



BIOCAP CANADA *Annual Report 2005-2006*



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A MESSAGE FROM THE BOARD CHAIR



It is a great pleasure for me as Chair of the BIOCAP Board of directors, to be welcoming you to our Annual Report. Along with our President I am delighted to be able to document another year of solid progress and achievement for the BIOCAP national partnership.

After 7 years of effort, the BIOCAP Canada Foundation has become a unique and influential force mobilizing the science and the policy options for Canada's biosphere solutions for carbon capture. Through these efforts Canada can exploit its natural advantages as well as its contribution to global climate change progress. Public credibility is built upon sound science. By recognizing the value of Canada's forestry, agricultural and aquatic resources as a source of renewable energy and environmental values, BIOCAP is helping to shape a vision for the transformation towards a sustainable bio-based economy.

A transition of this magnitude requires the active engagement of many sectors, and what makes BIOCAP unique is their work to connect, assemble and communicate to the key parties across the country. Throughout this report you will read example after example of linkages and partnerships that exist because BIOCAP initiated them.

The momentum created over these past 7 years is impressive and includes over 100 funded research projects involving over 300 researchers and another 300 graduate students. The organization has leveraged a \$10 million dollar federal investment to over \$44M for programs and research, and has engaged the support of hundreds of research partners from universities, funding organizations, industry, all levels of government and non-governmental organizations.

This past year was in some ways one of BIOCAP's most successful in terms of partnership building. In the 2005-6 fiscal year, we were delighted to welcome Lafarge and BC Hydro as official industry sponsors of BIOCAP. During this time, the provinces of Alberta and British Columbia doubled their annual sponsorship of the Foundation and committed to do so for the next 5 years. In addition, BIOCAP welcomed 10 new industry partners linked to its various program initiatives. We are very thankful for the support and engagement of these organizations in BIOCAP and its various initiatives, as it sends a strong message that the Foundation is producing products that are of value to Canadian governments, industry and society.

In March of this year, the completion of BIOCAP's \$10M federal Contribution Agreement coincided with the arrival of a new Conservative government in Ottawa. The new government is reviewing Canada's environmental policies and investments and has committed to announce a "Made-in-Canada" strategy later this year. As I write this letter, I am delighted to announce that BIOCAP has received interim (FY 2006-7) federal support to allow it to maintain and build on the considerable momentum that the Foundation has achieved in recent years.

We are hopeful that BIOCAP's leadership in developing biologically based solutions for environmental issues (climate change, clean air & water) can be linked to broader issues of concern to Canadians (including energy security with new options and rural economic development). We are linking energy and the environment into the broader themes of sustainable development.

In closing I would like to thank all our staff members for their dedication and their expertise in making the above possible. The job of pioneers in a new field is never easy. Thank you for your interest in BIOCAP and please let us know if you have any comments.

Sincerely,

Dr. Bob Page
Board Chair, BIOCAP Canada
VP Sustainable Development, TransAlta Corp.

LEVERAGING OUR BIOLOGICAL CAPITAL FOR A SUSTAINABLE BIOECONOMY



The BIOCAP Canada Foundation is now embarking on its 8th year of work in developing the insights and tools for use in harnessing Canada's Biological Capital to address some of the major challenges facing the world today. With rising concern over energy prices and security, not to mention the growing awareness of our warming climate and declining air quality, nations are beginning to search for solutions.

At the core of our work is the concept that Canada's vast aquatic, forest and agricultural resources can produce more than just food, feed and fibre. Through improved management and use of these resources, and by implementing existing and new technologies, Canada has the potential to become a world leader in the transformation to a Sustainable Bioeconomy.

What do we mean by Sustainable Bioeconomy? This is an economic system in which renewable biomass provides a significant portion of the nation's needs for transportation fuels, heat, electrical power, chemicals and greenhouse gas emission reductions. This system would revitalize the rural economy through investments in agriculture and forestry while helping to fight climate change and stabilize the price and supply of transportation fuels, heat and power with clean and green biomass energy. Ultimately, Canadian industry will have a competitive advantage in world markets and all Canadians will benefit from a healthier environment and economy.

The time is ripe. Biomass from agricultural and forestry production can be converted to energy at less than one third the current cost for crude oil or about half the wellhead price for natural gas. Although biomass is currently expensive to transport and process, the energy price differential between biomass and fossil fuels is now close enough to make biomass a credible alternative energy resource. The environmental and 'energy security' benefits of biomass serve to further narrow this gap.

Few countries can claim a similar bioeconomy potential. Our extensive agricultural lands and vast forests relative to our small population provide our nation with a true 'Green Advantage'.

Our challenge now is to develop a sound scientific background in order to balance the use of our biological resources with responsible stewardship. Maintaining carbon stocks, conserving biodiversity and encouraging healthy ecosystems are critical issues that must not be overlooked as we plan future energy and environmental strategies.

This report provides examples of how BIOCAP is working to enable this balance. We assemble and support the nation's innovators and entrepreneurs to help decision makers define the balance of policies, investments, management practices and new technologies that will position Canada as a global leader in the transformation to a sustainable bioeconomy.

Sincerely yours,

David B. Layzell, Ph.D., F.R.S.C.
President and CEO
BIOCAP Canada Foundation

WHAT IS BIOLOGICAL CAPITAL?

Canada's natural resources are increasingly recognized as part of larger ecosystems that provide a range of unique ecological services with often incalculable environmental and economic benefits. These services include climate stabilization, oxygen production, flood control, waste assimilation, water filtration and clean energy feedstocks to name just a few.

Taken together, these essential ecosystem services and our considerable stock resources form what is known as "Biological Capital". With the second largest landmass of any nation and a wealth of diverse ecosystems performing an array of ecological services, Canada is rich in Biological Capital.

RESULTS

“Alberta Environment is proud to be a funding partner in BIOCAP, an organization that helps deliver leading edge bioscience research of significant benefit both to Alberta and to Canada.”

The Honourable
Guy Boutilier
Alberta Minister of
Environment

INSIGHTS AND TECHNOLOGIES FOR THE TRANSITION TO A SUSTAINABLE BIOECONOMY

Canada’s vast forest, aquatic and agricultural resources – our ‘biological capital’ – provide this nation with an opportunity to be a world leader in environmental stewardship while fostering economic growth and prosperity. With ten percent of the world’s forests and over 60 million hectares of agricultural land, Canada has a ‘Green Advantage’ that can be used to help fight climate change by reducing and sequestering greenhouse gases as well providing sources of clean and green energy to complement current fossil energy use.

To become a world leader in transitioning to a sustainable bioeconomy we need “Made-in-Canada” solutions. To develop these solutions, BIOCAP is engaging the national research community to work in partnership with government (federal, provincial, territorial and municipal), Canadian industry, agricultural producers and non-governmental organizations to develop the insights and technologies that will inform policy and investment decisions.

BIOCAP and its multi-sector partnerships focus on four key areas:

IDENTIFICATION

Sourcing technologies, management practices and economic analyses that can be implemented now

INNOVATION

Developing new technologies and management practices

QUANTIFICATION

Understanding and measuring the cycles that generate biological capital and the factors that impact sustainable management

TRANSLATION

Communicating critical insights for policy formulation and investment decisions

Results are emerging from each of these key areas and the following sections provide a brief synopsis of these results.



IDENTIFICATION

RESULTS

SOURCING TECHNOLOGIES, MANAGEMENT STRATEGIES AND ECONOMIC ANALYSES THAT CAN BE IMPLEMENTED NOW

The Bioenergy Opportunity in BC

“BIOCAP has played an instrumental role in bringing researchers together to merge existing information in the forestry area. This has been of high interest to the British Columbia government given our strong economic and environmental links to forestry. The mountain pine beetle has ravaged our forests and has left behind millions of hectares of damaged wood. BIOCAP identified an opportunity to explore potential energy uses for this wood and the British Columbia government agreed to partner with them to sponsor a two-stage feasibility study. This novel effort has stimulated our province and will alert local communities to seriously explore the potential to use this wood to produce electricity. The studies will help position the province and industry with information for a collaboration which will move this concept toward reality, with benefits to the environment and the economy of rural British Columbia communities.” Doug Konkin, Deputy Minister, BC Ministry of Forests and Range

Securing a Prosperous Future for Farmers

Canada’s 36 million hectares of croplands have potential to sequester millions of tonnes of carbon and help Canada meet its international commitments. At the same time, croplands can also be a source of N₂O, representing both a loss of nutrients for the growing crop and a significant proportion of Canada’s total greenhouse gas (GHG) emissions. A better understanding of the processes associated with N₂O emissions leads to more efficient agricultural practices and fewer overall emissions, and adds considerable economic value for farmers who implement beneficial management practices (BMPs) to generate GHG offset credits for sale to large final emitters or the federal government. BIOCAP-initiated research showed that BMPs such as no-till and reduced fertilizer can reduce N₂O emissions by 1.8 kg per hectare each year (0.5 tonnes CO₂ equivalents/ha/yr) without impacting crop yield. Given the millions of hectares of farmland in Canada, this BIOCAP research finding has significant implications for both farmers and large final emitters interested in purchasing GHG emission credits.

Forest Industry Acceptance of Timber Sustainability Tools

Developing and implementing strategies for increasing forest carbon stocks is a complex issue which requires science-based solutions and an integrated approach to resource management. A BIOCAP researcher (PI: Dr. David MacLean, UNB) has developed tools for integrating carbon budget and sequestration objectives into strategic forest management plans so that both timber yield and carbon stores may be optimized. BIOCAP's investment has delivered modeling tools to forest managers in New Brunswick that help determine the optimal timing and allocation of interventions to manage the forest for increased carbon and a sustainable timber supply. Bowater and J.D. Irving are two forest companies that have adopted these timber management models incorporating carbon sequestration objectives into forest management planning.

Setting the Stage for Green Power

BIOCAP's report Exploring the Potential for Biomass Power in Ontario, which was publicly commended by Ontario's Minister of Energy for guiding the province's thinking, focuses on the potential and strategies for biomass-based power generation to make a significant, cost-competitive contribution to Ontario's electricity requirements. The paper concludes that a) bioenergy is far more price competitive with natural gas and petroleum than it was ten years ago, primarily due to rising fossil fuel prices, and b) Ontario is rich in biomass resources that could be sustainably managed to produce more than 50% of the province's current electricity requirements. This report is available at www.biocap.ca

Enhancing Forest Productivity

Climate is the primary factor controlling the distribution of tree species and long-term health of regional forests. Even minor climatic shifts have important ecological and socioeconomic implications since climate-related reductions in growth reduce the volume of merchantable timber available and the net amount of carbon fixed over time. A BIOCAP researcher (PI: Dr. Sally Aitken, UBC) has clearly demonstrated the value of managing genetic diversity as a strategy for maintaining and enhancing forest productivity in a changing climate. The results of this work are guiding adjustments to BC seed use policies in order to promote forest adaptation to climate change. Climate prediction tools and a modeling framework for determining optimal seed deployment strategies will be especially beneficial for assessing future reforestation plans.

Facilitating Productivity and Economic Development

"BIOCAP and the Ontario Ministry of Natural Resources (OMNR) joined forces to provide leadership in addressing: a) the acquisition of forest biomass data and the development of tools for business decisions, and b) policy, institutional and incentive options to ensure sustainable use of biomass as a mitigation strategy. The project combines partners in the forest industry, federal and provincial governments, and non-profit organizations in developing a model for the inventory and logistical orientation of unused forest biomass from harvesting operations, silviculture treatments, natural disturbances and industrial waste. The valuable information gleaned in this study, and in the OMNR bio-refinery pilot, in which biomass is converted to bio-liquid for energy and specialty chemicals, is being used to help develop an enabling policy framework." Dr. David DeYoe, Senior Advisor, BioProducts/Biotechnology, Industrial Relations Branch, OMNR.

"Lafarge planners have identified the urgent need for research into the use of biomass fuels as they are paramount to the future of our industry and our drive to sustainability. Through BIOCAP Canada Foundation, made-in-Canada technologies can be researched and developed to create economic sources of biomass (renewable) fuels and to use them effectively to manufacture Portland cement."

Robert H. Cumming
Resource Recovery
Manager
Lafarge



Bioenergy Flagship Demonstration Projects

BIOCAP and EnergyINet forged a partnership to coordinate the Canadian Bioenergy Challenge Dialogue to establish a cross-sectoral strategy to advance Bioenergy in Canada. As part of this effort, participants at the Bioenergy Challenge Dialogue workshop adopted the concept of Flagship Demonstration Projects as a means to rapidly and substantially raise awareness of the importance of Canada's bioenergy sector in providing environmentally sustainable, reliable, competitively-priced energy. Participants highlighted 13 existing (operating or planned) Bioenergy Flagship Demonstration Projects and proposed nine new projects:

- Mountain Pine Beetle Consortium
- Integrated Cattle Biomass
- Prairie Biofuel (Syngas) Centre
- Wetlands Biomass
- Combined Heat and Power and Agri-Fuel Bioheat
- Northern Ontario Green Auto/Green Community
- Combined Heat and Power Initiative for District Heating Involving an Industrial Cluster
- Biogas for Extraction of Oil Sands
- Pyrolysis Biorefinery

These projects, involving industry, government, university, academia and NGOs, were designed to demonstrate that bioenergy can work in various locales and conditions and ultimately will enable the growth of the bioenergy sector in Canada. A Flagship Project Program is being developed to provide success stories to increase acceptance and uptake of bioenergy by the public, investors and politicians, while at the same time enabling cross-project learning for rapid sector growth. Bioenergy Challenge Dialogue working papers, including full descriptions of the flagship projects listed above, are available online at www.biocap.ca.



INNOVATION



"BIOCAP-funded research has been the central component of the Canadian Steel industry contribution to the International Iron and Steel Institute's CO₂ Breakthrough Program, an international, long term research and development effort."

Jim C. Stirling
General Manager,
Environment and
Energy
Dofasco Inc.

DEVELOPING NEW TECHNOLOGIES AND MANAGEMENT STRATEGIES

BIOCAP, DuPont and Ontario Partnership on Mobile Pyrolysis Unit

BIOCAP directed the Canadian Pyrolysis Initiative, a project which helped to define a strategic direction for pyrolysis conversion of biological feedstocks (forest wastes and agricultural residues) to bio-liquid (a crude oil-like substance). BIOCAP encouraged DuPont to join the project steering committee, despite the company's limited experience with pyrolysis technology, believing that it could benefit from the emerging field and find a way to utilize the pyrolysis bio-liquid for their operations. Through this initiative, DuPont formed a partnership to investigate bio-liquid as a valuable chemical source with Advanced BioRefinery Inc. (ABRI), a start-up company from North Gower, Ontario, which developed a mobile pyrolysis plant. Additionally, BIOCAP worked with the Government of Ontario to help forge the financial partnership that has led to the building of mobile bio-liquid facilities to pre-process and concentrate residual forest biomass for easier transportation and subsequent use.

International Iron and Steel Institute's (IISI) CO₂ Breakthrough Program

In 2003, BIOCAP was invited to give a keynote address to the emerging CO₂ Breakthrough Program on bioenergy opportunities in the steel industry, and has played a key role in establishing bioenergy as a central component of the the steel industry's climate change strategy in the US and Canada.

"In 2005, the Canadian Steel Producers Association and the governments of Canada and Ontario signed a Memorandum of Understanding to work together to reduce greenhouse gas emissions. BIOCAP-funded research has been the central component of the Canadian Steel Industry contribution to the International Iron and Steel Institute's CO₂ Breakthrough program, an international, long term research and development effort. In Dofasco's view, we can foresee the use of bio-materials to replace coal-based feedstock in iron and steelmaking processes. This sharing of best practices highlights Canada's international role with respect to the global climate change conversation." Jim Stirling, General Manager, Environment & Energy, Dofasco Inc.



Suncor's Bioenergy Investment Strategy

"Suncor has made a commitment to developing biofuels – more specifically bioethanol and biodiesel. Since 1996, Suncor has been blending ethanol into its Sunoco gasolines and is also supporting renewable energy development in Ontario by building a \$120-million ethanol plant in the Sarnia-Lambton region. The plant, which is due to be commissioned later this year, is expected to produce approximately 200 million litres of ethanol annually. Ethanol-blended gasolines help reduce carbon monoxide emissions by up to 30 percent. It is through the programs and research of BIOCAP that other such projects will be brought to the table." Gord Lambert, Vice President, Sustainable Development, Suncor Energy Inc.

Lafarge's Biomass Strategy

"Lafarge is proud to be a supporting industrial sponsor of the BIOCAP Canada Foundation. Lafarge planners have identified the urgent need for research into the use of biomass fuels as they are paramount to the future of our industry and our drive to sustainability. Through BIOCAP, made-in-Canada technologies are researched and developed to create economic sources of biomass (renewable) fuels. We see an exciting prospect in using Canada's own biomass resources to fuel Canadian industry – to the co-benefit of Canadian farmers, foresters, and municipalities." Robert H. Cumming, Resource Recovery Manager, Lafarge

Alberta-Pacific Forest Industries Greenhouse Gas Reduction Initiative

"BIOCAP funds research in forestry, aquatic systems, agriculture, bioenergy and bioproducts which are all pertinent to the forest industry, especially with the threat of forest fires, insects and disease which accompany the warming climate. Currently, BIOCAP funds soil carbon research in Al-Pac's poplar plantation in Alberta, as well as maintaining fluxnet towers in the boreal forest, including Alberta, to measure carbon flux exchanges in the boreal ecosystem. As a forest nation, Canadians rely on the leadership of government to ensure healthy ecosystems to meet their needs of employment and aesthetics. To this end, Al-Pac supports the institutions which are in place to mitigate climate change impacts. BIOCAP is an important link in the knowledge stream, which is required to accomplish this." K.J. Plourde, Director Forest Strategies, Alberta Pacific Forest Industries Inc.

Mitigation Technologies for Emission Reductions

BIOCAP researchers (PI: Dr. Nigel Livingston, University of Victoria) are developing mitigation technologies for reducing methane emissions involving methanotrophic bacteria. These soil-dwelling bacteria consume methane as their only source of energy and then convert it to cellular carbon. Methanotrophic bacteria are a major biological sink for methane and therefore play an important role in the global carbon budget. Specific types of methanotrophic bacteria with potentially different methane consumption efficiencies have been identified, and further research will work to incorporate the bacteria into a bio-filter for use in trapping agricultural or landfill emissions of methane.

Dupont-BIOX-BIOCAP-NSERC Project Delivers Biodiesel Breakthrough

Biofuels can reduce greenhouse gas emissions and provide the foundation of a sustainable bioeconomy. For such an economy to be competitive, however, appropriate technologies and economic policies to deal with new waste streams generated by these and other biomass-based products are essential. With a federal government annual production target of 500 million litres of biodiesel by 2010, some 50 million litres of crude glycerol by-product is anticipated to flood the market each year, threatening the competitiveness of biodiesel production in Canada. BIOCAP researchers (PI: Dr. Marcel Schlaf, Guelph University) investigated syngas production from glycerol and discovered that under the right conditions, pyrolysis of glycerol can produce a final product that is 93% syngas. Such a high conversion ratio indicates the technical feasibility of using pyrolysis to produce syngas from glycerol and offers an excellent mechanism to add value to the production chain and prevent glycerol market suppression.

"BIOCAP has identified an industrial collaborator for me, in the form of DuPont Canada, and this has led to a proposal being submitted to NSERC in the area of bio-sourced chemicals (for a future post-petroleum petrochemical industry). This would have been impossible without BIOCAP's assistance."

F. M. Kerton
Assistant Professor
of Green Chemistry
Memorial University
of Newfoundland



QUANTIFICATION



RESULTS

RESEARCHING BIOLOGICAL GHG SOURCES AND SINKS AND DEVELOPING PROTOCOLS

Protocol Development for Reducing GHG Emissions and Enhancing Carbon Sinks

BIOCAP-funded research has increased understanding of greenhouse gas sources and sinks in agriculture and the opportunities to mitigate these impacts. Working collaboratively with Agriculture and Agri-Food Canada, Alberta Agriculture, Climate Change Central and industry stakeholders, BIOCAP has played a strategic role in the Pork, Beef, Manure Processing and Soils Technical Working Groups to develop ISO-compliant protocols for producers to help Canada reduce GHG emissions and develop standardized national measurement and reporting methods to support the National Offsets System and ensure Canada's credibility on the international stage. Communicating these findings through commodity producer groups and other partners may lead to greater adoption of GHG beneficial management practices with associated benefits such as enhanced water quality, integrated nutrient management and economic returns to the producer.

Canada's Peatlands Help Fight Climate Change

To understand what factors control greenhouse gas sources and sinks in Canada's 100 million hectares of peatlands, researchers with the BIOCAP-funded Fluxnet Canada Research Network measured the production and uptake of CO₂ for six years at the Mer Bleue peatland. Over the entire study period, there was no net loss of carbon to the atmosphere, despite large year-to-year variability in weather. If the average carbon gain of the Mer Bleue peatland is typical across Canada, the nation's peatlands could be removing about 140 million tonnes of atmospheric CO₂ each year, an amount equivalent to 50% of Canada's international commitment. Understanding the interactions between peatlands, climate and the atmosphere are critical to predicting the rate of global climate change and to formulating policies for peatland management.

Clear Cuts in a Changing Climate

Canada's more than 400 million hectares of forest are an enormous carbon sink, absorbing 10-20 times the amount of CO₂ emitted from fossil fuel use each year. While forest sinks are an important component of Canada's carbon budget, they are vulnerable to different types of disturbance, including harvest, pest outbreaks, forest fires and climate change. Understanding the role of disturbance on carbon cycling is essential to both determining the nation's carbon stocks in the near-term, and predicting the effects of a changing climate

in the long-term. BIOCAP researchers (PI: Dr. Andy Black, Fluxnet Canada Researcher, UBC) continuously measured the production and uptake of CO₂ in coastal Douglas-fir stands at three different stages of growth following harvest: a 53-year old rotation-aged stand, a 15-year old pole/sapling stand, and a 3-year old seedling stand. Harvesting had a much greater and longer-lasting effect on carbon cycling than expected; the youngest stand was the largest terrestrial source of carbon ever measured, while the middle-aged stand remained a significant carbon source even 15 years after logging. The research provides the first comprehensive assessment of carbon cycling in forests following disturbance, and will help refine estimates of Canada's carbon stocks. It will also help improve management of these ecosystems to enhance their sink potential and minimize carbon losses.

Forest Disturbance and Carbon Cycling

Forest fires and harvesting can have some of the largest impacts on carbon cycling and energy exchange in natural ecosystems. BIOCAP researchers (PI: Dr. Brian Amiro, University of Saskatchewan) studied these disturbances and determined that when broadleaf trees become established following fire in a coniferous forest, the amount of shortwave radiation reflected back to the atmosphere increases dramatically. This phenomenon can create a cooling effect that is independent of the changes in carbon exchange resulting from the fire. On the other hand, data from a recent cutover site in Quebec showed a 58% increase in emissions when 40% of the site was prepared for planting with mechanized equipment. This work highlights the importance of a full analysis of all GHG sources and sinks and the impacts of management practices on global climate.

Carbon Cycling and Air Quality from Coast to Coast: A Breakthrough Study in our Natural Ecosystems

BIOCAP's Fluxnet Canada Research Network operates 29 research sites across Canada's commercial forest zone. Researchers completed the first synthesis analysis of net carbon uptake across the country using data collected in August 2003. This analysis revealed that there were large differences in air quality fluctuations and carbon uptake related to age, disturbance (fire or logging) and ecosystem type (broadleaf forest, conifer forest or peatland). However, within a given ecosystem class and stage of development, carbon uptake showed a similar diurnal pattern across the continental transect. Middle-aged stands (35-60 years old) had the greatest rates of carbon accumulation. This suggests that strong carbon sinks may exist where stands of this age are common.

"BIOCAP played an important role in developing collaboration between the University of Alberta, the University of British Columbia, BC Ministry of Forests and Range (MOF) and experts from power industry to establish a research program on the mountain pine beetle infested wood for energy and fuels."

Amit Kumar
Assistant Professor
University of Alberta





PROVIDING CRITICAL INSIGHTS FOR POLICY FORMULATION AND INVESTMENT DECISIONS

TransAlta Offset Credit Strategy

TransAlta Corp. has been a pioneer in the buying and selling of GHG offsets credits to meet corporate, provincial and federal requirements. Insights gleaned from BIOCAP regarding the scientific and policy basis (and therefore the reliability) of various biosphere credits have been used by TransAlta in determining appropriate investment options. "Millions of dollars of investment have been affected by these decisions", Dr. Bob Page, Chairman, Board of Directors, BIOCAP Canada Foundation, Vice President Sustainable Development, TransAlta Corporation. BIOCAP continues to provide policy research to support informed investment. For example, research by PIs Dr. Elizabeth Wilman and Dr. Alan Law, University of Calgary, offers a new analysis of the impacts of intensity targets and dispute resolution mechanisms.

Socio-Economic Analyses for a Sustainable Bioeconomy

In 2003, BIOCAP designed, built and co-funded Greenhouse Gas Management Canada (GHGMC), a national research network involving more than 90 university researchers from the social sciences. Their work on domestic emission trading systems, the implications of agricultural and forestry management policies for GHG mitigation, the evaluation of the cost-effectiveness of biosphere management strategies and technologies and the socioeconomic ramifications of bioenergy and bioproducts has generated many valuable insights that are being applied at local, national and international levels across multiple sectors. For example:

- A Canadian Economic and Emission Model for Agriculture (CEEMA) and the Canadian Regional Agricultural Model (CRAM) to assess greenhouse gas sources and sinks and agricultural systems, with the results being used by Agriculture and Agri-Food Canada;
- A report analyzing the economic incentives generated by offset credit and temporary credit systems developed for the federal Working Group on Offsets;
- An evaluation of the impact of carbon credits on forest managers and First Nations People in Canada;
- An analysis of the economic feasibility of beneficial management agricultural practices (BMPs), which is being used by producer groups and policy analysts to understand how BMPs will be adopted and which BMPs provide the greatest reduction in GHGs per dollar of investment;

- Various bioenergy analyses including policies and effectiveness, and production of electricity via anaerobic digesters.

GHGMC research on the adoption of BMPs provides important insights into the role of agriculture in meeting Canada's commitments. It is evident from GHGMC research that without a federal policy response, the hesitancy of farmers to participate in the carbon market may result in a shortage of carbon offsets for sale domestically. GHGMC researchers are working with producer groups to analyze the potential use of the offset system to generate carbon credits for Canada. The exceptional research output of GHGMC has been showcased in two Policy Forums organized by the network and has attracted international interest.

Design of the Domestic Offset Trading System

Canada's Offset Trading System for Greenhouse Gases has drawn heavily on the scientifically sound policy insights gained from the collaborative research advanced by BIOCAP. The Foundation has helped to harness the knowledge of industry, NGOs, academia and governments to provide the science, the implementation strategies and protocols required to quantify and reduce human-induced sources and sinks of greenhouse gases. In doing so, BIOCAP has provided critical Canadian data to support a domestic offset trading system that will stimulate investment in 'Made-in-Canada' solutions.

Synthesized Research for Greater Understanding

BIOCAP's innovative Research Integration Program, launched in September 2005, was developed to synthesize research and generate insights on biosphere solutions to climate change and clean energy. Fourteen Synthesis Reports (see page 24) resulted from this inaugural program, generating insights relating to the offset system, forest policy considerations, anaerobic digestion opportunities, biofuel opportunities, and biofuel policy instruments for Canada. Key insights from these 14 reports were presented for the first time in April 2006 at the Research Integration Forum (see page 21) in Ottawa, Ontario.

The following is a sample of some of the insights from a few of the resulting papers.

"My long standing personal involvement with BIOCAP convinces me of the organization's relevance in critical areas such as understanding and mitigating the impacts of climate change, and identifying innovative solutions to the pressing need for clean energy and rural economic development."

The Honourable
Larry Bagnell, PC, MP
Member of
Parliament, Yukon

Adapting forest management to the impacts of climate change in Canada

Johnston et al. 2006

PURPOSE

This study examined the anticipated impacts of climate change on human and economic systems related to forest management, as well as the capacity of those systems to adapt, with a goal of identifying regions and systems with a high degree of vulnerability.

KEY INSIGHT

Vulnerability of forest ecosystems may be reduced through integrated assessment of system vulnerabilities, ongoing research on climate change impacts and adaptation science, forest policy, planning and management strategies that incorporate climate change science, enhanced risk management capacity and improved networking and communication strategies.

WHAT IT MEANS

Current forest policy does not contain adequate provision for climate change impacts and adaptation, but this deficiency may be corrected by incorporating a sound understanding of the biophysical and socio-economic impacts.

The potential for agricultural greenhouse gas emission reductions in the temperate region of Canada through nutrient management planning

Wall et al. 2006

PURPOSE

This project was conducted to determine the potential for greenhouse gas (GHG) emission reductions in agriculture in the temperate regions of Canada through the use of known beneficial nutrient management practices, specifically those related to nitrogen management.

KEY INSIGHT

Alterations in the timing and placement of nitrogen fertilizers used in corn production, along with changes in manure handling and storage offered the most significant reductions in GHG emissions.

WHAT IT MEANS

Full adoption of agricultural practices recommended for nutrient management planning in eastern Canada could lead to a 35% reduction in the annual agricultural soil and manure GHG emissions from this region. The added costs associated with changes in management practices, which must be borne by the producer, suggest that full adoption is unlikely to occur in the near term.

Optimum sizing for anaerobic digestion

Flynn and Ghafoori 2006.

PURPOSE

This study was designed to develop a specific model of power production from anaerobic digestion (AD) of manure using detailed data, to establish the optimal sizing of AD facilities and to assess the implications of scale on process alternatives.

KEY INSIGHT

Small farm-based manure digesters are less cost effective than centralized units that receive manure from many producers because the savings on capital cost per unit of input/output realized in a larger facility are greater than the cost of transporting manure to and digestate from the plant. Additional benefits of a centralized facility include more efficient treatment of the liquid fraction, opportunity for refinement of pipeline grade methane and optimization of transportation costs.

WHAT IT MEANS

AD offers potential benefits, but is a costly process for power generation at approximately 25 cents per KWhr. Revenue from pipeline quality biogas offers a better return and is made possible by centralization of AD facilities where livestock concentrations are high.

A critical cost benefit analysis of oilseed biodiesel in Canada

Reaney et al. 2006

PURPOSE

This project studied areas and opportunities for cost savings along the entire oilseed-based biodiesel production chain, from producer inputs and crop management to transportation, processing, and value-added products.

KEY INSIGHT

At existing petroleum oil prices, biodiesel made from virgin canola oilseed can compete on price with diesel fuel in Canada. However, return on canola production is not sustainable from a producer's standpoint. Thus, to compete in the longer term, producers must look to value-added products for added revenue streams. In addition, processing plants must be large and gain economy of scale to justify higher-return (and cost) solvent extraction processes.

WHAT IT MEANS

Existing oil prices are still not high enough for biodiesel producers to compete sustainably using high-quality virgin seed under existing policies. Producers must look to multi-product biorefineries to generate sufficient revenue, despite the added complexity.

"As your Government develops a made-in-Canada solution for greenhouse gas emissions in concert with the provinces, I firmly believe that BIOCAP-funded research, with its emphasis on science-based decisions for government policy and investment, will play a central role."

Dr. Kerry Rowe
Vice-Principal
(Research)
Queen's University

ACTIONS

BUILDING THE FOUNDATION

What makes BIOCAP a truly unique organization is the ability to engage collaborative support from disparate groups as well as the ability to translate and communicate insights to multi-disciplinary stakeholders in universities, governments and industries. To do this, BIOCAP has built a strong “Foundation” focused on three main areas of work: Creating Capacity, Linking with Leaders and Orchestrating Outreach.

CREATING CAPACITY

In the new and rapidly-growing area of biosphere research for climate change and energy solutions, BIOCAP organizes and maintains an integrated system of networked research. BIOCAP has worked to identify and engage an increasing number of established expert researchers, and is responsible for hundreds of graduate students being trained as the next generation of experts.

LINKING WITH LEADERS

BIOCAP has built a core of powerful partnerships in an effort to encourage multi-sector cooperation and information exchange. These partnerships help to ensure research relevance, rapid uptake of results, enabling policies, more competitive and successful companies, and a cleaner environment.

ORCHESTRATING THE OUTREACH

BIOCAP is actively working to increase Canadian’s appreciation of the potential and importance of a bioeconomy. This includes the rapid dissemination of research insights and new technologies critical to the development of optimal policies.

CREATING CAPACITY



"BIOCAP Canada is quite extraordinary and a unique organization. I can not think of another organization that has been so successful at bringing together the private sector, public utilities, government and non-governmental agencies, and university researchers to work on basic and applied science, and socio-economics of bioenergy and biofuels."

Nigel T. Roulet
James McGill
Professor of
Geography, Director
of the McGill School
of Environment
McGill University

In the new and rapidly-growing area of biosphere research for climate change and energy solutions, BIOCAP organizes and maintains an integrated system of networked research. BIOCAP has worked to identify and engage an increasing number of established expert researchers, and is responsible for hundreds of graduate students being trained as the next generation of experts.

CAPACITY STATS

University Researchers	232
Government Researchers	111
Graduate Students	339
Canadian Universities	32
International Universities	6
Provinces	9

University Researchers

In 1998 when BIOCAP began, it was difficult to identify 100 Canadian researchers working on biosphere solutions to climate change and clean energy. After eight years of extensive outreach and recruitment efforts, BIOCAP now funds over 200 university faculty and has a database of several hundred researchers across Canada interested in becoming affiliated with BIOCAP networks in support of the emerging bioeconomy.

Government Researchers

While current government funding regulations prevent BIOCAP from providing financial support to government researchers, over 100 are involved as collaborators in BIOCAP-supported research initiatives, and some are supervising graduate students supported by BIOCAP and its other funding partners.

Graduate Students

Research projects and networks launched to date have enlisted and trained over 300 graduate students across Canada. These graduate students will provide industry and government with the capability to build Canada's emerging bioeconomy.

LINKING WITH LEADERS



ACTIONS

BIOCAP has built a core of powerful partnerships in an effort to encourage multi-sector cooperation and information exchange. These partnerships help to ensure research relevance, rapid uptake of results, enabling policies, more competitive and successful companies, and a cleaner environment.

BIOCAP Sponsors and Board of Directors

The BIOCAP Canada Foundation was built with the engagement and financial support of a multi-stakeholder group of sponsors, many of which make up the BIOCAP Board of Directors (see page 40). These include: 4 federal departments, 4 provincial governments, 2 oil and gas companies, 3 power generation companies, a steel company, a cement company, 2 high profile environmental NGOs, a business development NGO and 4 Canadian universities.



Funding and Research Partners

BIOCAP brings diverse stakeholders together to identify research gaps and opportunities and to establish research priorities, and provides research seed funding which stimulates engagement and investment from the following communities:

- 45 Industries
- 38 Universities (32 Canadian, 6 International)
- 24 NGOs
- 9 Provinces
- 4 Federal Government Departments
- 4 Granting Agencies

Linking with the SME Community

Many small to medium enterprises (SMEs) are linked to BIOCAP-initiated bioenergy research projects across Canada. The following are examples of university researchers working in partnership with a company to develop innovative new technologies that will benefit both the company and the Canadian economy.

COMPANY	LOCATION	UNIVERSITY RESEARCH PARTNER
BIOX Inc.	Ontario	Ajay Dalai, Professor, Department of Chemical Engineering, University of Saskatchewan Project: Production of Biodiesel from Vegetable Oils and Lubricity Additives for Ultra-Low Sulphur Diesel Fuel and of Hydrogen from Byproduct Glycerol.
DynaMotive	British Columbia and Ontario	Sheldon Duff, Professor, Chemical and Biological Engineering, University of British Columbia Project: Enhancing Prospects for Higher Value Uses for Bio-Oil.
Enerkem Technologies Inc.	Quebec	Jean Lessard, Professor, Chemistry Department, Université de Sherbrooke Project: Biomass-derived High Octane Synfuels from C5 Sugars.
Lignol Innovation Corp.	British Columbia	Jack Saddler, Dean, Faculty of Forestry, University of British Columbia Project: The Development of Value-Added Bioproducts from the Bioconversion of Lignocellulosics.
KMW Energy	Ontario	Janusz Kozinski, Associate Vice-Principal (Research & International Relations), McGill University Project: Application of Bioenergy for GHG Mitigation in the Iron and Steel Industry.
Okanagan Biofuel	British Columbia	Jack Saddler, Dean, Faculty of Forestry, University of British Columbia Project: The Development of a Technically and Economically Viable Pretreatment and Enzymatic Process for the Conversion of Softwood Residues to Ethanol.
Fuel Cell Technologies Inc.	Ontario	Kunal Karan, Asst. Professor, Department of Chemical Engineering, Queen's University Project: Technical and Economic Analysis of Alternative Processes for Agricultural Waste Fueled Solid Oxide Fuel Cell.
Neoteric Biofuels Inc.	British Columbia	Marc Dube, Associate Professor, Department of Chemical Engineering, University of Ottawa Project: Biodiesel Production from Acid-Catalyzed Transesterification of Waste Oils.
Kingston Process Metallurgy	Ontario	Andrew Daugulis, Professor, Department of Chemical Engineering, Queen's University Project: Biomass to Hydrogen via H ₂ S.

“During its relatively short existence, BIOCAP has made significant contributions to Canadian science and to public awareness concerning sustainability and future opportunities in the new bioeconomy. Of particular note has been BIOCAP’s success in harnessing the scientific capacity at universities across Canada and directing this considerable talent to tackling problems and developing new opportunities in green manufacturing processes and products.”

Ian de la Roche
President and CEO,
Forintek Canada
Corporation & Forest
Engineering Research
Institute of Canada

ORCHESTRATING THE OUTREACH



BIOCAP is actively working to increase Canadian's appreciation of the potential and importance of a bioeconomy. This includes the rapid dissemination of research insights and new technologies critical to the development of optimal policies.

Learning Forums

BIOCAP has designed and delivered over 50 'learning forums' which have enabled multi-disciplinary and multi-sector partnerships to take shape, research insights and new technologies to be shared and new research to be spawned. The following are a few examples of the many successful forums hosted by BIOCAP in 2005 – 2006.

Research Integration Forum, April 2006

Ottawa, Ontario

Insights from 14 Synthesis Reports, generated through the BIOCAP Research Integration Program, were highlighted at the Forum with researchers from across Canada presenting their conclusions and recommendations. After each of four panel discussions, BIOCAP requested feedback on application of insights as well as feedback on research priorities. Active discussions among the participants resulted in a wealth of feedback that will enable BIOCAP to shape further Integration programs. Reports and feedback are available at www.biocap.ca.

Growing a National Bioenergy Strategy: Challenge Dialogue Workshop, April 2006

Ottawa, Ontario

To further the Bioenergy Challenge Dialogue, sponsored by BIOCAP and EnergyINet, the two organizations held a National Dialogue Workshop. This event created alignment between participants on strategy components such as the magnitude of the bioenergy potential, sector development support mechanisms, and R&D priorities. A major outcome of the workshop was the formulation of bioenergy flagship projects, which were presented in a marketplace forum (see pg. 7).

Sustainable Bioeconomy Showcase, December 2005

Regina, Saskatchewan

Hosted with Ag-West Bio Inc., this event featured the work of Saskatchewan industry, government, NGOs and universities in their quest to find ways to build a sustainable bioeconomy. Showcase speakers, including David Forbes, Saskatchewan's Minister of the Environment, presented to a standing-room only audience. The event concluded with an exciting tradeshow exhibition and reception.

United Nations Climate Change Conference (COP 11), December 2005

Montreal, Quebec

BIOCAP delivered Canada's "Green Advantage" message to the United Nations Climate Change Conference (COP 11) at both Side and Parallel Events. Stakeholders presented a case for harnessing Canada's vast biological resources - our "Green Advantage" - as feedstocks for clean, sustainable energy and as a way to fight climate change. The BIOCAP Exhibit was visited by hundreds of COP participants from around the world, and BIOCAP Board Chair, Bob Page, was invited to a special Media Event with the Head of the Canadian Delegation of COP 11.

National Aquatic Systems and Climate Change Workshop, September 2005

Winnipeg, Manitoba

The workshop was called by the Steering Committee and organized by BIOCAP to achieve alignment on "State of the Science: GHG Sources and Sinks in Aquatic Systems" a state of the science discussion paper written by BIOCAP staff. The workshop also focused on gaining consensus on the establishment, as well as the goals and objectives of a national research network on understanding and developing management strategies for disturbed aquatic systems. The group endorsed the discussion paper and built a framework for a national network.

Agricultural Sustainability in a Changing Climate, August 2005

Calgary, Alberta

Current knowledge relating to agriculture and climate change was exchanged among 50 participants at this two-day workshop. Featured speakers reviewed the ongoing research of university and government groups, and producers presented insights on the practical application of GHG mitigating strategies during a field tour of local farms. BIOCAP introduced the concept, scope and objectives of a Sustainable Agriculture Research Network, and used focused breakout sessions to discuss air, soil and water themes within the Network. Emphasis was placed on forging collaborative relationships among attendees.

Capturing Canada's Green Advantage: Biosphere Solutions for Climate Change and the Economy, February 2005

Ottawa, Ontario

BIOCAP's 1st National Conference hosted over 370 delegates from academia, industry, government, NGOs, producer groups, environmental organizations and media. The two-day conference featured a poster session of over 115 scientific posters and presentations by internationally renowned climate change experts and senior policy makers. Go to www.biocap.ca for information on the upcoming 2nd National Conference to be held Oct.31-Nov.1, 2006.

"I do not receive financial support from BIOCAP; I am moved to write because I think this organization has created and supported programs of enormous importance to Canada, and to the world community, both scientifically and socially."

Steven C. Wofsy
Division of
Engineering and
Applied Science,
Department of
Earth and Planetary
Science
Harvard University



Feedstock Integration for the Bio-Industry in Canada Workshop, February 2005

Ottawa, Ontario

BIOCAP hosted this workshop, attended by academic, government and industry leaders, to provide a forum for discussing technical, biological and socio-economic issues inherent in the development of bio-based industry in Canada. Presentations enhanced understanding and led to a plan for integrated research clusters to address research gaps. Affiliations formed at the workshop led to integrated research teams that produced papers for the Research Integration Program, and to ongoing discussions about the structure and priorities of a research cluster.

Speaking Engagements

BIOCAP principles are invited to deliver presentations on various biosphere related topics at workshops, conferences, public events and private discussion groups with ever increasing frequency totaling several hundred since 2002. The following are just a few of the many events at which BIOCAP was invited to present this past year:

G8 Workshop on Innovation and Research in Energy, Oxford, United Kingdom

Pollution Probe Green Power Workshop and Public Forum, Toronto, Ontario

Natural Resources Canada Side Event at COP 11, Montreal, Quebec

Energy Leaders Roundtable, Toronto, Ontario

Forest Leadership Conference, London, Ontario

Tools, Reports and Publications

BIOCAP programs and partnerships produce tools, reports and various other publications to provide insights which help to inform policy and investment decisions. The following are examples of some of the many products that have been produced.

TOOLS:

National Bioenergy Strategy Logic Model

Biomass Cost & Feasibility Model

Ontario BIOS Spatial Analysis Tool

Economic Model Comparing Permanent versus Temporary Credits

Models to Optimize Timber Yields and Carbon Stores

Models to Predict Climate Change Impacts on Seed Planting Zones

Beneficial Management Practices in Agriculture

Beneficial Management Practices in Forestry & Natural Ecosystems

2005/2006 REPORTS:

Strategies for Strengthening the Bioenergy Sector for Canada: Final Report of the Canadian Bioenergy Challenge Dialogue

The Canadian Bioenergy Challenge Dialogue, a process jointly sponsored by the BIOCAP Canada Foundation and EnergyINet was initiated to accelerate the development of a vibrant and sustainable bioenergy industry in Canada. Approximately 230 participants representing agriculture, forestry, oil and gas, petrochemicals, waste management, academia, government and NGOs addressed the question of bioenergy in Canada. The purpose was to establish a comprehensive, cross-sectoral strategy to advance the proposition that the nascent bioenergy sector can become a significant contributor to Canada's energy mix while providing sustainable environmental, societal and economic benefits to the citizens of Canada. While it cannot be said that a comprehensive, unified, national bioenergy strategy was developed during the Challenge Dialogue, there was alignment that five core themes should be pursued to illuminate and address the key issues and challenges to developing a robust and viable bioenergy strategy in Canada. The final report from the Challenge Dialogue is available on-line at www.biocap.ca.

The BIOCAP Research Integration Program: Research Insights

The BIOCAP Research Integration Program was designed to generate a series of synthesis papers / reports addressing specific areas of interest within the BIOCAP mandate. The inaugural program resulted in 13 funded Projects and 14 Synthesis Reports. Insights from the Reports were presented publicly at the first ever BIOCAP Research Integration Forum in Ottawa, April 2006, and are summarized in the Research Insights document available online at www.biocap.ca

Research Integration Program Reports:

1. Threats and Impacts of Exotic Pests under Climate Change: Implications for Canada's Forest Ecosystems and Carbon Stocks
2. Combined Forest Management Effect on Landscape Carbon Stock Changes in West-Central Canada
3. Adapting Forest Management to the Impacts of Climate Change in Canada
4. A Conceptual Comparison of Using Bioenergy Options for BC's Mountain Pine Beetle Infested Wood
5. Whole Farm Modeling to Evaluate Economic and Production Implications of BMPs Designed to Reduce GHG Emissions – Case Study of Dairy Production in Coastal British Columbia
6. The Potential for Agricultural GHG Emission Reductions in the Temperate Region of Canada through Nutrient Management Planning

“The Conservative Party has repeatedly claimed they want a “made in Canada solution” to climate change and our energy needs. What better example can one find for a foundation that can provide “made in Canada solutions” than the BIOCAP Foundation? ”

John P. Smol
FRSC, Professor,
Canada Research
Chair in
Environmental
Change
Queen's University



7. Disputes and Dispute Resolution in the Offset System
8. Offsets for Carbon Sequestration in Agricultural Soil and Tradable Emission Permits for Large Final Emitters
9. A Critical Cost Benefit Analysis of Oilseed Biodiesel in Canada
10. Benefits and Costs of Shifts to Biomass Crops – Producer and Public Perspectives
11. Cost Benefit of Biomass Supply and Pre-processing Enterprises in Canada
12. Optimum Sizing for Anaerobic Digestion
13. Environmental and Social Benefits of 2nd Generation Biofuels in Canada
14. Policies to Stimulate Biofuel Production in Canada: Lessons from Europe and the United States

***Exploring the Potential for Biomass Power in Ontario:
A Response to the OPA Supply Mix Report***

Released February 2006, this BIOCAP report focused on the potential for biomass-based power generation to make a significant, cost-competitive contribution to Ontario’s electricity requirements. Written in response to the Ontario Power Authority’s Supply Mix Advice Report, the BIOCAP paper concluded that a) bioenergy is far more price competitive with natural gas and petroleum than it was ten years ago, primarily due to rising fossil fuel prices, and b) Ontario is rich in biomass resources that could be sustainably managed to produce more than 50% of the province’s current electricity requirements. This report is available at www.biocap.ca.

Mountain Pine Beetle Reports

In April 2005, BIOCAP and the Government of BC funded an initial report, British Columbia’s Beetle Infested Pine: Biomass Feedstocks for Producing Power, on the feedstock availability and cost of producing electricity from surplus Mountain Pine Beetle (MPB) killed trees in British Columbia. This report, plus two additional reports now published: Feedstock Availability and Power Costs Associated with Using BC’s Beetle-Infested Pine, and Site Visit to Alhoholmens 240MW Power Plant Pietersaari, Finland, have provided the feasibility information necessary for BC to develop a Bioenergy Strategy using beetle-killed wood. These reports are available at www.biocap.ca.

Earlier Reports:

Canadian Biodiesel Initiative: Aligning Research Needs and Priorities with the Emerging Industry (2004)

A Canadian Biomass Inventory: Feedstocks for a bio-based economy (2003)

An Assessment of the Opportunities and Challenges of a Bio-Based Economy for Agriculture and Food Research in Canada (2003)

“BIOCAP, with their reach into university research communities, help industry and government to explore biosphere solutions to environment and economic challenges. It was for these reasons that British Columbia recently committed \$500,000 in support of BIOCAP.”

Doug Konkin
Deputy Minister,
Ministry of Forests
and Range,
Government of
British Columbia

PUBLICATIONS:

BIOCAP researchers have authored more than 150 peer reviewed journal articles, and BIOCAP has issued dozens of media releases, and created a loyal readership for several targeted communications publications. The following are highlights of a few of these.

Linking Biomass Energy to Biosphere Greenhouse Gas Management

BIOCAP authored a chapter in a recently published book: *Climate Change and Managed Ecosystems* by Jagtar Bhatti, Canadian Forest Service; Rattan Lal, Ohio State University; Michael J. Apps, Canadian Forest Service; Mick A. Price, University of Alberta; December 2005.

Primer on Bioproducts

In a successful second partnership with Pollution Probe, BIOCAP sponsored the development of this popular introduction to the world of bioproducts. A previous BIOCAP-sponsored Primer focused on the Technologies of Renewable Energy.

In The News

Boasting over 600 subscribers, “In The News” is a monthly digest-style news service that synthesizes current biosphere, bioenergy and greenhouse gas management news. To subscribe, go to www.biocap.ca.

BIOCAP Briefs

BIOCAP Briefs are informative memos delivering succinct highlights of current research initiatives, new research projects, breaking results and technologies, and pending research and policy questions within a specific area of biosphere greenhouse gas or bio-product research. Thirteen Briefs have been published to date.

BIOCAP IN THE MEDIA

BIOCAP and its work to enable the transition to a sustainable bioeconomy have become increasingly popular topics in Canadian media. Media coverage highlighting BIOCAP research has spanned the country in print, television and radio. The following are some recent examples of BIOCAP in the Media.

B.C. Ready to Burn Pine-beetle Wood

Times Colonist
June 2006

Kyoto and the Conservatives

CMA Management
May 2006



Studies Fuel Kyoto Hopes for Tories

Toronto Star
April 10, 2006

Conservative Cuts to Climate Change Funding

CBC's The National
April 5, 2006

BC's Dead Trees Could Supply Fuel for Power Plant

CKNW Radio
January 6, 2006

Beetle Wood Could Fuel Power Plant

Prince George Citizen
January 5, 2006

Clean Energy Gets Push

Globe and Mail
November 25, 2005

New Life for Dead Wood

Vancouver Sun
November 8, 2005

BIOCAP Seeking Funding Increase as Support of Alternate Energy Research Soars

Research Money
November 7, 2005

Using Canada's Green Advantage to Combat Pollution

Ontario Agrologist
Fall 2005

Rekindling that Old Flame

Ottawa Citizen
October 9, 2005

NETWORKING

“Canada, with its vast expanses of agricultural land relative to its population, has a tremendous opportunity to take advantage of a bio-based economy more effectively than any other nation on earth without compromising its oil and gas sector. BIOCAP could play a crucial role in developing this bio-based economy.”

David T. Dennis
President and CEO
Performance Plants

THE RESEARCH NETWORKS

Since 2002, BIOCAP has been coordinating and funding networks and projects with a goal of creating a coordinated national effort in the search for biosphere-based solutions to the challenges of climate change and clean energy. Within the four main areas of Agriculture, Bioenergy, Forestry and Natural Ecosystems, and Human Dimensions, BIOCAP has built a ‘network of networks’ encouraging cross-cutting and cross-discipline synthesis of research results.

AGRICULTURE

Landscape-Scale Cropping Systems Network (LSCS)

University Lead: University of Saskatchewan

Network Leader: Dr. Daniel J. Pennock

Established: 2003

Funding: \$140,000 (BIOCAP, Ducks Unlimited, OSCIA)

The LSCS network focuses on understanding and quantifying the effects of various crop and landscape management practices on greenhouse gas emissions (particularly N₂O) and soil carbon stock changes in agricultural systems.

Animal Production and Manure Management Network (APMM)

University Lead: University of Guelph

Network Leaders: Dr. Claudia Wagner-Riddle and Dr. James France

Established: 2003

Funding: \$70,000 (BIOCAP)

The goal of the APMM network is to understand and quantify the sources and sinks of GHGs associated with beef, dairy, and pork production, and use this understanding to identify beneficial management practices and new technologies that can mitigate GHGs.

Environmental Goods and Services Network

This multidisciplinary initiative proposes to identify management strategies, develop new technologies and assess socioeconomic impacts of efforts to reduce biological GHG emissions, enhance C sinks or provide other environmental services in agricultural production systems.



Green Crop Network

University Lead: McGill University

Network Director: Dr. Donald Smith

Established: 2005

Funding: \$6.6M (NSERC, NRC, McGill, BIOCAP, Environment Canada, Saskatchewan Univeristy, Syngenta, Manitoba University, Philom Bios, Reductase)

This network is developing the insights and, eventually, new crop cultivars that will: improve the sustainability of crop production by emitting less N₂O, enhance soil C stocks, flourish in an elevated CO₂ atmosphere, and provide materials for bio-based products.

Biomass Crops Research Network

This initiative will focus on the development of new crops or trees for the sustainable production of biomass to provide energy chemicals and materials or to enhance biological carbon stocks as an offset for fossil fuel GHG emissions

FORESTRY AND NATURAL ECOSYSTEMS

Fluxnet Canada Research Network (FCRN)

University Lead: Université Laval

Network Lead: Dr. Hank Margolis

Established: 2002

Funding: \$13.6M (CFCAS, NSERC, BIOCAP)

FCRN is a national research network examining the influence of climate and disturbance on carbon cycling along an east-west transect of Canadian forest and peatland ecosystems. Researchers at FCRN completed the first synthesis analysis of net carbon uptake across Canada revealing large differences in air quality fluctuations and carbon uptake relating to stand age, disturbance and ecosystem type.

The Canadian Carbon Program (CCP)

University Lead: Université Laval

Network Lead: Dr. Hank Margolis

Established: 2006

Funding: \$4M

The CCP is a national research network developing a scientific framework for reducing uncertainty in estimating the carbon budget of Canada and North America at monthly to multi-annual time scales. This will provide critical information for analyzing the effects of different scenarios of climate variability and disturbance regimes on future carbon stocks and wood supply and for developing strategies for mitigating and adapting to the impacts of climate change.

Sustainable Forest Management Network (SFMN)

University Lead: University of Alberta

Network Leader: Dr. Vic Adamowicz

Established: 2003

Funding: \$1.6M (SFMN, BIOCAP)

The BIOCAP aspect of the SFM Network focuses on integrating the study of forest carbon management into the SFM program to inform investment and policy decisions regarding how forest carbon management can provide GHG emission reduction credits while preserving non-timber values such as biodiversity.

National Aquatic Systems and Climate Change Network (NASCC)

The NASCC Network is working to quantify the effects of climate change, natural disturbance and human activities on the carbon (C) and nitrogen (N) cycles in aquatic systems and develop models that will draw on research results to describe and predict C and N cycle fluxes in aquatic systems.

BIOENERGY

Bioenergy Research Network Cluster

This large and complex emerging initiative is focusing on feedstock to product threads and cross-cutting themes. Feedstock to product threads will include four platforms: 1) waste (MSW, biosolids, manure), 2) sugar (bioethanol, biobutanol, etc.), 3) oil (biodiesel and products from plant and animal oils), and 4) thermochemical (combustion, gasification and pyrolysis conversion). Cross-cutting themes will address feedstock logistics, the biomass refinery, socio-economics and policy.

“Shell Canada has long recognized the potential of biological systems to capture and store greenhouse gases. It is for this reason that the company is a long-standing supporter of BIOCAP.”

Tim Bancroft
Vice President
– Sustainable
Development,
Technology and
Public Affairs
Shell Canada



HUMAN DIMENSIONS

Greenhouse Gas Management Canada Network (GHGMC)

University Lead: McGill University

Network Director: Dr. Paul Thomassin

Established: 2003

Funding: \$3.3M (SSHRC, BIOCAP, Agriculture and Agri-Food Canada)

GHGMC investigates the human dimensions of biosphere GHG management and bio-based products. The socioeconomic work of GHGMC complements, extends and integrates research in the areas of natural science and engineering, with a specific focus on agriculture, bioenergy and bioproducts, and forestry.

Funding Partner Acroynms

AAFC	Agriculture and Agri-Food Canada
ALPAC	Alberta-Pacific Forest Industries Inc.
CARC	Canadian Agri-Food Research Council
CFCAS	Canadian Foundation for Climate and Atmospheric Sciences
CSALE	Centre for Studies in Agriculture, Law and the Environment
FERIC	Forest Engineering Research Council of Canada
NRCAN	Natural Resources Canada
NSERC	Natural Science and Engineering Research Council
OSCIA	Ontario Soil and Crop Improvement Association
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
SFMM	Sustainable Forest Management Network
SSHRC	Social Sciences and Humanities Research Council

THE RESEARCH PROJECTS 2001-2006

Since 2002 BIOCAP has helped to build and shape over 100 research projects and networks. To do this, the organization has engaged the support of numerous funding partners. BIOCAP has invested \$6.8M in the research projects that are outlined in the following pages, and with the help of these partners, levered this funding to attract an additional \$31.7M for a total cash investment of \$38.5M in research focused on climate change and clean energy solutions. What is not itemized below is an impressive list of in-kind support that has also enabled the success of these projects. In the past several years, BIOCAP has engaged a further 100 partners which have contributed \$12.5M of direct in-kind support to these projects by way of time and expertise, facilities, equipment, and materials. Additionally, BIOCAP sponsors and partners have contributed many millions of dollars of in-kind support through their leadership and active engagement in meetings, committees, workshops, and conferences on behalf of BIOCAP's programs and projects.

AGRICULTURE						
Principal Investigator	Recipient Institution	Title / Description	Term	Financial Support		Key Funding Partners
				BIOCAP	Total	
Canadian Agricultural New Uses Council	Canadian Agricultural New Uses Council	An Assessment of the Opportunities and Challenges of a Bio-Based Economy for Agriculture and Food Research in Canada	FY03	16,000	32,000	CARC
Layzell, David	Queen's University	Understanding and quantifying the linkages between the carbon, nitrogen and oxygen cycles.	FY03	50,000	50,000	Queen's University
Thomsen, Joseph	Thomsen Corporation	Beneficial Management Practices to Reduce Greenhouse Gas Emissions and Increase Carbon Sinks in Canadian Agriculture	FY03	16,000	48,000	CARC, AAFC
Lobb, David	University of Manitoba	Integrated Catchment Monitoring of GHG Emissions in the Prairie Pothole Region – Manitoba Site	FY03-04	16,667	46,667	Ducks Unlimited, Manitoba Agriculture, GHG Mitigation Program
Pennock, Daniel	University of Saskatchewan	Integrated Catchment Monitoring of GHG Emissions in the Prairie Pothole Region - Saskatchewan Site	FY03-04	16,667	46,666	Ducks Unlimited
Wagner-Riddle, Claudia	University of Guelph	Long-term Greenhouse Gas Flux Monitoring Site at Elora, Ontario	FY03-04	16,667	46,667	OSCIA
Livingston, Nigel	University of Victoria	The Development of Methanotrophic Biofilters and Bioreactors to Reduce Point Source Methane Emissions, Sequester Carbon and Increase Soil Fertility	FY03-06	233,000	466,000	NSERC
Tulip, John	University of Alberta	Laser Atmospheric Sensing	FY03-06	203,500	407,000	NSERC
Pennock, Dan	University of Saskatchewan	Landscape-Scale Measurement and Upscaling of Process-Level Nitrous Oxide Measurements	FY04-06	307,742	750,483	NSERC, Ducks Unlimited, Environment Canada, CSALE
Pennock, Daniel	University of Saskatchewan	Secretariat Funding: Landscape-Scale Cropping Systems Network	FY05	25,000	25,000	n/a
France, James and Claudia Wagner-Riddle	University of Guelph	Secretariat Funding: Animal Production and Manure Management Network.	FY05-06	45,000	45,000	n/a
Wagner Riddle, Claudia	University of Guelph	Temporal Dynamics of Greenhouse Gas Fluxes linked to Soil Biophysical Processes and Management Practices	FY05-07	80,000	562,843	NSERC, OMAFRA, OSCIA
Fenton, Jim	Jim Fenton & Associates	Benefits and Costs of Shifts to Biomass Crops – Producer and Public Perspectives	FY06	27,945	27,945	n/a
Swift, Mary Lou	Pacific Agri Technologies Ltd.	Whole Farm Modeling to Evaluate Economic and Production Implications of BMP's Designed to Reduce GHG Emissions – Case Study of Dairy Production in Coastal British Columbia	FY06	18,630	18,630	n/a
Wall, Greg	Soil Resource Group	The potential for agricultural greenhouse gas emission reductions in the temperate region of Canada through nutrient management planning	FY06	20,131	20,131	n/a
Jamieson, Rob	Dalhousie University	Development of Tools for Predicting Nitrogen Processes in Agricultural Settings	FY06-08	30,000	605,900	NSERC
Trevors, Jack	University of Guelph	Environmental regulation of denitrifying activity in soil producing nitrous oxide and the expression of denitrifier genes in the soil bacteria	FY06-08	25,000	424,320	NSERC
Smith, Don	McGill University	Green Crop Network	FY06-10	100,000	6,621,550	NSERC, NRCan, Environment Canada, McGill University, University of Saskatchewan, Syngenta, University of Manitoba, Philom Bios, Reductase
				1,247,949	10,244,802	

BIOENERGY

Principal Investigator	Recipient Institution	Title / Description	Term	Financial Support		Key Funding Partners
				BIOCAP	Total	
Wood, Susan and David Layzell	BCF	A Canadian Biomass Inventory: Feedstocks for a Bio-based Economy	FY03	0	20,000	Industry Canada
Karan, Kunal	Queen's University	Technical and Economic Analysis of Alternative Processes for Agricultural Waste Fueled Solid Oxide Fuel Cell	FY04-05	15,000	48,000	OMAFRA
Schlaf, Marcel	University of Guelph	Direct Synthesis of 1,3-propane diol from Glycerol Using Transition Metal Based Ionic Hydrogenation Catalysts	FY04-05	15,000	125,949	NRCan, OMAFRA, U of Guelph
Dube, Marc	University of Ottawa	Biodiesel Production from Acid-Catalyzed Transesterification of Waste Oils	FY04-06	143,070	286,140	NSERC
Duff, Sheldon	University of British Columbia	Enhancing Prospects for Higher Value Uses for Bio-Oil	FY04-06	171,750	343,500	NSERC
Dalai, Ajay	University of Saskatchewan	Production of Biodiesel from Vegetable Oils and Lubricity Additives for Ultra-Low Sulphur Diesel Fuel and of Hydrogen from Byproduct Glycerol	FY04-06	120,000	240,000	NSERC
Saddler, Jack	University of British Columbia	The Development of a Technically and Economically Viable Pre-treatment and Enzymatic Process for the Conversion of Softwood Residues to Ethanol.	FY04-06	227,750	455,500	NSERC
Sain, Mohini	University of Toronto	Sustainable Biopackaging Materials for Green Technology	FY04-06	133,000	309,478	NSERC, Atofina
Sokhansanj, Shahab	University of British Columbia	British Columbia's beetle infested pine: biomass feedstock for producing power	FY05	22,000	22,000	Gov't of BC
Daugulis, Andrew	Queen's University	Biomass to Hydrogen via H ₂ S	FY05-06	30,000	220,000	NRCan, NSERC
Thomson, Murray	University of Toronto	Enabling Biodiesel Fuel Use for Sustainable Mobility	FY05-06	30,000	310,000	NRCan, Auto21, Ontario Centres of Excellence, Canada Research Chair, International Truck & Engine Co., Imperial Oil, NSERC
ULERN (Deyoe, David)	OMNR	BIOS: Forest Biomass Opportunities Supply Model for Ontario	FY05-06	15,000	103,500	FERIC, Tembec, Grant Forest Products
Kozinski, Janusz	McGill University	Application of Bioenergy for the GHG Mitigation in the Iron and Steel Industry	FY05-07	52,000	444,850	NSERC
Lessard, Jean	University of Sherbrooke	Biomass-derived High Octane Synfuels from C5 Sugars	FY05-07	24,000	187,500	NSERC
Levin, Dave	University of Victoria	Hydrogen Production from Cellulosic Biomass	FY05-07	36,000	298,300	NSERC
Saddler, Jack	University of British Columbia	The development of value-added bioproducts from the bioconversion of lignocellulosics	FY05-07	30,000	255,000	NSERC
Flynn, Peter	University of Alberta	Optimum sizing for anaerobic digestion	FY06	16,500	19,400	n/a
Kumar, Amit	University of Alberta	Feedstock Availability and Power Costs Associated with using BC's Beetle-Infested Pine	FY06	25,000	25,000	Gov't of BC via BIOCAP
Kumar, Amit	University of Alberta	A conceptual comparison of bioenergy options for using BC's mountain pine beetle infested wood	FY06	19,910	21,910	n/a
Mabee, Warren	University of British Columbia	Economic, Environmental and Social Benefits of 2nd Generation Biofuels in Canada	FY06	19,900	39,900	NRCan
Reaney, Martin	University of Saskatchewan	A critical cost-benefit analysis of oilseed based biodiesel	FY06	26,169	49,220	NRCan
Sokhansanj, Shahab	University of British Columbia	Cost benefit of biomass supply and pre-processing enterprises in Canada	FY06	31,244	31,244	n/a
Walburger, Allan	University of Lethbridge	Policies to Stimulate Biofuel Production in Canada: Lessons from Europe and United States	FY06	18,600	18,600	n/a
Cabral, Alexandre	University of Sherbrooke	Attenuation of Greenhouse Gases Emitted by Landfills Using an Engineered Passive Methane Oxidation Barrier	FY06-08	24,702	321,125	NSERC
Kennedy, Kevin	University of Ottawa	Development of Technically and Economically Viable Microwave Pretreatment for Enhanced Biogas Production and Green House Gas Recovery from Municipal Sludge and Agricultural Waste	FY06-08	20,000	358,400	NSERC, Environmental Waste International
Liss, Stephen	University of Toronto	Anaerobic Membrane Processes for Energy Recovery from Wastewater	FY06-08	30,000	420,000	NSERC
Sheppard, John	McGill University	Control of bacterial contamination in continuous ethanol fermentation processes	FY06-08	22,000	272,675	NSERC
Sokhansanj, Shahab	University of British Columbia	Biomass Feedstock Integration for an Emerging Bio Industry in Canada	FY06-08	22,000	327,100	NSERC, AAFC
				1,340,595	5,574,291	

FORESTRY and NATURAL ECOSYSTEMS

Principal Investigator	Recipient Institution	Title / Description	Term	Financial Support		Key Funding Partners
				BIOCAP	Total	
Margolis, Hank	Laval University	Fluxnet Canada Research Network	FY02-06	1,000,000	13,631,731	NSERC, CFCAS
Griss, Paul	Griss, Paul (Consultant)	Forest Carbon Management Pilot Series The objective of this project was to initiate and coordinate a Forest Carbon Management Pilot series in Canada that ensures consistency in the application of science in the development of tradable carbon credits across eligible forest carbon management activities.	FY03-04	20,000	120,000	Various
Adamowicz, Vic	University of Alberta	A Bioregional Assessment of Sustainable Forest Management for the Boreal Plains	FY03-05	75,000	262,800	SFMN
Aiken, Sally	University of British Columbia	Adapting Forest Genetic Resource Management to Climate Change	FY03-05	230,026	460,052	NSERC
MacLean, David	University of New Brunswick	Influence of Forest Management, Silviculture, and Pest Management on Carbon Sequestration	FY03-05	138,100	276,200	SFMN
Fyles, Jim	University of Alberta	Central Administration for SFMN	FY03-06	12,500	25,000	SFMN
Armstrong, Glen and Vic Adamowicz	University of Alberta	Carbon credit trading: the law, firm behaviour, economics and landscape impacts	FY04-06	123,376	330,201	SFMN
Duinker, Peter	Dalhousie University	Old-Growth forests in Eastern Canada: exploring tradeoffs among timber, biodiversity, carbon, and public preferences	FY04-06	38,033	85,270	SFMN, Bowater
Lantz, Van	University of New Brunswick	Role of pest management in sequestering carbon in the 2008-12 Kyoto Commitment Period: integration with CBM-CFS3 and economic analysis	FY04-06	63,590	164,500	SFMN
Moore, Tim	McGill University	Dissolved Organic Carbon and Carbon Cycling in Canadian Forests	FY04-06	130,635	261,270	NSERC
St. Onge, Benoit	UQAM	Analysis of Forest Biomass and Carbon Stocks Using Lidar and Photogrammetry in Support of the National Forest Inventory	FY04-06	201,275	402,550	NSERC
Malcolm, Jay	University of Toronto	Dynamics of woody debris in eastern boreal forests: implications for C and wildlife management	FY05-06	85,500	444,720	SFMN
Grayston, Sue	University of British Columbia	Forest fertilization and identification of microbial indicators to enhance C sequestration and reduce GHG emissions	FY05-07	50,000	410,639	NSERC
Hunt, Shelley	University of Guelph	Threats and impacts of exotic pests under climate change: implications for Canada's forest ecosystems and carbon stocks	FY06	17,020	17,020	n/a
Johnston, Mark	Saskatchewan Research Council	Adapting forest management to the impacts of climate change in Canada	FY06	20,000	20,000	n/a
Li, Chao	Canadian Forest Services	Combined forest management effect on landscape carbon stock changes in west-central Canada	FY06	19,000	19,000	n/a
Amiro, Brian	University of Manitoba	Climate and Hydrology Drivers of the Carbon Balance in Northern Black Spruce Forests	FY06-07	39,640	328,397	Fluxnet, CFCAS, Harvard University
Chang, Scott	University of Alberta	Land use changes, greenhouse gas emissions, and C budgets in hybrid poplar plantations	FY06-08	30,000	292,000	NSERC, ALPAC
Chen, H	Lakehead University	Can mixed wood management increase carbon sequestration in the eastern-central boreal shield?	FY06-08	18,000	387,000	NSERC, Ontario Forest Research Institute
Lucotte, Marc	UQAM	Effects of land use change on organic matter fluxes to aquatic ecosystems : the case of forest management and flooded lands	FY06-08	36,267	471,467	NSERC, Environment Canada
Moore, Tim	McGill University	Atmospheric Exchange of Methane and Nitrous Oxide in Canadian Forest Soils	FY06-08	30,000	330,000	CFCAS
Pharis, Richard	University of Calgary	Identification and Selection of Fast-growing Poplar Genotypes for Sequestration of Carbon & Biomass Production	FY06-08	28,000	364,000	NSERC
Predoi-Cross, Adriana	University of Lethbridge	Spectroscopic studies and instrumentation to enable accurate simultaneous measurements of sources and sinks of methane, carbon dioxide and nitrous oxide	FY06-08	13,000	169,000	NSERC, University of Lethbridge
				2,418,962	19,272,817	

HUMAN DIMENSIONS

Principal Investigator	Recipient Institution	Title / Description	Term	Financial Support		Key Funding Partners
				BIOCAP	Total	
Fulton, Murray	University of Saskatchewan	Transformative Change in Biosphere Greenhouse Gas Management	FY03-06	331,045	614,030	SSHRC
Klein, Kurt	University of Lethbridge	Socioeconomic Research Network on Bioproducts and Bioprocesses	FY03-06	347,810	646,030	SSHRC
Kulshreshtha, Suren	University of Saskatchewan	Integrated Analysis of Mitigation Strategies for Greenhouse Gas Emissions from Agriculture	FY03-06	305,720	438,590	SSHRC, AAFC, NRCan, OMAFRA
Thomassin, Paul	McGill University	Central Administration for GHGMC	FY03-06	0	200,000	SSHRC
Thomassin, Paul	McGill University	Institutional Development of a Domestic Emission Trading System that Includes Carbon Offsets from the Agriculture and Forestry Sectors	FY03-06	277,455	541,585	SSHRC
Van Kooten, G. Cornelis	University of Victoria	The Economics of Terrestrial Carbon Sinks: Land Use, Land Use Change and Forestry	FY03-06	202,730	388,525	SSHRC
Weersink, Alfons	University of Guelph	Cost-Effective Agricultural Management Strategies and Technologies for Mitigating Greenhouse Gas Emissions	FY03-06	275,240	511,240	SSHRC, Ducks Unlimited, OMAFRA, AAFC
Van Loon, Gary	Queen's University	International CHEMRAWN Congress on Greenhouse Gas Mitigation Strategies	FY04	10,000	10,000	n/a
Wilman, Elizabeth	University of Calgary	Property Rights and Contracts for Carbon Sequestration	FY04-05	88,160	88,160	Government of AB
Lucas, Alastair	University of Calgary	Disputes and Dispute Resolution in the Offsets System	FY06	9,797	9,797	n/a
Wilman, Elizabeth	University of Calgary	Offsets for Carbon Sequestration in Agricultural Soil and Tradable Emissions Permits for Large Final Emitters	FY06	9,797	9,797	n/a
				1,857,754	3,457,754	

RESEARCH INVESTMENTS

TOTAL BIOCAP FUNDING = \$6,865,260
TOTAL LEVERAGED FUNDING = \$38,549,664

Please refer to the Statement of Activities and Changes in Fund Balances

REVENUES totaled \$2,591,786 (FY 2004-05 \$2,672,420):

The contributions of all stakeholders have enabled BIOCAP to deliver on its mandate to bring together leading researchers and decision-makers from across Canada to find biosphere solutions to clean energy, climate change, and economic development.

The **federal government contributed \$2,000,000** in FY 2005-06 (2004-05 - \$2,000,001), the 2nd and final year under the May 18, 2004 contribution agreement (BIOCAP's second with the federal government). This represents 77% of total revenue. BIOCAP is seeking renewal of long term funding from the federal government.

Four provinces (BC, AB, SK, ON) contributed \$180,000 (2004-05 - \$180,000) unrestricted funds for the general operations of BIOCAP.

Key industry sponsors contributed cash totaling \$240,000 (2004-05 - \$229,250) unrestricted funds for the general operations of BIOCAP. Sponsors included TransAlta, Shell, Alberta Pacific Forest Products, Suncor, Ontario Power Generation, Canadian Fertilizer Institute, and one new sponsor, Lafarge NA.

Queen's University contributed in-kind a portion of Professor David Layzell's time as President and CEO valued at \$70,000 (2004-05 - \$70,000).

Targeted giving to specific projects totaled \$80,000 (2004-05 - \$135,286). The Government of Alberta provided \$32,000 to pay for a workshop and initiative entitled 'Agricultural Sustainability in Changing Climate'. The Government of British Columbia contributed \$15,000 to co-fund with BIOCAP a 2nd phase study of a techno-economic assessment of using a portion of BC's mountain pine beetle damaged timber as a fuel source to generate power. Hydro Quebec and Manitoba Hydro each contributed \$15,000 towards a workshop with the objective of building alignment and momentum for a new research network: *National Aquatic Systems and Climate Change*. The Canadian Cattlemen's Association gave \$2,500 towards an Animal Production and Manure Management Network Communication Project. Finally the Canadian Pork Council gave \$500 to the Agriculture workshop.

Investment income totaled \$20,247 (2004-05 - \$11,765) from short-term investments, which was higher than the prior year due to higher interest rates and increased balances invested.

Cost recoveries \$789 (2004-05 - \$46,118) is negligible whereas in the prior year it included registration fees to cover part of the costs of our very successful first National Conference. A large national conference was not run in FY 2005-06. A number of smaller workshops and events were held as described below.

EXPENDITURES totaled \$2,643,532 (2004-05 - \$2,626,400):

Program Activity Expenditures totaled \$2,253,918 (2004-05 - \$2,229,332) (*i.e.*, 85% of all expenditures):

Research Grants by BIOCAP totaled \$1,355,364 (2004-05 - \$1,313,908), representing 51% of all expenditures. Research grants were provided to 78 projects / principal investigators, at 32 universities and a number of other private and government research agencies across Canada as reported elsewhere in this report. Over the last five years for every \$1 invested by BIOCAP \$4.62 (\$4.28 FY 2004-05) has been leveraged with partner funding resulting in total research funding of \$38,549,664. Below is a Table of recent BIOCAP Research Funding by major categories.

BIOCAP Research Funding To:	2005-06	2004-05
Green Crop Network (new in 2005-06)	\$100,000	\$--
Fluxnet Canada Research Network	70,000	200,000
Sustainable Forest Management Network	103,500	132,000
Human Dimensions of Biosphere GHG Mgt. Network	--	300,000
NSERC Strategic Grant Joint Initiative with BIOCAP	622,581	564,908
Research Integration Program (new in 2005-06)	274,643	--
Other Research Grants	134,640	35,000
Short-term Projects & Discussion Papers	30,000	32,000
Network Secretariat Grants	20,000	50,000
Total	\$1,355,364	\$1,313,908

Communication Activities totaled \$483,034 (2004-05 - \$540,555), representing 18% of expenditures. This investment provided salaries and benefits for four (4) FTE BIOCAP staff and includes costs related to various initiatives such as annual report production, translation and printing, the side and parallel events at COP 11 in Montreal, BIOCAP Day information sessions in Ottawa, a Bioeconomy Symposium in Regina, a new BIOCAP special event / conference booth, sponsorship of and registration fees for various national workshops (e.g. ISTMM III) and conferences (i.e. Globe, Forestry), news releases, marketing materials, web design and updates, advertising, and communications services / consultants. 2004-05 expenditures were higher primarily due to the national conference which was not held in 2005 - 2006.

Research Networking Activities totaled \$415,520 (2004-05 - \$374,869), representing 16% of expenditures. This investment provided salaries and benefits for four (4) FTE BIOCAP staff, and covered costs associated with organizing and hosting an *Aquatic Systems and Climate Change* workshop in Montreal, an *Agriculture* workshop in Calgary, the Bio-energy Challenge Dialogue process and discussion papers, phone, cell phone, fax, internet networking costs, CEO time and travel, staff travel, and a few consultants.

Supporting Activities totaled \$389,614 (2004-05 - \$397,068) representing 15% of all expenditures. In order to deliver the above noted programs, expenditures of a general and administrative nature are necessary. These expenditures include (3) FTE BIOCAP staff, board of directors fees, meeting costs, liability insurance, audit fees, computer equipment, office supplies, postage & delivery, and a number of services from Queen's University costing \$96,120 (2004-05 - \$99,291) for office facilities, financial administration, human resources, contract assistance, and research funding advice.

The (Deficiency) of revenues over expenditures for FY 2005-06 was (\$51,746). There was an excess of \$46,020 in FY 2004-05.

Operating Fund Balances, end of year \$259,784 = Net Assets per the SUMMARIZED STATEMENT OF FINANCIAL POSITION as at March 31, 2006. (see p.39)

NET ASSETS (Assets - Liabilities) total \$554,115 (2004-05 - \$605,861)

- General Operating Funds as at March 31, 2006 totaled **\$259,784** (March 31, 2005 - \$304,348) after the FY 2005-06 deficiency of revenues over expenditures of \$(44,564)
- Internally Restricted Funds as at March 31, 2006 totaled **\$280,000** (March 31, 2005 - \$280,000)
- Invested in Capital Assets as at March 31, 2006 totaled **\$14,331** (March 31, 2005 - \$21,513), lower due to not replacing assets at the same rate as their depreciation.

BIOCAP CANADA Summarized Statement of Activities and Changes in Fund Balances

Year Ended March 31, 2006, with comparative figures for 2005

	"A"	"B"	"C"	"D"	"E"			"F"	
	BIOCAP Canada Funds @ Queen's University - Kingston		Outside Queen's (separate legal entities)		Combined All Funds Managed by BIOCAP Canada Foundation			Combined All Funds Managed by BIOCAP Canada Foundation	
	Env. Can. Queen's / BIOCAP Fund	BIOCAP @ Queen's University Fund	BIOCAP Canada Foundation	BIOCAP Canada Charitable Foundation		Total 2006 (A+B+C+D)	Total 2005 (comparison)		
	to account for the F.G.C.A.	in the direct support of the F.G.C.A.	to manage and extend the F.G.C.A.	to extend the F.G.C.A.					
Revenues:									
Contributions:									
Federal government	\$2,000,000	--	0	--	2,000,000	77%	\$2,000,001	75%	
Provincial governments	--	50,000	130,000	--	180,000	7%	180,000	7%	
Industry	--	50,000	190,000	--	240,000	9%	229,250	9%	
Individuals	--	--	--	750	750	0%	--	0%	
Queen's U. in-kind	--	70,000	--	--	70,000	3%	70,000	2%	
Targetted	--	--	80,000	--	80,000	3%	135,286	5%	
Other:									
Investment income	--	--	19,068	1,179	20,247	1%	11,765	0%	
Cost recoveries	--	750	39	--	789	0%	46,118	2%	
	2,000,000	170,750	419,107	1,929	2,591,786	100%	2,672,420	100%	
Expenditures (by functions):									
Program Activities:									
Research funding	1,205,731	--	149,633	--	1,355,364	51%	1,313,908	50%	
Communication	263,126	50,903	169,005	--	483,034	18%	540,555	21%	
Research networking	234,591	77,284	103,645	--	415,520	16%	374,869	14%	
	1,703,448	128,187	422,283	--	2,253,918	85%	2,229,332	85%	
Support activities (admin.)	290,347	4,876	92,991	1,400	389,614	15%	397,068	15%	
	1,993,795	133,063	515,274	1,400	2,643,532	100%	2,626,400	100%	
Excess (deficiency) of revenues over expenditures	6,205	37,687	(96,167)	529	(51,746)		46,020		
Inter-fund transfers		48,000		(48,000)	--		--		
Balance, beginning of year	4,431	96,953	451,291	53,186	605,861		559,841		
Balance, end of year	\$10,636	182,640	355,124	5,715	554,115		\$605,861		

Note: These summarized financial statements have been prepared from information in the complete audited annual general purpose financial statements (which are available upon request) for each of the individual funds.

Note: F.G.C.A. = Federal Government Contribution Agreement (between Environment Canada and Queen's U. and managed by BIOCAP Canada Foundation)

BIOCAP CANADA Summarized Statement of Financial Position

March 31, 2006, with comparative figures for 2005

	"A"	"B"	"C"	"D"	"E"	"F"
	BIOCAP Canada Funds @ Queen's University - Kingston		Outside Queen's (separate legal entities)		Combined All Funds Managed by BIOCAP Canada Foundation Total 2006 (A+B+C+D)	Combined All Funds Managed by BIOCAP Canada Foundation Total 2005 (comparison)
	Env. Can. Queen's / BIOCAP Fund to account for the F.G.C.A.	BIOCAP @ Queen's University Fund in the direct support of the F.G.C.A.	BIOCAP Canada Foundation to manage and extend the F.G.C.A.	BIOCAP Canada Charitable Foundation to extend the F.G.C.A.		
Assets						
Current Assets	\$78,344	261,612	408,251	6,865	755,072	\$781,374
Capital Assets	10,664	225	3,442	--	14,331	21,513
	89,008	261,837	411,693	6,865	769,403	802,887
Liabilities and Net Assets						
Current Liabilities:						
Accounts payable and accrued liabilities	35,034	15,697	13,407	1,150	65,288	167,026
Deferred revenue	0	100,000	50,000	--	150,000	30,000
Due to (from) other funds	43,338	(36,500)	(6,838)	--	--	--
	78,372	79,197	56,569	1,150	215,288	197,026
Net Assets:						
Invested in capital assets	10,664	225	3,442	--	14,331	21,513
Externally restricted	(28)	--	--	--	(28)	(8,525)
Internally restricted	--	105,000	175,000	--	280,000	280,000
Unrestricted	--	77,415	176,682	5,715	259,812	312,873
	10,636	182,640	355,124	5,715	554,115	605,861
	\$89,008	261,837	411,693	6,865	769,403	\$802,887

Note: ** The March 31, 2006 Operating Fund Balances (bolded above) total \$259,784 which are carried forward to FY 2006-07 for operating fund budget purposes.

Note: These summarized financial statements have been prepared from information in the complete audited annual general purpose financial statements (which are available upon request) for each of the individual funds.

Note: F.G.C.A. = Federal Government Contribution Agreement (between Environment Canada and Queen's U. and managed by BIOCAP Canada Foundation)

BOARD OF DIRECTORS

AS OF MARCH 31, 2006

“Suncor is a founding sponsor and we continue to provide both financial and corporate support to the organization. We believe that programs currently in place have already, and will continue to have significant impacts on shaping Canada’s ability to develop pragmatic solutions for addressing climate change. Suncor believes BIOCAP is a key player in helping to develop transformative opportunities in the areas of clean energy and climate change.”

Gordon Lambert
VP Sustainable
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BC Hydro

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Financial Officer
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University of Guelph

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- Human Resource Committee
- Audit and Finance Committee

RESEARCH OVERVIEW COMMITTEE

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President and CEO
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For Canadian Fertilizer Institute
Manager, Public Relations
Agrium Inc.

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Climate Change Research Chair
Nova Scotia Agricultural College

Richard Butts
Science Director, Water, Air & Soil Quality
Agriculture and Agri-Food Canada

Graham Campbell
Director General
Office of Energy Research and Development
Natural Resources Canada

Christiane Deslauriers
AIDG, Bio-based Products and Processes
Agriculture and Agri-Food Canada

Jim Fyles
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Sustainable Forest Management NCE & Professor
McGill University

Art Jaques
Director, Greenhouse Gas Division, Science & Risk
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Environment Canada

Mark Johnston
Manager, Forest Ecosystems Branch
Saskatchewan Research Council

Don MacIver
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John Richards
Director General, Atlantic Forestry Centre
Natural Resources Canada

Jack Saddler
Dean, Faculty of Forestry
University of British Columbia

Barb Thomas
Geneticist Alberta-Pacific Forest Industries &
Adjunct Professor, University of Alberta

Susan Wood
Associate Research Director
BIOCAP Canada Foundation



Back (Left to right): Sarah Bates, *Science Writer*; John Telgmann, *Financial Officer*; Sue Gora, *Executive Assistant*; Katie Lundy, *Network Support*; Lisa Jones, *Administrative and Financial Assistant*; Peter Ralevic, *Research Assistant*; Viviane Paquin, *Network Facilitator Forestry and Natural Ecosystems*; Jamie Stephen, *Research and Communications Coordinator*; Lisa Doulas, *Communications Manager*
Front (Left to Right): Susan Wood, *Associate Research Director*; David Layzell, *President and CEO*; Janice Mady, *Director of Operations*.

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