Ecological Inventory of Forest Plant Communities

Bear Creek Nature Park

Comox Valley Regional District - 2014

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I INTRODUCTION

I-A Background

The Oyster River Enhancement Society was established in 1983 with a goal to improve salmon habitat and salmon production in the Oyster River. Side Channel Number 1 was constructed by the Department of Fisheries and Oceans in the late 1980's (Map 1). All hatchery side channels and rearing pens were built on land that was at the time owned by the University of British Columbia, which was privately purchased in 2006. Ducks Unlimited Canada and CVRD formed a partnership and came to a purchase and donation agreement with the land owner. In 2010 the lands containing the fish hatchery and the surrounding forests became protected as CVRD, Bear Creek Nature Park (Map 2).

This report documents information collected during an ecological inventory of forest plant communities in Bear Creek Nature Park with YER from the 20th to 24th of August 2014. YER provides work experience, training and support for youth aged twelve to eighteen (YER 2014). Through studying local watersheds with community members, youth gain a sense of worth, belonging and place. The focus of YER, Phase I is to work one on one with youth conducting ecological restoration activities with a variety of environmental organizations; YER, Phase II has two youth and two adults concentrating on a specific project to further develop teamwork, research techniques and communication skills.

The four ecological inventory contributors were YER coordinator, Wendy Kotilla; Registered Professional, Biologist Ian Moul; and two youth participants, Katie Schulz and Marcus Maurice (Photograph 1). This is a citizen science project with a goal of using scientific methods in ways that are interesting to the youth, helping them gain a more in-depth understanding of what makes up a functioning ecosystem, while documenting meaningful information for the CVRD. The first three days included habitat assessment and data collection, on day four the youth prepared for a public tour, which they presented on the fifth day (Photographs 11, 12 and 13).

Photograph 1:
Youth and Environmental Restoration Team for the Ecological Inventory of Forest Plant Communities at Bear Creek Nature Park, 2014
(from top left clockwise) Ian Moul, Katie Schulz, Wendy Kotilla and Marcus Maurice

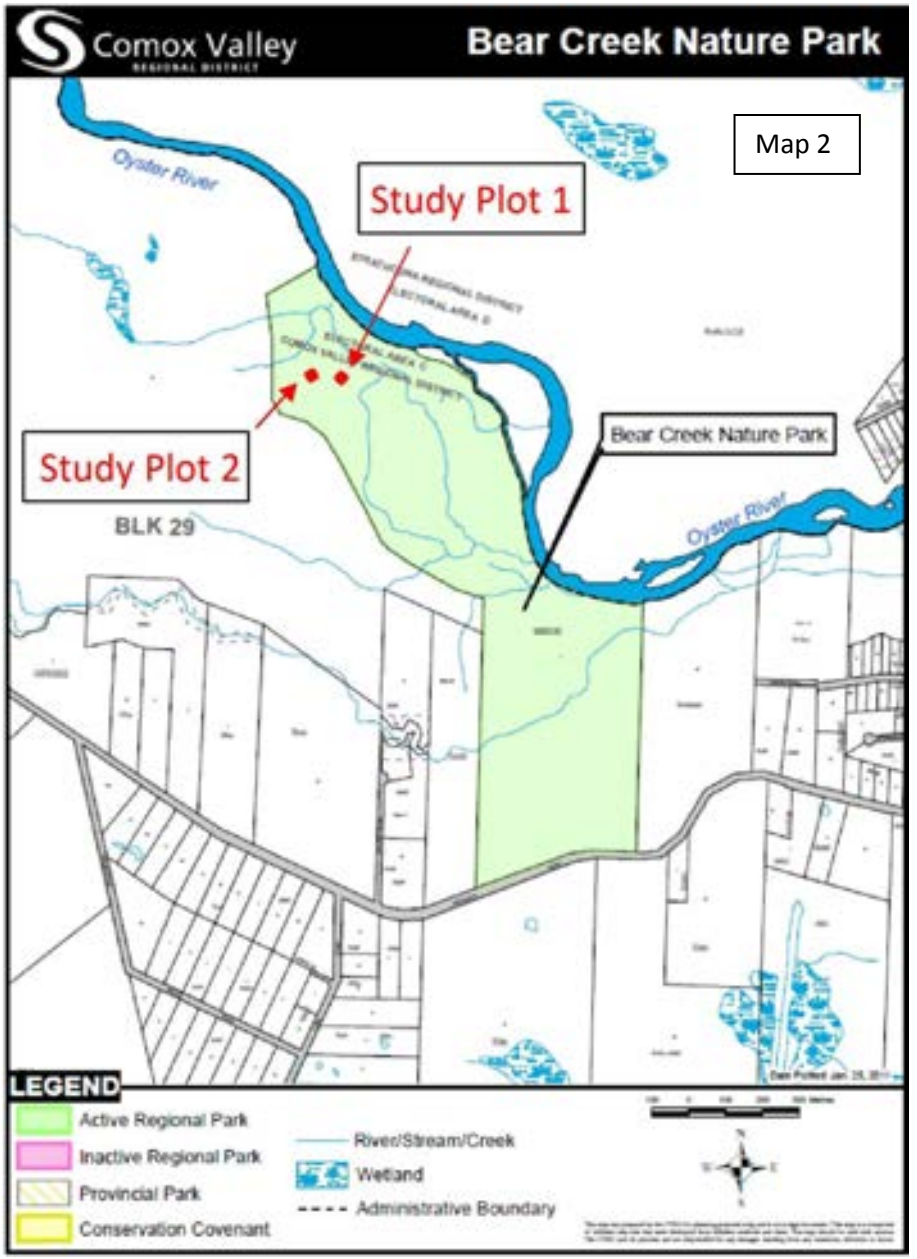
I-B Purpose of the Study

The purpose of this study is twofold:

1) To create two study plots as a living laboratory for a forest plant community inventory to further the understanding of natural habitat in Bear Creek Nature Park.
2) To develop a methodology for an educational experience that is scientifically sound yet is interesting, hands on and understandable by youth that may or may not have experience working or spending time in the natural world.

I-C Location

Maps 1 and 2: The location of the two study plots at the site of the fish hatchery run by the Oyster River Enhancement Society in Bear Creek Nature Park.



II METHODS

The forest plant community inventory method used in the study plots was an abbreviated reconnaissance form of the Biogeoclimatic Ecosystem Classification described in MOELP (1998) and Green and Klinka (1994). Two study plots were chosen near the Oyster River Enhancement Society hatchery, in floodplain riparian forest habitat that appeared to have a differing mix of trees and understory vegetation (Maps 1 and 2).

Two 20m wide by 20m deep study plots were measured off and marked with temporary flagging tape, which were then further subdivided into four 10m X 10m sub plots (Maps 3 and 4). All trees were identified by species, measured for diameter at breast height (DBH) (Photographs 9 and 10), and located as a measure of metres along or sideways from a fixed point (Appendix 1 and 2). Plant species within each sub-plot were inventoried and scored based on relative abundance in each of the forest layers of: Moss/Lichen; Herb; Shrub; and Tree. We assigned quantities of vegetation based on looking at the sub-plots and through mutual discussion and consensus to determine the relative percentages within each forest layer.

The use and function of global positioning (GPS) devices and laser rangefinders was demonstrated but kept to a minimum. It was decided that hands on measuring and documenting by the youth was more engaging than the use of electronic instruments (Photographs 9, 10 and 14). To avoid trigonometry and still teach the use of handheld compasses we made measurements based on magnetic north. Fixed points were measured with a Trimble GeoXH GPS and differentially corrected using the CANSEL base station in Courtenay. Following the field exercises, the collected data was compiled and maps of the trees in the study plots were produced by Ian Moul.

III RESULTS and DISCUSSION

III-A Study Plot 1

Study Plot 1 was measured from the fixed point of a Sitka spruce tree at the north-west corner. The west to east lines of the plot were established at a bearing of 23.5° Magnetic North. A tape was laid out and the plot was marked temporarily by flagging in four 10m x 10m square sub-plots (Map 3). For this study plot, we chose a location near a service road that might easily be located again in the future. Working together, we discussed the various terrestrial substrates and soil materials of the site and how they interrelate (Table IIIA 1).

Table IIIA 1: Site description for Study Plot 1

General Location: South-east of the hatchery building and on the north-east side of service road beside the side channel number One.			
Fixed point of study plot coordinates at a tree in the west corner of the plot	UTM Zone: 10	Easting: 344041 Northing: 5526409	Horizontal precision: +/- 2m
Elevation: 33m above sea level	Slope: Flat <1%	Aspect: more open towards the west.	
Moisture Regime: Water is received from precipitation and from groundwater of the moist flood plain water table. Water is removed slowly enough to keep the soil moist for most of the growing season.			
Succession and Structural Stage: Young forest of between 20 to 50 years. The canopy is sufficiently closed to allow for a mainly shade tolerant understory vegetation.			
Terrestrial substrate	Organic Matter: 49%	Rocks: 1%	Decomposing wood: 50%
	Mineral Soil: 0%	Bedrock: 0%	

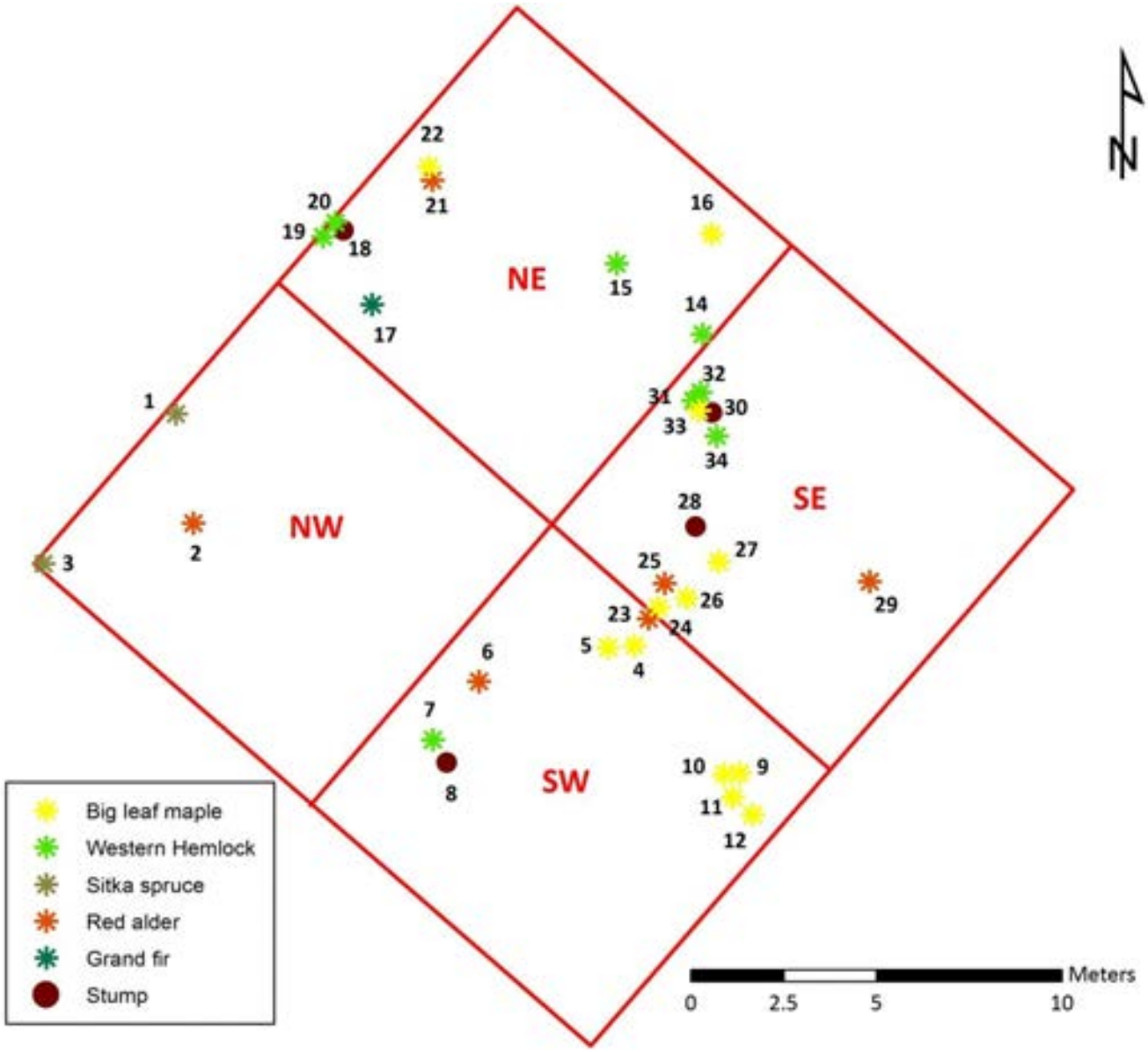
Photograph 2: Study Plot 1, looking east from near the centre of the study plot

Study Plot 1 had homogeneous understory vegetation. We considered the mix of plant species within various vegetation classes and how this changed in relation to soil conditions and the light levels penetrating the tree canopy (Table IIIA 2).

Table IIIA 2: Vegetation cover in Study Plot 1, % cover by Layer				
Tree	**Shrub**	**Herb**	**Moss/Lichen**	**Bare ground**
4%	7%	85%	Trace	4%

Twenty-nine trees and four stumps were measured for DBH (Photographs 9 and 10), or as high as possible if we were measuring a stump (Map 3; Appendix 1). We had five tree species in Study Plot 1 (Table IIIA 3), with big leaf maple being the most common. The mix of trees tells a story of how most trees had been cut some 50 or 60 years ago and the area has been regenerating as a variety of deciduous and coniferous trees.

Table IIIA 3: Summary of trees measured in Study Plot 1			
Species	**Number of trees**	**Average DBH (cm)**	**Range in DBH (cm)**
Big leaf maple	12	26	6 to 58
Western hemlock	8	20	9 to 31
Red alder	6	32	14 to 45
Sitka spruce	2	32	14 to 50
Grand fir	1	72	
Stump	4	100	87 to 121



Map 3: Layout of Study Plot 1 - Details on the individual trees may be found in Appendix 1.

An inventory of the shrub and herb layers helped us to understand the competition for light between the tree canopy and the forest floor (Table IIIA 4). In this location the dense canopy cover has led to a high percentage of the shade tolerant sword fern.

Table IIIA 4: Inventory of shrub and herb layers in Study Plot 1

Species of shrubs	% coverage[1.]	Species of herbs	% coverage[1.]
Huckleberry	3	Sword fern	84
Snowberry	2	Trailing blackberry	Trace
Salmonberry	1	Oregon grape	Trace
Elderberry	1	Lady fern	Trace

1. % coverage is based on the amounts presented in Table IIIA 2. Trace represents about 1% ground coverage.

The mix of tree and vegetation types at this study plot, while it is of a young forest age class, is best described as a mature forest plant community of Coastal Western Hemlock very dry maritime, western redcedar / three-leaved foamflower [Conservation Data Centre Ecological Community Code: CWHxm1/7](Green, R.N. and K. Klinka 1994; CDC 2014). The dominant tree species of this plant community is usually the Douglas-fir which was not represented in our survey plot. The mix of understory plant species and the position of the site in the floodplain justified our selection of this plant community. It is Blue Listed in British Columbia, indicating it is "*of Special Concern (formerly Vulnerable) in British Columbia. Ecological communities of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed ecological communities are at risk, but are not Extirpated, Endangered or Threatened"* (CDC 2014).

III-B Study Plot 2

Study Plot 2 is in a stand of young forest approximately 220m south-south-west of the cleared area by the Oyster River hatchery building, and west of side channel one. The 20m x 20m study plot with four 10m x 10m subplots were laid out based on the fixed point of a red alder tree in the north-east corner (Table IIIB-1; Map 4). The north to south edge of the study plot is 131.5° magnetic north. The species and DBH was measured for each tree in the plot (Photographs 9 and 10).

Table IIIB-1: Site description for Study Plot 2

General Location: South-west of the hatchery building and clearing, west of the service road.			
Fixed point of study plot coordinates at the north-east corner of the viewing platform	UTM Zone: 10	Easting: 351192.0 Northing: 5507834	Horizontal precision: +/- 1.4
Elevation: 30m above sea level	Slope: Flat <1%	Aspect: more open towards the west.	
Moisture Regime: Water is received from precipitation and from groundwater of the moist flood plain water table. Water in the root zone is removed slowly enough to keep the soil moist for most of the growing season.			
Succession and Structural Stage: Young forest of between 40 and 50 years. The oldest red alder are just beginning to die out. It is expected that western hemlock will become increasingly the dominant tree species.			
Substrate (%)	Organic Matter: 90	Rocks: 0	Decomposing wood: 10
	Mineral Soil: 0	Bedrock: 0	Water: 0

Study Plot 2 had a much greater diversity of understory vegetation when compared to Study Plot 1 (Table IIIA 2).

Table IIIA 2: Vegetation cover in Study Plot 2, % cover by Layer					
Sub-plot	**Tree**	**Shrub**	**Herb**	**Moss/Lichen**	**Bare ground**
NE	5	45	40	Trace	10
SE	7	31	50	5	7
SW	5	30	55	7	3
NW	6	31	51	4	8
Average	6	34	49	4	7

Of the 31 trees and 4 stumps measured, (listed in Appendix 2), the majority were red alder, estimated to be in the 20 to 50 year age range (Table IIIB-3; Map 4).

Table IIIB 3: Summary of trees measured in Study Plot 2			
Species	**Number of trees**	**Average DBH (cm)**	**Range in DBH (cm)**
Red alder	14	26	13 to 52
Western hemlock	9	24	5 to52
Grand fir	5	33	7 to 58
Western red cedar	2	19	13 to 25
Douglas-fir	1	47	
Stumps	4	92	70 to 120

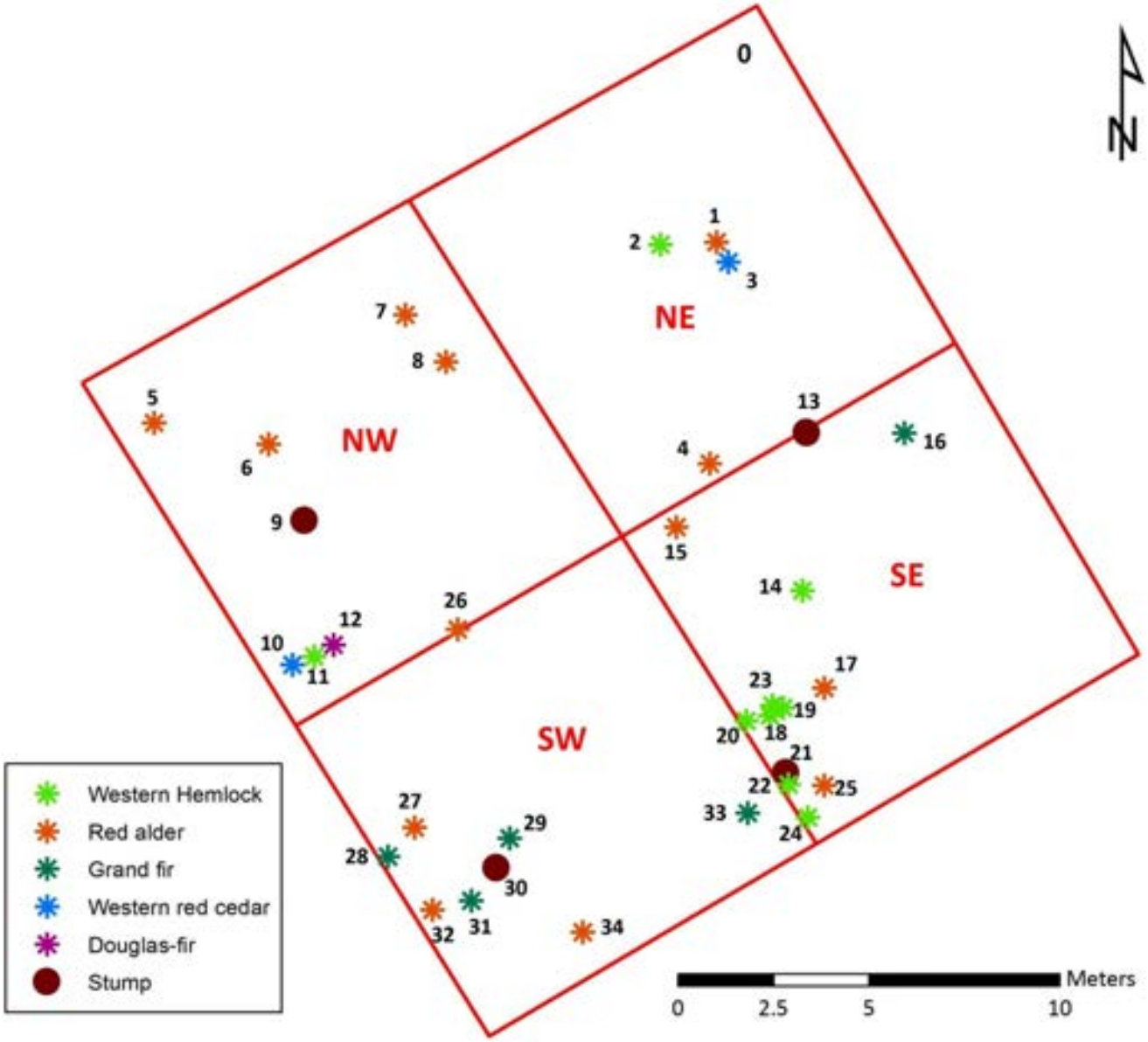
The diversity of species in the shrub and herb layer is an indication of extended periods of soil moisture and good light penetration. (Table IIIB-4).

Table IIIB 4: Inventory of shrub and herb layers in Study Plot 2			
Species of shrubs	**% coverage[1.]**	**Species of herbs**	**% coverage[1.]**
Elderberry	12	Sword fern	25
Salmonberry	12	Grasses and sedges	10
Red huckleberry	5	Vanilla leaf	7
Snowberry	5	Trailing blackberry	Trace
Saskatoon berry	Trace	Lady fern	Trace
		Oregon grape	Trace
		False lily of the valley	Trace

1. % coverage is based on the amounts presented in Table 2. Trace represents about 1%

The mix of tree and plant types at this study plot, while similar to Study Plot 1 as a young forest age class, suggests the best description of a mature forest plant community of Coastal Western Hemlock very dry maritime, Sitka Spruce / Salmonberry [Conservation Data Centre Ecological Community Code: CWHxm1/8](Green, R.N. and K. Klinka 1994; CDC 2014). This plant community occupies a high bench floodplain and experiences flooding at greater than five year intervals. It is Red Listed in British Columbia, indicating it is "*Endangered or Threatened in British Columbia. Endangered ecological communities are facing imminent extirpation or elimination. Threatened ecological communities are likely to become endangered if limiting factors are not reversed. Placing ecological communities on these lists flags them as being at risk and requiring investigation"* (CDC 2014).

Photograph 3: Study Plot 2, Looking south from the north-east corner



Map 4: Layout of Study Plot 2 - Details on the individual trees may be found in Appendix 2

III-C The Importance of Riparian Area Forests

> Riparian areas support some of the most diverse and productive of all plant communities. This is primarily a result of the rich soils and abundant moisture. Readily available water and productive soils support a greater plant biomass than is usually found in upland areas, resulting in forests with a wide variety of species and complex vertical structures
>
> (LaRue, Belanger and Huot 1995).

The complex of the Oyster River hatchery is mainly made up of two constructed side channels that serve as adult spawning and juvenile rearing areas for salmon. The forests surrounding the hatchery side channels, now protected as part of the Bear Creek Nature Park, are highly important in both providing natural shade for the side channels and supporting native plant and animal diversity. Shade is critical to a healthy environment for fish, where small rises in water temperature can quickly reduce the oxygen levels in the water and can result in algae blooms or changes in water conditions that will not support fish.

River floodplains are active landscapes that are frequently disturbed by floods, and river channels change locations, moving back and forth (meander) across these landscapes over time. The forest that we studied has been altered by natural events in the floodplain and by human activities of logging and agriculture. Biodiversity allows for rapid recovery of plant and animal species following disturbance events. The forest study plots allow us to record a snapshot of the present day plant community in a location where we may return again in the future and learn more about how the forest plant community changes.

The public tour presented by the youth participants drew 15 people from the local community (Photographs 11, 12 and 13). During the tour Katie Schulz and Marcus Maurice spoke about the history of the area, the importance of riparian area forests and described the study plots they helped to create.

IV RECOMMENDATIONS

Bear Creek Nature Park and the activities carried out by the Oyster River Enhancement Society are important both in supporting salmon production and as a living classroom for local area residents. The protection of this area allows for long term study, as well as inventory and monitoring that can help us understand the changes occurring within other regional landscapes. The lands surrounding Bear Creek Nature Park are used for forestry, agriculture, human settlement and recreation. Bear Creek Nature Park is valuable as it is a large enough area of protected forest to observe how nature can recover from natural and human related changes to the landscape. The study plots established during this project may be revisited and help us understand forest growth and how the plant community changes over time.

V REFERENCES

CDC 2014. B.C. Conservation Data Centre. 2014. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Dec 9, 2014).

Green, R.N. and K. Klinka 1994. A field guide to site identification and interpretation for the Vancouver Forest Region. Land Management Handbook No. 28. BC Ministry of Forests, Victoria BC

LaRue, P.; Belanger, L.; Huot, J. Riparian edge effects on boreal balsam fir bird communities. Canadian Journal of Forest Research: 25: 555-566

MOELP 1998. Field manual for describing terrestrial ecosystems. Land Management Handbook No. 25. BC Ministry of Environment, Lands and Parks and BC Ministry of Forests, Victoria BC

YER 2014. http://www.youthecology.ca/index.htm

Photograph 9: Katie measuring a tree diameter

Photograph 10: Marcus measuring a tree diameter

Photograph 11: Public Tour of the forest area

Photograph 12: Public Tour of forest area

	
Photograph 13: Public Tour of Oyster River area	Photograph 14: Katie and Marcus recording tree information

Appendix 1: Tree measurements in Study Plot 1.

Tree Number	Quadrant	Species	Dead Trees	Diameter Breast Height (cm)	UTM Zone 10	
					Easting	Northing
1	W	Sitka spruce	Dead	14	344045	5526413
2	W	Red alder		41.5	344045	5526410
3	W	Sitka spruce		50	344041	5526409
4	S	Maple		26	344057	5526407
5	S	Maple		45.3	344056	5526407
6	S	Red alder		33	344053	5526406
7	S	Western Hemlock		30	344052	5526404
8	S	Stump		121	344052	5526404
9	S	Maple		9	344060	5526403
10	S	Maple		11	344060	5526403
11	S	Maple		6	344060	5526403
12	S	Maple		38	344060	5526402
14	N	Western Hemlock		17	344059	5526415
15	N	Western Hemlock		31	344057	5526417
16	N	Maple		52	344059	5526418
17	N	Grand fir		72	344050	5526416
18	N	Stump		87	344049	5526418
19	N	Western Hemlock		13	344049	5526418
20	N	Western Hemlock		24	344049	5526418
21	N	Red alder		39	344052	5526419
22	N	Maple		18	344052	5526420
23	E	Red alder		45	344058	5526408
24	E	Maple		22.3	344058	5526408
25	E	Red alder		14	344058	5526408

Appendix 1: Tree measurements in Study Plot 1 continued...

Tree Number	Quadrant	Species	Dead Trees	Diameter Breast Height (cm)	UTM Zone 10	
					Easting	Northing
26	E	Maple		15	344059	5526408
27	E	Maple		58	344059	5526409
28	E	Stump		90	344059	5526410
29	E	Red alder		17	344064	5526409
30	E	Stump		100	344059	5526413
31	E	Western Hemlock		16	344059	5526413
32	E	Western Hemlock		9	344059	5526414
33	E	Maple		12	344059	5526413
34	E	Western Hemlock		20	344059	5526412

Appendix 2: Tree measurements in Study Plot 2

Tree Number	Quadrant	Species	Dead Trees	Diameter Breast Height (cm)	UTM Zone 10	
					Easting	Northing
0	NE	Red alder		14	343978	5526430
1	NE	Red alder		52	343977	5526424
2	NE	Western Hemlock		27	343975	5526424
3	NE	Cedar		13	343977	5526423
4	NE	Red alder		13	343977	5526418
5	NW	Red alder		21	343962	5526419
6	NW	Red alder		15	343965	5526419
7	NW	Red alder		27	343969	5526422
8	NW	Red alder		24	343970	5526421
9	NW	Stump		79	343966	5526417
10	NW	Cedar		25	343966	5526413
11	NW	Western Hemlock		35	343966	5526413
12	NW	Douglas-fir		47	343967	5526413
13	SE	Stump		100	343979	5526419
14	SE	Western Hemlock		27	343979	5526415
15	SE	Red alder		33	343976	5526416
16	SE	Grand fir		33	343982	5526419
17	SE	Red alder		34	343980	5526412
18	SE	Western Hemlock		52	343978	5526411
19	SE	Western Hemlock		12	343979	5526412
20	SE	Western Hemlock		6	343978	5526411
21	SE	Stump		120	343979	5526410
22	SE	Western Hemlock		13	343979	5526410
23	SE	Western Hemlock		5	343978	5526412
24	SE	Western Hemlock	Dead	40	343979	5526409

Appendix 2: Tree measurements in Study Plot 2 continued...

Tree Number	Quadrant	Species	Dead Trees	Diameter Breast Height (cm)	UTM Zone 10	
					Easting	Northing
25	SE	Red alder		19	343980	5526410
26	SW	Red alder		25	343970	5526414
27	SW	Red alder		24	343969	5526408
28	SW	Grand fir		18	343968	5526408
29	SW	Grand fir		47	343972	5526408
30	SW	Stump		70	343971	5526407
31	SW	Grand fir		7	343971	5526407
32	SW	Red alder		27	343970	5526406
33	SW	Grand fir		58	343978	5526409
34	SW	Red alder		35	343973	5526406