Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) Initiative

Ontario Pilot

Establishing New Forests to Address Kyoto

FAACS Fall Focus Sessions

A Report on

Offset Carbon Credits from Afforestation, Customers Needs and the Investment Challenge in Ontario

Focus Session held in Toronto,
Days Hotel and Conference Centre Toronto Airport
November 19th 2003

Jointly Convened by:
Eastern Ontario Model Forest and Natural Resources Canada, Canadian Forest Service

In partnership with:
Conservation Ontario, Ontario Ministry of Agriculture and Food,
Ontario Ministry of Natural Resources, Ontario Woodlot Association,
and Trees Ontario Foundation.

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Executive Summary

For the past year the Canadian Forest Service has led the Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) national policy development initiative to determine whether afforestation to create new carbon sinks is a viable option for Canada to meet a portion of its Kyoto commitments. The Eastern Ontario Model Forest is leading the Ontario FAACS Pilot to test afforestation interest and potential participation in Ontario. The Government of Canada wishes to promote afforestation within its climate change agenda, but expects that market/investment mechanisms rather than direct government funding will be the key driver over the long term in this effort. This report outlines the findings of a Focus Session held by the Eastern Ontario Model Forest entitled, "Offset Carbon Credits from Afforestation, Customer's Needs and the Investment Challenge".

The purpose of the Carbon Focus Session was to look for common ground and potential business structure, and key business aspects for landowners, Carbon brokers and Large Final Emitters all interested in afforestation projects for the purposes of carbon sequestration. The audience of the session included individuals from the forestry sector, carbon brokers and Industry.

The Focus Session was made up of two parts. The first part, "Forests, Afforestation, Carbon Sequestration and the Climate Change Convention", was designed to provide information on all aspects of afforestation and carbon sequestration to those involved in the acquisition and use of offset carbon credits. This first session was made up of presentations to highlight the relevant information.

The purpose of the second part, "The Marketplace – Growing, Selling, and Buying Offset Carbon Credits from Afforestation", was to present key business aspects of the growth and sale of offset carbon credits from afforestation projects. In this session speakers presented the key points on various aspects of the business arrangements that must be made to develop a viable marketplace for offset carbon credits from Canadian afforestation projects.

The discussions following each of the presentations brought forth relevant topics with respect to afforestation, offset carbon credits, and investment opportunities. They are summarized as follows:

- Policy uncertainties with respect to the Kyoto Protocol and Canada's commitment
- Protection of the investment in afforestation for carbon sequestration
- Economic investment model/scenario to showcase ROI for afforestation for carbon sequestration
- Risk Management and Aggregation
- Permanence
- Demonstration projects
- Determination of a start date
- Coordination amongst relevant players

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Offset Credits from Afforestation, Customers Needs and the Investment Challenge in Ontario

1.0 Introduction

For the past year the Canadian Forest Service has led the Feasibility Assessment of Afforestation[1] for Carbon Sequestration (FAACS) national policy development initiative to determine whether afforestation to create new carbon sinks is a viable option for Canada to meet a portion of its Kyoto commitments. The initiative involves three main components: 1) a compilation of records of lands afforested between 1990 and present (the 'backcast'); 2) the development of an afforestation module as a component of the national carbon budget model; and 3) the establishment of five pilot sites across Canada that can assess and test a variety of mechanisms to incite afforestation on private lands. The Government of Canada wishes to promote afforestation within its climate change agenda, but expects that market/investment mechanisms rather than direct government funding will be the key driver over the long term in this effort.

The Eastern Ontario Model Forest, in partnership with other agencies, is leading the Ontario FAACS Pilot to test afforestation interest and potential participation in Ontario. As part of this pilot efforts are underway to examine landowner attitudes, barriers, market influences, and funding and delivery mechanisms that contribute to policy analysis related to afforestation in Ontario. The overall goal is to understand what the best approach might be towards developing policy recommendations for a potential provincial afforestation program. Partners include: Canadian Forest Service, Conservation Ontario, Eastern Ontario Model Forest, Landowners, Ontario Ministry of Agriculture and Rural Affairs, Ontario Ministry of Natural Resources, Ontario Forestry Association, Ontario Woodlot Association, Stewardship Councils, Trees Ontario Foundation, and others.

The overall goal of the series of the FAACS Fall Focus Sessions is to understand what the best approach might be towards developing policy recommendations for a potential provincial afforestation program for Ontario.

The purpose of the Carbon Focus Session was to look for common ground and potential business structure, and key business aspects for landowners, Carbon brokers and Large Final Emitters all interested in afforestation projects for the purposes of carbon sequestration. The audience of the session included individuals from the forestry sector, carbon brokers and Industry.

As background to the Carbon session, participants were provided with "A Short Explanation of the Role of Canadian Forests in the Kyoto Protocol" Appendix I. This paper briefly outlines how Canada's forests are included in the Kyoto Protocol, addressing the basics of Afforestation and the Managed Forest. The full Focus Session Agenda can be found in Appendix VII.

2.0 Session I: Forests, Afforestation, Carbon Sequestration and the Climate Change Convention

The focus of the morning sessions was Forests, Afforestation, Carbon Sequestration and the Climate Change Convention. This portion was designed to provide information on all aspects of afforestation and carbon sequestration to those involved in the acquisition and use of offset carbon credits.

The following information outlines the material covered in each presentation. A brief biography of each of the speakers in included in Appendix II. The complete presentation material is included in Appendices III. The highlight notes have been prepared by the authors of this report and represent both the speaker's presentations as well as key

[1] Afforestation Defined: The conversion of land that has not been forested for a period of time (the definition in the Kyoto Protocol is 50 years) to forested land through human activities such as planting and seeding. Canadian Forest Service – Forest Carbon Accounting Definitions

points arising from the discussions. A DVD was developed which includes video footage of all the presentations, coordinated with the presentation slides, and the discussion sessions. This DVD is available through the CFS – Great Lakes Forestry Centre (contact Darren Allen) and the Eastern Ontario Model Forest (contact Martha Copestake).

Chair: Jim Farrell, A/ Director General, Industry Economics and Programs Branch, CFS

- **1. Introduction to Forests and the Kyoto Protocol** (Tony Lempriere, Senior Economist, CFS)
    - Forest activities in the Kyoto Protocol
    - Definitions
    - Accounting rules
    - Offset trading system
    - Forest carbon in a trading system

Highlights: There is a policy debate about the need to meet Canada's Kyoto GHG targets and maintain our GDP growth in a carbon constrained economy. There is uncertainty about programs and commitments after 2012.

There are two types of forest in the Kyoto Protocol. The 'existing managed forest' has a cap on offset carbon credits in the first commitment period (2008-2012). Canada must define the "managed forest" by 2006 to have it counted during the first commitment period. 'New forests' established through afforestation of 'eligible lands' (e.g. old fields, not under forest cover on Dec 31 1989) have no cap on offset carbon credits. Forestry offset carbon credits will be included in an Offset Trading System to be finalized in 2004.

Credits from forest management and afforestation may trade at a discount due to concerns about a lack of permanence. Lack of permanence can be overcome through the planting of large areas of land and the development of a new area of permanent forest managed under sustained yield/SFM systems.

- **2. Afforestation in Canada: The big picture and a look at Ontario** (Darren Allen, Forestry Specialist, CFS)
    - Area of Available Land for Afforestation
    - Components of an Afforestation Program
    - FAACS – what is it and why are we here?

Highlights: Studies have determined that there are between 7-11 million ha of marginal and sub- marginal agricultural land available for afforestation in Canada. Most of this is in private ownership. Ontario has 4.4 million ha of cropland, of which 1.2 million ha are abandoned fields. 300,000 ha is in Northern Ontario, (900,000 ha) are in Southern Ontario. Economic analysis indicates that 300,000 ha would be available for afforestation. However, due to relatively slow growth of planted trees there will be little development of offset carbon credits in the first commitment period-2008-2012.

- **3. Afforestation and Carbon Sequestration** (Thomas White, Physical Scientist Afforestation and Carbon Accounting, CFS)
    - Where is Carbon (C) found in the plantation ecosystem?
    - What changes can we expect to see following plantation establishment and through the life of the stand?
    - How can we measure or estimate C stock and C stock change in the plantation ecosystem?
    - How can we ensure that afforestation is an effective mitigation measure against the build-up of greenhouse gases in the atmosphere?

Highlights: Canadian average figures for carbon in conifer trees were provided as an illustration. One cubic meter of merchantable stem-wood provides 0.788 tonnes of CO_2e in offset carbon credits. For every cubic meter of stem-wood there will be 0.358 tonnes of CO_2e in the crown (tops and branches) of the tree and 0.312 tonnes of CO_2e in the root mass, for a total of 1.458 tonnes.

- **4. *Climate Change Plan for Canada* Forest 2020 Demonstration Project** (Christy Arseneau, Forest Sector Analyst, CFS)
    - Background
    - August 2003 : $1 billion announced toward implementation of the *Climate Change Plan for Canada*
    - Forest 2020 Fast Growing Plantation Demonstrations
    - Investment Mechanisms
    - Establish Demonstrations
    - Outcome

Highlights: Forest 2020/Greencover is a program to establish plantations of fast growing species to sequester carbon and provide wood (fibre) for industry. The first idea was to concentrate on Hybrid Poplar but a wider choice of fast growing species will be offered in 2004/5 to gain experience in plantation establishment, developing relationships and agreements with landowners. Some fast growing species are relatively short lived (20-40 yrs) longer lived species retain their carbon longer.

- **5. Intensive Forest Management: Domtar's 28 years of experience in Eastern Ontario** (Wayne Young, Fibre Supply Manager, Domtar)
    - Who is Domtar (corporately)?
    - Who is Domtar (locally)?
    - Domtar Policies and Strategies
    - Domtar Southern Ontario Wood Supply Strategy "Flexibility"
    - 3 "Bests" for Hybrid Poplar
    - Challenges
    - Summary

Highlights: Domtar's experience with Hybrid poplars started in 1980. The purpose is to produce wood for the Cornwall Mill. Success depends on"3 Bests": to use the best soils (just on the margin for economic cropland), plant the best clones, and use the best site preparation and cultivation techniques. Hybrid poplar is suited for a specific use by industry. Planting hybrid poplars is often due to a wood supply shortage. Planting costs are $1600-$1900/ha. Growth rates average 10 m^3/ha/yr or 5 ODMT/ha/yr[2].

- **6. Afforestation Economics for Timber and Carbon Production: A Simple Spreadsheet Model and Beyond** (Dan McKenney, Chief, Landscape Analysis and Applications CFS)
    - Some context
    - A little "theory"
    - The Model: biological/economic inputs and outputs
    - CFS – AFM: a more complex spatial model
    - Some issues
    - A quick run through

Highlights: Key Economic Factors are: Growth and Yield Curves; agricultural land values and need to pay an annual rent; the applicable discount rate; the conversion of biomass to carbon content and credits depends on the specific gravity of the wood.

- **7. Agroforestry Land-Use for the Kyoto Future** (Naresh Thevathasan, Ph.D., P.Ag. Department of Environmental Biology)
    - Forests & Afforestation and the Kyoto Protocol
    - Agroforestry
    - Biophysical Resources
    - Carbon Sequestration potential
    - Agroforestry and Afforestation
    - Policy Gaps

[2] ODMT = oven-dried metric ton

3.0 Session II: The Marketplace - Growing, Selling and Buying Offset Carbon Credits from Afforestation

The focus of the afternoon session was to present key business aspects of the growth and sale of offset carbon credits from afforestation projects. Speakers presented the key points on various aspects of the business arrangements that must be made to develop a viable marketplace for offset carbon credits from Canadian afforestation projects.

The following information outlines the material covered in each presentation. A brief biography of each of the speakers in included in Appendix II. The complete presentation material is included in Appendix IV. The highlight notes have been prepared by the authors of this report and represent both the speaker's presentations as well as key points arising from the discussions. A DVD was developed which includes video footage of all the presentations, coordinated with the presentation slides, and the discussion sessions. This DVD is available through the CFS – Great Lakes Forestry Centre (contact Darren Allen) and the Eastern Ontario Model Forest (contact Martha Copestake). Brief notes outlining the question and answer period of this session can be found in Appendix VI.

Chair: Mike Innes, President, M.R.J.I. Consulting Services Inc.

- **1. Introduction presentation: Getting Beyond Rhetoric** (Mike Innes, M.R.J.I. Consulting Services Inc.)
    - Is this Feasible?
    - The Puzzle of Kyoto & Forests
    - Necessary Elements
    - Business Drivers
    - Rules
    - Structural enablers
    - Innovation
    - Anything Missing?
    - Conclusion

- **2. The landowner's point of view** (Jim Gilmour, landowner, Eastern Ontario Model Forest Director)
    - Rural Landowners
    - Landowner Objectives OWA
    - Woodlot Owners' Objectives
    - Why Do Landowners Plant Trees?
    - Reforestation/Afforestation
    - Landowner Contribution
    - Incentives Required
    - Taxes
    - Offset Carbon Credits
    - Agreements
    - Summary

Highlights: Landowners are interested in planting trees if their land management objectives are respected. Most want trees for aesthetics, nature, wildlife habitat and economic returns. The delivery agency must be local and trusted. Land values, potential lost income, planting costs can be covered by well designed incentives. Property tax changes (farm to residential rates) are an important consideration. Property tax rates should be low to recognize the long-term commitment to forest cover and provision of ecological services to society. Plantation costs should be tax deductible like farming costs. Trees contain two commodities- wood; and offset carbon credits. Offset carbon credits are not well understood. If the incentive package is right they may be transferred to an investor. Agreements must be in clear language and for a period of approx. 15 yrs. A simple management plan covering both wood and offset carbon credits is needed. Long rotation species are preferred.

- **3. The Carbon Marketplace – What Do Buyers Want?** & **Aggregating Supply of GHG Credits** (Jamie MacKinnon, GSCI-Natsource)
    - Natsource: At a Glance
    - Who makes up the marketplace?
    - Market Liquidity and Prices
    - Terms of sale/purchase
    - Canadian Domestic Offsets
    - How can domestic reforestation projects meet the demands of the market?
    - Barriers for small-scale suppliers
    - Natsource Supply Aggregation Proposal
    - Assumptions and Economics
    - Path forward

Highlights: Compliance grade credits, certified to comply with Kyoto market standards. Transaction volumes are small and costs are high. Offset carbon credit prices are now low due to uncertainties. Terms of sale are; forward sales of 5 yr streams of credits, good credit ratings on both sides of the transaction, trading blocks of 100-150K tonnes CO_2e with consistent delivery, careful measurement, 3rd party verification and proof of ownership. Markets for afforestation credits will suffer from the lack of permanence and heavy risk management will be required through reserves of credits. Economies of scale through large-scale projects and aggregation of credits on small properties will be important. Prices will be under $15/tonne. Brokerage fees will reflect the work required. Natsource will provide assistance to establish a Canadian Offset Supply Aggregation facility. Credits aggregated from several sources can reduce risk and increase supply.

- **4. Carbon Registries and Aggregation** (Ray Rivers, Executive Director, Clean Air Canada Inc.)
    - CleanAir Canada: At a Glance
    - Registration Process
    - Banking
    - Aggregation

Highlights: A Registry is needed to ensure that credits are: Real, Surplus to the requirements of the owner, Quantifiable, Verifiable and are counted and sold only once. The Registry may act as a pooling agency, like a bank. There is a cost ($7000) for project validation (good for 7 years). $3500 may be required for verification. The Registry may also bundle services required to: validate projects, measure, verify, register credits. Conflict of interest must be avoided.

- **6. Designing an Investment Vehicle** (Tony Rotherham, T.Rotherham Consulting)
    - Framing the Investment
    - The Investors
    - The Commodities and/or Benefits and The Revenue Streams
    - The Forest
    - Commodity Production and Revenues
    - Investment and Management Inputs
    - Split Revenues and ROI
    - A Special Tax Benefit Program for Afforestation
    - How about a partnership?
    - Key Points & Conclusions

Highlights: Investor interest in funding afforestation projects is low/non-existent, due to uncertainties about 'coming into force', what happens after 2012 and the value of afforestation credits. Added complications are: two commodities (wood and offset carbon credits) in one material, 20-40 yr investment horizons, offset carbon credits are a new commodity, prices are unknown, and an uncertain domestic and international policy framework. The profit sharing relationship is not clear if there are two parties involved-the landowner and an investor who pays for tree planting. The ROI from sale of offset carbon credits is very low, however adding in revenues from the sale of wood can

increase the ROI considerably. But the landowner must get something out of the commitment of land and payment of property taxes for up to 40-50 years. The trees become an important landscape feature and are attached to the land. An attractive ROI for the investor can be achieved with a mix of tax write-off benefits to reduce the effective investment, ownership of the offset carbon credits plus a share of the revenues from the thinning operation.

4.0 Summary

At the conclusion of each of the presentation from both sessions participants were encouraged to engage in discussion. The following points represent the key points from both the discussion, as well as the key points from the speakers and the Chairs from both sessions.

Policy: Policy uncertainties surrounding the Kyoto Protocol and Canada's commitment must be resolved in order to create an attractive environment for financial investors. In addition, property tax considerations are a crucial part of the equation for the private landowners to invest their land in an afforestation project.

Protection of Investment: The non-exchangeable nature of offset carbon credits means the Canadian Government may have to act as a "backstop" to protect investors from the effects of unexpected changes in international or Canadian government policy. A GHG emissions reduction program founded on Canadian law would provide more certainty.

Return on Investment (ROI): Land is available and land owners will participate with the right incentives and investment package. In addition, the expertise to grow trees/establish plantations exists. However even if all of these elements are in place, if insufficient revenue is generated from the sale of offset carbon credits to provide an adequate ROI, an afforestation program will not be attractive to investors. To make the investment attractive there must be other benefits attached to the offset carbon credits. More work must be carried out to nail down the costs of a program involving afforestation for carbon sequestration, as well as to determine the overall economics of such a program.

Risk Management / Aggregation: Afforestation on private lands is risky, and may be impermanent, and fragmented. Aggregation of offset carbon credits from afforestation can overcome much of the risk. The government must provide clear rules and allow the private sector to provide the services for aggregation, registries, validation, verification and brokerage systems for afforestation.

Permanence: The market requires a steady flow of credit, at the minimum of 5 years ahead. Temporary credits lacking permanence will be discounted in the marketplace.

Demonstration Projects: Offset carbon credit trading and market development are at the very early stages. There must be demonstration projects (such as was done with PERT[3]) to show not only that the process can work, but also to generate some confidence in the system.

Start Date: In order for an afforestation project to be eligible to produce tradable offset carbon credits, the project must not start before the official starting date determined by the government of Canada. Investors will not be attracted to a program until a start date is set. It is recommended that the start date be set for January 1st, 1990. An early start date will ensure early establishment of a market mechanism and set prices for afforestation offset carbon credits. This provides a tool to attract investors.

Coordination: Development of marketable offset carbon credits from afforestation is a multi-level initiative involving coordinated cooperation from all levels of government, as well as the coordination of land owners and investors.

[3] The Pilot Emission Reduction Trading (PERT) project was an industry-led, multi-stakeholder initiative established in 1996.The objective of the PERT program was to evaluate emissions trading as a tool to assist in the reduction of GHG emissions.

Appendix I

A SHORT EXPLANATION OF THE ROLE OF CANADIAN FORESTS IN ACHIEVING GHG EMISSIONS REDUCTIONS UNDER THE KYOTO PROTOCOL

A note to the reader:
This short explanatory document has been prepared as a basic aid in understanding of how forests are included in the Kyoto Protocol. It is the viewpoint of the author, and should be read as a guide and not as a rule. Canadian forest management terminology has been used, rather than Kyoto terminology, for purposes of simplicity and clarity. For example: two words afforestation and reforestation are used in the Kyoto Protocol to denote the planting of two categories of treeless land. 'Afforestation' is used here to denote the planting of trees on any eligible land (vacant/treeless land with primary emphasis on marginal/sub-marginal agricultural land) to avoid confusion with the usual Canadian forestry meaning of 'reforestation' which is 'regeneration after harvest'. Forests are included in the Kyoto Protocol under two general headings: afforestation and the managed forest.

1.0 AFFORESTATION

Afforestation is the establishment of plantations on land that was bare of trees in 1990. There is no cap on the amount of offset carbon credits that can be developed through Afforestation. Land being considered for a potential afforestation program is poor pasture land considered to be on the economic margins of agriculture. Most of the land considered to be eligible for such a program is in private ownership. It is recognized that the dedication of private land to forest for long periods of time is a substantial contribution by the landowner as other land use opportunities may be lost. If the eligible land were to be planted with trees to develop offset carbon credits, this land must remain under forest for a rotation period of 20-50 years. The length of rotation is dependant on the species planted, as not all species grow at the same rate. For example, hybrid poplars grow faster than conifers and are generally managed on shorter rotations.

1.1 Starting Date

In order for an afforestation project to be eligible to produce tradable offset carbon credits, the project must not start before the official starting date determined by the government of Canada. This starting date can be set any date after January 1, 1990. As of February 2004, this date had yet to be set by the government. This affects both afforestation projects as well as the managed forest.

1.2 Carbon Accounting

Carbon accounting is straightforward. Prior to planting trees, the amount of carbon on the site must be measured in order to establish a baseline. After planting the trees, the site must be periodically measured for the carbon being stored. This would include the measuring the stored carbon in the stems, limbs, foliage, stumps, root mass, soil and litter on the forest floor. A mix of field measurements and factors will probably be used. The second step would be to subtract the baseline amount of carbon. This net gain of carbon would then be converted into carbon dioxide equivalent (CO2e), using appropriate conversion factors. The result would be the amount of offset carbon credits.

The carbon accounting must also taking into consideration risk management of the carbon being stored. Risk management strategies should be part of the management plan in order to make provision for possible carbon losses. One strategy would be to sell only a percentage of the total offset carbon credits, perhaps 70-80%, keeping the rest in the bank, as insurance against loss. Potential losses could be due to natural disturbances like fire, insect attack, disease, or to logging, clearing or other management and stewardship failures.

1.3 Leakage

Leakage can be either from the clearing/deforestation by landowners or from the greenhouse gas (GHG) emissions involved in establishing the plantation (site preparation, fertilization, weed control, seedling production and delivery, supervision, etc.) Although accounting for leakage is an important aspect, it could also be an impediment to action if measured at a highly scale. The management control system could cost more than the value of the carbon being managed.

1.4 Permanence

Permanence is a problem. A lack of permanence can be caused by deforestation by fire or clearing for development of one type or another. Risk management strategies will help to overcome these problems. But lack of permanence gets to be less of a problem as we move up the size scale from a very small patch of trees covering 1 ha, to a plantation of 100 ha, to a new forest at a landscape scale covering perhaps 100,000 ha or more. A new forest of 100,000 ha or more has a dynamic of its own and will tend to become a permanent forest.

1.5 Ownership of Offset Carbon Credits

Ownership of the offset carbon credits is not absolutely crystal clear but landowners have the strongest and natural claim to title. Legal certainty will be required. Sale of a commodity with a clouded title will not work. There should be legal work done on this to provide certainty before any program starts.

There are two areas requiring legal work:

- the contract between the landowner and the buyer of carbon must be very clear;
- the removal of any provincial government title to timber on private lands that is a residual artifact of colonial times.

There may be some joint funding partnerships to establish plantations on private lands. In this case the ownership of some or all of the offset carbon credits may be contracted by the landowner to the investors.

1.6 Purchase and Sale of Offset Carbon Credits

Offset carbon credits could be sold by the owner to any customer who needs credits to meet their emission reduction targets, with the price being established by the market.

2.0 THE MANAGED FOREST

The managed forest is also in the Kyoto Protocol. Canada has 418 million ha of forest. Approximately 210 million ha is Multiple Use Forest available for forest management. Approximately 150 million ha is now subject to active management and fire and pest control operations. It is this ~150 million ha, that Canada may designate as "managed Kyoto Forest". The Canadian government must designate the area of managed forest to be included in the Kyoto Protocol by 2006, if the government intends to use the huge potential carbon sink capacity in the managed forest in the first measurement period (2008-2012).

Canada has a total forested area of approximately 418 million ha. Of this forested area, the possible area of 'managed Kyoto forest' is ~150 million ha. Federal lands make up a very small portion, while Provincial ownership consists of ~125 million ha. The remainder of the managed forest would be ~8 million ha of Industrial Private Ownership, and ~17 million ha of Small Private Woodlots (450,000 owners).

2.1 Offset Carbon Credit Accounting

There is a cap on offset carbon credits from the managed forest in the first measurement period of approximately 64 Mega tonnes. The government of Canada has made a commitment for the first measurement period (2008-2012), however there is no commitment beyond this period. The future status of this sink and any extension of the cap will be sorted out during negotiations for the Kyoto GHG Emissions reduction targets for the second measurement period (2013-2017), as will everything else in the agreement.

The carbon accounting for the managed forest is complex as there are many factors to consider. On the debit side there is harvesting, thinning, damage from fire, insects and disease as well as some deforestation for development, mining etc. The situation on linear deforestation such as clearing for roads and transmission lines is still unclear and is the subject of negotiation. On the credit side of the ledger the situation for linear afforestation is also unclear but will presumably be resolved in a complementary manner. Credits will also include natural regeneration, planting, juvenile spacing and natural growth, etc. All of these activities (at their present level of implementation) and natural disturbances are considered to be Business As Usual (BAU). To develop and claim offset carbon credits we require a forest carbon measurement and inventory system that will allow us to measure change. We must also start implementing new and additional forest management and silvicultural operations and strategies (above and beyond BAU) that will increase the rate of sequestration and the size of the forest carbon sink. New or additional forest protection strategies can also be implemented to reduce the loss of forest carbon to natural disturbances like fire, insect epidemic and disease.

It is the changes in the rate of sequestration and in the volume of carbon in the forest, brought about by the implementation of these new and additional forest management and silvicultural operations and forest protection strategies that will provide the offset carbon credits.

If a good measurement system is not implemented, the detection and verification of the changes will not be possible resulting in no credits being identified. The first job required of the measurement system will be to establish a carbon content baseline of the managed forest. The next task will be the measurement of changes in the carbon content of this vast forest due to the application of additional forest management and silvicultural operations and forest protection strategies. Simulation and modeling supported by sample plots to provide base data is one possibility. There is a huge task involved in getting all this done in a way that is timely, credible, verifiable and accurate enough to pass the test that will be applied by critics and buyers of offset carbon credits. The area of forest is huge and there is a lot of diversity that must be accommodated in the sampling system. There is a huge potential, but it will not be easy or cheap. There will be substantial additional benefits to the Canadian forest sector from any such program of management strategies, silvicultural operations, growth and yield studies and forest inventory

2.2 Ownership of Offset Carbon Credits

The question of the ownership of offset carbon credits is both politically and economically charged. To add to the complexity, Canada has a relatively small cap (64 Mt) to be shared among these players. The federal government has a strategic interest in the way managed forest offset carbon credits are used and applied. The provinces own the vast majority (~80%) of the managed forest (Crown Land) and thus would have the first claim to ownership of the offset carbon credits. Private interests own the other 20%, and also have a stake in offset carbon credits from the managed forest. The forest products companies are now

doing the bulk of the forest management and silvicultural operations and are also the likely implementation agents for any new forest management activities. Forest protection strategies such as enhanced control of fire and insect attack are generally under the control of the provincial governments. None of these players are likely to do anything extra unless they are rewarded. Another factor causing ownership uncertainty is the effects of Native Land Claims, eventually resulting in a possible change in the ownership of forest land and, the ownership of any related offset carbon credits. This possibility may cloud the title to offset carbon credits.

The main negotiators will be the federal and provincial governments. There are many areas to negotiate including:

- The control and management of the offset carbon credits.
- The allocation of the credits among the provinces, and the allocation of offset carbon credits to the private owners in each province. It is useful to note that agreement by all the provinces may not be required for some parts of the country to move forward on developing offset carbon credits from the managed forest.
- Establishment of agreement and measurement systems in time to benefits during the first measurement period
- Allotment of available credits: handed out on a 'first come first served' basis or allocated. What happens if one party cannot develop all the credits allocated, could they sell the unused allocation to another party?

A significant area (20-25 million ha) of this Multiple Use Forest land is in private ownership. Here the forest management activities are the responsibility of the private owners. About 30% of this private land is large blocks of forest land in industrial ownership. The rest is owned by 450,000 small private owners with property size averaging 40 ha. Although the presumption is that title to the offset carbon credits lies with the private owners, legal clarity will be required. A system of aggregation will be needed to bundle the credits from small private properties to create marketable volumes and reduce transaction costs. But even the private owners access to any offset carbon credits may be dependent on agreement between the federal and provincial governments on how to share both the offset carbon credit cap and the offset carbon credit benefits from additional forest management activities in the managed forest. Needless to say there are enough questions here to provide uncertainty for a while.

2.3 Permanence

Permanence should not be a big concern in the managed forest. Most of the Crown Land is protected by legislation or policy, and will remain forested land. Only a very small percentage will be alienated to other uses over the foreseeable future. Risk management strategies, however, will have to be implemented as there is always the danger of damage and loss due to fire, insect, and disease vectors.

3.0 OFFSET CARBON CREDITS AS A COMMODITY

Is a offset carbon credit a real product with enduring value on the market? Offset carbon credits are not like wood which has a long-standing value in the marketplace. The carbon embodied in wood became a commodity due only to the negotiation and signature of the Kyoto Protocol. Before this, the carbon embodied in wood had no value, except perhaps when wood is used as a fuel; as carbon is the main component of wood that combusts and produces heat.

Carbon in wood has value as an offset carbon credit only as long as the Climate Change Convention is legally in force or is honoured by Canada. Offset carbon credits are a compliance tool for the first measurement period (2008-2012). Their value will be increased if the Canadian government states that they will also be a compliance tool for the second, third and ongoing measurement periods. The value of offset carbon credits are entirely dependent on the Canadian government staying in the Climate Change Convention or establishing a domestic GHG emissions reduction program that is based on the same general principles and reduction mechanisms. Under these circumstances it is reasonable to expect that the government of Canada would either provide assurance that the value of offset carbon credits will be maintained, or they would undertake to provide a significant portion of the investment required to establish plantations under any afforestation program. This investment would serve to underwrite the risk to any investment made by private land owners or others interested in the development and use of offset carbon credits.

Landowners and forest managers must understand and accept the nature and foundation of the value of offset carbon credits in their decisions to invest in the production of offset carbon credits. Landowners who invest in afforestation on marginal/sub-marginal agricultural lands may want to consider the value of a 'basket of benefits' that will result from their expenditures of plantation establishment. Some of these benefits will be more certain and tangible than others. The 'basket of benefits' will include such things as: wood, offset carbon credits, aesthetics, wildlife habitat, water quality conservation and rural jobs and community stability. All of these are good things but with very different returns on investment. These returns are enjoyed by society at large, not just the landowner. This is an additional reason for government action to provide assurances of the long-term value of offset carbon credits or to underwrite the risks by becoming an important investor.

Tony Rotherham R.P.F. has 38 years experience in the forest management and industry sectors in Canada, and has been involved in the development of international and Canadian policy and certification strategy since 1994.

Appendix II

SPEAKER BIOGRAPHIES

DARREN ALLEN, M.Sc.F. – R.P.F., Forestry Specialist, CFS Great Lakes Forestry Centre

After having graduated from the faculty of Forestry and Environmental Management in the spring of 1995, Darren was hired by the British Columbia Ministry of Forests, BC Forest Service in northeastern BC at the Fort St. John district office. During his tenure with the BC Forest Service Darren held positions of Woodlot Forester, Zone Forester and acting Timber Officer until his departure for graduate school in the fall of 1999. Graduate work focused on abiotic influences on forest landscape ecology, primarily focusing on the impacts of climate change on forest health. After having completed graduate school Darren was hired in the fall of 2002 as the Forestry Specialist - Afforestation with Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre in Sault Ste. Marie, Ontario. Darren's role as the Forestry Specialist focuses on the Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) Initiative and the Forest 2020 / Greencover project.

Graduated from University of New Brunswick in 1995 with a Bachelor of Science in Forestry, focus in GIS (B.Sc.F.), and in 2003 with a Master of Science in Forestry, Landscape Ecology and Climate Change (M.Sc.F.). Inducted into the Association of British Columbia Registered Professional Foresters in 1997.

CHRISTY ARSENEAU – Forest Sector Analyst, CFS

Christy is a Forest Sector Analyst with the Canadian Forest Service in Ottawa. For the past three years, she has worked on sustainable forest development policies and is currently part of the operational team for Forest 2020. She has a Bachelor of Science in Forestry from the University of New Brunswick, and a Master of Forest Conservation from the University of Toronto.

J.B. (JIM) GILMOUR – Landowner, Eastern Ontario Model Forest Director

A graduate of Queen's University and McMaster University. Worked as a Research Scientist (Metallurgy) with Natural Resources Canada before retiring in 1994. For many years, with the help of his wife and children, made maple syrup on their wooded rural property in Lanark County where they now live. A member of the Board of Directors of the Eastern Ontario Model Forest, the Lanark Stewardship Council, and President of the Eastern Ontario Certified Forest Owners.

MICHAEL R. INNES R.P.F. – President, M.R.J.I. Consulting Services Inc.

Michael R. Innes is currently President of M.R.J.I. Consulting Services Inc. based near Eden in south-western Ontario. Mr. Innes is a registered professional forester who graduated in Forestry in 1965 from the University of Toronto. He also holds a Master's degree in Forest Economics and a Master's degree in Business Administration. following graduation, he worked for the Canadian federal government as a research officer; then with the Ontario Ministry of Natural Resources latterly serving as the Regional Forester for the Northern Ontario Region.

He joined Abitibi-Price in 1980 and was named the Manager of Forestry in 1984. Subsequently he led a company-wide initiative in Consistent High Performance in manufacturing processes and then spent several years as Chief of Staff of the Operating Committee. This committee had the function of overseeing the business and people performance of 10 mill business units and head office functions. After the merger of Abitibi-Price with Stone Consolidated and the subsequent acquisition of Donohue Inc., Mr. Innes has held positions as vice-president in the fields of environment, health and safety, and energy. Latterly he was Vice-President Environment, Abitibi-Consolidated Company of Canada Inc., responsible for company-wide environmental affairs encompassing 27 pulp and paper mills in Canada, the U.S.A., the U.K. and Asia; 22 sawmills; 3 remanufacturing facilities; a market pulp mill; and 10 recycling centres.

Mr. Innes is a past president of the Ontario Professional Foresters Association; past president of the Forest Research Advisory Council of Canada; past Chairman of the Board of the Forest Engineering Research Institute of Canada; past chairman of the Environment Section of the Canadian Pulp and Paper Association; past chairman of the Environmental Effects Monitoring Committee of the Forest Products Association of Canada; and a past member of the American Forests and Paper Association Regulatory Policy Committee.

TONY LEMPRIÈRE – Senior Economist, CFS

Tony has been a Senior Economist (Industry, Economics and Programs Branch) with the Canadian Forest Service of Natural Resources Canada for almost 9 years. He has been involved in the climate change negotiations process under the United Nations Framework Convention on Climate Change since 1997, and has attended almost all major international negotiating sessions on the Kyoto Protocol in recent years as part of Canada's delegation. Domestically, his responsibilities involve contributing to work needed to implement and take advantage of the forest carbon provisions of the Kyoto Protocol, including participating in the design of an offset trading system

He was the Review Team Leader for the only forest sequestration project to have undergone an official review in Canada, in 2001-2002 through the Greenhouse Gas Emission Reduction Trading (GERT) Pilot.

Tony holds an MA in Economics from Queen's University, and a MSc in Resource Management and Environmental Studies from the University of British Columbia. Prior to joining the Canadian Forest Service he worked as a Research Associate with the Forest Economics and Policy Analysis Research Unit at the University of British Columbia, and as an Economist with the Economic Council of Canada.

JAMIE MACKINNON – GSCI-Natsource

Jamie MacKinnon is a Consultant in the Ottawa office. Mr. MacKinnon's work with GCSI-Natsource has focused on assessing the implications of Climate Change and Air Quality policy for business and providing emissions market intelligence. His recent work has been in the analysis of the financial impacts of GHG limitation scenarios on Canadian energy firms under the proposed parameters for domestic emissions trading. He has also led the research and writing work on a study for the Commission for Environmental Cooperation on the key components for cross-border multi-pollutant trading within NAFTA. Mr. MacKinnon's experience with emissions trading is both at the policy and market level where he has conducted assessments of GHG offset project activities and CDM/JI projects and delivered presentations to business groups on emissions market development. His other areas of expertise include: the role of the financial services sector in adaptation to climate change; the economic assessment of the costs of climate change; and national and regional air quality regulation. Prior to joining GCSI-Natsource, Mr. MacKinnon worked on major environmental impact and compliance issues for a large multinational based in Ireland. He has a degree in Management Economics from the University of Guelph and is fluent in English, French, and Spanish.

DANIEL MCKENNEY – Chief, Landscape Analysis and Applications CFS, Great Lakes Forestry Centre

- Ph.D. The Australian National University, Centre for Resource and Environmental Studies, Canberra, Australia.
- M.Sc. University of Guelph, Dept. of Ag. Economics and Business, Guelph, Ontario
- B.Sc. Texas A&M University, College Station, Texas, U.S.A., Dept. of Forest Science.

The section focuses on multi-disciplinary approaches to landscape modelling of wood and non-wood values. Specific issues include developing spatial models of the bio-physical drivers of forest systems such as climate, topography, soil moisture and nutrients; deriving statistical relationships between these and land cover and plant and animal distributions, abundance and productivity at multiple-scales. We also undertake a variety of economic studies in the areas of the economics of forest management inclusive of wood and non-wood values and the economics of research and research priority setting

RAY RIVERS – Executive Director, Clean Air Canada Inc.

Ray Rivers is currently Executive Director of Clean Air Canada Inc., a not-for profit membership organization that promotes greenhouse gas emissions reductions and emissions trading. Previously Ray Rivers operated Rivers Consulting, a environmental and economic policy consulting firm with clients that included Environment Canada, Ontario Ministry of Municipal Affairs and Housing, Cominco, Ethyl Canada, The Organic Crop Improvement Association, Pollution Probe and the Walkerton Inquiry. He has authored articles on a wide variety of topics, and has spoken frequently at conferences.

Ray holds undergraduate degrees in Economics from the University of Western Ontario and the Victoria University of Wellington (New Zealand), as well as a Master's degree in Economics from the University of Ottawa. For several years he lectured on Public Administration and, in the early 1990s, designed and taught a course on "sustainable development" for the Wilfred Laurier University MBA program --the first such course in a Canadian business school.

Rivers spent twenty-five years with the federal government working in Environment Canada, the Department of Fisheries and Oceans and Agriculture Canada. Despite his broad experience he has specialized in emissions trading and is a former Board Member of Clean Air Canada Inc., and founding member of this organization committed to emission trading in order that Canadian industry can cost-effectively meet emissions limits including the internationally binding Kyoto targets.

Ray spent April to November 2002 working with the Air Policy and Climate Change Branch of the Ontario Ministry of the Environment developing processes to fully implement Ontario Regulation 397 – the first major emissions trading program in Canada. He advised the Ministry on a number of related issues including improvements to the Emissions Trading Code and greenhouse gas reduction in Ontario to meet the Kyoto Accord.

TONY ROTHERHAM, R.P.F. – T.Rotherham Consulting

A bilingual forester educated at the University of New Brunswick. 38 years experience in the forest management and industry sector in Canada, has provided a sound knowledge of Canada's forests, forest history, forest statistics, types of forest management and silviculture operations, as well as the size and structure of the Canadian industry and its markets. Tony has been involved in the development of international and Canadian policy and certification strategy since 1994.

THOMAS WHITE – Physical Scientist: Afforestation and Carbon Accounting, CFS Pacific Forestry Centre

Joined the Canadian Forest Service Carbon Accounting Team in April of 2002. Thomas is currently working on developing a database of afforestation activities in Canada, in co-operation with researchers in other CFS centers, as part of the Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) program. He is also researching requirements for the afforestation module of Canada's National Forest Carbon Accounting System, pursuant to Canada's obligations to report on Land Use Change under various international treaties, including: Internet based data collection systems for afforestation Updates to the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS2) to address afforestation/reforestation.

WAYNE D. YOUNG, R.P.F. – Fibre Supply Manager, Domtar

Fibre Supply Manager, Domtar. Responsible for forest management, fibre procurement and fibre processing for Domtar's Southern Ontario pulp & paper mills in Cornwall & Trenton. 24 years of progressive positions with Domtar, 10 years in Northern Ontario, 14 years in Eastern Ontario.

Wayne is currently a Chairperson of the Forest Gene Conservation Association, as well as a Chairperson of Sir Sanford Fleming College Forestry Advisory Committee. He is a member of Board of Directors of Forest Genetics Ontario, a Member of Board of Directors of Empire State Forest Products Association, and a Member of Board of Director of Friends of Forestry Centre. He is a former Vice-President of Board of Directors - Eastern Ontario Model Forest, and the recipient of a Canadian Forest Stewardship Recognition Program Award (2003).

Wayne is a graduate of Lakehead University, Thunder Bay, Ontario, BSc.For. in 1979, For. Dip. in 1975

Appendix III

Session 1 Presentations

An Introduction to Forests and The Kyoto Protocol

FAACS Fall Focus Session
19 November 2003

Tony Lemprière
Canadian Forest Service
Natural Resources Canada

Natural Resources Canada | Ressources naturelles Canada
Canadian Forest Service | Service canadien des forêts

Canada

Outline

1. Forest activities in the Kyoto Protocol
2. Definitions
3. Accounting rules
4. Offset trading system
5. Forest carbon in a trading system

2

Forest Activities in the Protocol

- In 1st commitment period, Canada must account for ARD as defined for the Protocol
  - Afforestation (A), Reforestation (R) since 1990
    - both are creation of new forest
    - planting, seeding and human promotion of natural seed sources qualify
  - Deforestation (D) since 1990
    - non-temporary removal of forest
- In 1st commitment period, Canada can choose to account for forest management (FM) as defined for the Protocol
  - must decide by 2006 if we want to do this
  - must define the land area and show it has been subject to management since 1990

3

Definition of Forest

Forest

…is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30% with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent or tree height of 2-5 m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.

- Canada must choose its values for the three ranges

4

Definitions of Afforestation, Reforestation and Deforestation

Afforestation (A)

…is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.

Reforestation (R)

…is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forest land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

Deforestation (D)

...is the direct human-induced conversion of forested land to non-forested land.

5

Definition of Forest Management

Forest Management (FM)

...is a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.

- Canada must decide on how to implement the definition in terms of what area should be included
- To be part of FM, an area must
  - satisfy the definition of forest
  - be subject to a system of practices consistent with the forest management definition

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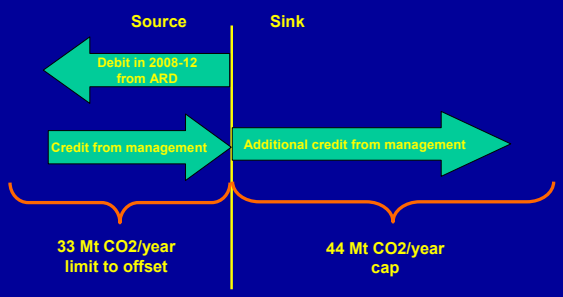
Accounting for Forests in the Protocol

Accounting rules in 1st commitment period for ARD and FM at national level:

- in 2008-12, Canada must account for
  - all land subject to FM (if decide to include) & ARD since 1990
  - carbon stock changes in all ecosystem carbon pools on this land
  - non-CO2 emissions/removals on this land
- once land enters the accounting system, it must be accounted for in all future commitment periods
- debits from harvesting an area of AR land are limited to size of any credit previously given for the AR activity on the area

7

Accounting for Forest Management



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Forest Areas in the Kyoto Protocol

- Area of forest
  = 418 million ha
- FM area - not defined
  - timber productive forest - 245 million ha
    - non-reserved, with access - 137 million ha
- Area of afforestation / reforestation (new forest)
  = approx 1,500 ha / year (very crude 2000 estimate)
  = approx 0.02 million ha since 1990
- Area of deforestation (permanent loss of forest)
  = approx 46,000 ha / year (very crude 2000 estimate)
  = approx 0.6 million ha since 1990

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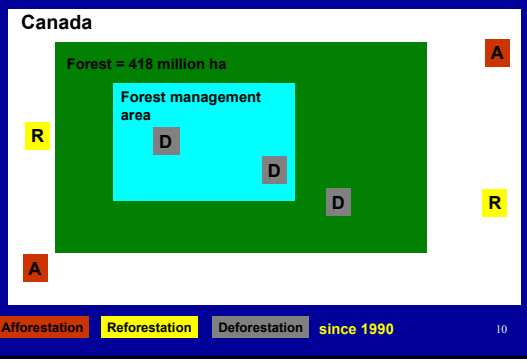
Forest Areas in the Kyoto Protocol



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Forest Management Decision by 2006

- If forest management (FM) is a sink, it will fully or partially offset expected debits from deforestation
- Inclusion
  - will incent and promote sustainable FM
  - is consistent with goals and objectives of the UN Framework Convention on Climate Change and its Kyoto Protocol to protect and enhance sinks and reservoirs
  - contributes to conserving biodiversity, promoting clean air, protecting streams, lakes, and rivers
  - will help ensure development of systems to better track and measure forests
- There is a risk of being a source due to natural disturbances

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Offset Trading System Development

- Work to date
  - June 2003 Federal Offset System Discussion Paper
  - June 2003 consultations
  - see http://www.climatechange.gc.ca
- Work underway
  - assessment of messages from consultations
  - analysis of costs associated with different design choices
  - analysis of design options
- In 2004:
  - release of Design Paper - proposed system
  - development of guidance documents

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Offset System Basics

- Eligibility requirements for participation of a project in the system:
  - real, measureable, verifiable, surplus, unique emission reductions or carbon sequestration
  - ownership is clear
  - project began after specified start date
- Credits awarded for reductions/removals that result from the project, relative to project baseline
  - credits can be used by large final emitters (LFEs) for compliance with their backstop/covenant target
  - LFEs include oil and gas, electricity generation, mining and manufacturing including pulp and paper mills
  - potential for other buyers

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Offset Trading System

- Project cycle:
  - Project development
    - by project proponent
  - Project documentation / approval
    - submitted by proponent for validation
    - approved by Offset Program Authority
  - Emission reduction / sequestration
    - measurement and monitoring by proponent
    - verification (third-party)
    - certification/issuance by Offset Program Authority
  - Trading
    - by market participants

Proposed offset system

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Forests in an Offset System

- Forest carbon projects eligibility:
  - afforestation and reforestation projects would be eligible
  - FM projects eligible only if Canada includes FM in its national accounting
  - Avoided emission projects could be eligible e.g. reduced deforestation, some types of forest management projects
- Forest projects:
  - must involve "forest" as defined in Marrakech Accords
  - have to account for all ecosystem carbon pools and non-CO_2 gases specified in Protocol in both baseline and with the project
  - will be subject to a permanence provision

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Forest Carbon in an Offset System

- Project-based system does not preclude
  - pooling - multiple land-owners or land managers include their individual activities or land areas in one project
  - aggregation of credits from multiple projects
- Changes in forest carbon certified and sold as offset credits into the domestic emissions trading system would need to:
  - be measurable and verifiable
  - reflect changes relative to a baseline of what would happen in the absence of the project

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Forest Carbon Project Baselines

- Represent reductions/removals that would occur in the absence of the project (includes BAU reductions/removals)
  - for afforestation projects - the activity and carbon stock changes that would have occurred if no planting
- Want baselines to be:
  - cost-effective to develop - variety of methodologies are possible
  - consistent across similar projects but reflect specific project circumstances
  - transparent and straightforward to verify
  - conservative
  - updated as needed to reflect significant changes in project circumstances

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Non-Permanence

- Non-permanence issue
  - partial or total loss of a carbon stock due to a natural disturbance (e.g., pest outbreak) or a change in land management practice (e.g., harvesting, soil cultivation)
  - is an issue for offset system if credits had previously been issued for the carbon sequestration
  - key issue is who has liability for a carbon reversal after the issuance of offset credits
- Risk management plan
  - would be required for all forest carbon projects
  - requirement to identify likely risks, develop risk management strategy and implement it

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Non-Permanence

- Treatment of issued credits when the carbon is emitted
  - likely will be a number of choices available to project proponents
  - Seller replacement
    - project developer accepts liability to replace the credits for a specified lengthy period
  - Insured credits
    - project developer purchases insurance for non-permanence events, and insurer has liability to replace the credits for a specified lengthy period
  - Temporary credits
    - project developer sells credits with a short life
    - from buyer's perspective is a temporary deferral of emission liability
    - these credits will have a lower price

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For more information:

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604-822-5466

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ANNEX
Proposed Principles and Eligibility Criteria for an Offset Trading System

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Principles for System

- 5 Principles to guide the design of the offset system
- Trade-offs among these principles may be required

(1) Enhance market liquidity
- increase number of market participants and supply of compliance units through
  - clarity on eligibility, trade, use & banking rules
  - transparent & consistently applied review process
  - minimizing administration costs
- market as unfettered as possible

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Principles for System

(2) Open as practical
- Maximize opportunities for innovation and development of low cost reduction/removal projects
- Open to potentially all sectors/facilities outside covenant system
- 'Workable' system

(3) Contribute to Kyoto commitment
- Direct contribution to achieving Canada's target (in addition to assisting LIEs achieve their target at lower cost)
- Some projects will already have made a contribution (e.g., forest and agricultural sinks)
- Other projects will contribute a portion of the reductions achieved

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Principles for System

4) Create incentive for investment in Canada
- Create value for domestic actions & encourage long-term structural change

5) Provide right signals for action
- Provide incentives for long term as well as short term reductions/removals
- Avoid perverse incentives

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Eligibility Criteria

- **Criteria will:**
  - Determine eligible projects and reductions/removals
  - Ensure integrity of system

1) inclusion in the inventory
   - Kyoto gases
   - Activity included in Canada's international reporting

(2) project start date
   - Intent is to encourage new action to reduce/remove GHGs beyond the national BAU baseline
   - Define 'project start date'

25

Eligibility Criteria

(3) crediting period
   - Before 2008 - reductions/removals not eligible
   - 2008-2012 reductions/removals eligible
   - Beyond 2012
     - eligibility will depend on international & domestic rules
     - best efforts to recognize reductions/removals from registered projects in subsequent commitment periods

(4) real
   - Identifiable project
   - Net of leakage (all GHG changes must be taken into account)

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Eligibility Criteria

(5) measurable
   - Quantify baseline scenario & actual reduction/removal
   - Quantification and verification methodology set out in a protocol
   - Use standard (pre-approved) quantification protocol when available

(6) verifiable
   - Verification requirements included in protocol
   - Raw data must be available to appropriate authority

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Eligibility Criteria

(7) surplus
   - Not required by regulation/voluntary agreement
   - Exceeds reduction/removal expected from receipt of other government climate change incentives

(8) unique
   - Reduction/removal can only be used once (avoid double counting)

(9) ownership
   - All potential claims to ownership must be identified
   - Ownership defined in system rules or private contracts

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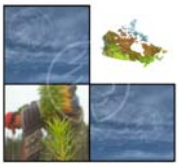


Afforestation in Canada

The big picture and a look at Ontario

FAACS Fall Focus Session
Establishing New Forest to Address
Carbon Credits and Customer Needs

Darren Allen, Forestry Specialist - Afforestation
Canadian Forest Service, Great Lakes Forestry Centre

Outline of Presentation

- Area of Available Land for Afforestation
- Components of an Afforestation Program
- FAACS – what is it and why are we here?

2

Area of Land Available

- Upwards of 7 - 11 million hectares of land available in Canada
- Comprised mostly of marginal agricultural land – includes pasture, water margins and other areas difficult for tillage (I.e., rocky, isolated, impede drainage, etc.) or with low fertility
- Mostly in private ownership
- In Ontario, there are approximately 4,428,634 ha's of cropland (low potential) and 1,242,250 ha's of pasture and abandoned fields (high potential)

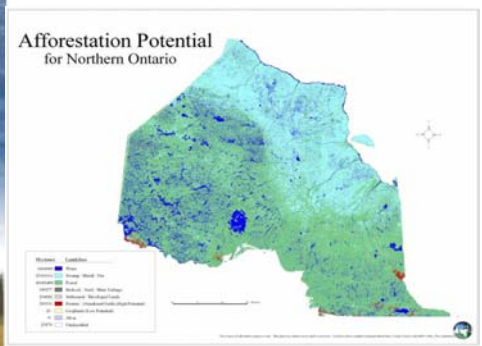
3

Overview of Presentation

Source OMNR, 2002

4

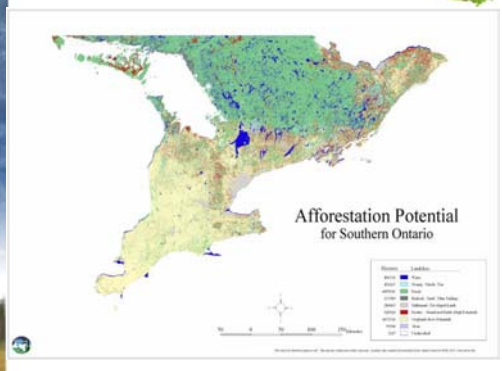
Pasture / Abandoned Fields = 293,551 ha's



Source OMNR, 2002

5

Pasture / Abandoned Fields = 920,549 ha's



Source OMNR, 2002

6

Ontario Potential

- Estimates reflect as much as 212,000 ha's +/- 4% of farmland and 97,000 ha's of non-farmland could be converted to new forests if planting costs are paid**. "Economics" are key incentives for convincing landowners to plant trees on their lands.
- Areas could potentially increase if costs are paid **and** other forms of incentives are offered to the landowner.

** results of a study completed for Ontario Ministry of Natural Resources by Woodrising Consulting Inc. in 2002.

7

Components of an Afforestation Program

8

Components

- Agreements with landowners
  - Their contributions
    - Land, establishment, tending and monitoring activities…
- Plantation establishment and tending activities
  - Site preparation – discing / plowing, herbicide (reduce competition)
  - Planting – manual or mechanical
  - Tending – weeding / grass mowing, spray, thinning, pruning
  - Monitoring – plantation survival assessments,fire, insects and disease
- Extension services
  - Sharing of information to enabling the landowner to directly / indirectly take part in activities
- Forest Industry – could play role in establishment, tending and monitoring activities for "first offer to purchase" fibre/wood when they mature (i.e., short rotation species 15 – 20 years or longer term for more traditional species could receive thinning products and/or end product) – this enables long term forecasting of future inventories

9

Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS)

10

Background to FAACS

- Oct. 2000 announcement of "Government of Canada Action Plan 2000 on Climate Change"
- $500 million investment over five years on specific measures that reduce greenhouse gases (GHG)
- Targets key sectors, i.e., Transportation, Energy, Industry, Buildings, Agricultural and **Forestry**
- Aimed at possibly helping Canada achieve one-third of its Kyoto Protocol emission reduction target during 2008-2012 commitment period
- Includes forestry component focusing on advancing carbon sequestration opportunities through FAACS initiative
- Forestry activities such as afforestation, reforestation, and deforestation (ARD) are presently included in the Kyoto Protocol under Article 3.3

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So, what is FAACS ?

- FAACS initiative is a preparatory measure intended to evaluate whether a large national afforestation effort is justifiable and, if so, how to best initiate and support such an effort.
- FAACS considers both the sequestration potential and the cost of implementing a large-scale planting program to increase forest cover in Canada as a cost-effective solution to offset GHG emissions.
- Main focus is to carry out information collection and land assessment research on private lands, as well as develop required carbon measurement and accounting infrastructure to support Canada's Kyoto Protocol reporting requirements

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FAACS Goals/Timelines

- Carry out information assessment and evaluate program mechanics to explore a range of options for implementing a large scale national afforestation program
- Establishment of afforestation pilots/trials to assess interest, design, mechanics and feasibility
- Historical afforestation data collected will feed into national afforestation database - to be used to create afforestation module of the CFS Carbon Budget Model (CBM-CFS2)
- Three year timeframe 2001/02 to 2003/04

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What is going on in Ontario?

- Activities currently underway in Ontario include:
  - **an assessment of historical afforestation since 1990 (CFS, GLFC),**
    - largely complete (~95%), few data sets being submitted
    - linkage to relevant growth and yield information ongoing
    - completion date March 31, 2004
  - **completion of a cost/benefit economic afforestation model (Dr. Dan McKenney, CFS, GLFC).**
    - cost/benefit information system that is designed to link the biology and the economics of afforestation for agricultural lands in Canada
    - workshop on draft model to be held November 20-21, 2003

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Pilot Projects Under FAACS Initiative

- Nationally under FAACS a total of five pilots are currently underway across the country, each contributing a regionally developed approach to national policy development in this area.
- Eastern Ontario Model Forest is leading Ontario pilot

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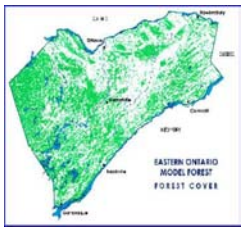
Eastern Ontario Afforestation Pilot Project

- Represents the Great Lakes St. Lawrence Forest Region
- 1.5 million hectares
- 34% forested
- 1 million people
- 23% rural
- 88% privately owned

"*A settled landscape*"



Eastern Ontario Model Forest

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Objectives of FAACS Ontario Pilot

The Eastern Ontario Model Forest (EOMF) in partnership with other agencies is leading the pilot to:

- **Design** and **test** potential afforestation scenarios
- **Maximize early carbon** returns and **minimize planting cost**
- In consideration of the **management objectives** of the **landowner**
- Determine **landowner interest** and potential **participation**
- Determine incentives to **maximize participation**

Eastern Ontario Model Forest

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Key Components

- Landowner Incentives Focus Sessions
- Carbon Credits from Afforestation and Customer Needs Focus Session
- Policy barriers to an Afforestation Program in Ontario
- Detailed look at available lands in eastern Ontario linking to socio-economic model

Eastern Ontario Model Forest

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Next Steps

- Results from all efforts and focus sessions will be compiled into a report which will help support national policy development which considers regional information and needs

Eastern Ontario Model Forest

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Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS)

If you would like **more info** regarding the pilot study… contact:

Sharleen Hawco
Project Coordinator
FAACS - Eastern Ontario Afforestation Pilot Project
Eastern Ontario Model Forest
shawco@eomf.on.ca
613.258.6567

Darren Allen
Forestry Specialist
Canadian Forest Service,
Great Lakes Forestry Centre
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705.541.5774

Eastern Ontario Model Forest

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Other Projects Under FAACS Initiative (National)

- Other national level initiatives include:
  - Incentives Review and Assessment, NOFC
  - National Incentives Survey Research - Environics, NCR HQ
  - Co-benefits Research, GLFC/University of Guelph
  - Carbon Accounting Tools, PFC
  - Prototype Afforestation Project Reporting System, PFC
  - Measurement and Monitoring Afforestation Protocols/Guidelines, NoFC
  - Enhancement of Land Suitability Data, NoFC
  - FCM Pilot Series, network of industry projects

21

Can afforestation make a difference?

- For first reporting period (2008-2012) – modest sink
  - In Ontario some carbon will be sequestered
    - 15, 000 t CO2e** (OPLAP)
    - It is predicted that Canada will have a minor contribution from Afforestation for this period
- Cumulative to 2052 (subsequent reporting periods)
  - Estimates by OMNR state that as much as 14,545,000 t CO2e** could be sequestered
- Other non-carbon benefits must also be considered which include; enhanced biodiversity, improved air quality, source water protection, wildlife habitat and numerous other benefits

****OMNR, 2002**

22

Afforestation and Carbon Sequestration

Thomas White
CFS Carbon Accounting Team

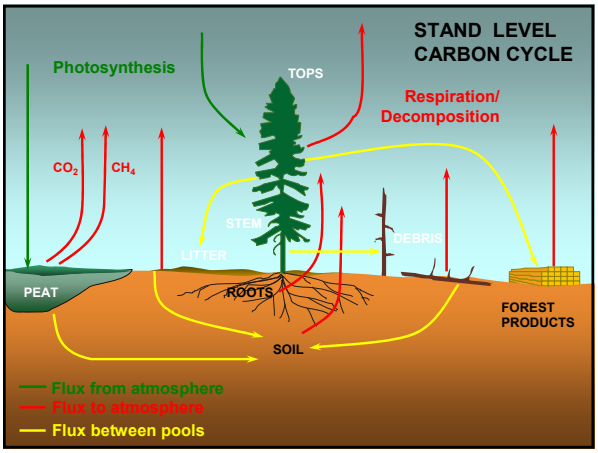
FAACS Fall Focus Session
November 19th, 2003
Toronto, ON

Overview

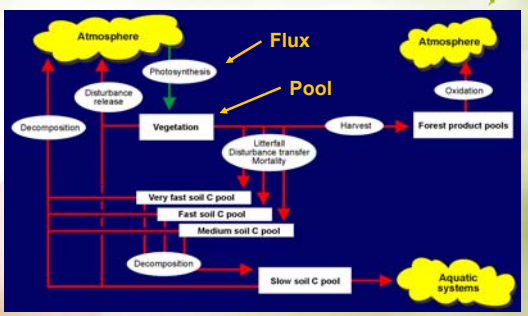
- Where is Carbon (C) found in the plantation ecosystem?
- What changes can we expect to see following plantation establishment and through the life of the stand?
- How can we measure or estimate C stock and C stock change in the plantation ecosystem?
- How can we ensure that afforestation is an effective mitigation measure against the build-up of greenhouse gases in the atmosphere?

Terminology

- Carbon Sequestration - The process of increasing the carbon content of a carbon pool other than the atmosphere.
- Carbon stock - The absolute quantity of carbon held within a pool at a specified time.
- Carbon sink –A carbon pool can be a sink for atmospheric carbon if, during a given time interval, more carbon is flowing into it than out of it, i.e. the carbon stock in that pool increases with time.
- Carbon source - Opposite of a carbon sink. A carbon pool can be a source for atmospheric carbon if, during a given time interval, more carbon is flowing out of it than into it, i.e. the carbon stock in that pool decreases with time.



A Conceptual model of C in the forest ecosystem



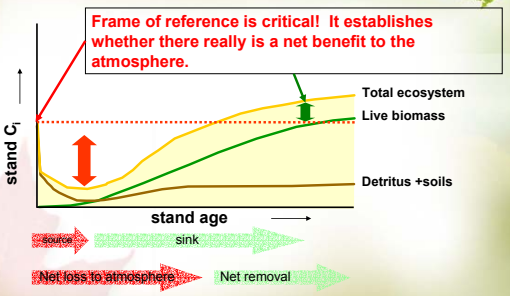
Important Observations

- The terms ‘sink’ and ‘source’ refer to the direction of a carbon flux relative to the atmosphere.
  - A sink process results in a net decrease in atmospheric CO2. A source results in a net increase.
- What matters is whether there is a net gain or loss at the ecosystem level.
  - Whether a forest stand is a sink or a source at single point in time depends on the difference between the sum of the fluxes entering the ecosystem pools and the sum of the fluxes leaving the same pools. Some pools may accrue carbon faster than they loose it. For others, the reverse may be true.

Important Observations

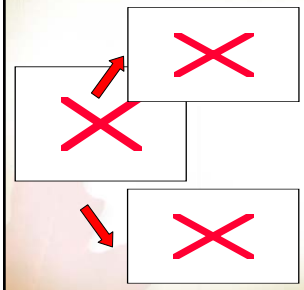
- **Carbon pools are representations of different turnover rates of ecosystem carbon:**
  - When CO2 is removed from the atmosphere through photosynthesis, it is converted into sugars and starches that are allocated to different parts of a plant - in the case of a tree to stem, branches, leaves, coarse roots, fine roots.
  - These different plant parts keep carbon sequestered out of the atmosphere for different lengths of time, depending on their life spans. Carbon held in leaves and fine roots cycles relatively rapidly. Carbon in the stem persists as long as the tree remains alive.
- **These rates fluctuate over time and space.**
  - Climate and soil type are important determinants of overall site productivity. This has important ramifications for measurement.

Change in stand level C storage with time



Different stands, different C profiles

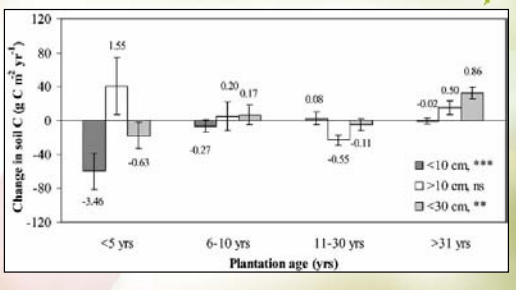
Landscape Level Effects



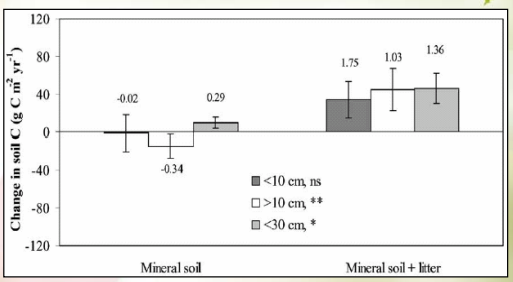
Increasing disturbances: Age-class shifts left:
younger forest,
lower C content
C SOURCE

Decreasing disturbances: Age-class shifts right:
older forest,
higher C content
C SINK

Soil C change following Afforestation



Forest floor buildup



Soil and DOM C stock change following Afforestation

- **Bashkin, M and D. Binkley, 1998.**
  - Eucalyptus inputs to 0-10cm layer offset by losses of cane derived C from 10-55cm layer (age 10-13yr)
  - Homogenization of soil C distribution through tillage, which adds soil C to deeper layers vulnerable to losses once tillage stops
- **Soil C losses can be mitigated by short term maintenance of cover crop between plantation rows (Tolbert, V.R. et al. 2002) and medium term DOM buildup on forest floor (K.I. Paul et al, 2002).**
- **Change in non-biomass pools is affected by**
  - Productivity of new relative to previous vegetation cover
  - Different patterns of above and below ground biomass allocation and turnover times for herbaceous vs. woody plants
  - Land use history that has altered the C profile of soils (tillage)
  - Change in decomposition rates

Overview

- Where is Carbon (C) found in the plantation ecosystem?
- What changes can we expect to see following plantation establishment and through the life of the stand?
- **How can we measure or estimate C stock and C stock change in the plantation ecosystem?**

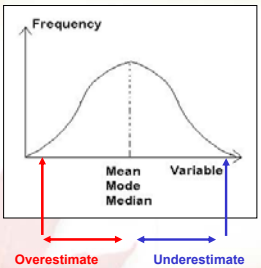
Site Specific Measurement

- **Use a plot-based sampling approach to estimate change in stand level carbon between t1 and t2:**
  - Well established procedures for sampling merchantable volume.
  - Procedures exist for sampling C is soil, fine and coarse woody debris.
  - Destructive sampling of trees would provide site specific allometric relationships.
- **An approach based entirely on site-specific measurement will be costly, but very accurate.**

Estimation derived from information obtained off site

- **Opposite end of the spectrum is to use regionally appropriate information derived from offsite research to estimate change in stand level carbon between t1 and t2:**
  - Use of stand yield tables, Allometric relationships (biomass expansion factors), predicted change in soil and dead organic matter carbon based on biogeoclimatic signals, etc. that are acceptable to scientific community.
- **Less accurate than site specific measurement, but less costly too.**
- **Error terms can be significant for individual projects.**

Justifying use of information derived off site



- **Need to demonstrate that selection of offsite information is appropriate. There two types of risk associated with use of this information:**
- Underestimate actual C in a pool:
  - The difference between the true and calculated buffers the estimate and does not affect environmental credibility
- Overestimate actual C in a pool.
  - Undermines the environmental credibility of the estimate

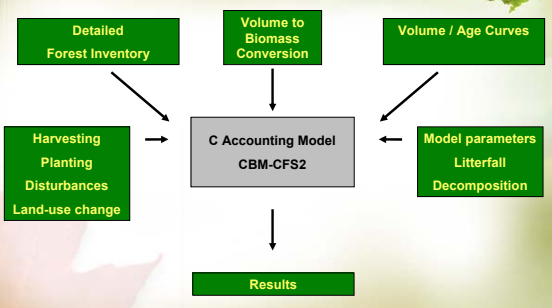
Hybrid approach

- **A hybrid approach will provide best mix of cost effectiveness and accuracy.**
  - Use direct measurement at regular intervals to calibrate models
  - Use a model (e.g. CBM-CFS2) to model C stock change from biomass, DOM and soil between measurement intervals
- **Possible to achieve economies of scale if sampling a normally distributed population :**
  - factors are equally likely to over and underestimate actual values for C pools in specific stands, but estimate for entire population is more accurate.

Using Scaling factors and simulation models

- Scaling factors, such as those recommended by the IPCC and computer simulation models, such as the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS2) are often used to estimate carbon sequestration in forests.
- Biomass expansion factors and carbon budget models are mathematical models of reality that differ in their complexity.
- The accuracy of a method for a specific application is not *a priori* dependent on its complexity. The use of factors or models does not lend any credibility to an estimate. What matters is the appropriateness of the rationale for the choice of specific values for the various parameters of the mathematical models – the science behind the models.
- Simple factors can be useful for quick estimates. Complex computer models are designed to process large or complex datasets.

CBM CFS2



Overview

- Where is Carbon (C) found in the plantation ecosystem?
- What changes can we expect to see following plantation establishment and through the life of the stand?
- How can we measure or estimate C stock and C stock change in the plantation ecosystem?
- **How can we ensure that afforestation is an effective mitigation measure against the build-up of greenhouse gases in the atmosphere?**

Permanence

- When CO2 sequestered in trees is used to offset the emission to the atmosphere of an equivalent amount of fossil fuel it becomes a stored pollutant.
- If that sequestration is reversed -through the planned (harvesting, land-use change) or unplanned (fire, insects, disease) death of the tree- the sequestered carbon is eventually released back to the atmosphere. There is no net benefit to the atmosphere following a complete reversal.
- Permanence refers to the length of time that carbon 'lives' in a carbon pool. In forest conditions, this is on the order of months to centuries. For carbon stored in geologic fossil fuel reserves this is nearly permanent (unless it is extracted and burned).
- Avoiding the emission of 1t of C from fossil fuel burning is considered the equivalent of leaving it in the ground indefinitely.

Mitigating non- permanence

- Permanence can only be overcome at the stand level if a forest stand is maintained in perpetuity. However the risk of reversal is always present.
- At the landscape level, the risk of reversals can be mitigated through geographic diversification – the whole isn't compromised if reversals occur in individual stands.
- Landscape level planning is the only way to mitigate against anticipated reversals such as harvesting. It is possible to manage for sustained removal of CO2 from atmosphere by managing in the same way we manage existing forests to produce a continuous supply of wood.
- The effectiveness of any biological sinks strategy is finite - limited by available space and the sum of the carrying capacities of individual stands within a landscape.

Leakage

- Leakage refers to a loss of C to the atmosphere as an indirect consequence of a GHG removal project.
- Leakage can occur because of activity displacement or through market forces. For example:
  - If a project results in an area being planted, and the unscrupulous project proponent subsequently clears an adjacent forested area to resume the previous use of the land, the project will not result in any net benefit to the atmosphere.
  - The same phenomenon can occur over distances due to market forces. Taking land out of production might encourage other lands to be brought into production elsewhere.
- Leakage can be positive or negative. Negative leakage affects the environmental credibility of projects.
- Leakage can be mitigated through project planning that addresses broader land-use issues.

Liability for future reversals

- *"In [the] case of sequestration, a current, or intervening, generation might pursue sequestration in leaky reservoirs realizing that only future generations would bear the extra costs associated with the leakage and these future generations have no way to go back and make the earlier generations pay. Obtaining efficiency, and equity, requires that each generation respects the long-term carbon management plan and operate without shirking its responsibility."* Herzog et al. 2003.
- The assignment of liability is a three way pack between the buyer and seller of the credit and the public, who have to live with the consequences of future reversals that are not adequately mitigated.

Designing effective solutions

- **Long-term mitigation of the buildup of greenhouse gases using biological sinks will only be successful if**
  - the financial incentives and regulatory controls used to encourage and maintain these activities continue in perpetuity, or
  - Projects can be sustained with or without incentives
- **The successful projects will be those that leverage additional, non carbon benefits:**
  - Restoration of natural forests to conserve/enhance biodiversity and wildlife habitat.
  - Management of new forests on a sustained yield basis for timber production.
  - Other benefits such as water quality, aesthetic and recreational pursuits, etc

CFS activities

- **CFS is working with other federal departments, academic, provincial and industry partners to:**
  - Develop a national Monitoring, Accounting and Reporting System for Forest Carbon, to comply with international reporting commitments
  - Develop protocols for site-specific measurement of carbon sequestered in forest ecosystems.
  - Incorporate the best available science into CBM-CFS2 in order to more accurately simulate C stock change following afforestation
  - Conduct sensitivity analyses using CBM-CFS2 to highlight research needs by identifying largest sources of variation in project level estimates and addressing these during pilot initiatives.

Thomas White
Canadian Forest Service
Natural Resources Canada

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http://carbon.cfs.nrcan.gc.ca

Climate Change Plan for Canada
Forest 2020 Demonstration Project

November 19, 2003

Background

- CCFM Forest 2020 Concept
  - Address fibre supply and conservation pressures
- Federal interest in climate change benefits from A/R and agricultural land management
  - Action Plan 2000
  - Greencover Canada (shelterbelts and agricultural land conversion)
- What if fibre and carbon sequestration benefits from fast growing plantations are combined?
  - Are benefits high enough to drive private investment?
- CFS proposed a pilot to examine the joint fibre and carbon benefits from plantations

2

August 2003

- $1 billion announced toward implementation of the *Climate Change Plan for Canada*
- Includes Forest 2020 Plantation Demonstrations
  - Two-year, $20 million, fast growing plantation investigation
  - Initial actions toward using fast growing trees in the fight against climate change

3

Forest 2020 Fast Growing Plantation Demonstrations

- Objective
  - Demonstrate fast growing plantations across Canada and explore potential investment models to attract funds for future plantations
- Two Key Components
  - Investment Mechanism Options and Feasibility – policy, economics and science considerations
  - Fast Growing Plantation Demonstrations – regional partnerships with key players…e.g., provinces, conservation groups, woodlot associations, etc.

4

Investment Mechanisms

- Planned Activities
  - Evaluate investment potential and risk of fast growing plantations using best available information
  - Improvement of biophysical (e.g., G&Y) and economic information (e.g., oppt cost of land, carbon and fibre values)
  - Development of financial mechanism options to attract investment into plantations
  - Refine plantation science and technical information requirements
- Next Steps
  - What financial mechanisms have worked in other countries and why
  - What makes sense for Canada

5

Establish Demonstrations

- Planned Activities
  - Delivered regionally
  - Identify partners for delivery
  - Tree stock acquisition (fast growing species)
  - Identify suitable land for fast growing plantation demonstrations (eligible under Kyoto)
  - Site preparation and plantation establishment (Spring / Fall)
  - Information collection
- Next Steps
  - Negotiate arrangements with delivery partners
  - Some land has been identified and site preparation underway (very small amount)
  - Secure planting stock and prepare for Spring 2004

6

Outcome

- Network of fast growing plantation demonstrations
- Information on economic and scientific aspects of fast growing plantations in Canada
- Identification of mechanisms to attract future investment into plantations
- Contribute toward development of OTS
- Work with partners in understanding full range of benefits from fast growing plantations

7

Contacts

To find out more about what the Government of Canada is doing and what you can do,
please call 1 800 O-Canada (1 800 622-6232),
TTY 1 800 465-7735
or visit www.climatechange.gc.ca
www.gc.ca

8

Intensive Forest Management

Domtar's 28 years of experience in Eastern Ontario

Wayne D. Young
Fibre Procurement Manager
Cornwall, Ontario

Who is Domtar (corporately)?

- 3rd largest producer of uncoated freesheet paper in NA
- $5.5 billon in sales, 12,000 employees

- **Paper**
  - 6 pulp and paper mills in Canada, 5 in USA
  - business, commercial printing and publications and technical and specialty papers
- **Wood Products**
  - 11 sawmills in Que and Ont.
- **Packaging**
  - Norampac Inc. – joint venture with Cascades
  - 25 containerboard mills/box plants

- 11.5 million ha. of sustainable managed forests

Who is Domtar (locally)?

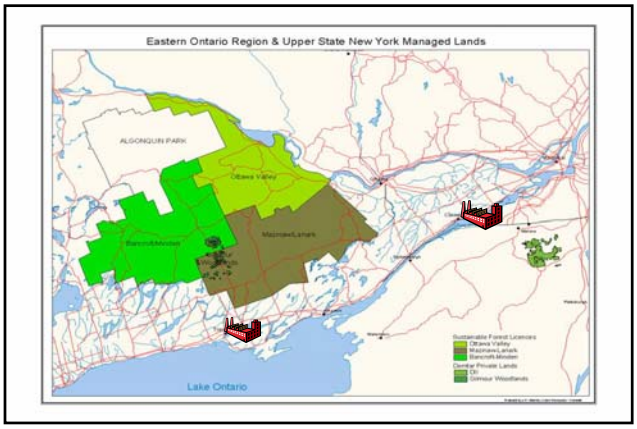
Norampac, Trenton *(Joint venture with Cascades)*

- Corrugated Medium
- Annual Wood Fibre requirements: 115,000 odmt of hardwood or approx. 6,500 truck loads

Who is Domtar (locally)?

Cornwall Mill *(Canadian Pulp and Paper Manufacturing Group)*

- Fine Papers (coated cover, opaque offset - annual reports)
- Annual Wood Fibre requirements: 245,000 odmt of hardwood or approx. 13,500 truck loads



Domtar Policies and Strategies

Domtar's Environmental Policy

"Domtar shall conduct business in a manner that protects the environment, conserves resources, ensure sustainable development and seeks continuous improvement in its environmental performance"

Domtar's Forest Policy

-Corporate commitment to Sustainable Forest Management

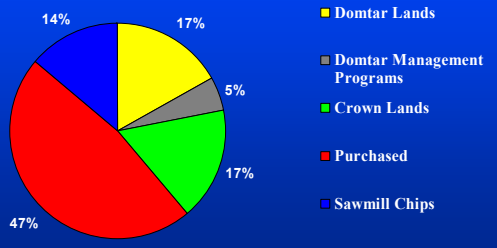
-Addresses public concerns regarding forestry and the environment

-www.domtar.com

Domtar Southern Ontario Wood Supply Strategy

"Flexibility"

Source of Wood (Cornwall Mill)



Traditional wood purchasing . . .

Secure wood supply at lowest cost

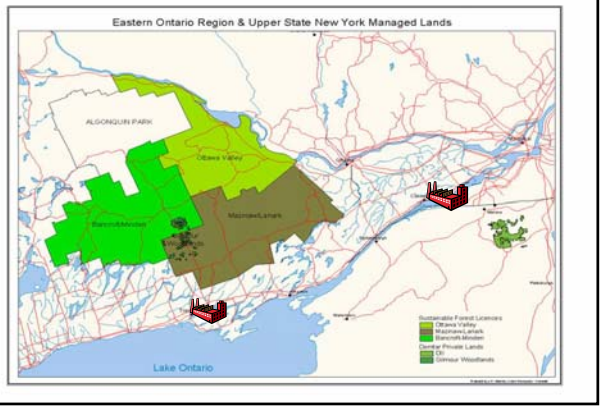
Today's wood purchasing . . .

from sustainably managed forests

Secure wood supply ^ at lowest cost

Insuring Sustainable Development

Domtar Lands	- Adirondack Forest (ISO & FSC Certified)
Crown Lands	- SFLs - CFSA
Open Market Purchases	- "Managed Wood" Strategy
Private Land Programs	- Woodlots - Plantations



Private Land Programs

Woodlot Management

Woodlot Management

- Over 200 landowners since 1978
- Over 3,500 ha of woodlots thinned
- FSC Resource Manager Certification under EOMF

Private Land Programs

Hybrid Poplar

Volume

5,000 ODMT/year

or approximately

2% of Cornwall Mill Supply

Production Objective

60 ODMT/ha (150 GMT/ha) in 12 years
or
5 ODMT/ha/year

Implementation

- Domtar owned lands
  - initiated in 1975 with OMNR partner
  - originally utilized as "Guinea Pig"
  - 1,094 ha. of hybrid poplar
- Tree Farm Agreements (TFA)
  - first TFA in 1978
  - 956 ha on 92 properties
  - 15 year leases with annual lease payment and stumpage at harvest

3 "Bests" for Hybrid Poplar

1) Best Soils
2) Best Poplar Clones
3) Best Cultural Techniques

Best Soils

Hybrid Poplar is tree farming, the best agricultural soils grow the best hybrid poplar trees.

Bio-solid application has helped increase fertility on marginal sites.

Best Poplar Clones

Domtar's strategy is to focus on a limited number of high production clones (8-10).

DN74, DN154, DTAC26, NM1, NM6, 2293-19

Best Clone Characteristics

- High yield
- Disease resistance
- Good rooting ability
- Adaptability to local climate
- Elastic site requirements

Clone Site Trials

Domtar has clone site trials to evaluate new clones for production.

Best Cultural Techniques

Site preparation, planting, tending, thinning and harvesting techniques are designed to optimize costs, growth and yield.

A Grower's Guide to Hybrid Poplar .

Hybrid Poplar: Non-Timber Values

National Audubon Society

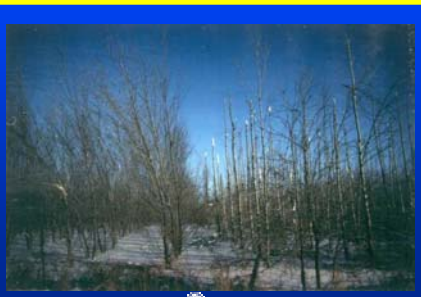
The Habitat Value of Short-Rotation Poplar Plantations (1993)

- "Forest interior birds made substantial use of more mature plantations, especially ones that abutted natural forest."
- "Inclusions of mature trees within the plantations contributed greatly to species richness and abundance."

Challenges

- Landowner acceptance
- Competition for planting sites
- Septria canker
- Economics
- Conversion to native natural forests
- Continued hybrid poplar clone breeding

Ice Storm Damage



In Summary

- Domtar's Forestry Programs confirm our commitment to sustainable forest management while enhancing flexibility in wood supply.
- Hybrid Poplar plantations are a small but important component of Domtar's Cornwall Mill wood supply.

AFFORESTATION ECONOMICS FOR TIMBER AND CARBON PRODUCTION: A SIMPLE SPREADSHEET MODEL AND BEYOND

Dan McKenney and Denys Yemshanov
Landscape Analysis and Applications
Great Lakes Forestry Centre, Canadian Forest Service
dmckenne@nrcan.gc.ca dyemshan@nrcan.gc.ca

- Some context
- A little "theory"
- The Model: biological/economic inputs and outputs
- CFS – AFM: a more complex spatial model
- Some issues
- A quick run through

CANADA'S NATURAL RESOURCES NOW AND FOR THE FUTURE

http://www.glfc.cfs.nrcan.gc.ca/landscape/index_e.html

1

Context

- Growing demand for cost effective investments in forests (eg. IFM, Kyoto-afforestation)
- Clients: Treasury Boards, CEOs, Carbon brokers, Landowners, forest policy planners/analysts
- FAACS
  - A need to justify investments -- opportunities for joint financing?
  - *Quantifying the Benefits of Afforestation programs in Canada* – project with University of Guelph
  - A cost/benefit information system on afforestation – CFS-AFM
  - Request for a simple model

2

Model Economics

NPV of afforestation:

NPV_{AFF} =

$= PV_{(timb)} \pm PV_{(C\ acc.)}$

$- PV_{(est.)} - PV_{(tend.)} - PV_{(agl.)}$

Break-even analysis:

Find carbon price for $NPV_{AFF} = 0$

Uncertainty:

Simulating probability-density distributions for model parameters via Monte-Carlo technique

Benefits:

- PV of timber production
- PV of carbon uptake by biomass and soil

Costs:

- PV of carbon emissions
- PV of plantation establishment
- PV of plantation tending and maintenance
- Opportunity costs of agricultural land (annual)

3

Purpose and Functions

- Quick assessment of afforestation feasibility inclusive of wood and carbon only
- Basic version does not require specialized software
- "Easy" to use
- @RISK version adds options to explore parameter uncertainty

4

Biological Inputs

Growth and yield table:	
Growth year	Timb.volume, m3 per ha
0	0
1	2.00001
2	4.00002
3	6.00003
4	8.00004
5	10.00005
6	12.00006
7	14.00007
8	16.00008
9	18.00009
10	20.0001
11	22.133444
12	24.266788
13	26.400132
14	28.533476
15	30.66682
...	

Up to 100 years

- Traditional growth and yield table (m^3/ha)
- Cut and Paste
- Maximum rotation age – 100 years
- @RISK version adds the option to explore uncertainty via site suitability coefficient

5

Biological Inputs

Standard version

Biological inputs:		Suggested values
Timber volume -> into dry timber weight (wood density)	0.42	0.389
Timber volume -> into aboveground biomass	1.5	1.5
Aboveground -> into belowground biomass	0.396	0.396
Conversion from biomass -> into carbon	0.5	0.5
Site suitability factor (growth/yield curve multiplier)	1	1
Post-harvest (on-site) biomass decay period (years)	3	3
For. products decay rate (Min - > 0; Max - 1)*	1	0.96
Annual carbon accumulation rate by soil, ton C/ha/year	1.1	0.67
Period of soil carbon accumulation, years	50	50

* Set for prod. decay rate to 1 to choose a "Kyoto" accounting

- Only the most general parameters are included
- Follows Kyoto requirements
- @RISK version can specify all parameter as distributions
- Suggested values are provided

@RISK version

Biological inputs:	Min	Mode	Max		Suggested values
Timber volume -> into dry timber weight (wood density)	0.36	0.38	0.41	0.383	0.389
Timber volume -> into aboveground biomass	1.3	1.5	1.6	1.467	1.5
Aboveground -> into belowground biomass	0.36	0.39	0.41	0.387	0.396
Conversion from biomass -> into carbon	0.479	0.5	0.51	0.496	0.5
Site suitability factor (growth/yield curve multiplier)	0.95	0.99	1.1	1.013	1
Post-harvest (on-site) biomass decay period (years)	1	3	5	3	3
For. products decay rate (Min - > 0; Max - 1)*	0.8	0.95	1	0.917	0.96
Annual carbon accumulation rate by soil, ton C/ha/year	0.76	0.8	0.89	0.817	0.67
Period of soil carbon accumulation, years	45	51	59	51	50

* Set forest product decay rate to 1 to choose a "Kyoto" accounting for CO2 emissions from the harvested wood

6

Economic Inputs

Standard version

Economic inputs:		Suggested values
Discount rate (Min - >0; Max - 1)	0.04	0.06
Rotation age (Min - 1; Max - 100 years)	50	40
Price for carbon ($ per ton C)	1.9	10
Price for timber ($ per m3 log)	20	12
Establishment costs ($ per ha)	1000	800
Annual tending costs ($ per ha per year)	0	10
Annual monitoring costs ($ per ha per year)	0	5
Annual agricultural land opportunity costs (land rent, $ per ha per year)	46.55	200

- Includes standard economic variables:
  - Agricultural land annual rent
  - Establishment costs
  - Annual tending/survey costs
- The user can specify prices for carbon and timber
- @RISK version adds options to explore parameter uncertainty

@RISK version

	Input distribution parameters:				Suggested
Economic inputs:	Min	Mode	Max		values
Discount rate (Min - >0; Max - 1)	0.018	0.02	0.03	0.023	0.06
Rotation age (Min - 1; Max - 100 years)	10	45	50	35	40
Price for carbon ($ per ton C)	4	8	15	9.00	10
Price for timber ($ per m3 log)	5	12	22	13.00	12
Establishment costs ($ per ha)	100	200	280	193.33	800
Annual tending costs ($ per ha per year)	0	3	10	4.33	10
Annual monitoring costs ($ per ha per year)	0	4	6	3.33	5
Annual agricultural land opportunity costs (land rent, $ per ha per year)	100	140	200	146.67	200

7

Economic Outputs

Example of the output section

Present values , $ per ha:		
Total NPV	-1424.47	<- @RISK Output
PV(carbon sequestered)	564.81	<- @RISK Output
PV(carbon BG biomass)	127.02	
PV(carbon AG biomass)	604.27	
PV(carbon for.prod. emissions)	265.81	
PV(carbon on-site biomass decay)	121.56	
PV(soil carbon accumulation)	220.88	
PV(establishment)	355.63	
PV(tending)	103.93	
PV(monitoring)	79.95	
PV(agricland value)	3517.68	
PV(timber products)	2067.91	

- Represented by traditional estimates:
  - Net present value
  - Present values for the particular costs and benefits
  - Effect of discounting is taken into consideration
- Additional options of the @RISK version:
  - Uncertainty estimates
  - Sensitivity analysis for particular inputs
  - Additional graphic and post-processing capabilities

8

Other Outputs

Example of the output section

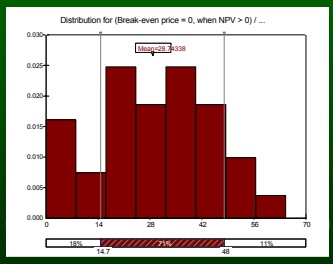
Break-even carbon price:	$ per ton C	$ per ton CO2	
(Break-even price = 0, when NPV> 0)	31.70	116.24	<- @RISK Output
Discounted carbon, t C per ha:	**Lump sum**	**Annualized**	
Total carbon sink	62.756	1.422	<- @RISK Output
Belowground biomass sink	14.114	0.320	
Aboveground biomass sink	67.142	1.522	
Emissions from for.products	29.535	0.669	
Emissions from on-site biomass decay	13.507	0.306	
Accumulation by soil	24.542	0.556	
Timber volume at harvest age, m3 per ha		189.49	

- Represented by simplified estimates:
  - Break-even carbon price
  - Estimated values for the discounted carbon sink (not C budget numbers!)
  - Timber yield
- Additional options of the @RISK version:
  - Uncertainty estimates
  - Sensitivity analysis for particular inputs
  - Additional graphic and post-processing capabilities

9

Example @RISK Outputs

Example of the @RISK output graphs

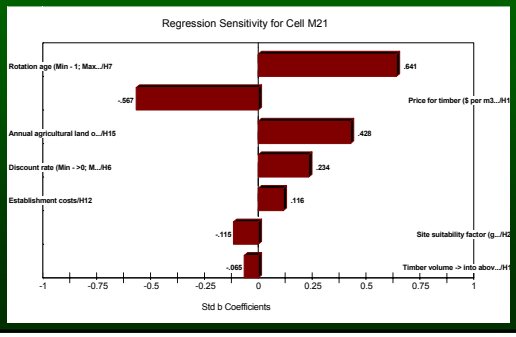


- Distribution of break-even prices

10

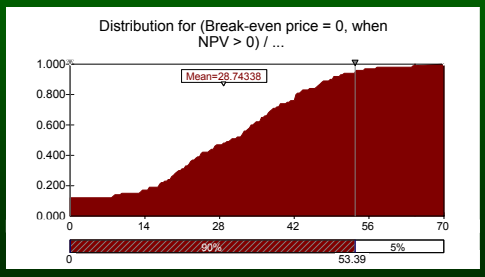
Example @RISK Outputs

- Tornado graph – a sensitivity analysis taking each parameter from zero to its expected value



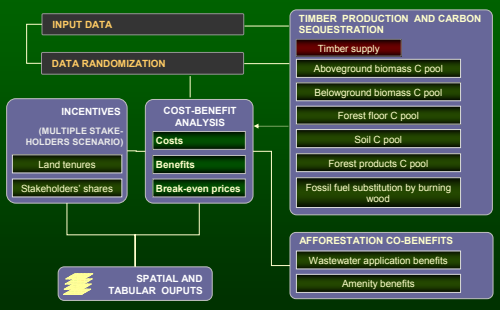
@RISK Outputs

Example of the @RISK output graphs: cumulative distributons



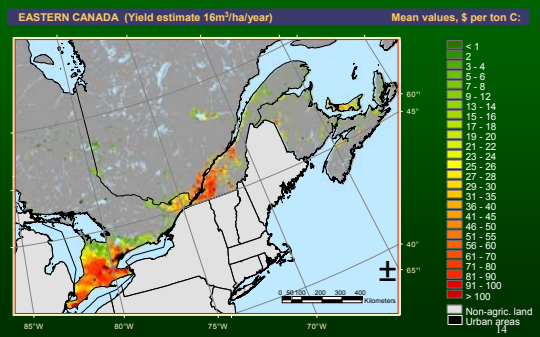
12

Beyond the spreadsheet- CFS AFM



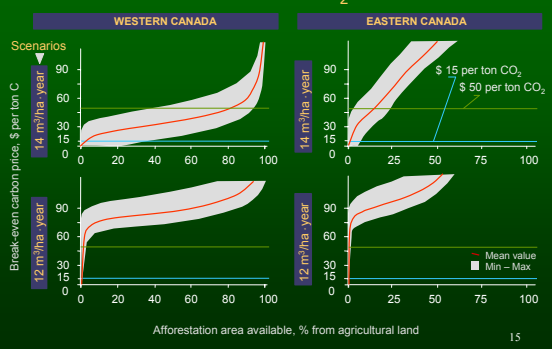
13

Example of GIS Outputs: Break- Even C Prices



14

Use of Model Outputs: Land Available vs. CO_2 Break Even Price



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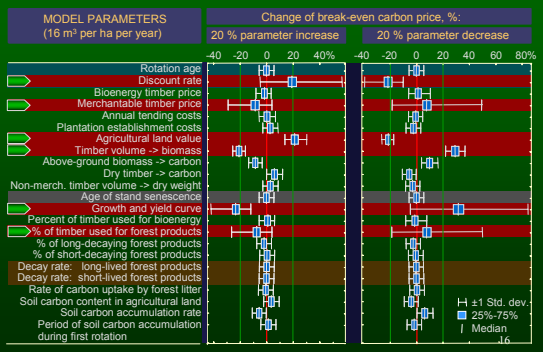
Sensitivity Analysis: Hybrid Poplar Example



16

Discussion Points

- What affects break-even carbon prices most …
  - Growth and yield curves, prices, rotation ages
  - Agricultural land values (opportunity costs)
  - Discount rate
  - Conversion of biomass into carbon content
- Future priorities for CFS-AFM
  - An accessible library of scenarios
  - More efforts to link productivity with existing spatial information (climate, soils, terrain)
  - Better estimates of prices and agricultural opportunity costs
  - Selected non-wood / non-carbon values
  - Pilot fine-scale studies: Specifying regions and scenarios
- A quick Demo - contact us for spreadsheet

17

Agroforestry Land-Use for the Kyoto Future

By
Naresh Thevathasan, Ph.D., P.Ag.
Andrew M. Gordon, Ph.D., R.P.F.
Department of Environmental Biology

1

Forests and the Kyoto Protocol

The Kyoto Forest is a minimum area of land (0.05-1.0 ha) with >10% tree crown cover consisting of trees with the potential to reach a minimum height of 2-5m at maturity.

2

Afforestation and Kyoto Protocol

Afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human induced promotion of natural seed sources.

3

Agroforestry

Agroforestry is a planned and systematic integration of trees into farming systems in order to derive multiple benefits that includes: environmental, ecological, economic and social benefits from a unit land area in a sustainable way (Gordon and Newman, 1997).

4

These benefits: Environmental, Ecological, Economic and Social, are derived as a result of series of biophysical interactions that occurs at the tree-crop inter-phase

5

Biophysical Resources

- Soil, water, nutrients (macro and micro), temperature, light, fauna, trees and crops
- Rate and extent
- Nature and intensity of component interactions

6

What are the interactions?

1. Soil fertility changes (F)
2. Microclimatic modifications (M)
3. Resource availability and utilization (light, water and nutrients) (C)
4. Pest and disease incidence (P)
5. Allelopathy (A)
6. Soil conservation (L)

7

Interaction Formula

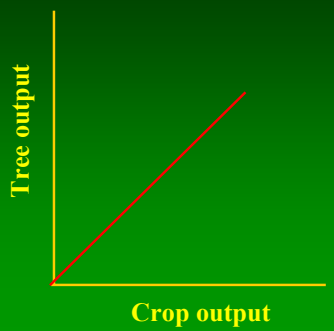
I = F + M + C + P + A + L

I = Overall, positive interactions

I = Overall, negative interactions

8

Complementary Interactions



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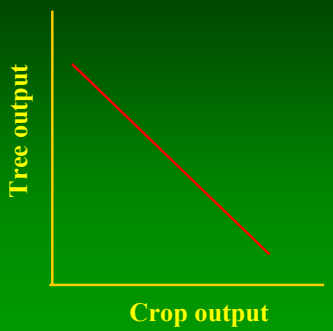
Competitive Interactions



10

- Forest Farming Systems
- Windbreak Systems
- Silvipastoral Systems
- Integrated Riparian Management Systems
- Intercropping Systems

13

14

- Carbon budgets
- GHG
- Animal welfare
- Erosion control
- Reduced nutrient loading

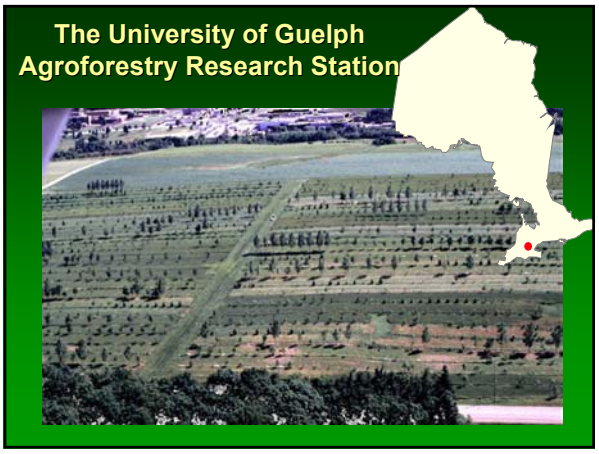
15

16

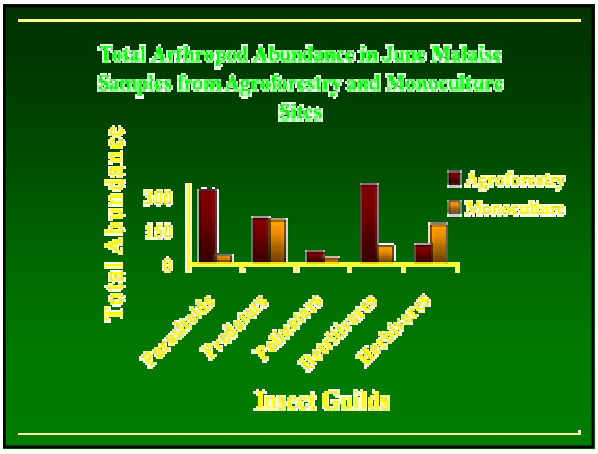
Benefits of Streambank Reforestation

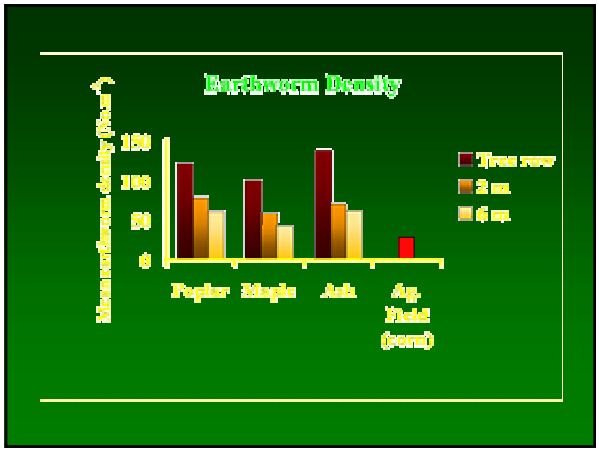
- Control erosion
- Nutrient filtering
- Shading effects on streams / modification of aquatic habitat
- Food for invertebrates
- Enhance stream denitrification
- Wood production
- Wildlife corridors
- Carbon sequestration (4 5ODT ha y^{-1} biomass)

17



Bird species richness for two distinct adjacent ecosystems	
SITE	SPECIES RICHNESS
Agroforestry	10
Corn field	2





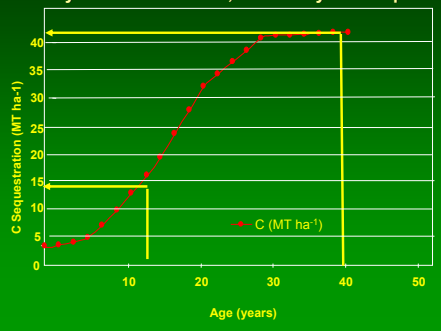
HOW MUCH CARBON *COULD* THEY HOLD?

Landuse	Sequestration Potential (Megatons C/year)
Newly planted and regrowing forests	197 to 584
Deforestation	**-1788**
Better management of:	
Croplands (no-till, erosion control, etc.)	125
Grazing land	240
Forests (fertilization, species choices, etc.)	170
Changes in land use:	
Agroforestry (grow crop trees such as orange or apples on unproductive grassland and cropland)	**390**
Cropland to grassland	38
Other	42

Adapted from News of the week. May 2000. Science vol. 288 p. 942

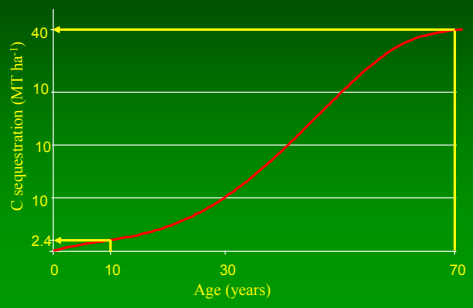
26

C Sequestration trend in a fast-growing fibre tree species (hybrid poplar) Agroforestry Research Station, University of Guelph - 2002



27

C sequestration in a slow growing conifer tree species (Norway Spruce) Agroforestry Research Station, University of Guelph - 2000



28

C sequestration potentials in fast-growing tree-based intercropping systems over conventional agricultural systems in southern Ontario, Canada

Percentage increase = 1.79/0.28 x 100 =

639 . 3 % **OR**

6 times more sequestration potential

29

Poplar leaf biomass distribution in the field for the 1993 and 1994 Growing seasons at Ontario, Canada

Distance from the poplar tree row (m)	Leaf biomass (Mg/ha)	
	1993a	1994b
0-2.5	2.67 ± 0.04	2.76 ± 0.14
2.5-6.0	0.52 ± 0.05	0.61 ± 0.06

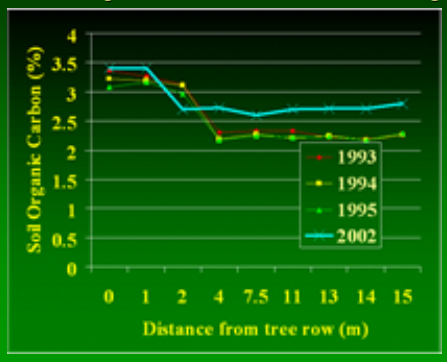
[a] 84% of leaf biomass found in the 0-2.5 m zone.

[b] 82% of leaf biomass found in the 0-2.5 m zone.

Adapted from Thevathasan and Gordon. 1997. Agroforestry systems vol. 37 pp 79-90

30

Carbon Sequestration in Soil from Tree Inputs



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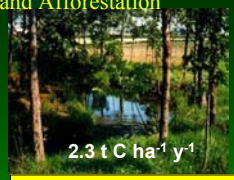
Agroforestry and Afforestation

Tree-based Intercropping



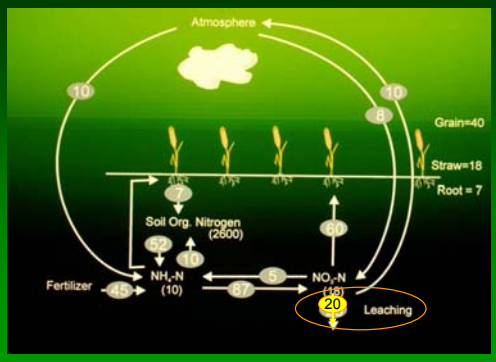
Riparian Plantings

Aggrading Plantations

Established Plantations

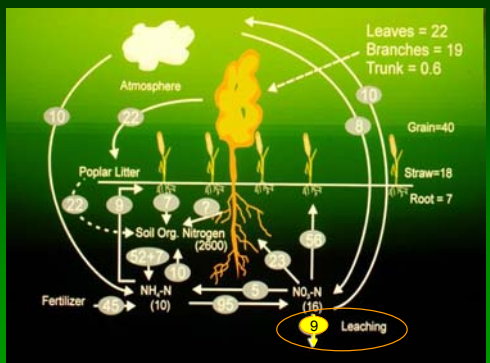
Tree-based intercropping and N_2O emission reduction potentials

33



N cycling in a **monocrop**

34



N cycling in a **tree/crop intercropping system**

35

N2O Reduction Potentials	N Fertilizer Savings ($Kg \cdot ha^{-1}$)	N_2O emission reduction (N_2O - N $Kg \cdot ha^{-1}$)
10% less land area	8 (corn-bean-wheat rotation, average annual N fertilizer application = 80 Kg $N \cdot ha^{-1}$)	8 X 0.0125 = 0.1
N cycling in tree based intercropping	7	7 X 0.0125 = 0.09
Reduction in N leaching	20	20 X 0.025 = 0.50 (2.5% of the leached N is lost as N_2O)
Total N_2O Reduction Potential		**0.69 N_2O - N $Kg \cdot ha^{-1}$**

36

Ontario agricultural fields should reduce N_2O - N emissions to 2 Kg N_2O - N / ha over the next 10-12 years to meet the terms of reference of the Kyoto Protocol

37

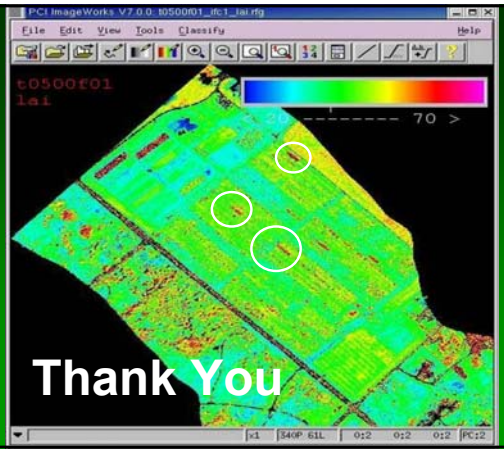
Conclusions

38

Policy Gaps

Needed to realize full environmental potentials

- **Forest Farming:** Increase adoption
- **Windbreaks:** Economic and management models
- **Silvopasture:** C – cycle and shelter effects
- **Riparian:** Nutrient interception
- **Intercropping:** Carbon and nutrient cycles, biodiversity
- **Overall** – Address policy gaps



Thank You

Appendix IV

Session 2 Presentation

Getting Beyond Rhetoric

M. R. Innes, M.R.J.I. Consulting Services Inc.
November 19, 2003

1

Feasible?

- Tree planting is acceptable to Canadians
- New forests do sequester carbon – permissible under the Kyoto protocol
- Enough land is available to make a meaningful contribution
- Landowners will participate if economic conditions are "right"
- We know the technicalities of doing this

2

The Puzzle of Kyoto & Forests

- Confusing to those who do not work in this every day
- Appears formidable in scope and content
- Like a tangled ball of yarn – where do you start to unravel it
- International ramifications
- Many participants nationally

3

Newfie Crossword Puzzle

Across:

1. A sharp blow with the fist
2. A tool used to make a hole in leather
3. Judy's friend
4. Type of fruit drink
5. A magazine

P	U	N	C	H
P	U	N	C	H
P	U	N	C	H
P	U	N	C	H
P	U	N	C	H

Down:

1. Vegetable
2. Female sheep
3. Lays eggs
4. Ocean
5. Often dropped

4

Necessary Elements

- Business drivers
- Rules of the game
- Structural frameworks and enablers
- Innovation

5

Business Drivers

- Liquidity
- Low transaction cost
- Transparency
- Certainty
- International consistency
- Links to international markets

6

Rules

- Can be made only by governments
- Must permit the attainment of business needs
- Must set expectations for all players
- Balance simplicity with explixcitness
- Don't forget: "Rules were made for the obedience of fools and the guidance of wise men" – G.B. Shaw

7

Structural enablers

- Understand what has to be in place for the program to work for all player groups
- Make explicit what the value chain of "must haves" looks like
- Example: Texas Nox/Sox market in the USA as set up by the EPA/TNRCC

8

As the hotshot consultant explains……

38769887.0987÷0.00987±ñ↪16.6¼*23987341ƒGZ•ß349ø+2984324[(æ@14.64009851€16.0286378)-GBL*LBG]¹&{444.444[þ+1º](99%@33.0963214567835)*Ø×¥<>?6/day}+[**AND HERE A MIRACLE HAPPENS**] = $16 million added to the bottom line

9

Innovation

Drive innovation across entire enterprise

- Robust idea generation
- Concept development
- Fast, flexible responses to business development (because it will change)
- Cross discipline linked networks (true innovation never occurs in isolation)
- Many small quick wins to build confidence

10

Missing

- Foolproof compliance mechanism to guarantee the value of a carbon credit
- Start date (generates focus)
- Compatibility of domestic programs with international treaties
- Mitigation of long term risk
- What will happen after 2012 (any clues?)
- A strong policy framework

11

Conclusion

The road to success is always under construction

12

The Landowner's Point of View

Jim Gilmour

Woodlot Owner, Lanark County

19/11/2003

1

Rural Landowners

	Eastern Ontario	South Western South Central Ontario
	%	%
Farmers	20	32
Retired	35	19
Working	45	49

2

Rural Landowners

	Average Age	Average Acres
Eastern Ontario	57	160
South Central/Western	55	100

3

Landowner Objectives OWA

4

Woodlot Owners' Objectives

Weighted Results

Financial	37%
Environmental	63%

5

Why Do Landowners Plant Trees?

- Primarily to enjoy their property.
  (Eastern Ontario)
- Primarily for aesthetic and environmental reasons.
  (South-Western Ontario & South-Central Ontario)

6

Reforestation/Afforestation

1. Landowners with open areas are interested in planting trees.
2. Delivery agent must be local, familiar and trusted.
3. Landowner must be involved in decisions.
4. A few landowners will lease land to others.
5. Right species for the site.

7

Red Pine

8

Sugar Maple Orchard

9

Poplar Plantation

10

Poplar / White Pine

11

Landowner Contribution

1. The land - $400 - $2000+ per acre.
2. Lost income - $15 - $40 per acre per year.

Planting Costs

$1.50 - $2.00 per tree, 1000 trees per acre

$1500 - $2000 per acre

12

Incentives Required

1. Most of the costs of planting and tending.
2. Technical advice and assistance.
3. Assurance of stability of the programs affecting the plantation.
4. Tax considerations.

13

Taxes

1. Income Tax - Plantations should be treated as a business. Deduct losses (expenses) from other income.
2. Property Tax - Must be at least as low as Farm Tax Program.

   Better yet, same as Conservation Land. No Property Tax.

14

Carbon Credits

- How can the carbon credit be separated from the tree?
- If I sell a carbon credit, does that give the buyer a licence to pollute?
- What happens if the trees burn/die/are cut? Do I have to replace the carbon credit?
- What are they worth? Now? In the future?
- Landowners are unlikely to sell in perpetuity.

15

Agreements

1. Term: 15 years is probably okay.
2. Must be in language that landowner can understand.
3. Include a management plan for the plantation.
4. Register on Title.

16

Landowner Protest

17

Summary

1. Land is available.
2. Landowners want to plant.
3. Financial incentives are needed.
3. Carbon Credits will be a tough sell.
4. Governments are distrusted.

18

The Carbon Marketplace
What Do Buyers Want?

Jamie MacKinnon
Consultant, GCSI-Natsource

November,2003

STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

Outline

- Natsource: At a Glance
- Who makes up the marketplace?
- Market Liquidity and Prices
- Terms of sale/purchase
- Canadian Domestic Offsets
- How can domestic reforestation projects meet the demands of the market?

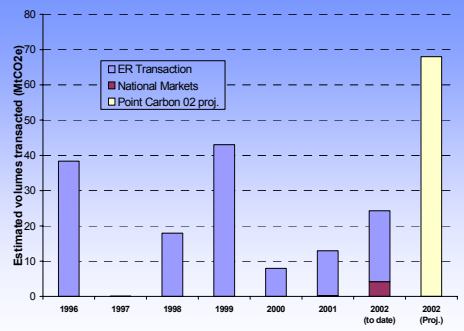
STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

Natsource: At a Glance

- 160 employees
- Global reach
  - New York, Washington, Ottawa, Calgary, London, Tokyo, Sydney
- Strategic Services + Brokering + Portfolio Management = Total Hedging Strategy
- Executive Experience in Policy and Market Design + Hands on Experience in the Marketplace

STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

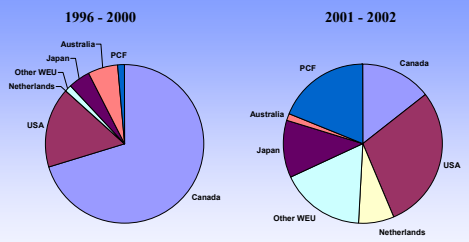
Size of Market



Source: World Bank Prototype Carbon Fund Presentation

STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

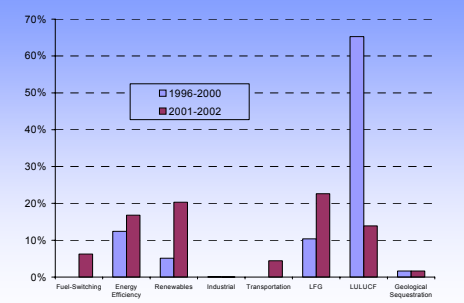
Who is Buying?



STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

Types of Projects in Int'l Market?

This graph expresses the share of each technology out of total declared transactions



STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

International Market Prices

Commodity Type	Vintage Year	Price per ton CO2E (US$)
Verified Emission Reductions ("VERs")		
Annex B VERs	1991-2007	$0.30-$2.00
Annex B VERs	2008-2012	$1.50-$3.00
CDM VERs	2000-2012	$3.00-$5.00
Dutch ERUs		$4.40-$7.99
Compliance Tools		
Danish allowances	2001-2002	$1.96-$3.07
Danish allowances - Bid/Offer	2002	$1.77-$2.03
UK allowances	2002	$6.81-$8.79
UK allowances - Bid/Offer	2002	$8.06-$8.50

Updated: September 2003

NATSOURCE

STRATEGIC SERVICES
Greenhouse Gas
PORTFOLIO MANAGEMENT

What Are Buyers Looking For?

- Forward sales of minimum 5 year streams
- Prefer guarantees of delivery
- Acceptable credit rating of project developers
- Larger vs. Smaller projects
- Pay on delivery
- Verified by a 3rd party
- Clear title
- Government backing/Host country approval in CDM

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Canadian Domestic Offsets

- Diminished demand given policy uncertainty
- Non-permanence issue could be a major obstacle for bringing aforestation projects to market
- Preferred options for Risk Management Plans
  - Accounting methods
  - Partial crediting
  - Temporary credits
- Compete at under $15/tonne
- FPAC Memorandum of Understanding?

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Meeting Market Demands - Reforestation Projects

Key needs

- Insurance against natural risk of loss
- Large scale projects - reduce fixed cost and risk per tonne

Way forward

- Aggregate small woodlots
  - Spread monitoring, verification, other transaction costs
  - Spread risk of natural loss across diversified woodlots
  - Alternative structures for aggregation

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NATSOURCE

Aggregating Supply of GHG Credits

Jamie MacKinnon
Consultant, Natsource

November,2003

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Outline

- Barriers for small-scale suppliers
- Natsource Supply Aggregation Proposal
- Assumptions and Economics
- Path forward

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Barriers for Small-Scale Suppliers

- Asset owners not expected to meet LFE's investment criteria (creditworthiness)
- High reserve margin requirements
- Liability for delivery failure
- High transaction costs = low yield to individual owners
- Project economics; period over which emission credits have value is currently limited to 2008-2012
- LFE's require a constant annual delivery of compliance units. Landfill Gas & forestry projects each have credit delivery curves that do not meet this requirement

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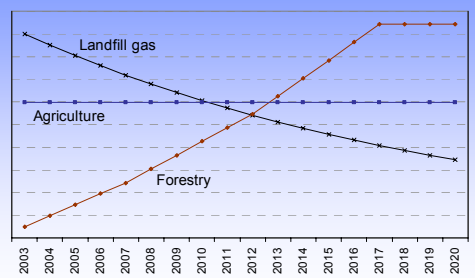
Illustration of Emission Credit Production Curves



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Supply aggregation across sectors can remove the barriers

Aggregation across project types offers:

- Delivery of a constant stream of credits to buyers
- Lower delivery risk to buyers
- Steady cash flow to suppliers
- Government purchase of pre 2008 and backstop purchase of post 2012 eligible credits provides the projects with sufficient revenue certainty
- Lower reserve margin requirements for suppliers

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Key Assumptions

- Modeled 2003 thru 2020 with first delivery in 2006
- Average of 3 MT aggregated annually
- Number of asset owners does not exceed 30% of potential market in each sector
- Delivery/credit risk hedged by escrow of tonnes

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Key assumptions: Asset Owners and technologies assumed

- A standard asset owner was defined for each supply category
  - Forestry: 12.5 ha land owner with growth curves based on green ash
  - Swine: 2,300 head implementing a digester with on-site usage of the biogas (electricity/direct heat)
  - Cattle: 300 head implementing a digester with on-site usage of the biogas (electricity/direct heat)
  - Landfill Gas: 5 ha site implementing capture and utilization equipment (electricity)

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Key Assumptions: Sectoral Intermediaries needed

- One intermediary for each sector
- Non-profit, owned by the asset owners
- Managed by industry associations (non-profit model)
- Execute supply agreements with the asset owners and sales agreements with SAP [Inc.]

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Planning Assumptions for SAP Inc.

- SAP Inc. acts as the interface with buyers and asset owners
- Natsource prepared to invest but will not operate the entity; require additional investors and an operator
- Operating costs to be covered:
  - Legal, brokerage and management fees
  - Payments to sectoral intermediaries
  - Staffing costs
  - Measurement &Verification costs

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Buyer Sales Contracts

- LFE's would purchase 2008-2012 vintages
- Government would purchase 2004-2007 vintages and provide backstop of purchases of 2013-2020 vintages

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Key next steps

- Secure startup funding
- Negotiate Emission reduction purchase contract with Government
- Secure participation of Intermediaries in each sector
- Secure participation of the minimum number of asset owners:
  - Agriculture sector (poultry, swine, cattle) : 1800 asset owners
  - LFG sector: 30 landfills needed
  - Forestry sector: 65,000 Ha needed

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CleanAir Canada

Carbon Registries and Aggregation

Presentation to the FAACS Fall Focus Session
Toronto, November 19, 2003

Ray Rivers
CleanAir Canada

1

CleanAir Canada

- Started as PERT 1996
- CleanAir Canada 2000
- Registry with > 20 M tonnes CO2e
- Validation process experience
- Membership based, not-for-profit, business oriented, multi-stakeholder involvement

2

Registration Process

- Emission removal/reduction projects
- Validation to ensure:
  - 'real',
  - 'surplus',
  - 'quantifiable',
  - 'verifiable',
  - 'unique'
- Emission removals/reduction creations
- Independent verification

3

Banking

- Removals posted to accounts on the registry - bulletin board or exchange
- Registry acts like a bank (for money)
  - protect account confidentiality
  - maintains transaction log
  - registers, transfers, clears
  - allows access to accounts and internet banking

4

Aggregation

- Registry accounts may be for single or combined entities
- Rounding and economic packaging (eg. Ontario Reg. rounding requirement)
- Potential role for registries to facilitate aggregation for sellers of removals/reductions
- Require standard validation/verification procedures and protocols
- Require contracts among sellers/registries

5

Carbon Credits from Afforestation & Customer Needs

Designing an Investment Vehicle

Ideas from:
Gray Taylor- Davies Ward Phillips & Vineberg LLP,
Bill Tharp- Quantum Leap
Martin Whittaker- Innovest
Duncan Rotherham – ICF Consulting

Tony Rotherham
Toronto, November 19, 2003
Days Hotel and Conference Centre

Framing the Investment

- **There may be more than one investor**
  - The landowner
  - The investor who pays to plant the trees
- **There are two commodities in one material:** Carbon (credits) and wood- cooperation essential.
- **The investment horizons are long; 20- 40 yrs.** Who shares this long planning horizon??
  - Pension plans

Framing the Investment

- Companies with a strong CSR program and a need for Carbon Credits
- Families with an intergenerational strategy
- Governments
- The forest industry
- Some institutional investors

- **The traditional market for wood is well understood by landowners and the forest industry**
- **The market for Carbon Credits is a mystery:**
  - As to price per tonne CO2e as we move forward
  - As to the level of demand- the number of tonnes.
- **The policy framework is "a work in progress"**

The Investors

There are several ways to view this:

- The person or organization that pays to do the tree planting is obviously an investor.
- The landowner who owns land now and will retain ownership may not be viewed as an investor. ***
- If this landowner pays taxes and supplies some management services, these are investments.

The Investors

- A person who buys land for the purposes of participating in an afforestation program is an investor. They pay property taxes and supply management services.
- There may be no emotional attachment to the land. It is just an investment.
- In this case it would be simpler if a partnership was formed with the tree planter.

The Commodities and/or Benefits and The Revenue Streams

- **Carbon Credits**
  - Value uncertain,
  - Revenues start at age 5 10 years.
- **Wood**
  - A traditional commodity
  - Wood values are better understood
  - Revenues at 30 and 40 years after planting

The Forest

- **Ecological & Environmental Services.**
  No revenues from these public values.
- **Aesthetics and Intangibles.**
  These accrue mostly to the landowner.
- **The forest is attached to the land and is an enduring landscape feature.**

This makes the wood a difficult commodity to share. The land owner may want to keep the forest. Can perhaps buy the other investor out at the end.

Commodity Production and Revenues

- **Wood production:**
  - 7m3/ha/yr over 40 years at $20/m3 = $5600/ha @ 40 yrs.
  - Inflated @ 2% = $12,122
  - There may be revenues from thinnings before 40 years of age. Keep it simple.
- **Carbon Credits:**
  - 5.6 tonnes CO2e/ha/yr over 40 years at $7/tonne = $1575 in total.
  - Inflated @ 2% = $3410.
  - These revenues will start at age 10 years and flow in increasing amounts till age 40 years.

Investment and Management Inputs

- **Land (cost $1000/ha) will be retained by the owner and have value at the end of the period.**
- **Plantation establishment $1000/ha**
- **Property Taxes:**
  - $2/ha/yr for 40 yrs = $80
  - Inflated at 2% for the period = $120
- **Management services from landowner:**
  - $5/ha/yr for the period age 10 to 40 yrs = $150.
  - Inflated at 2% for the period = $212

Split Revenues and ROI

Tree Planting Investor gets the carbon revenues:

- Investment $1000
- CO2e sales $1575 and inflated to $3410
- ROI = 1.2 % inflated ROI= 3.2%

Investment reduced by income tax benefits. Ontario's top marginal rate 53%. Investor files a crop and business plan. Gets $530 back.

- Net investment $470
- Revenues $1575 inflated $3410
- ROI =3% ROI= 5.2%

A Special Tax Benefit Program for Afforestation

- **Investment $1000/ha**
- **Further tax incentive takes net investment to**
  - $300 -ROI over 40 years = 4.2% **hmm!**
  - $100 -ROI over 40 years = 7.1% **Maybe!**
- **Landowner gets the wood revenues:**
  - Property taxes and mgmt costs $332
  - Wood sales **$5600** inflated to **$12,122**
  - **ROI = 7.5%** **ROI= 9.7%**

How about a partnership?

- **Using an approximation of a real ROI analysis**
  - **Inflate wood revenues ($5600) at 2% over 40 years = $12,122**
- **Inflate carbon revenues at 2% over 40 years $1575 = $3410 Total = $15,532**
- **Plantation establishment costs-net $470/ha**
- **Land ownership investment- nil**
- **Property Tax $2/ha -$80 inflated at 2%= $120**
- **Management cost - $150 inflated at 2%= $212**
  - ROI = 7.9% (straight line)
  - ROI = 5.8% (straight line)

Key Points & Conclusions

- The landowners' interest is to maintain control over their land and have a forest at the end.
- A partnership that includes fully shared ownership of the wood in the forest will reduce landowner control and probably participation.
- The person who pays for the plantation establishment must get a competitive ROI.
- Some acceptable revenue sharing plan can be devised- carbon credits plus thinnings ??

Key Points &Conclusions

- A special tax benefit is required to reduce the net investment from $1000/ha to approx. $300-400.
- Net cost to government will be modest.
- OR-Carbon credits from afforestation could be supported at up to?- $15/tonne (market distortions)
- Industry GHG reduction projects are now priced at $3/tonne of CO2e with a 2012 payback deadline.

Key Points &Conclusions

- Forest projects cannot succeed with a payback deadline shorter than 20 years- 40-50 years is more practical.
- The main sources of uncertainty MUST be removed or this won't fly.
- Strong and clear policy must be stated.
- The Canadian government must take a backstop position for carbon credits beyond 2012.

Appendix V

Focus Session Registrants

Name	Organization	email	Name	Organization	email
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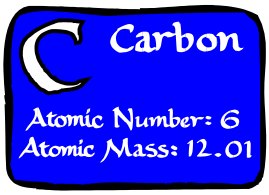
Appendix VI

Brief Notes for the Afternoon Session Q & A's

FAACS – Offset Carbon Credits & Afforestation Session
November 19, 2003



Brief Notes: Afternoon Session Q & A's

1) JIM GILMOUR – "The Landowner's Point of View"

Q:	**What payments are required? $20-50/acre?**
A:	- The costs of putting trees in the ground - Assistance with planting (like the WIA program) - Most landowners don't expect a yearly payment
Q:	**Short rotation?**
A:	- No, long rotation – maple, oak on appropriate soils - Hybrid poplar not popular with landowners particularly - Red pine might be an easier sell
Q:	**Would a 15-year landowner contract be appropriate / acceptable?**
A:	- Yes, probably not longer though
Q:	**What about natural succession, allowing the land to re-grow at its own pace?**
A:	- Landowners will plant in open areas
Q:	**Is there interest in sharing benefits on the part of landowners? Their views on sharing returns from carbon?**
A:	- Depends on who's putting up the money - Landowners want to "do the right thing" (this is a key concern on their part)
Q:	**How do they feel about products flowing off their woodlot?**
A:	- Landowners realize they need to thin/remove some trees to better the remaining woodlot (accept that you have to remove some to improve others) - They would support a program that gave them some assistance

2) JAMIE MACKINNON – "The Carbon Market Place: What do Buyers Want?" & "Aggregating Supply of GHG Credits"

Q:	**Who will pick up the extra 10%? $15/tonne cap?**
A:	- Not clear how the government will do this - International market prices - Some margin for selling reductions above $15/tonne

	- Potential to create joint implementation projects; sell on international market
Q:	**Monopolies?**
A:	- Should not be a concern
Q:	**Measurement?**
A:	- Calculated for asset owners; aggregate by sector - Entities that 3rd party verify emissions reductions
Q:	**Biogas considered, but what about other nutrients (in the agricultural sector)?**
A:	- Not definitive as to what would be considered, but what is feasible in agriculture at the moment is biogas; this is not to say that other possibilities will be excluded
Q:	**Management fees? Brokerage fees?**
A:	- Brokerage fees reflect the work you need to put into it
Q:	**Domestic offsets? Different than a world market**
A:	- The proposal in this case is dealing with domestic (supply is domestic; could be SOLD on international market)
Q:	**Third party verification by who?**
A:	- Currently done by companies that offer verification services - Under the offset system, there are various ways in which an entity could be set up to verify

3) <u>RAY RIVERS</u> – **"Carbon Registries and Aggregation"**

Q:	**Pooling mechanism? Could you pool enough to be earning income from assets?**
A:	- NO, clearly cannot!
Q:	**How many other registries are there and how do you ensure that [interests?? – sorry missed the term here] are only registered once?**
A:	- There are 30-34 registries (depending on what you call a "registry") - A conference will be held in March to discuss how these various registries can be harmonized (communicate with each other; don't register in two places)
Q:	**How much to validate? What are the costs?**
A:	- $7,000 / project plus $3,500 in verification costs – as one snapshot in time
Q:	**Period of validation. Ontario system is 7 years. This may be appropriate for a landfill project, but is this appropriate for forests? What happens when 7 years is up?**
A:	- Do you count removals on annual basis or present value? - Difficult to verify something 3 years out; Different than doing it on an annual basis - Look at an aggregation over time
Q:	**Should there be a separation of registry and validation functions?**
A:	- This is a pilot - Should probably keep validation separate - Spot audits - What goes on registry needs to be appropriately validated

- Consistent with protocols
- Large emitter registry; one for Canada; and for offsets
- Validation still needs to be associated with registry

Q: Issues relative to risk – stipulation in contracts?

A: - Would not subject small entities to expensive/costly third party verification
- Check the numbers; make sure the addition is right

4) TONY ROTHERHAM – "Designing an Investment Vehicle"

Q: Carbon deficits? Philosophical question.

A : - Wouldn't see a significant loss at any time (at breaking point at first 5 years)

Q: How many other products come off the woodlot that don't involve processing, etc. (machinery never has to touch)? Carbon doesn't have to move to a processing facility.

A: - $2-3/tonne ($C0_2$ equivalent) – figure used in analysis

Q: Red pine labour? How do you reconcile this?

A: - Clarification - haven't had to do any tending

Q: ROI – people need to be compensated somehow. Landowner prepared to take it even if break even?

A: - The landowner is looking for a forest at the end
- Some other mechanism to reduce costs for them (e.g., tax break)

5) WRAP UP – Mike Innes

- Have land and Have potentially interested landowners
- Need to firm up the numbers
- Risky, fragmented – but can be done
- 5 year stream of benefits – market
- Flux – need refinement of registry, validation, etc.
- Need for CERTAINTY! Some ASSURANCES

6) CLOSING COMMENTS

Q: Where is this all going? What's going to CFS at the end of the day?

A: - Series of workshops held to date (policy barriers, landowner incentives, carbon credits) – from these, recommendations as to a potential afforestation program will go to CFS
- Today's session – an information session designed to foster a greater understanding and sharing of experiences and knowledge among partners relative to carbon credits and afforestation

COMMENT:

- The process will be one of pulling the information together
- If there are views counter to what we've heard today they should come to us (EOMF) or CFS

COMMENT:

- Rules have not been set RE: policy
- Bits and pieces regarding the landowner that we've heard today are useful

Appendix VII

Focus Session Agenda

FAACS Fall Focus Sessions

Establishing New Forests to Address Kyoto
Offset Carbon Credits from Afforestation & Customers Needs

Date: November 19th 2003

Location: Toronto Airport Strip, Days Hotel and Conference Centre
6257 Airport Road, Mississauga, Ontario

The objectives of the Seminar:

Part 1 - Morning Session - designed to provide information on all aspects of afforestation and carbon sequestration to people involved in the acquisition and use of offset carbon credits.

Part 2 - Afternoon Session- the objective is open discussion on key business aspects of the growth and sale of offset carbon credits from afforestation projects. We want to hear what the customers have to say.

A discussion period will follow all of the speakers.

Part I: 8:30am - 12:00pm

Forests, Afforestation, Carbon Sequestration and the Climate Change Convention

	Welcome and Opening Comments from the Chair: **Jim Farrell, A/ Director General, Industry Economics and Programs Branch, CFS**
1.1	**Introduction to Forests and the Kyoto Protocol** – **Tony Lempriere, Senior Economist, CFS**
1.2	**The potential for Afforestation in Canada, with emphasis on Ontario** – **Darren Allen, Forestry Specialist, CFS**
1.3	**Carbon and Carbon Credits** **Thomas White, Physical Scientist Afforestation and Carbon Accounting, CFS** • The plantation ecosystem- • Science and Measurement
10:10am – 10:25am, Coffee Break -15 minutes	
1.4	**Forest 2020** – **Christy Arseneau, Forest Sector Analyst, CFS**
1.5	**Plantation Establishment** – **Wayne Young, Fibre Supply Manager, Domtar** • the field operations involved in the establishment, maintenance and growth of a plantation
1.6	**Plantation Establishment Costs, Revenues and ROI** – **Dan McKenney, Chief, Landscape Analysis and Applications CFS**
12:00pm - 1:00pm Lunch Break, A light lunch will be served	

Part II: 1:00pm – 5:00pm

The Marketplace - Growing, Selling and Buying Offset Carbon Credits from Afforestation

The Objective is open discussion on key business aspects of the growth and sale of offset carbon credits from afforestation projects. We want to hear what the customers have to say. Speakers will present the key points on various aspects of the business arrangements that must be made to develop a viable marketplace for offset carbon credits from Canadian afforestation projects. A discussion period will follow all of the speakers.

The Market Speaks:

	Discussion Leader: ***Mike Innes, President, M.R.J.I. Consulting Services Inc.***
2.1	**The landowner's point of view-** **Jim Gilmour, landowner, Eastern Ontario Model Forest Director**
2.2	**The Marketplace - what does it want? Jamie MacKinnon, GSCI-Natsource**
2.3	**The Need for Aggregation and Options for Corporate Structures to do it.** **Jamie MacKinnon, GSCI-Natsource**
2:25pm – 2:40pm, Coffee Break	*15 minutes*
2.4	**Carbon Registries and Aggregation –** **Ray Rivers, Executive Director, Clean Air Canada Inc.**
2.5	**Funding the program - Development of an Investment Vehicle TBA**
2.6	**What Uncertainties and Questions need to be resolved?** **Mike Innes, President, M.R.J.I. Consulting Services Inc.**
	Wrap-up comments and take-home messages from the Chair, **Jim Farrell, A/ Director General, Industry Economics and Programs Branch, CFS**

Focus Session Partners include:

Canadian Forest Service, Conservation Ontario, Eastern Ontario Model Forest, Ontario Ministry of Agriculture and Rural Affairs, Ontario Ministry of Natural Resources, Ontario Woodlot Association, Trees Ontario Foundation and others.