Restoration of *Tricholoma magnivelare* (Pine mushrooms) in the second growth forests of Jordan River, Vancouver Island, British Columbia, Canada.

University of Victoria

Restoration of Natural Systems

Prepared: DEC 7/2005

Prepared for: Don Eastman and Val Schaefer

ER 390 Core Project

Prepared by: Jeff Brown

Student #: 0338589
Abstract

The purpose of this restoration report is to restore patches of *Tricholoma magnivelare* in the second growth forests of Vancouver Island through an inoculation process. The second growth forests of Jordon River will be inoculated with mycelium from the mushroom species *T. magnivelare*. An inoculum mycelium will be developed through a natural process of decomposition. The inoculum will be a mycelium distinct to *T. magnivelare*. An inoculation procedure will be developed through the experimental trials of this report.

The mushroom species *T. magnivelare* is evident within the first growth forests surrounding Jordon River. It can be concluded that the mushroom species *T. magnivelare* once grew in the first growth Douglas-Fir forests of Jordon River. Present patches of *T. magnivelare* fruiting in Jordon River support this conclusion.

Introduction

*T. magnivelare* mycelium has been disturbed through the process of logging in Jordan River on Vancouver Island. The disturbance of the *T. magnivelare* mycelium has resulted in *T. magnivelare* nearly becoming extinct in this area. Mycelium, a key component to the fruiting of *T. magnivelare*, has been lost due to clear-cut logging in Jordan River. When a forested area has been clear cut the *T. magnivelare* mycelium within the forest floor is disturbed because of the disturbance in the mushroom species environment. Increase in temperature caused by sun exposure and loss of tree canopy cover. This is clearly evident when a location that produced *T. magnivelare* is logged and no longer produces mushrooms.

The mushroom species *T. magnivelare* is an important factor for forest health. "Mushrooms contribute phosphorus and confer other ecological benefits to the riparian and forest ecosystems. Mushrooms become launching platforms for explosive growth of bacteria populations, many of which are critical for plant health. Mushrooms have a pre selecting influence on the bacteria sharing their habitat." (Tornberg et al.2003) Bacteria
beneficial to trees regulate inputs and outputs of nitrogen and are phosphorus limited.” (Stamets Paul 2005).

When the clear cut area grows through the growth of natural seedlings or plantations, *T. magnivelare* will not grow as rigorously until the mycelium has been re-established. "Mycelium absorbs phosphorus from its surroundings moving these mineral salts distances, and later releases this mineral when mushrooms rot or the mycelium dies. Fungal decomposing bacteria then absorb the phosphorus. As the mushrooms rot, the ecosystem benefits from the cycling of essential minerals in which the bacteria allow phosphorous, zinc, potassium and other minerals to be re deposited back into the nutritional bank." (Stamets Paul .2005)

*T. magnivelare* will benefit animals. It has been observed that deer, bear, and squirrel consume *Tricholoma magnivelare*. "A variety of animals consume matsutake. It is an important food source for wildlife including squirrels, deer, elk, and bear” (Hosford D., Pilz D., Molina R., Amaranthus M., 1997).

This restoration report is a component to ER-390 Core project, Restoration of Natural Systems University of Victoria.

Natural History of Tricholoma Magnivelare

It is in my opinion that carbon is a contributing factor to the growth of *T. magnivelare*. It is in my opinion that the mushroom species *T. magnivelare* grows as a result of a fire that engulfed all of Vancouver Island 300 years ago. The evidence of this is natural fruiting of *T. magnivelare* occurs in old growth Douglas - Fir forests that have evidence of the fire that occurred 300 years ago. This evidence is supported by physical observations of black carbon on the surface of Douglas - fir trees. Upon site excavation of natural patches of *T. magnivelare* further evidence of the fire can be seen in soil regimes. A fine layer of ash is present between humus layers and soils.

First Nations used *T. magnivelare* as a food and medicinal source” Pine Mushrooms and the related cottonwood mushroom (*Tricholoma populinum*) have been used by the
Interior Salish, Thompson and Lilloet, First Nation people as a food source.” (British Columbia Non Timber Forest Products, Pg3)

http://bemushrooms.forrrex.org/ntfp/pages/trichomagniv/trichomagniv_syn.htm

The mushroom species T. magnivelare has changed names as a result of changes in the knowledge of the mushroom species T. magnivelare and its environment. “The name of Tricholoma Magnivelare was obtained through the succession of its former name Armirilla Ponderosa. You may have learned this mushroom as Armillaria ponderosa but is certainly not an Armillaria. One important character that makes Armillaria ponderosa an incorrect name is that the fungus is mycorrhizal not a wood decay fungus, as Armillaria is defined.” (Volf Tom, Sept 2000)

“We know this mushroom belongs in the genus Tricholoma (at least for now) since it has notched (adnexed) gills, white spores and mycorrhizal.” (Volf, Tom Sept 2000)

**Methods**

A natural process of inoculation has been chosen to restore T. magnivelare to the second growth forests of Jordan River on Vancouver Island. The species T. magnivelare was harvested in first growth locations in the Sooke foothills to initiate the inoculation process of second growth forests in Jordan River.

Approximately 50 pounds (2 five gallon buckets full) of T. magnivelare was harvested in the Sooke foothills in the month of October 2004. The mushrooms were stored in two plastic 5-gallon containers. The containers were placed outside (partial shading), not covered. A natural decomposition process was initiated. During the decomposition process it was discovered that a fungus similar to the web found between stalk and cap of T. magnivelare was discovered. The fungus is also similar to mycelium in growth, this discovery is important because of the possibility of the decomposition process is responsible for the future of the mycelium culture that produces T. magnivelare.

“(Tricholoma Magnivelare) mycelia” (Stamets Paul 2000)

Decomposing mushrooms in clumps were placed within plot locations in the second growth Douglas -Fir forests in Jordan River within close proximity to where
T.magnivelare was discovered growing naturally. Decomposed Mushrooms were placed within 25 to 200 Meters of where T.magnivelare was found growing naturally.

Plot Areas

A series of plot areas were used in Jordan River with the use of the decomposing T.magnivelare. Decomposing T.magnivelare was mixed into the soil forest floor. 5 individual 1m x 1m plot areas were used to determine if mixing decomposing T.magnivelare is a successful way to initiate the fruiting of T.magnivelare. Soil regimes were modified on the first two test plots to determine if increased clay based soils are a contributing factors to the fruiting of T.magnivelare. Approximately 2 pounds of clay was used on each of the first two test plots. Plots were modified to 50% clay and 50% soil. Soils were changed to a “Sandy Clay” soil texture. (British Columbia, 1998). The modification of soil regimes was created because of a discovery in 2004 where a patch of “Lobster mushrooms Hypomyces Lactifluorum” (Williamson, B.L., 2002) was found in soils with a high clay concentrate. The third test plot was modified with nitrogen to determine if increased nitrogen will influence T.magnivelare. Approximately 2 liters of water mixed with kelp fertilizer was mixed in the third plot. Approximately nine pounds of decomposing T.magnivelare were used on each 1m x 1m plot area.

A series of 10 10cm x 10cm test sites were established using decomposing T.magnivelare. Decomposing T.magnivelare was placed in the 10 10cm x 10cm test sites. Smaller quantities of decomposing T.magnivelare were used. Approximately one half pound of T.magnivelare were placed in the 10 10cm x 10cm specific areas.

The 15 plot areas are located at approximately 200 meters on the West Side of desolation creek. The first 10 plots stretch from approximately 200 meters to 250 meters. The 5 plot areas are located at approximately 300 meters. All inoculation plots are marked with green tape.

Results

It is expected that fruiting of T.magnivelare will not be seen until September – October 2005 and onwards. An eleven month time period will be required to allow the mycelium to spread through soils. A monitor’s guide will have to be established to determine if any
fruiting occurs through this inoculation process. It should be noted that results of the experiment could result in fruiting locations 10 meters away from inoculation areas. The possibility of patches of *T. magnivelare* fruiting 10 meters away is based on the concept that the mycelium distinct to *T. magnivelare* will spread in length. To what length the mycelium of *T. magnivelare* will spread under the ground is unknown. It is in my opinion the distance of the mycelium growing will be limited from road fragmentation. Inoculation patches revealed that mycelium over disturbed patches had re established with the growth of “Red-Juice Tooth *Hydellum Pecki*” (Knopf Alfred A, 1981) There was no evidence of *T. magnivelare* in the restoration project in the year 2005.

**Environmental Conditions**


- Dominant tree species in both polygon areas are *Pseudotsuga menziesii*, *Tsuga heterophylla*, and *Thuja plicata*. Average tree density is approximately 1200 stems per hectare, based on 3.99m circular plots taken. Diameter at breast height (dbh) of the average tree in both polygon areas was 1.45m.
- Humus form can be identified as a moder form.
- The forest floor through visual observation and soil plots observed the following: L, F, and H layers were prominent – L layer 2mm, H layer 1.8cm. – F horizon was loose and friable – fungal mycelium was less abundant – a rich potting soil smell was evident – a thin Ah horizon was present. Humus Form Types – *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* #28 p.269
- Soil moisture regime – Both polygons revealed a 5 (very moist to wet) in the Key to Relative Soil Moisture Regime – *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* #28 p.274
Soil Nutrient Regime – Soils in both polygons revealed a soil nutrient regime of a medium I.S.G. #2 in the *Key to Relative Soil Nutrient Regime* #28 p.278

Soil test through moist cast test revealed soils in polygons 1 and 2 of a sandy clay loam. *Key to Hand Texturing Soil—A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* #28 p.272

Site series classification polygon 1 – 04 Fd – Sword Fern
  - SMR revealed soil moisture regime of (0.5 to 2.5)very dry to moderately dry – SNR revealed medium to very rich C-E

Site series classification polygon 2 – 01HwFd - Kindbergia
  - SMR revealed moderately dry to fresh (2.5 to 4.5) – SNR revealed very poor to medium A-C

It can be concluded that any soil moisture regime between the two polygons is 2.5 moderately dry. An average nutrient regime of medium to rich.

Vegetation table site series on p106 was consistent with field forms pertaining to *Polystichum munitum* and *Mahonia nervosa*

Polygon 1 revealed soils of sandy clay loam – moist cast test – strong cast (easily handled 30% to 40% clay)

Polygon 2 revealed sandy clay loam – moist cast test – strong cast (very easily handled 30% to 40% clay)

The above environmental conditions were listed to describe the environmental conditions that surround the restoration project. This is essential to the creation of an artificial environment to test the inoculation procedures.

**Discussion**

Based on my 15 years of experience picking *T.magnivelare*, *T.magnivelare* prefers to fruit in first growth forests rather than second growth forests. With first growth forests shrinking and second growth forests increasing the inoculation of second growth forests of *T.magnivelare* is a benefit to the forest and mushroom industry at large. A new industry of inoculating second growth forests with *T.magnivelare* mycelia and the harvesting of *T.magnivelare* in second growth forests could become an emerging industry.
*T. magnivelare* will benefit animals. It has been observed that deer, bear, and squirrel consume *T. magnivelare*. "A variety of animals consume matsutake. It is an important food source for wildlife including squirrels, deer, elk, and bear" (Hosford D.; Pitl D.; Molina R; Amaranthus M., 1997).

Restoring mushrooms is a special challenge because the creation of mushrooms is extremely complex. With there being many different factors influencing the creation of mushrooms the scientific understanding of them is difficult. "This is the reason no one has been capable of fruiting *T. magnivelare.*" (Stamets, 2005) With clear cutting and the disturbance of the environment in which mushrooms coexist. The ability to restore a mushroom species is extremely difficult because the mushroom species environment has been altered.

It is in my opinion that the mushroom species *T. magnivelare* fruits as a result of a mycelium unique to the species *T. magnivelare*. The *T. magnivelare* is unique to itself because the *T. magnivelare* mycelium carries the spore of *T. magnivelare*. This *T. magnivelare* mycelium interacts with existing mycelium under the forest floor. The already existing mycelium under the forest floor transports essential minerals nitrogen and phosphorous. The combination of the two mycelium's creates the fruiting of fungus that is *T. magnivelare.*" The spore and initial hyphae are haploid, that is, they contain only one copy of each chromosome. When a haploid mycelium meets another haploid mycelium of the same species, and they are sexually compatible the two mycelia join together and each cell receives a nucleus from the other mycelium. This process is called diploidization." [http://www.ilmvco.gen.chicago.il.us/Terms/mycel137.html](http://www.ilmvco.gen.chicago.il.us/Terms/mycel137.html)

It is in my opinion that clay particles are an essential component to the soil regimes of *T. magnivelare*. "Clay particles bind phosphorous and nitrogen when exposed to an increase in ions or static charge"(Schaefer Val). This ion activity is created during a rain storm."On a heavy rain day there are 270 more negative ions per cc than positive ions" (United Dynamics Corp) [http://www.superforce.com/Press-Releases/press-release-Ions-Threaten-Stock-Market-Fundamentals.htm](http://www.superforce.com/Press-Releases/press-release-Ions-Threaten-Stock-Market-Fundamentals.htm)
When the ions disperse the clay particles release essential nitrogen and phosphorous. When nitrogen and phosphorous are released they are transported in increased quantities. These increased quantities interact with the *T. magnivelare* mycelium. Once the interaction commences *T. magnivelare* fruits.

The ion theory of stimulating the growth of mycelium is supported by the consistent discovery of increased quantities of *T. magnivelare* during full moons.”high positive ion concentrations in the air are associated with the full moon” (United Dynamics Corp) [http://www.policeops.com/full-moon-ion-effect.htm](http://www.policeops.com/full-moon-ion-effect.htm)

This observation is supported by fifteen years of natural harvesting of *T. magnivelare* by restorationist Jeffrey A Brown. It is possible the mycelium of *T. magnivelare* is stimulated from the effects of increased ion activity from the earth’s magnetic field. The magnetic field surrounding the earth is stronger in certain positions during full moon periods.”

Raining down on this electromagnetic shield are ions of both solar and galactic origin. Some 85% of these ions are protons, the nuclei of hydrogen atoms. About 13% are nuclei of helium, known as alpha particles, our next most common atom. The remaining 2% is composed of the nuclei of heavier atoms including oxygen, nitrogen and iron, all traveling at tremendous speeds and known as the "heavies". Those of galactic origin have been brought to near light speed by powerful events such as supernovae and have energy levels some 10,000 times those of solar origin.”(Graveline, Duane Doc) [http://www.spacedoc.net/retinal_flashes.html](http://www.spacedoc.net/retinal_flashes.html)

It should be noted that *T. magnivelare* was discovered in the year (2000) of low precipitation in the Sooke area. It is possible that positive ions stimulated the *T. magnivelare* mycelium from solar winds.”The solar wind contains both ions (protons and heavier nuclei)”(Christian, Eric) [http://helios.gsfc.nasa.gov/qa_cr.html#swelec](http://helios.gsfc.nasa.gov/qa_cr.html#swelec) Communication with *T. magnivelare* buying stations revealed that the *T. magnivelare* in Sooke was the only harvest in North America.

When harvesting *T. magnivelare* from locations in the Sooke foothills, soil layers are consistently dry upon site excavation. A harvester can conclude that it is not necessarily the rain that produces *T. magnivelare* it is the ions associated with the rain that stimulate the mycelium unique to *T. magnivelare.*
It can be concluded that positive and negative ions are responsible for the stimulation of the mycelium distinct to *T. magnivelare*. The stimulation of *T. magnivelare* mycelium through positive and negative ion activity is responsible for the fruiting of *T. magnivelare*.

When mycelium is blocked from a natural object i.e.: a rock, the mycelium of *T. magnivelare* will expand under the correct environmental conditions and the mushroom will fruit. These environmental conditions include: slope, aspect, elevation, humidity, tree canopy cover, natural plants, soil regimes, moisture, temperature, static charge or negative ions, and precipitation.

Hence this is why the mushroom species *T. magnivelare* is difficult to create because of the number of perfect environmental conditions the mushroom species needs in order to fruit. It should be noted that the mycelium created by Jeffrey A Brown is in the University of Victoria Biology Department. Additional mycelium can be developed through decomposing *T. magnivelare*.

**Recommendations**

I recommend that the mycelium of *T. magnivelare* be developed on a large scale through the biology department at the University of Victoria. To increase further study of the inoculation process in second growth forests on Vancouver Island." Monitoring (baseline inventories repeated over time) is essential to detect trends and correlate productivity with habitat, forest management activities, and environmental conditions." (Emery M.R., McLain E., 2001). This multimillion dollar mushroom industry could mushroom to be a world leader in the province of British Colombia. There are no present successful inoculation procedures for *T. magnivelare* worldwide. The Japanese and Koreans have attempted to grow *T. magnivelare* without success. If the inoculation techniques work for the fruiting of *T. magnivelare* it will be an incredible breakthrough in the mushroom industry.

It is possible that *T. magnivelare* will have the same compounds, carbohydrates, and proteins as that of *T. matsutaki*. If this is true the discovery could be a significant
contribution to the medical community. “These compounds have been shown to aid in human moisture retention and stimulate circulation, and have antibacterial, antifungal and anticarcinogenic properties. Carbohydrates and proteins isolated from T. matsutake are reported to reduce sarcomas and other tumors. When T. matsutake is steeped in water overnight, the solution is used as a face wash to remove any darkened facial spots and wrinkles.” (British Columbia Non-Timber forest Products, Dec, 2005)

http://bcmushrooms.forsrex.org/ntfp/pages/trichomagniv/trichomagniv_syn.html

I recommend studying the cultivation of mushrooms through Paul Stamets mushroom cultivation Seminars Fungi Perfecti.

**Notes for Monitors Guide:** Course ER-390 final Core project Restoration of *T.magnivelare* created for the Restoration of Natural Systems program, University of Victoria.

**Purpose:** The Monitors Guide is to measure the success of inoculation procedures in the second growth forests of Jordan River, British Columbia.

**Inoculation:** Areas are marked with green tape. The person monitoring the inoculated area must hike to Desolation creek using maps provided in this paper.

**Inspection:** Inoculation areas must be inspected by individual by inspecting forest floor. Participant must look for any white portions of the mushrooms pushing through the forest floor. Inspector must observe any lumps or bumps on the forest floor. Mushrooms will sometimes be completely hidden to the naked eye. If bumps or lumps are observed inspector must get on hands and knees and feel for the mushrooms with their hands. It must be noted that if mushrooms are found in the inoculation area it could be from a natural process not the inoculation process. Therefore the monitoring of the project and the *T.magnivelare* that fruit could be a form of natural succession.
**Discoveries in 2005:** A small area of old growth in Jordan River was found in the fall of 2005. This find was critical to the restoration project. The area was similar to that of an Old growth area in Sooke where *T. magnivelare* fruits abundantly. Monitoring this area for *T. magnivelare* in the future will benefit the future of the project. It is in my opinion that the area found in Jordan River is an older age stand of old growth than the old growth in Sooke. This conclusion was obtained from the physical observations of the Douglas-fir trees. The old growth area discovered in Jordan River is unique because of the fact that almost all lands in Jordan River have been logged.

The location of this area is on the East Side of Sandcut Creek 300-meter mark.

**Discoveries in 2004 and 2003:** It should be noted that the mushroom species *T. magnivelare* were discovered in the second growth forests of Jordan River. It should also be noted that the discoveries were made during years of abundant fruiting of *T. magnivelare*.

**Continued inoculation:** Two different forms of inoculation will be attempted in 2005. Techniques will be different than 2004. The location of the new inoculation techniques will be in a third growth forest created by Jeffrey A Brown in 1997, the area is known as area 5. This will be beneficial for a variety of reasons. Less threat of logging compared to the inoculation site of 2004. Increased possibility of success due to different inoculation techniques. The techniques of 2005 will be the use of dehydrated mushrooms for the purpose of spreading of spores. The second technique will be a natural decomposition of *T. magnivelare* harvested in 2004 decomposed with Japanese plum leaves. The soil that was developed in the decomposition process will be placed in the third growth plantation.

**Inoculation Procedures 2005:** Two inoculation techniques were applied in the year 2005. The first technique was applied to a 7-year-old third growth plantation. The plantation was inoculated with dehydrated *T. magnivelare* and dehydrated *Cantharellus Cibarius*. It should be noted that this technique was experimental involving
dehydrated *T. magnivelare* and *C. cibarius*. The concept of this application was to have mushroom spores and bacteria interact with existing mycelium. The success of this technique will be measured over the next 30 years. The location of dehydrated *C. cibarius* is from a second growth forest Jordan River British Columbia. The location of the dehydrated *T. magnivelare* is from the Shannigan Lake area of Southern Vancouver Island from an area known as Kapoors Hill harvested in 1996.

The second inoculation technique involved the placement of the developed soils within a third growth plantation. Japanese Plum leaves were decomposed with decomposing *T. magnivelare*. The *T. magnivelare* was harvested from the Sooke foothills. Leaves decomposed along with *T. magnivelare* A black soil developed, the soil had a distinct smell of *T. magnivelare* “The mushroom’s distinctive odour can be identified from the belowground mycelium and experienced pine mushroom pickers can smell the fungus in a stand even when there are no mushrooms. Scientists have isolated 78 volatile flavour compounds, of which 22 have been identified, from *Tricholoma matsutake*. Methyl cinnamate, (a pleasant sweet odour) in combination with 1-octen-3-ol, (a musty or spicy odour) isolated from *T. matsutake* are the prime contributors in giving this mushroom its distinctive odour.”

. (British Columbia Non-Timber forest Products, Dec, 2005)

http://bcmushrooms.forrex.org/ntfp/pages/trichomagniv/trichomagniv_syn.html

The area was marked with green tape. Monitoring of the area will be done over the next thirty years. The exact location of the inoculation procedures of 2005 is in the area five plantation Desolation Creek.
<table>
<thead>
<tr>
<th>Date of Monitoring restoration area</th>
<th>Weather conditions</th>
<th>Mushrooms Observed</th>
<th>Plants Surrounding Mushrooms</th>
<th>Trees Surrounding Mushrooms</th>
<th>Mushrooms found in moss or needle bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday Sept 3/2005</td>
<td>Cool 20 Celsius</td>
<td>Red Juice Tooth, Hydellum Pecki</td>
<td>Sword ferns Polystichum munitum</td>
<td>Western Hemlock Tsuga mertensiana</td>
<td>Conifer Needle Bed</td>
</tr>
<tr>
<td>Mon Oct 10/05</td>
<td>Rain 14 Celsius</td>
<td>Orange Chanterelles, C. cibarius</td>
<td>No Plants</td>
<td>Western Hemlock and Douglas Fir Tsuga heterophylla Pseudotsuga menziesii</td>
<td>Moss and Conifer Needle Bed Kindbergia oregana</td>
</tr>
<tr>
<td>Mon Oct 17/05</td>
<td>Rain 14 Celsius</td>
<td>5 Lobster Mushrooms Hypomyces Lactifluorum Outside of Inoculation area</td>
<td>Sword Ferns Polystichum munitum (Large) Douglas Firs P.menziesii</td>
<td></td>
<td>Moss K.oregana</td>
</tr>
<tr>
<td>Thursday Oct 20/2005</td>
<td>Rain 14 Celsius</td>
<td>Cauliflower Mushroom Sparassis crispa</td>
<td>Sword Ferns Polystichum munitum (Large) Mushroom found on stump</td>
<td>Western Hemlock and Douglas Fir P.menziesii</td>
<td>Old growth Stump</td>
</tr>
<tr>
<td>Oct 30/05</td>
<td>Rain 12 Celsius</td>
<td>Short – Stemmed Russula Russula brevipes</td>
<td>Deciduous Huckleberry Vaccinium parvifolium</td>
<td>Western Hemlock and Douglas Fir P.menziesii</td>
<td>Conifer Needle Bed</td>
</tr>
</tbody>
</table>
References Cited


Cristian Eric, Cosmicopia, an abundance of cosmic rays, #23 Charge on Solar Wind Jan 19/2006 http://helios.gsfc.nasa.gov/qa_cr.html#swelec


Schaefer Val, Interview discussing ions, clay based soils and the effects on minerals, January 2006


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United Dynamics Corporation, Full Moon Ion Effect, Why does all hell seem to break loose on or around the Full Moon, Jan 19/2006 http://www.policemaps.com/full-moon-ion-effect.htm

Volk Tom, 2000, Tom Volks Fungus of the Month for September 2000. This month's fungus is Tricholoma Magnivelare, the American Matsutake mushroom, Jan 19/2006

Acknowledgements

Western Forest Products Limited, Head Forester Doug Stables

Steve Gillanders, B.Sc Environmental Science

Don Eastman, Former Restoration of Natural Systems Faculty Co-ordinator

Val Schaefer, Restoration of Natural Systems Faculty Co-ordinator

Appendix

Page # 18: Map of Biogeoclimatic Units of Vancouver Forest Region, Map Sheet 5 of 6
Southern Vancouver Island and Sunshine Coast, Province of British Columbia, Ministry of Forests Research Branch, Scale 1:250 000

Page # 19: Topographical Map of Jordan River, Vancouver Island British Columbia, Timber West,

Page # 20 Air photo Jordan River, Vancouver Island British Columbia 1980, #80083

Page # 21 Western Forest Environmental Policy, Jan 20 1999

Page # 22 Ground Inspection Form Polygon 1 Field Manual for Describing Terrestrial Ecosystems #25

Page # 23 Ground Inspection Form Polygon 2 Field Manual for Describing Terrestrial Ecosystems #25

Page # 24 Photo 1 of Steve Gillanders with Chanterelles from Jordan River B.C

Photo 2 of Active mushroom species fruiting on Alder tree, Jordan River B.C

Photo 3 of Jeff Brown with T. magnivelare harvested on Gulf Islands B.C
Page # 26 Photos 3-6 of decomposing *T. magnivelare*.

Page # 27 Photo 7 evidence of *T. magnivelare* fruiting in Jordan River B.C

Photo 8 Inoculation of 1m x 1m soil pit Jordan River B.C

Photo 9 Inoculation of 1m x 1m soil Pit using clay Jordan River B.C

Page # 28 Image of the Earth's magnetosphere,
Western Forest Products Limited (WFP) is committed to the protection of the environment and the sustainable development of the resources under its stewardship. WFP will work with government and other stakeholders to identify and address issues of environmental concern in all aspects of its forestry operations. In conducting its operations, WFP will attempt to minimize environmental impact through sound forestry and environmental management practices that meet or exceed government standards. In discharging its responsibilities, WFP is committed to:

1. Assessing and evaluating environmental risk on an ongoing basis in order to set environmental objectives and targets as well as proper operational control;

2. Allocating sufficient resources to ensure continuing compliance with environmental responsibilities;

3. Meeting or surpassing all applicable environmental regulations;

4. Establishing internal and external auditing and reporting procedures necessary to monitor environmental performance, continually improve environmental practices and prevention of pollution; and

5. Promoting environmental awareness among its employees and contractors and communicating its environmental performance both internally and to the public.

V. R. Woods
Vice President and General Manager
### GROUND INSPECTION FORM

**Project ID:** 1634
**Surveyor:** J.B.
**Map Sheet:** Plot # 1
**UTM Zone:** 7
**Lat./North:** 5.5
**Long./East:** 1
**Aspect:** 160° South
**Elevation:** 180 m

**Slope:** 20 %
**SNR:** 8 - 2.5
**SNR:** 0 - 5

**Soil:**
- **Texture:** Sandy (LS, S)
- **Organic Soil Texture:** Loamy (SLL, C, FSL)
- **Humus Form:** Mor, Molar, Mull
- **Coarse Fragment Content:** 20%
- **Surface Material:** Surf., Organic Horizon Thickness: 0 - 40 cm, > 40 cm
- **Root Restricting Layer:** Depth: 20 cm

**Terrain:**
- **TC1:** 2
- **TC2:** 2
- **TC3:** 2

**Ecosystem:**
- **Component:** EC1, EC2, EC3

**BGCU M:** CWMx
**Site Series:** 04
**Structural Stage:** (MF) 2
**Crown Closure:** 80 %

### DOMINANT / INDICATOR PLANT SPECIES

<table>
<thead>
<tr>
<th>Total %</th>
<th>A: 700</th>
<th>B: 411</th>
<th>C: 70</th>
<th>D: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.</td>
<td>Species</td>
<td>%</td>
<td>L.</td>
<td>Species</td>
</tr>
<tr>
<td>A1</td>
<td>Pseudotsuga menziesii</td>
<td>20</td>
<td>A3</td>
<td>Alnus rubra</td>
</tr>
<tr>
<td>A2</td>
<td>Tsuga heterophylla</td>
<td>41</td>
<td>A4</td>
<td>Acer macrophylla</td>
</tr>
<tr>
<td>A3</td>
<td>Pinus contorta</td>
<td>41</td>
<td>B2</td>
<td>Vaccinium</td>
</tr>
<tr>
<td>A4</td>
<td>Larix occidentalis</td>
<td>10</td>
<td>B3</td>
<td>Gaultheria</td>
</tr>
</tbody>
</table>

**Tree Mensuration**

<table>
<thead>
<tr>
<th>Sp.</th>
<th>DBH</th>
<th>Top</th>
<th>Bot</th>
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**NOTES (site diagram, exposure, gleysing, etc.)**

- Polymnur
GROUND INSPECTION FORM

DOMINANT / INDICATOR PLANT SPECIES

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TREE MENSURATION

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NOTES (site diagram, exposure, gleying, etc.)

- Test Area
- Kind ore
See Appendix Page 10 for descriptions.
See Appendix Page 10 for descriptions.
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