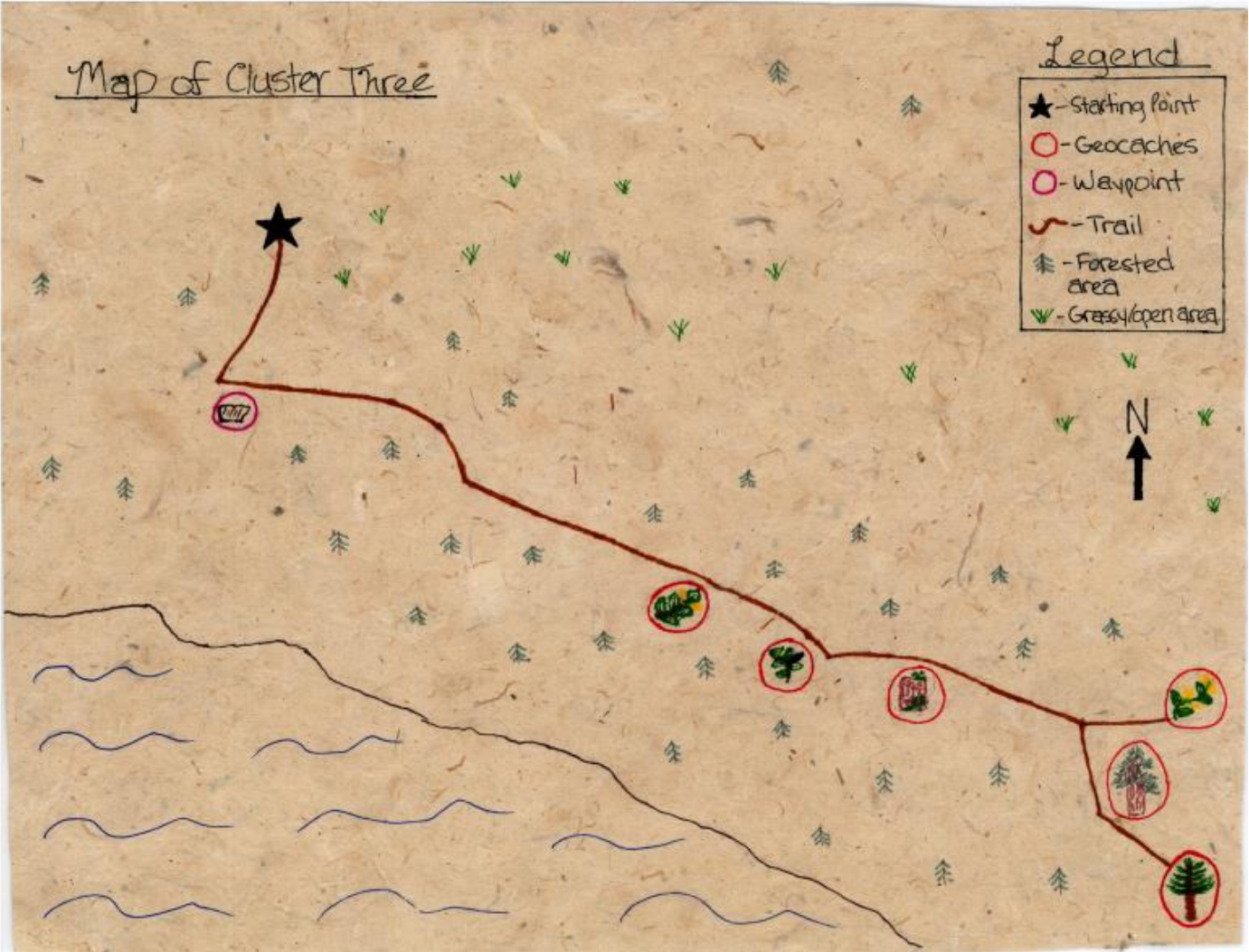
E 0465162

N 451985

Map of Cluster Three

Legend

- ★ - Starting point
- - Geocaches
- - Waypoint
- - Trail
- 🌲 - Forested area
- 🌱 - Grassy/open area



Appendix E

Cluster 4 Geocache Sheets

Cluster 4-2: Mission Briefing Dossier

WORD SCRAMBLE

Welcome to Cluster 4.

The following are things you need to know:

Space is really far away.

Depending on how many SpAcE RoBoT friends (satellites) we have at any given time (beep boop) the coordinates will be more or less accurate. The GPS will get you in the vicinity but your knowledge of nature will find you the Cache!

All the coordinates of the points are on the species ID cards or on in the caches. Write them down! Use the back of this paper if you like. Don't steal the papers from the Cache or trust the GPS, you may need to enter the coordinates again, and then you'd have to walk all the way back..

This Cluster has a WayPoint that you will discover, this is a reference place that you will use more than once to guide you on your way.

Even if the GPS tells you it's up a cliff, you don't need to take a straight line, take the path, go around. Everything is accessible from near some kind of reasonable path.

Sometimes you just need to start over: put the coordinates in again and see if it makes more sense.

Hit WayPoint CABLEHOUSE, and then find Red Alder. Along the way take in some of the heritage of this place. It's called the cablehouse because it appears to be held up in the back by a single cable... For obvious reasons please just look from afar.

Remember to collect a letter(s) at each cache location for your word scramble, it will be a word you learned on your journey! IF YOU DECIPHER THE WORD YOU WIN TOATALLY AWESOME STATUS!!!

WayPoint CABLEHOUSE

E 0465289

N 5419946

Your First Cache is...

Red Alder

E 0465212

N 5420023

Ain't She a Bute?

WORD SCRAMBLE LETTER(S):

P S

Look up, look wayyy up! You'll see that the top of the tree is dying. But that's ok because it will eventually fall over and feed the forest floor.

Red Alder are often the **first species to colonize an area after disturbance** like a tree falling or a fire. Species like this are called "early successional".

Red Alder grow fast and die young, most only reaching around 40 years old.



Welcome to this adventure, its nice to meet you.
What's your name?

Name(s)	Date

Sooooooo, your next step on this adventure is..

Oceanspray!
E 0465105
N 5420024



It's a bit of a choose your own adventure; You could go back toward WayPoint CABLEHOUSE and find the junction of the old road or, you could bushwack a bit until you find the old road.

Hey! Ya found it!

WORD SCRAMBLE LETTER(S):

O N

Do you know why oceanspray have this strange umbrella shape?? Its because deer enjoy eating this plant as a tasty treat! They cant reach it after a certain height so it develop s this strange shape.



And what a find indeed! You see that Big Grandpa Douglas fir just up the hill there? See all that sap? It's a response to an insect attack. Take a look and see who's getting in there.

While you're at it lets check out a few more of these epic old trees with the....

!!!Hill of Giants MultiCache!!!

Hidden Below 3 of these big trees are MiniCaches that each contain a letter and a number. Collect these to decipher your next coordinates!

Once you've figured it out Return to the Ocean Spray and head off to the

Cedar Cache!

E 0464965

N 5420XYZ



$$X = 0$$

$$Y = 9$$

$$Z = 4$$

Good Job!

WORD SCRAMBLE LETTER(S):

R C

These are some nice old Cedar trees. Cedars, called the “Tree of Life” by First Nations are a very useful tree. Used to make canoes, tools and even clothing!

Did you know that because of high temperatures related to climate change, cedars are starting to suffer from cedar leaf blight which eventually kills them....isn't that sad :(



Your next Mission, if you choose to accept it is to find the Yerba Buena!

Yerba Buena

E 0464883

N 5420092



You Did it! This is what you've been looking for

WORD SCRAMBLE LETTER(S):

E A

Yerba Buena, "Good Herb" is so named because it smells nice and can be used to make a pleasant tea. Squish up a leaf with you fingers and smell it. Mmmm...

Now for your next mission, you're headed to an area that has been affected by human activity. This forest did not grow on its own, it was planted to be harvested for timber!



Lets go find it!

Plantation Forest

E 465196

N 5419764



You've reached your final destination! This is a plantation forest planted by a logging company that once use to own this land!

WORD SCRAMBLE LETTER(S):

This is the last cache of this Cluster! Now if you're feeling ambitious, find the bonus cache (map of next cluster)

Or simply head back to the JUNCTION WayPoint and then either go to your next cluster or just go to the End. (Next cluster info on mission briefing sheet)

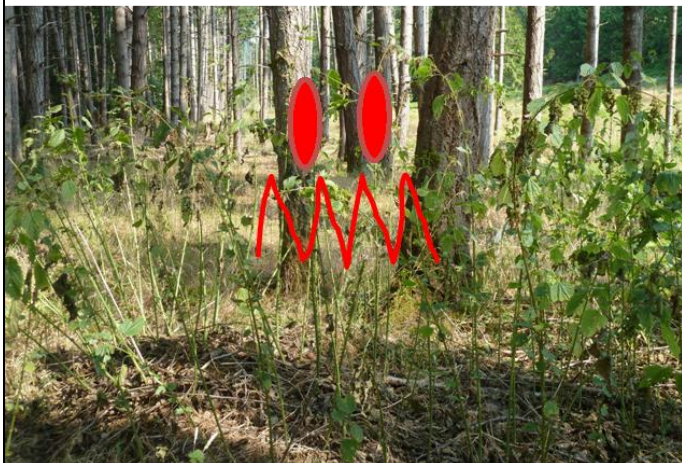
How long did that take you??

What is your word in the word scramble?

Name(s)	Date	Cluster Time (mins)

For a bonus take out your compass and head to the middle of the path. Head **East toward the Alder tree that looks "unnatural" in this "unnatural forest." Ironic eh?**

Watch out for the **STINGING NETTLE, a native yet hyper-abundant species!**



THE JUNCTION WayPoint
0465025 E

EndPoint!
E 0465162

You found the Alder!

Now find the entrance to the feeding pen where you'll find a bonus to help you visualize the next cluster!

Map of Cluster Four

- Legend
- ★ - Starting Point
 - - Geocaches
 - - Waypoints
 - ~ - Trail
 - 🌲 - Forested Area
 - 🌱 - Grassy/open Area



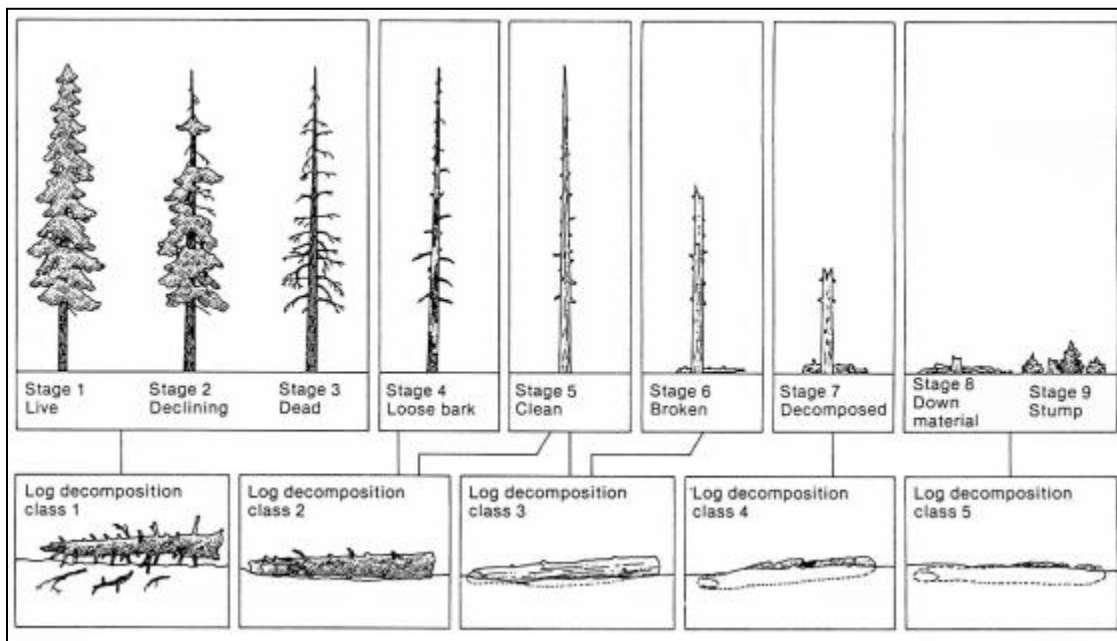
Appendix F

Stages of Decay Info Sheet

Stages of Decay Info Sheet

'Decay' and 'decomposition' may sound undesirable, but in the forest they're actually very important processes! Coarse woody debris, as it's termed once trees or parts of trees die and fall to the forest floor, is important for nutrient and mineral cycling, natural forest regeneration, and habitat for wildlife.

The image below portrays both standing tree decay and log decomposition stages/classes. Depending on the decay stage of the tree when it fell, the resulting log would automatically enter a certain decomposition class.



The following table by Maser *et al.* (1979) will help you decide how to classify logs from the geocache clusters:

Table 1-A 5-class system of log decomposition based upon work done on Douglas fir (reproduced from Maser et al. 1979, Table 20, p.80)

Log characteristics	Log decomposition class				
	1	2	3	4	5
Bark	intact	intact	trace	absent	absent
Twigs <3cm (1.18 in)	present	absent	absent	absent	absent
Texture	intact	intact to partly soft	hard, large pieces	small, soft blocky pieces	soft and powdery
Shape	round	round	round	round to oval	oval
Color of Wood	original color	original color	original color to faded	light brown to faded brown or yellowish	faded to light yellow or gray
Portion of log on ground	log elevated on support points	log elevated on support points but sagging slightly	log is sagging near ground	all of log on ground	all of log on ground