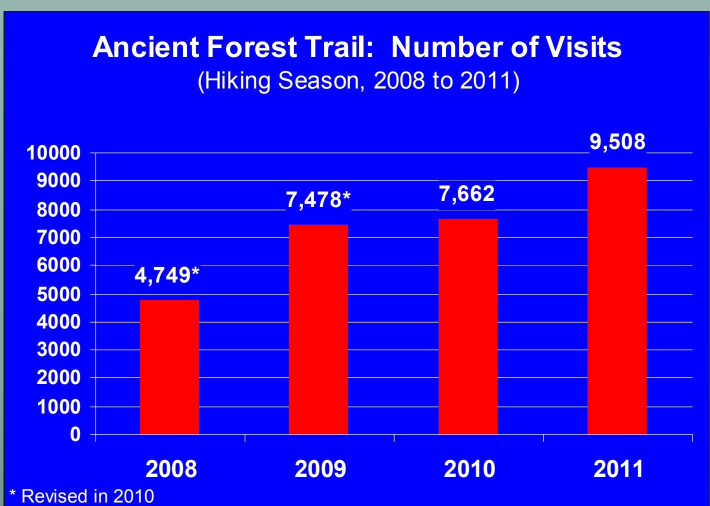
Ancient Forest

Socio-economic Benefits of Non-timber Uses of BC's Inland Rainforest
Research Bulletin, April 2012

Visits to Ancient Forest Trail Up 24%

Over the past four years, researchers at UNBC have been estimating the number of visitors at the Ancient Forest Trail, which is located near Dome Creek, BC, about half-way between Prince George and McBride. The Trail provides easy access from Highway 16 to BC's globally unique inland rainforest. Since its opening in September 2006, the Ancient Forest Trail has become a popular destination for day trips and an enjoyable stop for tourists. During the 2011 hiking season (long weekend in May to Thanksgiving in October) we estimate that 9,508 visitors walked the trail. This represents an increase of 24% compared to the 2010 season and continues a trend of increasing number of visitors since the Trail opened.

With each year we try to improve the accuracy of our trail count estimates. In 2010 we found a systematic error related to the physical location of the devise that we use to count the number of people hiking the Trail. We also changed the location of the counter at the end of the 2010 season. After testing the new location and follow-up assessments we believe that we eliminated the systematic counting error. In light of this error we revised estimates for the 2008 and 2009 seasons.



We are confident that our estimates for the 2011 hiking season are more accurate than in past years. However, a new issue arose during the season. We noticed that the counter had reset itself to zero on a few occasions, which resulted in a few days of lost data. After checking to make sure the counter was not reset by researchers we started looking for other explanations. We then realised there was a strong association between these resets and the presence of thunderstorms in the area. It appears that lightning discharges affected the counter. We will use the 2012 hiking season to confirm this hypothesis.

In this Issue

The purpose of this research bulletin is to communicate the results of on-going research on the socio-economic benefits of non-timber uses of the inland rainforest of the upper Fraser River valley in British Columbia. The information contained in this bulletin may be distributed freely with proper citation, as follows:
Connell, David J. and Jessica Shapiro (Editors) 2012. *Socio-economic Benefits of Non-timber Uses of BC's Inland Rainforest: Research Bulletin, April 2012*. Prince George, BC: School of Environmental Planning, University of Northern British Columbia.
For more information about this study please contact Dr. David J. Connell (email: connell@unbc.ca; tel.: 250-960-5835).

Dunster, BC, Hosts Conference on Carbon, Climate Change, and Community Forestry

With contributions from Tim Kelly

The Carbon, Climate Change, and Community Forestry conference was hosted by the Dunster Community Forest Society. The inaugural theme of the conference was "Managing the ICH/Wetbelt of Interior BC" The conference was well attended, with 38 people present the first day and 25 people on the second.

UNBC graduate students attending the conference (left to right): John Hall, Heidi Knudsvig, Chris Konchalski, Asha MacDonald, Eiji Matsuzaki, and Jessica Shapiro.

Keith Berg and Jane Holden, of Dunster's Berg Horns, opened the conference with a rousing performance with French horns, which attendees enjoyed while consuming their complimentary breakfast. The first day's activities included a potluck dinner with opportunities for everyone to talk informally.

"The relaxed schedule and atmosphere of the conference allowed participants from diverse backgrounds to fully explore questions and ideas without the pressure of time constraints, resulting in discussions as broad as connecting tree growth rates to small scale cottage industries in the interior wetbelt," commented Chris Konchalski, a graduate student from UNBC.

Over two days, 14 presentations from 13 people were given to an audience of local residents, forest professionals, academicians, students, and government employees. Eiji Matsuzaki of University of Northern British Columbia (UNBC) spoke about carbon stores in Interior Cedar Hemlock stands, while Ray Travers, who grew up in the McBride and Dunster area but now resides in Victoria, spoke of the impact of long rotation cycles on timber quality and carbon sequestration. Heidi Knudsvig (UNBC) spoke about future climates and Darwyn Coxson and Asha MacDonald (UNBC) spoke about the response of lichen to climate change in the Robson Valley. Chris Konchalski (UNBC) and Vanessa Foord, of Ministry of Forests, Land, and Natural Resource Operations, spoke of the impact of climate change on disturbance events such as insects and fires. David Connell, Jessica Shapiro, and Jonathan Hall, of UNBC, and Tim Kelly, of Simon Fraser University (SFU), presented the results of different economic and socio-economic surveys. (See the articles on the following pages for more information about these research projects.)

Marc von der Gonna, of McBride Community Forest Corporation, and Debbie Ladouceur, of Dunster Community Forest Society, gave brief talks about the local connection to Interior Cedar Hemlock forests, which were enhanced by several local residents who gave first-hand accounts of life in the Dunster and McBride areas over the last several decades. Fred Fortier spoke on behalf of the Simpcw First Nation, whose traditional territory includes the southern reaches of the Robson Valley. Ashley Smith, of SFU, outlined several methods for managing aesthetic qualities and Evelyn Pinkerton, also of SFU, presented an overview of the challenges facing different community forest governance structures. In the last presentation of the conference, Darwyn Coxson of UNBC proposed setting aside the ICH areas around Dome Creek as a national park.

"The thing I liked best about the conference," said Heidi Knudsvig, a graduate student from UNBC, "was the equal voice researchers and locals had. I loved the recognition that both sides need to have a strong voice in order to do what is best for the community now and in the future."

The conference was a successful example of collaboration between the Dunster Community Forest Society, the University of Northern British Columbia, and the Future Forest Ecosystem Scientific Council, offering a model for gaining benefits from forests in addition to harvesting.

"I hope the conference will become an annual event so others can come to share and learn more about the gem we have in this interior rainforest!" says Pete Amyoony, past president of the Dunster Community Association.

The conference was held October 13 and 14, 2012 in Dunster, BC, at the newly renamed *Dunster Fine Arts School and Conference Centre*. The conference was organised by Tim Kelly, graduate student at Simon Fraser University, with tremendous support from area residents.

For more details please visit the website: http://www.c4f.ca/

Climate Change and the Inland Rainforest: Research Update

The unique character of the northern interior wetbelt depends, in part, on its unique climate. As air masses moving east from the Pacific Ocean approach the Rocky Mountains and begin to rise, they drop precipitation on the western flanks of the mountains. This maritime influence creates a climate that is wetter than that of other ecosystems of the British Columbia interior. At the same time, the high latitude of the northern wetbelt and its distance from the ocean create a continental climate, one with a warmer summer and a colder winter than a coastal climate at the same latitude. As a result of these two influences, maritime and continental, a substantial portion of the precipitation in the interior wetbelt comes as snow. As the snow gradually melts each spring, it feeds the streams, rivers, and lakes of the interior wetbelt. It also seeps downslope through the soil, helping to keep water-receiving sites at low elevations moist throughout the growing season.

How will this unique regional climate, the ecosystems that depend on it, and the people that depend on the ecosystems, be affected by global climate change? That is the topic of a multidisciplinary research program being conducted under the auspices of the Future Forest Ecosystems Scientific Council of British Columbia (FFESC) at the University of Northern British Columbia. Professor Darwyn Coxson (Forestry, UNBC) is the project lead. Here we provide summaries for each of six areas of research completed as part of this project, entitled *Climate Change Vulnerability of Old-Growth Forests in British Columbia's Inland Temperate Rainforest*.

- Projecting Future Climates
- Sensitivity of Western Redcedar Growth to Climate and Western Hemlock Looper
- Carbon Budget
- Climate and Communities: Non-timber Values
- The Response of Lichen Communities to Climate Change
- Climate and Communities: Community Forests

For more information visit: http://wetbelt.unbc.ca

UNBC graduate student Eiji Matsuzaki takes a core sample of the forest floor.

Dr. Stephen Déry extracting a snow core with a Federal Sampler in the inland rainforest, 5th March 2010.

Hikers on the Ancient Forest Trail walk under a large fallen cedar. (Photo by Harold Armleder)

Projecting Future Climates

Research team: Stephen Déry (Environmental Science, UNBC), Theo Mlynowski, Heidi Knudsvig
Adapted from: http://wetbelt.unbc.ca/ProjectingFutureClimates.htm

Global climate models that project future climate regimes already exist, but before they can be applied to the inland rainforest, we must be sure we have the best possible understanding of its contemporary climate. This project has three components:

- defining the contemporary climate,
- projecting future climate, and
- examining the special role of snow in the climate and ecology of the inland rainforest.

To define the contemporary climate of the inland rainforest, we used independent meteorological records to validate the data generated by Climate BC, a program that calculates climate variables for specific locations based on latitude, longitude, and elevation. We have also established and maintained three weather stations in the Slim Creek Very Wet, Cool Variant of the Interior Cedar-Hemlock Zone (ICHvk2) in the upper Fraser River valley. Air and soil temperatures, relative humidity, wind speed and direction, precipitation, soil moisture, and snow depth are available at 15-minute intervals.

To provide estimates of the future climate in the inland rainforest, we applied two different global climate models and two different sets of assumptions about carbon emissions to climate data extracted from Climate BC, giving us four different future climate scenarios. The global climate models we used were the Coupled General Circulation Model, version 2 (CGCM2) of the Canadian Centre for Climate Modelling and Analysis, and the Hadley Centre Coupled Climate model, version 3 (HadCM3). The carbon scenarios (A2 and B2 of the Intergovernmental Panel on Climate Change) were chosen because other scenarios have results that can be interpolated between these two scenarios.

Over the past two winters we have conducted full snow surveys, especially near peak accumulation, to provide baseline snow information for parts of the inland rainforest. Information has been collected on the spatial variability of snow depth and snow water equivalent, as well as snow temperature profiles. Three sites have been selected near the weather stations to perform complete snow surveys during winter 2011/2012. Piezometers (instruments that measure water pressure) and weirs will be installed nearby to quantify water productivity from springs.

Preliminary results

Our results validated the use of Climate BC for our purposes. Figure 1 shows the close relationship between predicted and observed temperatures at six meteorological stations from across the geographical range of the inland rainforest.

All the scenarios showed increases in mean annual temperature and precipitation in the ICH vk2 for the 21st century. The amount of precipitation falling as snow, however, is projected to decrease (Figure 2).

With decreasing precipitation as snow, there is the potential for decreased snowmelt infiltration into the groundwater. Decreased infiltration could lead to depleted soil moisture, making the stands more susceptible to fire during summer. Our ongoing research on snow distribution in the inland rainforest, with a focus on the lateral transfer of soil moisture, will provide information about snow and groundwater along toe slopes that currently support old-growth stands of cedar and hemlock.

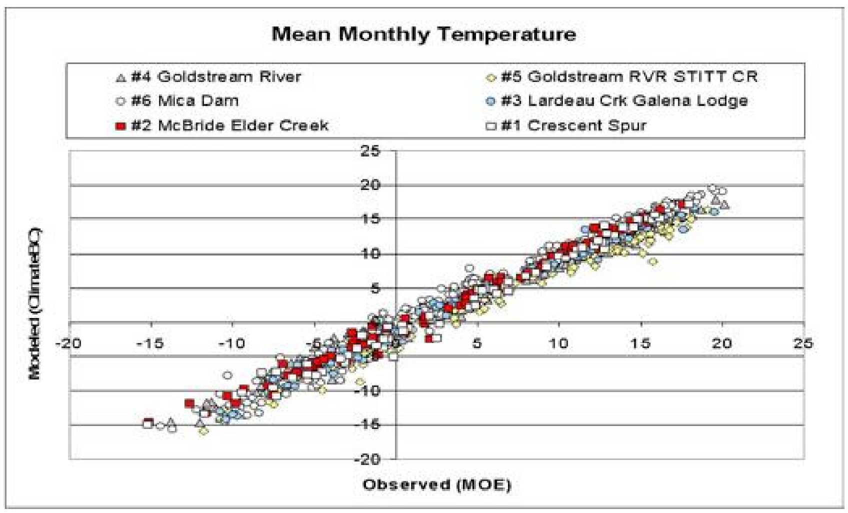


Figure 1. Comparison of mean monthly temperatures for observed values recorded by Ministry of Environment meteorological stations and modeled values calculated by Climate BC.

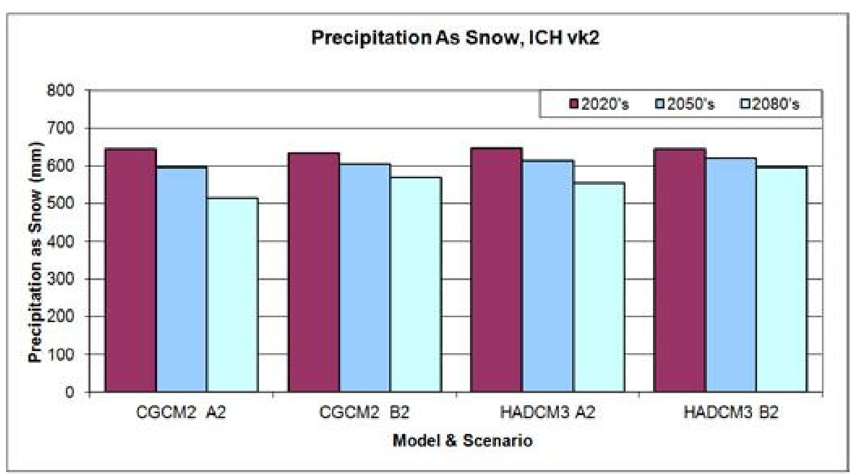


Figure 2. Future projection of precipitation as snow in the ICHvk2 BEC variant. Projections are shown for the CGCM2 and HADCM3 models and the A2 and B2 carbon emission scenarios for the 2020s, 2050s, 2080s.

Sensitivity of Western Redcedar Growth to Climate and Western Hemlock Looper

Team members: Kathy Lewis (Ecosystem Science and Management, UNBC), Chris Konchalski
Adapted from: http://wetbelt.unbc.ca/WesternHemlockLooper.htm

Growth rates of trees respond to variations in climate, tree health, and other environmental factors that affect growing conditions. Analysis of patterns in growth rings can help us understand how tree growth is affected by changes in growing conditions over time, or by differences in growing conditions among sites. If we know more about how growth of western redcedar has been affected in the past by changes in climate and by insect outbreaks, we will be better able to predict how western redcedar will respond to future conditions.

The western hemlock looper (Lambdina fiscellaria lugubrosa) is a defoliating insect that is normally present in the inland rainforest, and occasionally reaches outbreak levels. During outbreaks, the looper causes suppressed growth or mortality in affected trees. As the level of mortality resulting from such outbreaks is variable, the western hemlock looper has important but complex effects on stand structure. The climate drivers and periodicity of outbreaks have not yet been described in the scientific literature. Outbreaks are known to have occurred in the upper Fraser River valley in 1954-55 and 1992-94.

In this project, we are using dendrochronology (tree ring dating) to examine the following questions: Does radial growth of western redcedar vary with climate? Does sensitivity of western redcedar to climate vary with slope position, elevation, and aspect? Can we identify the occurrence of past outbreaks of western hemlock looper in the growth rings of western redcedar? What has been the frequency and severity of western hemlock looper outbreaks, as indicated by the growth rings of western redcedar? Are outbreaks of the western hemlock looper related to climate conditions?

Tree ring samples from western redcedar have been collected along elevational transects on the north-facing and south-facing sites of the upper Fraser River valley. Samples were also collected from a level, well-drained site, and from a moisture-limited site, to provide data for the analysis of the role of groundwater. The samples are either narrow cores, extracted with an increment borer at a height chosen to minimize the extent of heartrot, or discs cut from fallen trees or stumps. The 560 samples have been processed at the UNBC tree ring laboratory, and data analysis is in progress.

Two obstacles have made data analysis especially challenging. First, internal decay is prevalent in western redcedar in the study area, and the series of tree rings that can be obtained from a given tree is relatively short. Second, because all the inland rainforest tree species can be affected by the looper, we cannot compare tree rings in host and non-host species. That has made it more difficult to isolate western hemlock looper outbreaks from other variables that affect growth rates.

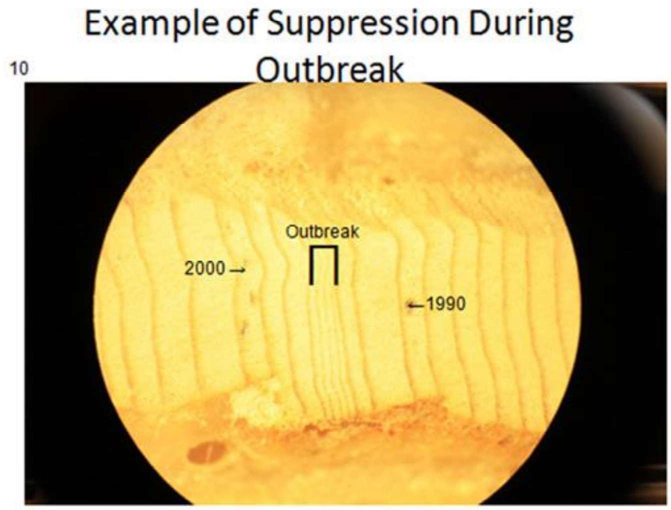


Figure 1. A series of narrow growth rings in the mid-1990s is attributed to defoliation by the western hemlock looper.

Nevertheless, our preliminary results show a clear pattern of growth suppression during western hemlock looper outbreaks. The thin rings illustrated in Figure 1 were produced during outbreak years. We were able to determine through cross-dating that one annual ring was missing, suggesting that defoliation was so severe during that year that no detectable growth occurred. Figure 2 shows reduced ring width indices coinciding with the two known western hemlock looper outbreaks in the study area, based on 18 samples at one of our sites.

Ongoing work includes developing criteria for distinguishing suppression due to looper attack from suppression for other reasons, and analyzing the climate data that are needed to address our climate-related objectives.

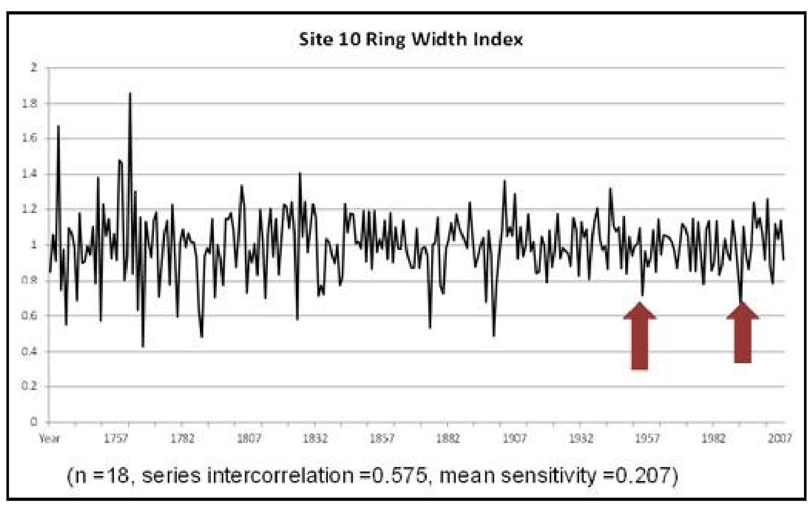


Figure 2. Standardized ring width indices for one of the sample sites. The red arrows indicate suppression events which line up temporally with known western hemlock looper outbreaks.

Carbon Budget

Team members: Art Fredeen (Ecosystem Science and Management, UNBC), Paul Sanborn (Ecosystem Science and Management, UNBC), Dave Coates, Eiji Matsuzaki, Jocelyn Campbell, Susan Stevenson
Adapted from: http://wetbelt.unbc.ca/CarbonBudget.htm

Old-growth stands in the inland rainforest support a great deal of biomass in the form of standing and fallen trees, and probably have a disproportionately large role in carbon storage, compared to other interior BC forest types. However, carbon stocks in the inland rainforest have not been quantified. The objectives of this project are: to quantify carbon stocks in old-growth and managed cedar-hemlock stands (including live trees, snags, coarse woody debris, and forest floor, but not mineral soil); to evaluate impacts of various retention-harvest methods on the C stocks; to incorporate the effects of hollowness and internal heart rot of western redcedar and western hemlock into the assessment of tree C stocks; and to develop a model capable of simulating the impacts of forest harvesting on carbon sequestration and carbon storage in the inland rainforest.

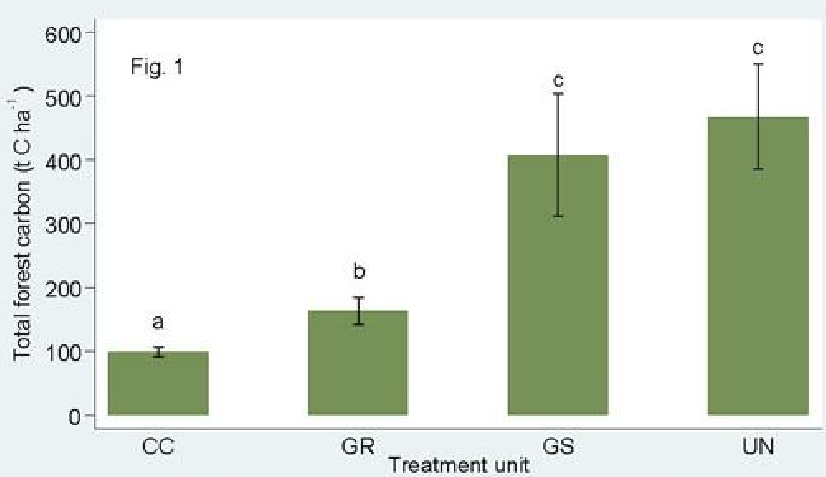
To quantify carbon stocks, we have drawn on data already collected at the Lunate, Minnow, and East Twin Creek sites as part of the Northern Wetbelt Silvicultural Systems project. Data on standing trees from permanent sample plots and data on coarse woody debris from permanent transects in harvested and unharvested portions of the three study sites were assembled. The three study areas have three or four treatment units based on % tree retention: clear-cut (CC, 0% tree retention), group retention (GR, 30%), group selection (GS, 70%), and control (UN, 100%). These data, together with literature-based allometric equations (equations that relate the size of a portion of an organism to the size of the whole organism), are being used to calculate carbon stocks. However, we had no data on one important reservoir of carbon that is likely to be influenced by forest management and by climate change – the forest floor. For that reason, forest floor samples were collected at all three study sites. The 640 samples were oven-dried, weighed, and ground, and have been analyzed for carbon concentration.

Calculation of carbon stocks in old inland rainforest stands should take into consideration the high incidence of internal decay and hollowness, especially in large western redcedars, but we had no data on which to base a correction factor. To remedy this problem, cross-sections of the stems of western redcedars were measured, and samples of decayed wood were collected for bulk density determinations. This information, in combination with information from the Ministry of Forests and Range on volume reductions due to stem defects, will be used to develop a correction for internal decay and hollowness.

Our preliminary results show that total forest C (excluding mineral soil) in uncut old-growth stands was 468 ± 161 tonnes of carbon per hectare (± 95% confidence interval; Fig. 1), similar to the regional average of the Pacific Northwestern USA (540 t C ha-1) and coastal cedar-hemlock stands in BC (357 – 710 t C ha-1). Despite the presence of extensive heart rot, old inland temperate rainforests have high total biomass C with live-tree C constituting 76% of total C. Nonetheless, analysis of the contribution of different components to uncertainty identified allometric equations for tree biomass to be the largest contributor to total uncertainty in live-tree C, indicating the need to develop allometric equations that specifically target old inland temperate rainforests for more accurate assessment of the C stocks. High-intensity harvesting (GR and CC) was significantly different from low-intensity harvesting (Fig. 1), indicating the reduction of long-term total forest C stocks by decreasing live-tree C. In contrast, low-intensity harvesting (GS) has the potential of maintaining long-term total C (Fig. 1).

Dead-organic-matter C (snag + coarse woody debris + forest floor) in uncut (UN) old-growth stands accounted for 23% of total C, demonstrating the importance of this C stock. Decaying wood in forest floor C accounted for 25 to 44% of forest floor C, suggesting key roles of coarse woody debris in dead-organic-matter C in old inland temperate rainforests. Dead-organic-matter C pools were relatively resilient to harvest intensity in the short-term. These results suggest the need to recognize the dynamic relationship between aboveground and belowground pools in old inland temperate rainforests.

Together, data on standing trees with corrections for internal decay, coarse woody debris, and the forest floor will provide a comprehensive snapshot of carbon stocks in old-growth and recently-harvested stands.



Error bars indicate standard error. Means sharing the same letter are not significantly different.
Note: to reflect the extent and characteristics of heart-rot in old-growth redcedar and hemlock stems, these estimates assume that 50% of the volume of this internal decay is actually hollow.

Climate and Communities: Non-timber Values

Team members: David J. Connell (Environmental Planning, UNBC), Jessica Shapiro, Jonathan Hall
Adapted from: http://wetbelt.unbc.ca/CC-NonTimberValues.htm

Changes to ecosystems brought about by climate change are likely to have a cascading effect on the people who use and value those ecosystems. How do local residents perceive future non-timber uses of the inland rainforest? How do they perceive the vulnerability of these uses to climate change? What opportunities do they perceive to mitigate or adapt to the effects of climate change? To help answer these questions we focussed our research in three areas: forest values held by area residents, potential economic benefits of tourists visiting the Ancient Forest Trail, and potential benefits and conflicts related to ecotourism development in the valley.

To assess held forest values we conducted surveys with residents of Dome Creek and Crescent Spur, two hamlets located among the forests of the valley. In the summer of 2011 we interviewed 34 of the 51 households. Ten households were deemed unapproachable (e.g., accessible only by boat, safety of researchers), resulting in an 83% response rate. Preliminary results from the household survey show that the inland rainforest plays a central role in the lives of the residents, with most participants indicating that the forest is either 'highly important' or 'important' (Table 1). We found that residents hold life-support values, such as air purifying and biodiversity, as most important to them, followed by aesthetic values such as beauty, and the natural/undisturbed state of the forest.

We also asked about the vulnerability of these values in relation to three areas of potential change to the forest: natural disturbances, climate change, and human disturbances (Table 2). We found that held forest values were most vulnerable to human disturbances, such as logging. Their levels of concern about climate change were less than their concerns about human disturbances, but more than natural disturbances. With regard for actions that would help preserve their forest values and reduce their vulnerability to future changes, area residents emphasized the need for education, working together, contacting local politicians, maintaining balance (between preservation and economic growth), increased tourism and research, and reducing human impacts, consumption, and waste.

Research conducted as part of this project also contributes to on-going efforts to examine the economic potential of ecotourism in the valley. Since 2008 data have been collected about the number of trail users during the hiking seasons (May to October). In 2010, 410 surveys were completed with Ancient Forest Trail hikers. An additional 42 surveys were completed in 2011. We found that among trail users, 54 percent were at the trail for a day-trip and 39 percent were tourists. For the 2011 hiking season we estimate that there were 9,508 visits to the trail (see story on page 1). Preliminary results suggest an annual economic impact of about $200,000 from tourists visiting the Ancient Forest Trail.

Key informant interviews were completed to study other non-timber economic values of the forest in the context of a changing climate. Thirteen key informant interviews were completed, including stakeholders representing multiple economic interests. Responses indicated that ecotourism could play a larger role in the future regional economy. Some potential conflicts relating to ecotourism development were identified, such as competing land uses. The results suggest that climate change is expected to have a significant impact on timber harvest and winter ecotourism and less impact on industrial development and timber manufacturing, with only a moderate impact overall.

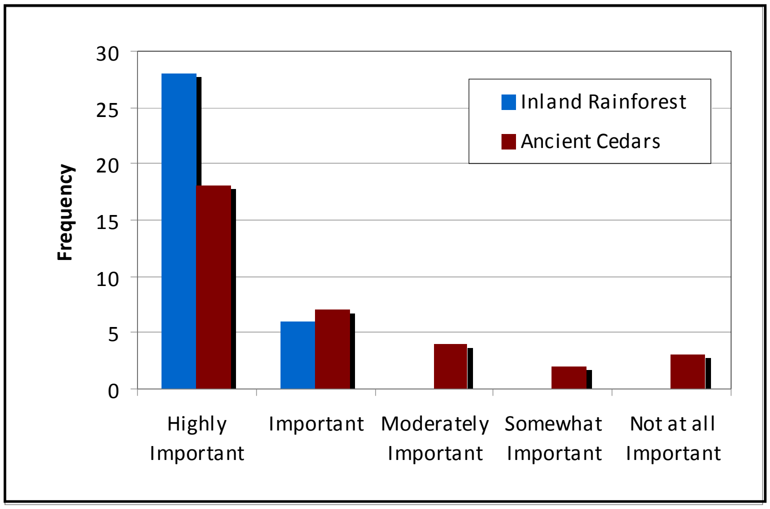


Table 1. Vulnerability of stands of ancient cedar trees to climate change, natural disturbances, and human disturbances (n = 34).

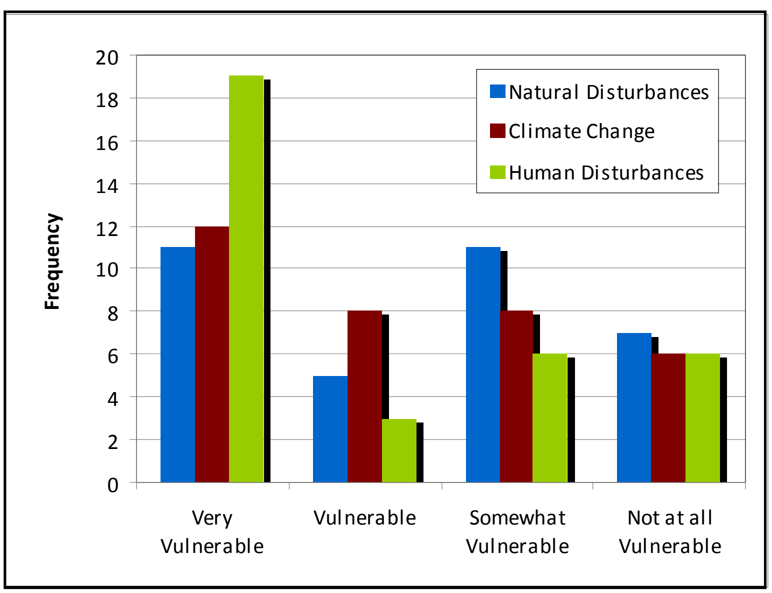


Table 2. After household members identified their forest values we asked them how vulnerable these values were to three disturbances. (n = 34)

The Response of Lichen Communities to Climate Change

Team members: Darwyn Coxson (Ecosystem Science and Management, UNBC), Curtis Bjork, Trevor Goward, Asha MacDonald
Adapted from: http://wetbelt.unbc.ca/EcologicalMonitoring.htm

Lichen communities have long been used as biological monitors, providing an inexpensive and effective means of assessing environmental change. They have been used to monitor air quality, forest health, and more recently, climate change. The inland rainforest is known for its rich lichen communities, which include a number of rare species, and which are sensitive to regional gradients in temperature and precipitation. This has raised concerns that future climate changes may have a disproportionate impact on the health of lichen communities in B.C.'s inland rainforest.

We have now examined this topic in a program of research at UNBC. Our project has two components. One examines changes in lichen viability after exposure to different simulated winter climate conditions. The second project component establishes lichen biodiversity assessment plots in the upper Fraser River valley. These plots will provide baseline data against which future climate change impacts can be assessed.

Current climate models suggest that climate change may affect winter more than any other season in the inland rainforest, with warmer temperatures and more periods of rain instead of snow. Climate scenarios calculated for the upper Fraser River valley (Figure 1) suggest that mean annual temperatures in valley-bottom locations may increase by up to 4°C by the year 2080, equivalent to that of present day climate differences between valley bottom and mountain peak locations. At the same time predicted future winter snow packs may decline by over 40% (Figure 2). Lichen communities will thus likely spend less time under protective snow cover in winter. Further they will likely experience more winter rainfall events and will generally face more variable winter climate conditions. The location of the climate transect is shown in Figure 3.

For lichen communities these changes may have important consequences. In a traditional wetbelt winter lichen communities are largely dormant, typically frozen for long periods, sometimes desiccated on branches if the onset of very cold conditions precedes snowfall, other times frozen under a thin crust of ice or snow, when snowfall accompanies the onset of subzero temperatures. If lichen communities in the future remain wet under low light winter conditions they may essentially starve, using up valuable carbon reserves to support vital metabolism.

We have now conducted a series of experiments examining how wetbelt lichens respond to different winter climate conditions. This work, based in the Aleza Lake Research Forest, examined the physiological responses of two species of cyanolichens (lichens that contain cyanobacteria). Photosynthetic and respiratory responses were measured after lichens had been exposed to a range of simulated climate change conditions, including alternating periods of freezing and thawing, and prolonged low-light exposure to wet conditions.

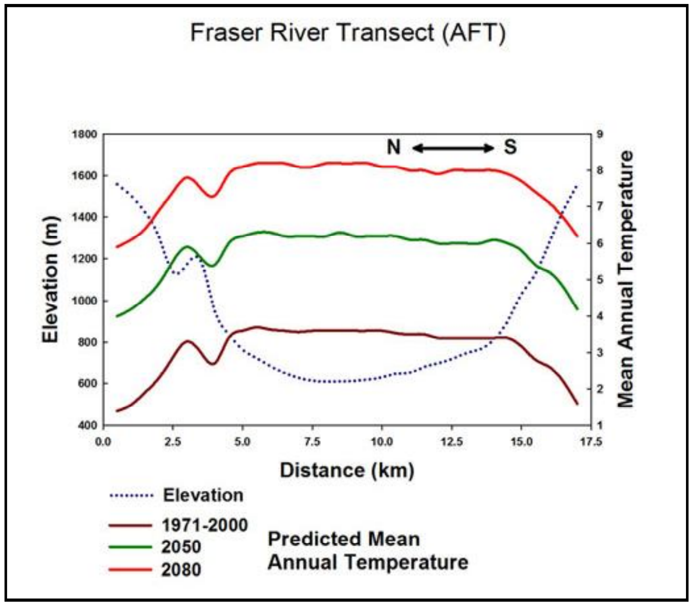


Figure 1. Predicted temperature changes in the Upper Fraser (see Fig. 1 for transect location). Based on CGCM2A1F1 scenario (continued high rate of greenhouse gas emissions).

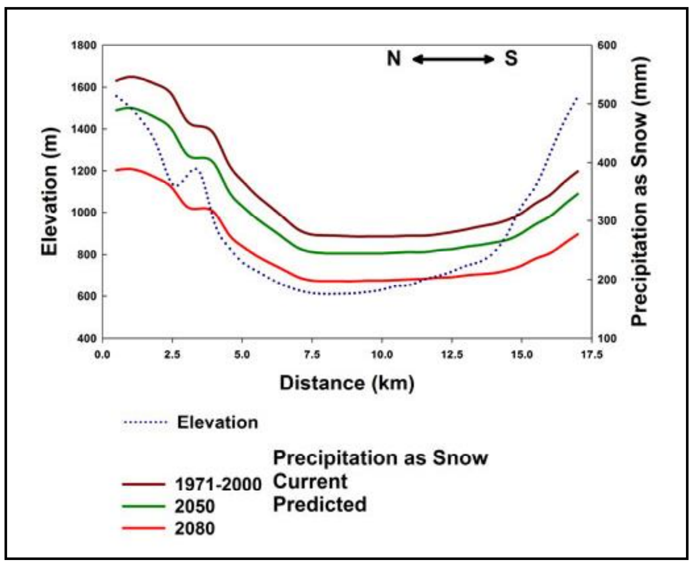


Figure 2. Predicted changes in precipitation as snow in the Upper Fraser (see Figure 3 for transect location). Based on CGCM2A1F1 scenario.

Continued on page 9

Lichen Communities

Continued from page 8

These experiments showed that Lobaria pulmonaria was amazingly resilient to increased hydration exposure under low-light winter conditions. The increased winter wetting resulted in increased photosynthetic activity compared to the start of the experimental period. However, one critical exception was lichens that were exposed to daily freeze-thaw conditions, where rates of photosynthesis were severely reduced. Unfortunately, this is a likely very future climate change scenario, where greater temperatures fluctuations are seen during the winter period, with lichen communities insulated by snow less often.

The second component of this project was the development of protocols to monitor the response of inland rainforest lichen communities to climate change. Based on new lichen monitoring protocols that have subsequently been developed we have now established over 60 permanent biomonitoring plots in the upper Fraser River valley near Slim Creek. Lichen species being assessed are listed in Table 1. Assessments of these plots in future years will provide an important index of climate change responses.

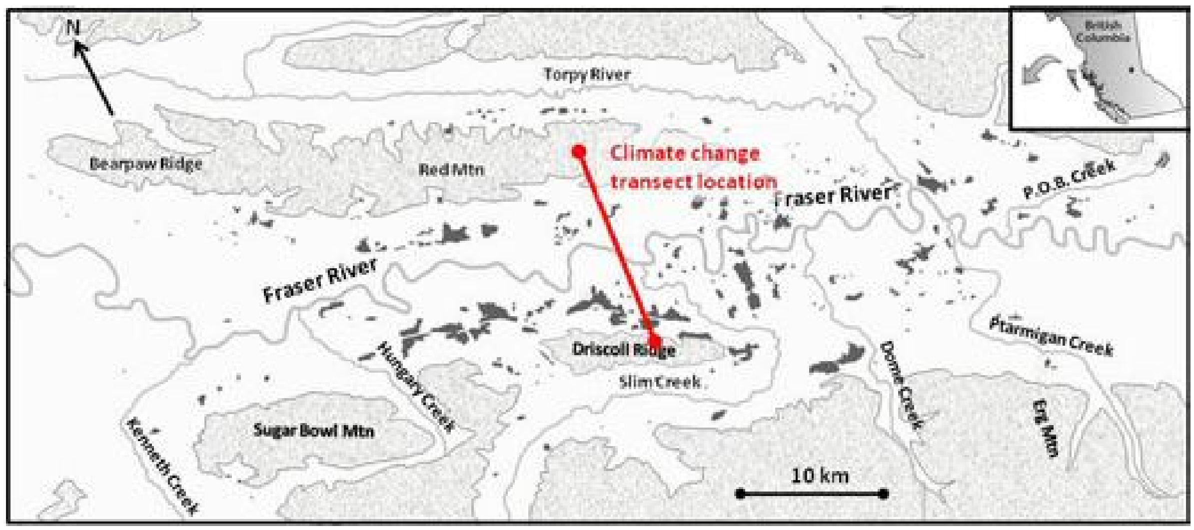


Figure 3. The location of the climate transect (red line) between Driscoll Ridge and Red Mtn. across the upper Fraser River valley.

Table 1. Lichens being assessed in upper Fraser River valley climate change biomonitoring plots.		
Alectoria sarmentosa	*Nephroma occultum*	*Sticta sylvatica*
Bryoria fuscescens	*Nephroma parile*	*Leptogium burnetiae*
Cladonia sp.	*Parmelia hygrophila*	*Green Sticta A*
Dendriscocaulon sp.	*Parmelia sulcata*	*Green Sticta B*
Hypogymnia enteromorpha	*Parmeliopsis ambigua*	*Ramalina dilacerata*
Hypogymnia physodes	*Parmeliopsis hyperopta*	*Ramalina pollinaria*
Hypogymnia tubulosa	*Peltigera collina*	*U. chaetophora*
Hypogymnia vittata	*Platismatia glauca*	*N. resupinatum*
Lobaria pulmonaria	*Pseudocyphellaria anomala*	*U. glabrata*
Lobaria retigera	*Ramalina thrausta*	*Polychidium spp.*
Lobaria scrobiculata	*Sticta fuliginosa*	*Physcia alnophila*
Melanelixia subaurifera	*Tuckermannopsis chlorophylla*	*S. limbata*
Nephroma bellum	*Usnea sp. (filipendula or scabrata)*	*Hypogymnia wilfiana*
Nephroma helveticum	*Vulpicida pinastri*	
Nephroma isidiosum	*Polychidium dendriscum*	

Table 1. Lichen species being assessed in permanent biomonitoring plots in the upper Fraser River valley near Slim Creek.

Climate and Communities: Community Forests

Team members: Evelyn Pinkerton (Resource and Environmental Management, Simon Fraser University), Tim Kelly
Adapted from: http://wetbelt.unbc.ca/CC-CommunityForests.htm

The way in which knowledge about the potential impacts of climate change is incorporated into timber management is likely to vary with different kinds of forest tenure. Community Forests are especially well positioned to be responsive to community concerns and to incorporate a long-term, place-based vision. In 2011, the Dunster Community Forest Society (DCFS) became our partner, and we worked extensively with them to evaluate their options in managing their 20,000-ha tenure area with a 15,000m3 Annual Allowable Cut.

Our aim is to encourage awareness and consensus on economic, social, and ecological practices that require adaptation in the face of climate change. We are doing this by engaging community members and the DCFS Board in exploring options and finding ways to balance local values. During three months of on-site research in Dunster, the Community Forest team spoke with many residents representing many different interests. The diverse needs of the community members show how essential collaborative planning is for sustainable management of a natural resource such as a community forest.

The community of Dunster faces many challenges as a result of climate change and past logging practices. While much of the DCFS Robson Valley tenure area has been hit by Mountain Pine Beetle, their tenure area in the Raush River Valley still contains a substantial amount of merchantable timber. However, the Raush River tenure areas are not readily accessible, perhaps explaining why this timber is still there. The Raush River Valley is nearly pristine, and many Dunster community members are working to keep it untouched. Within the DCFS's tenure area in Raush River Valley are three wet and dry cedar-leading old growth cedar hemlock patches. These stands were unknown to the DCFS before the summer of 2011, and their identification resulted directly from our efforts to explore and assess the tenure area with DCFS. The decisions facing DCFS include choosing between the extensive clearing of low value beetle-attacked pine in direct sight of the Dunster community, or logging in high value cedar, fir and spruce areas in the Raush River Valley, on the opposite side of a mountain range from the community.

After discussing the conditions and challenges facing Dunster, the Community Forest team and DCFS embarked on two strategies. The first was to map the local economy and attempt to quantify how much derived economic value is kept in the community in the absence of any logging in the tenure area (Dunster is a new Community Forest and as of October 1, 2011, had not received its single tenure-area cutting permit). Through a combination of mathematical techniques and social network analysis, DCFS has been given a definitive starting point on which to base decisions regarding the distribution of

Archie McLean, Chairman of Dunster Community Forest Society, in a wet cedar-leading old-growth ICH patch in the Raush River Valley part of DCFS's tenure. (Photo: Tim Kelly)

benefits, including logging opportunities, in order to optimize equitable distribution and capture of value. The data collection was completed by the end of August, 2011. The analysis has also been completed and the results, along with a modeling run, were presented to the Dunster community on October 14, 2011.

Even without the guidance of the economic mapping, DCFS members are aware that they have limited opportunities to capture economic value from the timber beyond simply cutting it down and selling it out of town. The second strategy DCFS has embarked on is to redirect management focus away from a purely logging strategy and instead position the Dunster Community Forest as a destination for researchers and graduate students.

The first step in this strategy is the extension of the originally planned workshops into an extensive two day conference, "Carbon, Climate Change, and Community Forests" (see page 2). The original grant called for six presentations to community members by the grant team, with one day in Prince George and one day in Dunster. Through the efforts of DCFS, the conference was held in Dunster on October 13 and 14, 2011. Dunster community members opened their doors to visiting graduate students, and arrangements were made for low cost and free meals during their stay. There was a community-sponsored dinner on the first evening. DCFS hopes to turn this into an annual conference, with a recurring emphasis on learning about the impacts of carbon management and climate change on community forestry.