BIOCAP Canada Foundation

Annual Report
2003 – 2004

PROGRESS TOWARD CAPTURING CANADA'S GREEN ADVANTAGE

Our Vision

Building knowledge partnerships to improve the life, health and international economic competitiveness of Canadians, through the use of human and biological resources to respond to climate change.

Our Mission

BIOCAP pursues its vision by:

- Advocating for research that explores the use of biological systems to reduce and sequester greenhouse gases and to complement fossil energy sources to respond to our changing atmosphere and climate.
- Building strategic research partnerships across the natural and social sciences, industry and government.
- Communicating, from an independent perspective, the university research policy insights and technology advances that address climate change with decision makers and the wider public.

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?

1. The manure production from one cow could be used to power:

   A. An entire, 3 bedroom house

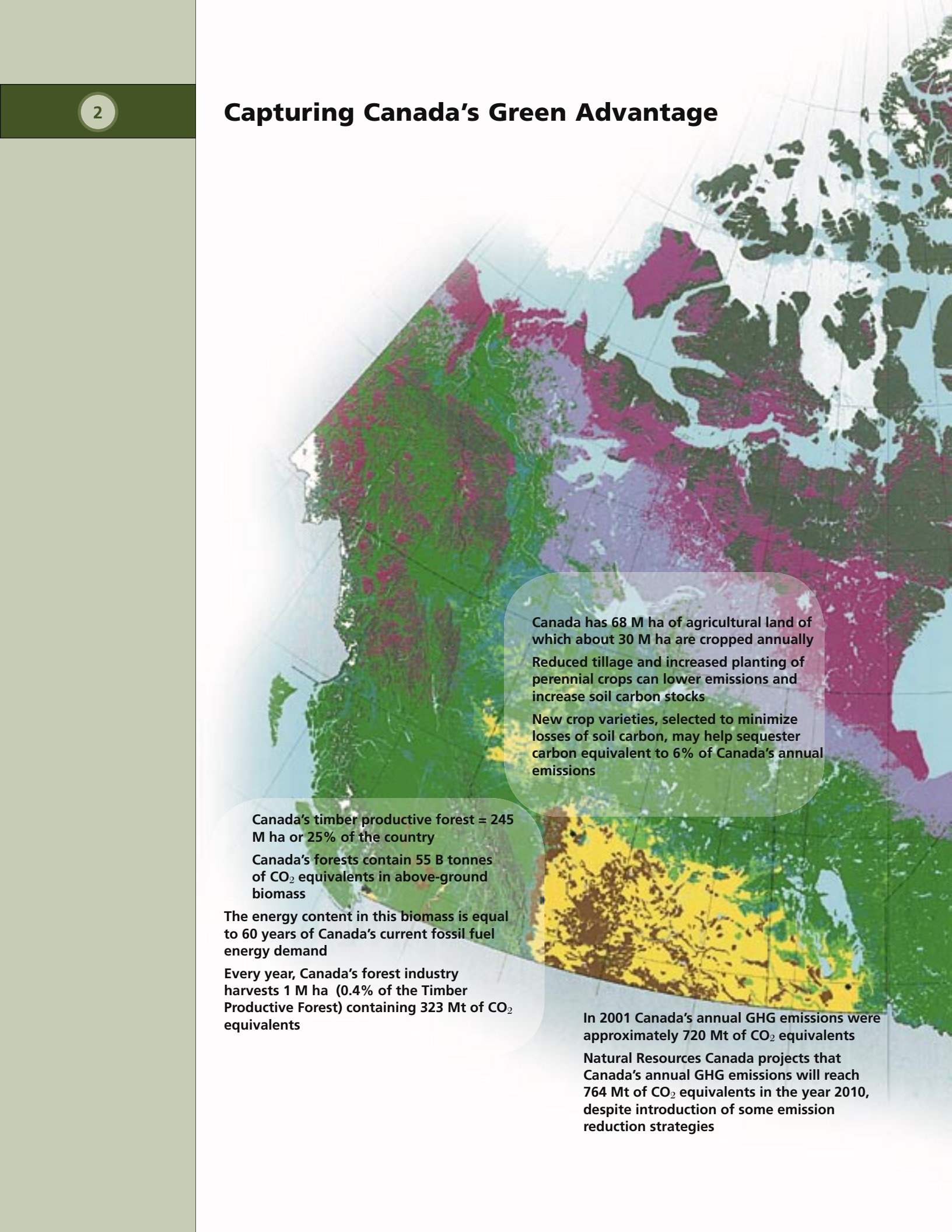
   B. 3 60 watt light bulbs

   C. A refrigerator and computer

   D. Nothing! That's a crazy idea!

BIOCAP Quiz

Capturing Canada's Green Advantage



Canada has 68 M ha of agricultural land of which about 30 M ha are cropped annually

Reduced tillage and increased planting of perennial crops can lower emissions and increase soil carbon stocks

New crop varieties, selected to minimize losses of soil carbon, may help sequester carbon equivalent to 6% of Canada's annual emissions

Canada's timber productive forest = 245 M ha or 25% of the country

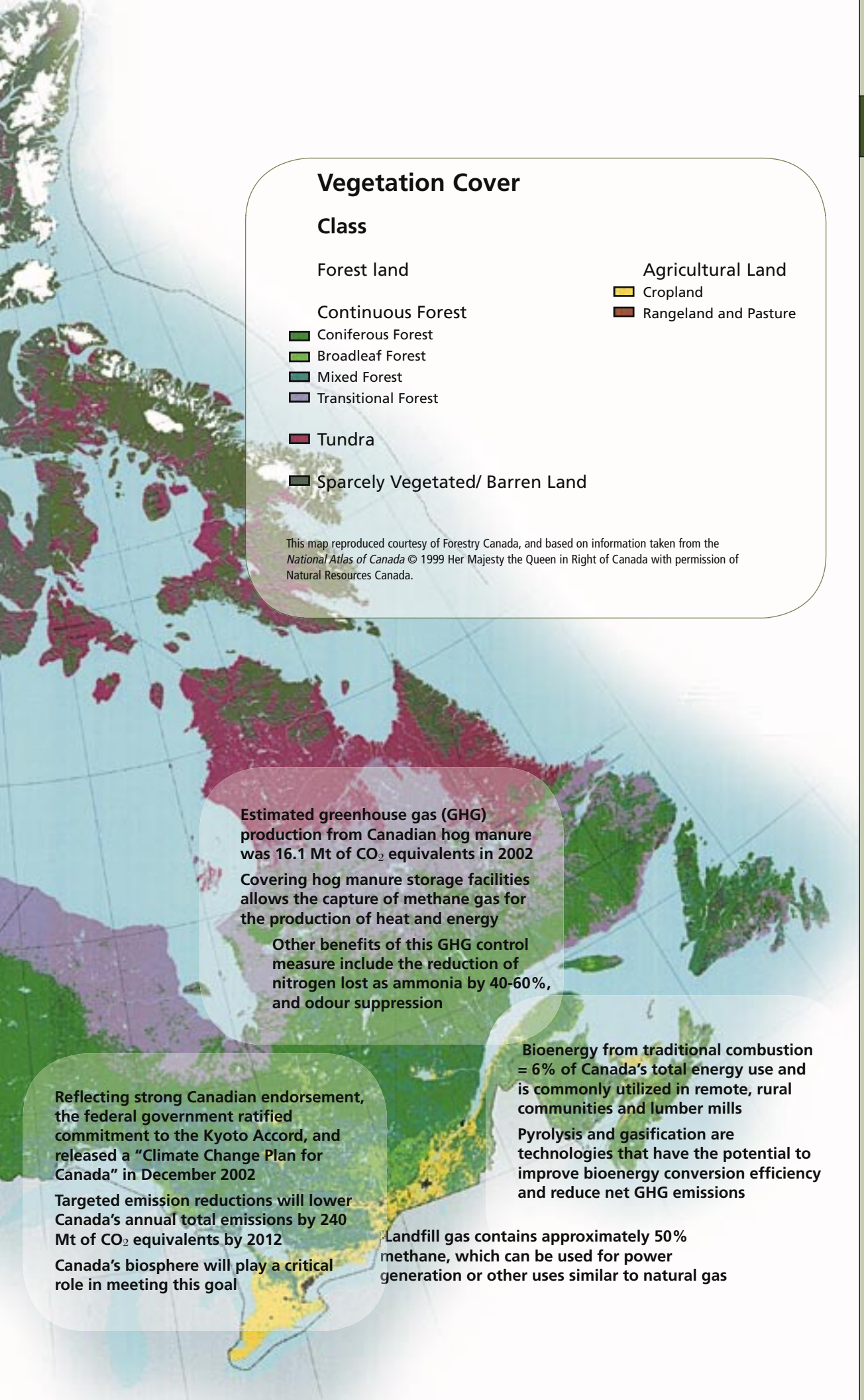
Canada's forests contain 55 B tonnes of CO_2 equivalents in above-ground biomass

The energy content in this biomass is equal to 60 years of Canada's current fossil fuel energy demand

Every year, Canada's forest industry harvests 1 M ha (0.4% of the Timber Productive Forest) containing 323 Mt of CO_2 equivalents

In 2001 Canada's annual GHG emissions were approximately 720 Mt of CO_2 equivalents

Natural Resources Canada projects that Canada's annual GHG emissions will reach 764 Mt of CO_2 equivalents in the year 2010, despite introduction of some emission reduction strategies



Vegetation Cover

Class

Forest land

Continuous Forest
- Coniferous Forest
- Broadleaf Forest
- Mixed Forest
- Transitional Forest

Tundra

Sparcely Vegetated/ Barren Land

Agricultural Land
- Cropland
- Rangeland and Pasture

Estimated greenhouse gas (GHG) production from Canadian hog manure was 16.1 Mt of CO_2 equivalents in 2002

Covering hog manure storage facilities allows the capture of methane gas for the production of heat and energy

Other benefits of this GHG control measure include the reduction of nitrogen lost as ammonia by 40-60%, and odour suppression

Bioenergy from traditional combustion = 6% of Canada's total energy use and is commonly utilized in remote, rural communities and lumber mills

Pyrolysis and gasification are technologies that have the potential to improve bioenergy conversion efficiency and reduce net GHG emissions

Reflecting strong Canadian endorsement, the federal government ratified commitment to the Kyoto Accord, and released a "Climate Change Plan for Canada" in December 2002

Targeted emission reductions will lower Canada's annual total emissions by 240 Mt of CO_2 equivalents by 2012

Canada's biosphere will play a critical role in meeting this goal

Landfill gas contains approximately 50% methane, which can be used for power generation or other uses similar to natural gas

Chair's Message

Dr. Bob Page
Board Chair,
BIOCAP Canada Foundation

BIOCAP is "Capturing Canada's Green Advantage". With 7% of the world's land area, 10% of the world's forests and over 60 million hectares of agricultural land – our "Green Advantage" – Canada has the potential to generate cost effective biosphere solutions to reduce and sequester greenhouse gases while complementing fossil fuel use with renewable bio-energy resources.

As Chair of the BIOCAP Canada Foundation, it is my pleasure to report that substantial progress has been made towards meeting the mandate and goals of the Foundation. By continuing to build, execute, monitor, and report on the growing consortium of research networks, BIOCAP is creating a unique partnership of industry, governments, and universities as they work to find viable solutions in meeting Canada's greenhouse gas (GHG) goals.

In October 2003 David Pollock, a widely recognized environmental leader, joined the BIOCAP team as the Foundation's Executive Director. Today David Pollock and Dr. David Layzell (CEO and Research Director) are leading a small but effective staff team to bring the national research community together, identify key research gaps and priorities, build the research networks to deliver the necessary insights and technologies and effectively communicate the results.

In this process, BIOCAP plays a critical role in ensuring that its limited resources are invested wisely, and that decision makers in government and industry are the beneficiaries of the insights this research generates. It has become increasingly evident that BIOCAP is earning the respect of leaders in research, industry and government for the excellent job it has been doing.

By coordinating and funding biosphere greenhouse gas research and communicating the research results, BIOCAP is providing the foundation on which government and industry can build an effective and publicly credible offsets system. Sound science will ensure the stability of an offset system and is a major step towards meeting Canada's greenhouse gas goals and documenting our climate leadership to the world.

We are delighted that the Canadian government decided in early 2004 to continue to support BIOCAP for an additional 2 years with $4 million in federal funding. By March of 2006, federal support will have totaled $10 million, and through strategic partnerships, this investment has been leveraged to well over $20 million with the help of industry, granting councils, provincial governments and federal departments. I am optimistic that discussions around longer term, more secure funding, required to continue consistent and high-quality university research, will deliver positive results.

In my mind, BIOCAP is fulfilling a critical role, ensuring that Canada develops its capacity for world-class research to explore biosphere solutions to the challenges of climate change for the benefit of Canadians and the world.

Sincerely,

Dr. Bob Page
Board Chair, BIOCAP Canada Foundation

A Year in Review

For BIOCAP, this is a special report as it gives us the opportunity to stop and reflect on the achievements of a most rewarding year of work.

Fluxnet Canada Research Network Completes First Full Year of Operation
Funded by NSERC, CFCAS and BIOCAP, Fluxnet has now set up 19 forest research sites across Canada to study the exchanges of CO_2 and water between the land and atmosphere. This work will provide the tools for quantifying forest carbon stock changes and will help to predict future climate and disturbance impacts on Canada's forests.

Five New Forestry Projects with Sustainable Forest Management Network of Centres of Excellence (SFMN)
SFMN began research on 2 forest carbon projects that were jointly funded with BIOCAP in March 2003 and 3 more BIOCAP-supported projects were launched in March 2004, bringing the total to over $1.1M in research support to develop strategies for managing forests to create carbon offsets.

Official Launch of Third BIOCAP Network- Greenhouse Gas Management Canada
Working in partnership, SSHRC and BIOCAP created this $3.4M, 3-year initiative exploring the socio-economic and policy implications, or "human dimensions" associated with reducing GHG emissions, enhancing carbon sinks in forestry and agriculture, and moving towards a bio-based economy.

Partnership with NSERC Seeding Development of BIOCAP Networks
In the 2003 competition of the NSERC Strategic Grants Program, BIOCAP and NSERC supported 8 new grants totaling $2.9M, bringing our total grant support under the NSERC program to $4.3M for 11 grants, all focused on developing biosphere solutions to the challenges of climate change.

Green Crop Invited to Prepare Full Proposal
This emerging network was invited by NSERC to prepare a full proposal for a 5-year, $6M NSERC Research Network Grant. This is a major milestone in the highly competitive process of creating a fully-funded research network.

Communications Capacity Increased
BIOCAP launched a new-and-improved web site, a series of BIOCAP Briefs and In The News, a weekly biosphere greenhouse gas research news service.

These successes were made possible by the dedicated work of our talented staff, the continuing support of our sponsors and the creativity and insights of the national research community. We especially appreciate the support of numerous federal government officials who, in early 2004, helped BIOCAP secure the last 2 years of support for our $10M federal contribution agreement.

BIOCAP is generating new opportunities for addressing climate change by "Capturing Canada's Green Advantage". By managing our biosphere effectively there are major benefits which can accrue to both current and future generations – benefits which protect our environment while enhancing our economy. We are proud of what BIOCAP has accomplished and are excited about the work that lies ahead.

David B. Layzell, Ph.D. F.R.S.C., CEO & Research Director

David Pollock, M.A., Executive Director

Governance

Board of Directors

As at March 31, 2004

Bob Page, (Chair) ♦ ♠
Vice President, Sustainable Development
TransAlta Corporation

Bruce Archibald
Assistant Deputy Minister
Agriculture and Agri-Food Canada (Research Branch)

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

Doug Beever
For Canadian Fertilizer Institute
Manager, Public Relations
Agrium Inc.

Henry Benskin
Director, Research Branch
British Columbia Ministry of Forests

Marc Denis Everell ♦
Assistant Deputy Minister
Meteorological Service of Canada
Environment Canada

Ralph W.F. Hardy +
President
National Agricultural Biotechnology Council

Bruce Hutchinson ♦ ♠ +
Associate Vice Principal (Research)
Queen's University

Gary Kachanoski
Vice President (Research)
University of Alberta

Gordon Lambert
Vice President, Sustainable Development
Suncor Energy Inc.

David B. Layzell ♦ ♠ +
CEO and Research Director
BIOCAP Canada Foundation

Raymond Leblanc
Vice-Rector (Research)
Laval University

William Leiss
NSERC Research Chair
University of Calgary

William Macdonald ♦
Director, Special Projects and Climate Change
Alberta Environment

Adele Malo
Vice President, Sustainable Development
Ontario Power Generation

Geoff Munro
Director General
Science Branch, Canadian Forest Service
Natural Resources Canada

Don McCabe
Vice Chair
Ontario Field Crop Research Coalition

Peter McCann +
President & CEO
Brighton BioConsulting

Ken Ogilvie ♦ ♠
Executive Director
Pollution Probe

David Pollock ♦ ♠ +
Executive Director
BIOCAP Canada Foundation

Ken Plourde
Director, Forest Management
Alberta-Pacific Forest Industries Inc.

John Telgmann ♦ +
Business Manager/Financial Officer
BIOCAP Canada Foundation

Alan Wildeman
Vice President (Research)
University of Guelph

♦ Executive Committee Member
♠ Human Resource Committee
+ Audit and Finance Committee

A special thanks to those who ended their service as board members during the past fiscal year:

Alrick Huebener, Manager of Policy Development, Central Experimental Farm, Agriculture and Agri-Food Canada

Irwin Itzkovitch, Assistant Deputy Minister, Earth Science Sector, Natural Resources Canada

Bob Mitchell, Consultant (Former Executive Director, Climate Change Strategic Directions, Alberta Environment)

Helen Howes, Vice President, Environmental Health & Safety, Exelon (Former VP Sustainability, Ontario Power Generation)

Research Overview Committee

As at March 31, 2004

David B. Layzell (Chair)
CEO and Research Director
BIOCAP Canada Foundation

Vic Adamowicz
Research Director, Sustainable Forest Management NCE
University of Alberta

Doug Beever
Manager, Public Relations
Agrium Inc.

David Burton
Professor and Climate Change Research Chair
Department of Engineering
Nova Scotia Agricultural College

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

Michael Goss
Chair of Land Stewardship
University of Guelph

Barry Grace
Acting Director, Pacific Agri-Food Research Centre
Agriculture and Agri-Food Canada

Art Jaques
Chief, Greenhouse Gas Division
Environmental Protection Service
Environment Canada

Mark Johnston
Senior Research Scientist
Environment Branch
Saskatchewan Research Council

Wayne Lindwall
Director, Semiarid Prairie Agricultural Research Centre
Agriculture and Agri-Food Canada

Geoff Munro
Director General
Canadian Forestry Service
Natural Resources Canada

Don McCabe
Vice Chair
Ontario Field Crop Research Coalition

Gordon Neish
Director, Pacific Agri-Food Research Centre
Agriculture and Agri-Food Canada

Nigel Roulet
Professor, Centre for Climate and Global Change Research and Department of Geography
McGill University

Jack Saddler
Dean, Faculty of Forestry
University of British Columbia

John Stone
Associate Director General
Policy & Corporate Affairs
Environment Canada

Barb Thomas
Geneticist and Poplar Farm Research Coordinator
Alberta-Pacific Forest Industries Inc.

Note: Guidance on research priorities is provided to the ROC by four Research and Development Advisory Councils (RDACs).

2. In terms of greenhouse gas emissions, how many kilometers can a car drive to have similar emissions to that produced in the breath of a 'typical' cow in one day?

A. 100 km

B. 25 km

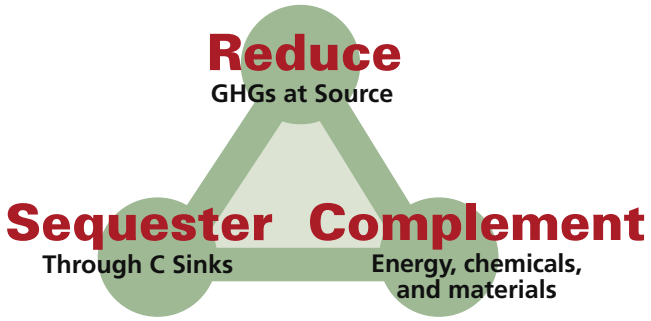
C. 10 km

D. 1 km

BIOCAP Quiz

The BIOCAP Model

The Canadian biosphere can assist in the fight against climate change on three fronts:



- Reduce greenhouse gas emissions from biological sources including agriculture, landfill sites and wetlands.
- Sequester atmospheric carbon by enhancing biosphere carbon sinks in agriculture, forestry and wetlands.
- Complement existing fossil energy use with biomass to provide a sustainable and renewable source of energy, chemicals and materials.

Climate change and how we address it are complex issues that touch every aspect of human society.

Consequently, the search for climate change solutions requires a multi-disciplinary and multi-sectoral effort. In response, BIOCAP is building a "Network of Networks" - national multi-sector, multi-disciplinary partnerships to address research questions within four areas of biosphere greenhouse gas research.

Growing a Research Network:

The creation of a research network is a detailed and involved process, requiring the commitment and dedication of BIOCAP, the organizing body, researchers, universities, sponsors and stakeholders – all working together to grow a network from the ground up.

SELECT Identify multi-sector leaders and define network scope

ENGAGE Find academic lead, develop vision

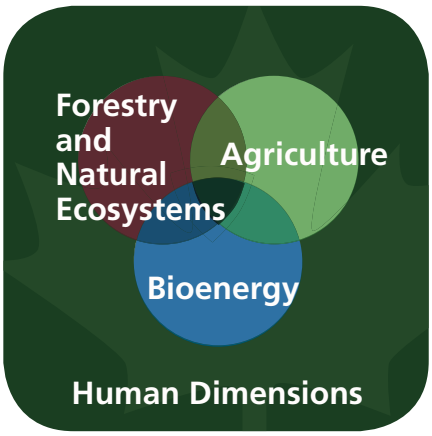
CONNECT Identify community, hold workshops

STRATEGIZE Define questions, objectives, disciplines needed

SEED Provide seed funding to initiate research

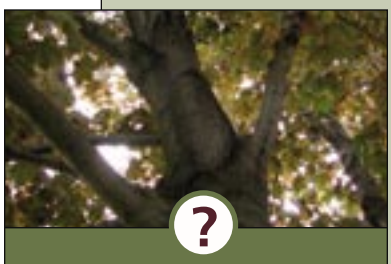
The BIOCAP "Network of Networks"

The "Network of Networks" is an interwoven group of research networks and grants within each of the four focused research areas: Forestry & Natural Ecosystems, Agriculture GHG Management, Bioenergy and Human Dimensions of GHG Management.



The "Network of Networks" concept enables efficient and synergistic communication among government, industry, non-governmental organizations, and university researchers. The concept also allows for the alignment of network research with user needs.

As you will see in the following pages, the creation of the "Network of Networks" has been the BIOCAP focus for the past few years. As research results become increasingly available, BIOCAP will shift focus to emphasize the translation and communication of these results to make them more accessible to decision makers within Canadian industry and government.



3. The energy content of the living biomass of Canada's forests is equal to how many years of the nation's current energy consumption from fossil fuels?

A. 101 years

B. 69 years

C. 22 years

D. 6 years

BIOCAP Quiz

LAUNCH Set up network secretariat

PROPOSE Prepare proposals for network funding

RESEARCH Utilizing network funding, begin research

MANAGE Set up network oversight structure

COMMUNICATE Deliver insights and results to stakeholders

Growing a "Network of Networks"

Forestry & Natural Ecosystems

At 1 billion hectares, Canada is steward for 7% of the earth's land area. Each year the biological systems occupying this land produce and consume vast quantities of greenhouse gases – much more than that produced through fossil fuel consumption in Canada.

Biosphere production and consumption of greenhouse gases is affected by human management activities as well as climatic change and natural disturbance. By learning how to better manage and measure this vast resource, Canada could use its biosphere as a sink to offset fossil fuel emissions, and as a source of renewable energy, chemicals and materials to reduce demand for fossil fuels.

The networks and grants in the Forestry & Natural Ecosystems research area are focused on understanding how climate change, natural disturbance and human activities affect the sources and sinks of GHGs, how to quantify and predict these effects and what we can do to enhance the GHG sinks while reducing GHG emissions. This work is closely integrated with research efforts in the government, especially in Natural Resources Canada.

These insights will feed into process and inventory-based models, and will be used to quantify the GHG costs and benefits that are associated with specific forest management activities. When combined with detailed socio-economic and policy analyses, the results will contribute to good policy and investment decisions by government and industry.

Networks

Fluxnet-Canada Research Network (FCRN)
Hank Margolis, Université Laval
Support: $11.1M over 5 years - NSERC, CFCAS and BIOCAP

Fluxnet Canada (www.fluxnet-Canada.ca) is a network of 47 university and government researchers that are using instrumented towers located in forest ecosystems across Canada to measure the exchange of CO_2 and water between the land surface and the atmosphere. When they combine this information with soil and vegetation measurements, the researchers gain an understanding of how climatic conditions, natural disturbance or human activities affect the uptake and release of CO_2 from forest ecosystems. These insights are used to develop predictive models that can explore future climate and forest management scenarios.

Since its launch in May 2002, Fluxnet (FCRN) has grown to 19 primary sites and 6 associate sites. It has detailed measurement and data handling protocols and created a centralized data information system that is attracting attention from around the world.

There are now more than 45 graduate students and post doctoral fellows associated with the Network and in May 2003, FCRN hosted its' first Carbon Cycle Short Course, a 10-day course attended by 24 students in Prince Albert National Park, Saskatchewan. Research activities in FCRN have generated 43 articles for publication in refereed journals, 18 presentations and posters, 6 conference proceedings and 2 theses.

Forest Carbon Management Initiative of Sustainable Forest Management Network (SFMN-FCM)
Vic Adamowicz, University of Alberta
Support: $1.1M over 4 years – SFMN and BIOCAP

The Sustainable Forest Management Network (http://sfm-1.biology.ualberta.ca/) is a fully-funded federal Networks of Centres of Excellence (NCE) that BIOCAP approached in 2002 with a proposal to launch a joint venture to integrate studies of forest carbon management into their research program. Since March 2003, the following 5 grants have been funded and a third competition will be launched in September 2004. These studies promise to provide valuable insights that will inform investment and policy decisions regarding how forest carbon management can provide GHG emission reduction credits.

The Influence of Forest Management, Silviculture, and Pest Management on Carbon Sequestration
David MacLean, University of New Brunswick

An Integrated Bioregional Approach to Sustainable Forest Management in the Western Boreal
Fiona Schmiegelow, University of Alberta

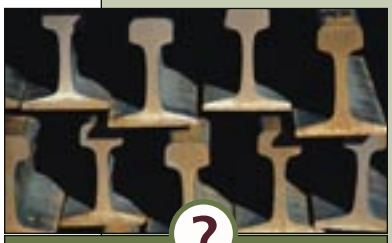
Carbon Credit Trading: The law, firm behaviour, economics, and landscape impacts
Glen Armstrong, University of Alberta

Role of Pest Management in Sequestering Carbon in the 2008-12 Kyoto Commitment Period: Integration with CBM-CFS3 and economic analyses
Van Lantz, University of New Brunswick

Old-growth Forests in Eastern Canada: Exploring tradeoffs among timber, biodiversity, carbon, and public preferences
Peter Duinker, Dalhousie University

Reservoirs & Aquatic Systems Network
Fresh water ecosystems cover large areas of Canada and play an important but poorly understood role in the carbon cycle. A better understanding of the aquatic carbon cycle is especially important in managed freshwater ecosystems such as reservoirs, since future international agreements are likely to require Canada to report and account for how these systems affect greenhouse gas sources and sinks. Even in natural ecosystems, it is important that we learn about the movement of carbon laterally across landscapes, in order to interpret the results of studies of vertical carbon flux, such as those being done within Fluxnet Canada.

In FY 2003-04, BIOCAP began the process of defining the scope and research focus of this emerging network and identified possible industry and government partners. Over the next year, BIOCAP will move forward in building the Network by bringing together leading researchers in government, universities and industries to identify research gaps and priorities and explore the structures and delivery mechanisms for a new national research network in this area.



BIOCAP Quiz

4. How many tonnes of biomass, in the form of charcoal, are required to produce 1 tonne of steel?

A. 6 tonnes
B. 1.9 tonnes
C. 0.5 tonnes
D. You can make steel from biomass?

Grants

Dissolved Organic Carbon and Carbon Cycling in Canadian Forests
Tim Moore, McGill University
Support: $261K over 3 years - BIOCAP and NSERC
Focus: Bridging the Fluxnet and Aquatic Systems Network by evaluating the effect of climate, vegetation, soil and management practice on the fluxes and chemistry of dissolved organic carbon (DOC) as well as inorganic and organic nitrogen at the Fluxnet Canada sites.

Analysis of Forest Biomass and Carbon Stocks Using Lidar and Photogrammetry in Support of the National Forest Inventory
Benoit St-Onge, Unviersité du Québec à Montréal
Support: $402K over 3 years - NSERC and BIOCAP
Focus: Using remote sensing technologies to characterize forest type and growth and develop an accurate and cost-effective method for estimating carbon sequestration within the framework of the National Forest Inventory.

Adapting forest genetic resource management to climate change
Sally Aitken, University of British Columbia
Support: $460K over 4 years – BIOCAP and NSERC
Focus: Exploring opportunities for mitigating the effects of climate change and enhancing forest carbon stocks by using seed for reforestation taken from genetically selected individuals from different populations, and evaluating the ability of natural populations of trees to adapt to new climatic and elevated carbon dioxide (CO_2) conditions.

Other BIOCAP Networks Linked to Forestry & Natural Ecosystems

Landscape-Scale Cropping Systems Network
Afforestation and Biomass Crops Network
Greenhouse Gas Management Canada Network

Networking & Outreach

Forest Carbon Management Pilot Series Meetings
Ottawa, Ontario, April 29, 2003

SFMN Workshop on Forest Carbon Management
Toronto, Ontario, August 25, 2003 *

World Forestry Congress
Quebec City, Quebec, September 25, 2003

Fluxnet-Canada Annual General Meeting
Banff, Alberta, February 27-29, 2004 *

* Organized by BIOCAP or its networks.

Agricultural GHG Management

Canadian agricultural emissions of the potent greenhouse gases (GHG) methane (CH_4) and nitrous oxide (N_2O) are about 60 Mt CO_2 equivalents or 8.3% of Canada's total GHG emissions. In addition, agricultural soils can be either a source or a sink for atmospheric CO_2. Since the magnitude of the GHG source or sink is affected by management practices, there is an opportunity to achieve emission reductions and tradable credits by changing these practices.

However, research is needed to better understand the processes that regulate GHG sources and sinks in agriculture and to quantify and model how management practices could be used to reduce emissions and sequester carbon. New crops, cropping systems and other technologies could also be developed to make our agricultural systems more sustainable.

The research being carried out in the various networks and grants described below is closely linked to research and policy development in provincial and federal departments, but especially in Agriculture and Agri-Food Canada.

Networks

Landscape-Scale Cropping Systems Network (LSCS)
Daniel J. Pennock, University of Saskatchewan

The LSCS network focuses on understanding and quantifying the effects of various crop and landscape management practices on greenhouse gas emissions (particularly N_2O) and soil carbon stock changes in agricultural systems. In FY 2003-04, seed funding of $140K was provided to this emerging network to begin the process of establishing targeted research sites across Canada. This investment helped to attract an NSERC grant (see next page) around which BIOCAP is working to develop a national initiative. The insights gained from this work will support the National Inventory of GHGs, and offer a critical analysis of those beneficial management practices being put forward to improve the efficiency and sustainability of landscape-scale farm operations.

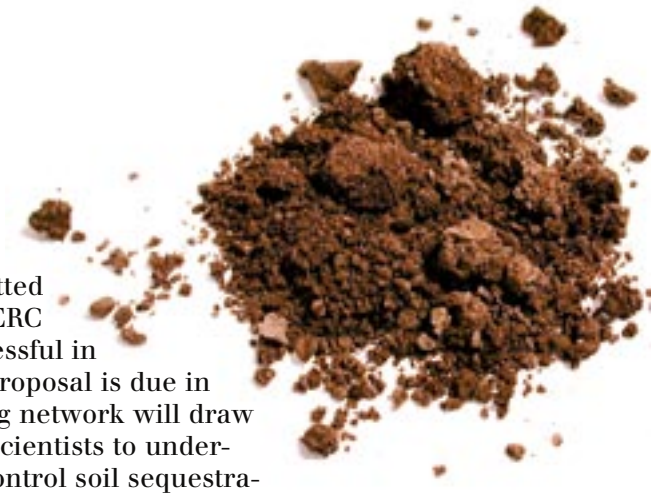
Animal Production and Manure Management Network
Claudia Wagner-Riddle and James France, University of Guelph

Livestock production provides a solid foundation for Canada's agriculture sector, with total red meat sales and dairy production generating in excess of $16B annually. Through improvements in animal production and manure management practices, it should be possible to reduce CH_4 and N_2O emissions, and to enhance carbons sinks in pastureland. Such activities should provide tradable emission reduction credits. The research in this emerging network will explore how beneficial management practices impact GHG sources and sinks and other environmental, social and economic values. The Network will provide a sound scientific basis for GHG emission reductions, inform the national inventory, and provide a shared database and standardized measurements of carbon stocks and GHG fluxes.

BIOCAP Quiz

5. How many litres of ethanol can be made from a hectare of corn?

A. 4140 L
B. 2280 L
C. 1020 L
D. 342 L



Green Crop Network
Don Smith, McGill University
Support: In competition for a NSERC Research Network Grant

In FY 2003-04, the Green Crop Network submitted a letter of intent to apply for a $6M, 5-year NSERC Research Network Grant. The group was successful in being allowed to go to full proposal, and that proposal is due in September 2004. The research in this emerging network will draw on Canada's leading plant, microbial and soil scientists to understand the plant and microbial processes that control soil sequestration of C, production of N_2O by crop production systems, the production of oil for conversion to biodiesel fuel and the optimal plant response to an elevated atmospheric CO_2. It will then use these insights to develop new crop plants and cropping systems for reducing Canadian agricultural GHG emissions, increasing soil C stocks, and for the enhanced production of oil that can be used in the production of biodiesel.

Afforestation and Biomass Crops Research Network
Ken Van Rees, University of Saskatchewan

Canada has millions of hectares of unused or marginal agricultural land that could be brought into production to sequester carbon or provide a renewable source of bio-based energy, chemicals and materials. This emerging network will provide the scientific understanding and new technologies to support this exciting new area that sits at the interface of agriculture, forestry and energy technology. In FY 2003-04, the network prepared a letter of intent for an NSERC Network grant on afforestation and agrofoestry that was not successful. Since then, the group has expanded its focus to include a range of biomass crops and over the next year BIOCAP will work closely with the emerging network and partner organizations to develop a research program that will inform policy and investment decisions on the optimal use of available agricultural lands to address Canada's climate change challenges.

Grants

Landscape-Scale Measurement and Upscaling of Process-Level Nitrous Oxide Measurements
Daniel J. Pennock, University of Saskatchewan
Support: $750K over 3 years – BIOCAP, NSERC, Ducks Unlimited, Environment Canada, Centre for Agriculture, Law and Environment
Focus: Establishing the linkage between upland management practices and wetland greenhouse gas dynamics in hummocky till landscapes located in Manitoba and Saskatchewan. The grant will form the core of the larger Landscape-Scale Cropping Systems Network.

Laser Atmospheric Sensing
John Tulip, University of Alberta
Support: $407K over 3 years – NSERC and BIOCAP
Focus: Developing a compact, lightweight instrument that can be used for unattended open path remote monitoring of greenhouse gases such as N_2O. If successful, it will improve the economic feasibility and accuracy of Canada's ability to monitor atmospheric GHG emissions.

The Development of Methanotrophic Biofilters and Bioreactors to Reduce Point Source Methane Emissions, Sequester Carbon and Increase Soil Fertility
Nigel Livingston, University of Victoria
Support: $466K over 4 years– BIOCAP and NSERC
Focus: Developing a biofilter that could be used to convert biological sources of methane, a potent greenhouse gas, into CO_2, a greenhouse gas with a lower warming potential.

Other BIOCAP Networks Linked to Agriculture GHG Management

Fluxnet-Canada Research Network
Sustainable Forest Management NCE
Greenhouse Gas Management Canada Network
Microbial Bioprocessing Network

Networking & Outreach

Afforestation and Agroforestry Workshop
Guelph, Ontario, April 22, 2003 *

Green Crop Workshop
Montreal, Quebec, May 4, 2003 *

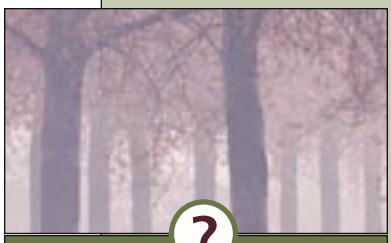
Animal Production and Manure Management Workshop
Ottawa, Ontario, December 12, 2003 *

Canadian Agri-Food Research Council (CARC) Workshop
Winnipeg, Manitoba, January 19, 2004

Landscape-Scale Cropping System Workshop
Winnipeg, Manitoba, February 23-24, 2004 *

Green Crop Workshop
Montreal, Quebec, March 28, 2004 *

* Organized by BIOCAP or its networks.



BIOCAP Quiz

6. Trees can provide an offset for fossil fuel emissions. The emissions from a car driven how many kilometers would equal the carbon sequestration ability of one hectare of hybrid poplar in one year?

A. 108,000 km
B. 51,000 km
C. 5000 km
D. 110 km

Bioenergy

When plants photosynthesize, they use the sun's energy to pull CO_2 out of the atmosphere and incorporate it into biomass. Some of the solar energy is locked into the chemical structures within the biomass, and there are a number of thermal, chemical or microbial processes that can be used to release this energy or convert it into a more convenient liquid or gaseous form for human use. Biomass in its various forms can be converted to heat (e.g. wood combustion) and electrical power, liquid fuels such as bioethanol, biomethanol, biodiesel, and bio-oil, or gaseous fuels such as methane and hydrogen. Many of these bio-products are similar to, or compatible with, fossil fuel energy and chemical streams, making it feasible for bioenergy to complement fossil fuel energy resources and distribution systems, thereby easing the transition towards a renewable and sustainable bio-economy.

Although much is known about biomass conversion technologies, additional research is required to develop efficient and effective feedstock-to-product threads. Our vast biological resources – "Canada's Green Advantage" - make the bio-economy a major opportunity for this nation.

Networks

Green Chemistry Network
Tak-Hang (Bill) Chan, McGill University
In 2002-03, BIOCAP worked with university researchers, government and industry officials to unite a team of over 80 of Canada's top scientists, engineers, and social scientists in the preparation of a full application for a more than $20M Network of Centres of Excellence (NCE) Grant. In June of 2003, the research team was informed that the application was not successful. An attempt was made to put another NCE application together, but this was not allowed to go to full proposal, despite strong support from many industry and government partners. BIOCAP made a decision to develop a different strategy to achieve its goals. Our current focus is on the creation of two national networks; one on thermo-chemical processes and one on microbial and enzymatic processes. We will build these networks using targeted grant projects and in partnership with provincial and federal agencies.

Green Synthesis Network
This emerging network will develop improved processes, novel reaction systems, and value-added products to provide cost-effective, environmentally sustainable energy, chemicals and materials from biomass feedstocks. Technologies will include trans-esterification, gasification, pyrolysis, Fischer-Tropsch synthesis, green chemistry and combustion. BIOCAP will build this network around some of the grant programs it has recently funded (see next page) and link it to a national biodiesel initiative that Natural Resources Canada will launch over the next year.

Microbial Bioprocessing Network
This emerging network will focus on microbial and enzymatic processing of bio-based feedstocks to produce liquid fuels such as ethanol and methanol, gaseous fuels such as hydrogen and methane, or commodity chemicals such as lactic acid or succinate. Technologies will include anaerobic digestion, fermentation and related refining and processing technologies. Research in this network will be closely linked with the Green Synthesis Network as part of a 'biorefinery' concept.

Grants

Biodiesel Production from Acid-Catalyzed Transesterification of Waste Oils
Marc Dubé, University of Ottawa
Support: $286K over 3 years – BIOCAP and NSERC
Focus: Providing technological improvements to the production of biodiesel fuel and increase process profitability with an overall objective to develop an efficient and cost-effective continuous process to manufacture biodiesel from low grade or waste oils.

Enhancing Prospects for Higher Value Uses for Bio-Oil
Sheldon Duff, University of British Columbia
Support: $344K over 3 years – BIOCAP and NSERC
Focus: Bringing the biomass refinery concept to reality by exploring the conversion of levogluosan to ethanol; thermal degradation of bio-oils in fuel and chemical conversion processes; upgrading of bio-oil to reduce oxygen content; and the development of emulsion fuels from bio-oil and biodiesel.

Production of Biodiesel from Vegetable Oils and Lubricity Additives for Ultra-Low Sulphur Diesel Fuel and of Hydrogen from Byproduct Glycerol
Ajay Dalai, University of Saskatchewan
Support: $240K over 3 years– BIOCAP and NSERC
Focus: Developing a new approach to produce effective fuel lubricity additives, canola as well as soya methyl-ethyl esters (known as biodiesels) from inedible low-grade canola and soya oils and restaurant waste grease. With cooperation of industrial partners, biodiesel from waste oils will be commercialized and introduced into the market.

The Development of a Technically and Economically Viable Pretreatment and Enzymatic Process for the Conversion of Softwood Residues to Ethanol
Jack Saddler, University of British Columbia
Support: $456K over 3 years – BIOCAP and NSERC
Focus: Fundamental and applied research to enhance the viability of establishing an overall biomass-to-ethanol process, using softwoods as a feedstock. This project will compare the established steam explosion pre-treatment process with the 'organosolv' process proposed by Lignol, the two technical bottlenecks of achieving fast, efficient, complete hydrolysis of the cellulose for eventual fermentation to ethanol.

BIOCAP CANADA

?

7. What is "Canada's Green Advantage"?

A. A large forest carbon sequestration potential

B. An ability to increase agriculture carbon stocks

C. An enormous potential for biomass energy production

D. All of the above

BIOCAP Quiz

Sustainable Biopackaging Materials for Green Technology
Mohini Sain, University of Toronto
Support: $309K over 3 years – BIOCAP, NSERC and Atofina Canada
Focus: Development of an economically integrated process for the production and commercialization of novel bio-packaging materials using nano-fibrils from agro-forest and recycled wood resources and biopolymers. Quantification of carbon sequestration potential of the products will be completed using a lifecycle analysis.

Technical and Economic Analysis of Alternative Processes for Agricultural Waste Fueled Solid Oxide Fuel Cell
Kunal Karan, Queen's University
Support: $48K for 1 year – OMAF and BIOCAP
Focus: Exploring the potential use of biomass-generated fuel gas in solid oxide fuel cell, to identify the most commercially viable process configuration for an agricultural-waste fueled fuel-cell power system.

Direct Synthesis of 1,3-Propane Diol from Glycerol Using Transition Metal Based Ionic Hydrogenation Catalysts
Marcel Schlaf, University of Guelph
Support: $126K over 3 years – OMAF, University of Guelph and BIOCAP
Focus: Developing a direct conversion of glycerol (the main waste product of biodiesel production from seed oils) to 1,3-propane diol. Results from this research has the potential to turn excess glycerol into a renewable source of a high-value added chemical or fuel directly impacting the overall economics of biodiesel production.

Other BIOCAP Networks Linked to Bioenergy and Biomass Energy

Green Crop Network
Afforestation and Biomass Crops Network
Greenhouse Gas Management Canada Network
Animal Production and Manure Management Network

Special Reports

A Canadian Biomass Inventory: Feedstocks for a bio-based economy
Susan Wood and David Layzell, Queen's University
Support: BIOCAP and Industry Canada
This paper (available at www.biocap.ca) estimates the magnitude of the waste carbon streams coming out of Canada's municipalities, forestry and agricultural sectors. It calculates the carbon and energy content of these and compares it to the nation's existing fossil fuel use. The study estimated that this residual biomass has an available energy content equivalent to about 25% of Canada's current fossil fuel use, a value 2.5 times greater than that of the USA.

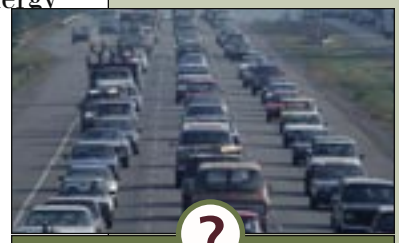
An Assessment of the Opportunities and Challenges of a Bio-Based Economy for Agriculture and Food Research in Canada
Canadian Agricultural New Uses Council
Support: BIOCAP and Canadian Agricultural Research Council
This study (available at www.biocap.ca) focuses on a selected number of industrial sectors (biofuels, bioplastics, bioadhesives, natural fibres, biolubricants and bio-platform chemicals) which might play an important role, not only in the control of GHG emissions, but also in providing new economic opportunities to farmers and rural communities.

Primer on The Technologies of Renewable Energy
Support: Pollution Probe, Industry Canada, Environment Canada, BIOCAP, Ontario Waterpower Association and Investors Group
BIOCAP was a sponsor of this Pollution Probe Primer (downloadable at www.biocap.ca and www.pollutionprobe.org) on the Technologies of Renewable Energy. It includes a clear and concise description of major renewable energy sources, including chapters on water, solar, wind and biomass.

Networking & Outreach

International Energy Agency Conference
Paris, France, April 1, 2003

BioProducts on the Hill
Ottawa, Ontario, April 30, 2003



BIOCAP Quiz

8. Octane provides the ability for a fuel to resist engine knocking resulting from incomplete fuel combustion. The higher a fuel's octane number, the better it is at resisting knocking. Ethanol is an effective octane enhancer because:

A. It has eight carbon atoms

B. It reduces carbon dioxide emissions

C. It contains oxygen

D. It increases lubricity

Human Dimensions of Greenhouse Gas Management

In addition to natural science and engineering research, there is also a need to assess the human dimension and policy implications associated with Canada using it's biosphere to manage greenhouse gases (GHGs) or to provide a renewable energy resource. Research in this area explores the costs, benefits and risks associated with new technologies and management practices. It also assesses various policy options for biosphere reductions in GHG emissions, enhancing carbon sinks and moving towards a bio-based economy.

Where possible, research on the human dimensions is being integrated into the other networks that are focused on the natural sciences and engineering. However, BIOCAP has also partnered with SSHRC to set up Greenhouse Gas Management Canada – a network focused entirely on the social science and policy issues.

Networks

Greenhouse Gas Management Canada
Paul Thomassin, McGill University
Support: $3.4M over 3 years – BIOCAP and SSHRC

Officially launched in Ottawa, June 24, 2003, the Greenhouse Gas Management Canada Network: a BIOCAP – SSHRC Human Dimensions Initiative, was launched to explore the social science and policy implications of biopshere GHG management and bio-based products. The network currently has a socio-economic focus and includes 6 research nodes, 42 researchers and a network secretariat at McGill University.

The nodes are:

Transformative Change in Biosphere GHG Management
Murray Fulton, University of Saskatchewan
Focus: To make policy recommendations that will aid in GHG mitigation through examination of regulatory regimes, policy development and the impact on and ability of industries adapting to change.

Socio-economic Research Network on Bio-products and Bioprocesses
Kurt Klein, University of Lethbridge
Focus: To study the economic, environmental and social impacts of new bio-processing technologies that can provide bio-based energy, chemicals and materials, thereby relieving dependence on resources producing greater GHG emissions.

Integrated Analysis of Mitigation Strategies for GHG Emissions from Agriculture
Surendra Kulshreshtha, University of Saskatchewan
Focus: Developing inter-linked models depicting agricultural production and management activities and their related economic and environmental impacts, as well as evaluating selected mitigation and policy measures using a multi-criteria assessment framework.

Institutional Development of a Domestic Emission Trading System that Includes Carbon Offsets from the Agriculture and Forestry Sectors
Paul Thomassin, McGill University

Focus: To investigate and develop the institutional structure and rules that would be required to provide the incentives for agriculture and forestry producers to create carbon offsets that would be available to industrial sectors and recognized under the Kyoto Protocol.

The Economics of Terrestrial Carbon Sinks: Land use, land use change, and forestry
G. Cornelis van Kooten, University of Victoria
Focus: Researching the environmental and socio-economic aspects related to carbon flux resulting from land use, land use change and forestry (LULUCF) activities.

Cost-effective Agricultural Management Strategies and Technologies in Mitigating GHG Emissions
Alfons Weersink, University of Guelph
Focus: Evaluating the economic-environmental trade-offs stemming from agricultural management strategies and technologies, using environmental indicators as GHG emission levels, water quality and soil health.

Grants

Property Rights and Contracts for Carbon Sequestration
Elizabeth Wilman, University of Calgary
Support: $88K for 1 year - BIOCAP and Government of Alberta
Focus: Exploring economics, law and soil science, the three sources of knowledge necessary to develop useful contracts for use in the carbon sequestration services market.

Other BIOCAP Networks Linked to Human Dimensions of GHG Management

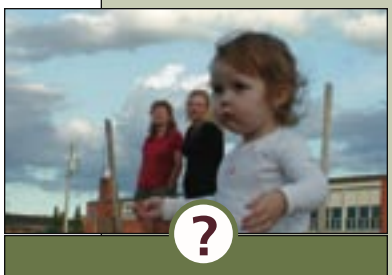
Sustainable Forest Management NCE
Afforestation and Biomass Crops Network
Animal Production and Manure Management Network
Landscape-Scale Cropping Systems Network
Green Crop Network
Green Synthesis Network
Microbial Bioprocessing Network

Networking & Outreach

Annual General Meeting of Greenhouse Gas Management Canada Network
Ottawa, Ontario, June 24-25, 2003 *

Greenhouse Gas Management Canada Policy Forum
Ottawa, Ontario, April 8, 2004 *

* Organized by BIOCAP or its networks.



BIOCAP Quiz

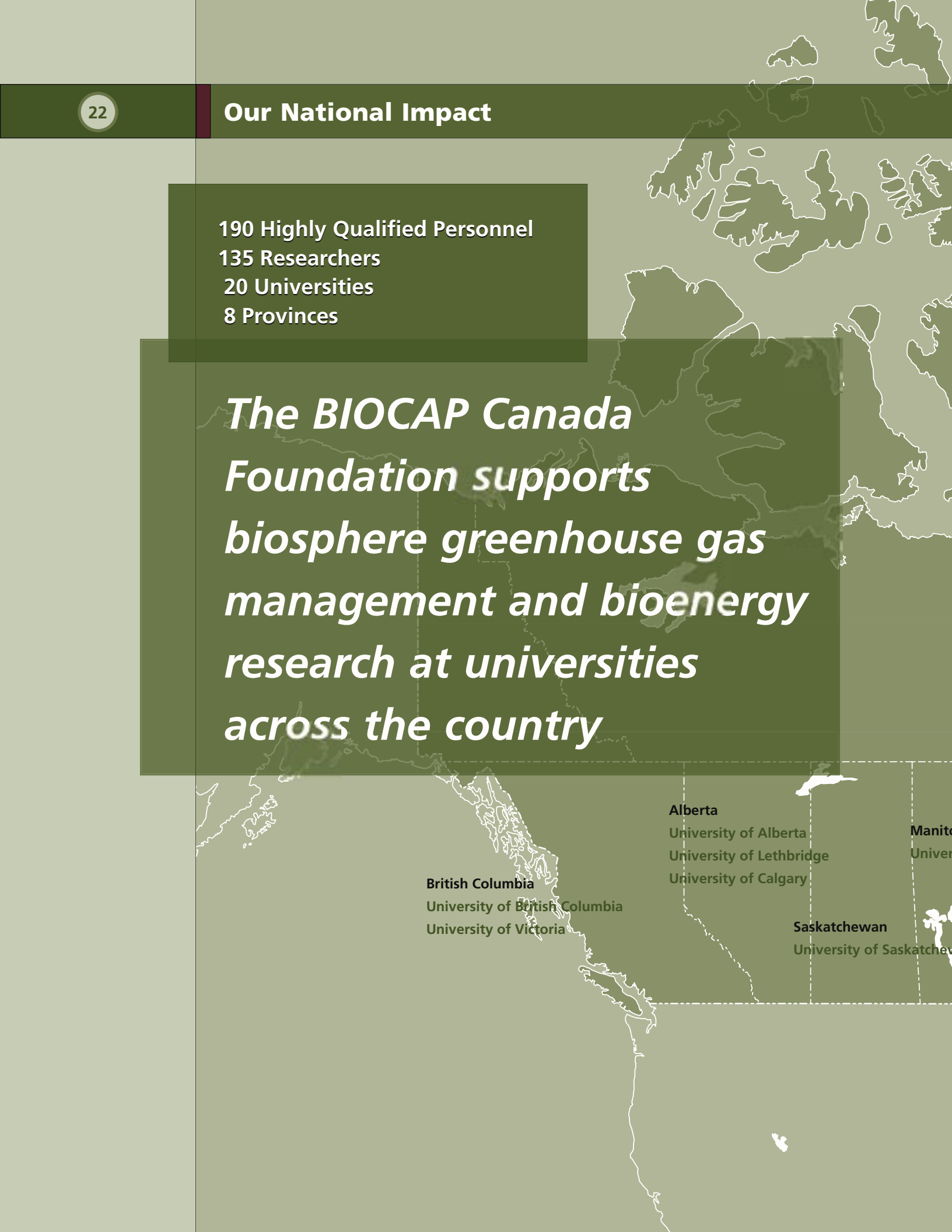
9. Atmospheric CO2 concentration is now 379ppm. The last time it is was this high was:

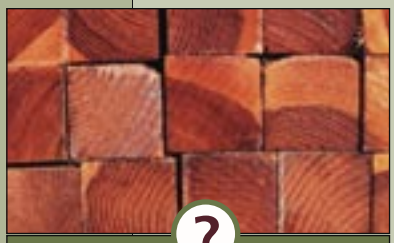
A. 1998 AD
B. 975 AD
C. 180,000 BC
D. 20,000,000 BC

Our National Impact

190 Highly Qualified Personnel
135 Researchers
20 Universities
8 Provinces

The BIOCAP Canada Foundation supports biosphere greenhouse gas management and bioenergy research at universities across the country





?

10. How much of Canada's timber productive forest is harvested each year?

A. 5%

B. 2%

C. 0.75%

D. 0.4%

BIOCAP Quiz

oba
rsity of Manitoba

Quebec
Université Laval
McGill University
Université du Québec à Montréal

wan

Ontario
University of Guelph
Queen's University
University of Toronto
Trent University
University of Ottawa
McMaster University
Lakehead University

New Brunswick
University of New Brunswick

Nova Scotia
Dalhousie University
Nova Scotia Agricultural College

Networking & Outreach

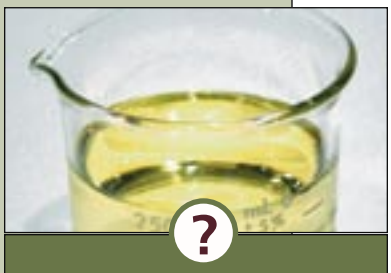
This past year saw a dramatic increase in the number of research initiatives being supported by the BIOCAP Canada Foundation. One of the pillars supporting the coordination of this research is BIOCAP's increasing outreach capacity. An ongoing commitment to improve upon and increase communications within and across networks and back to an ever increasing number of stakeholders resulted in the addition of a new Executive Director, David Pollock (formerly of the Pembina Institute for Appropriate Development), and the creation of some new strategic communications initiatives.

In March 2004, BIOCAP officially launched *BIOCAP Briefs* - informative memos that deliver succinct highlights of current research initiatives, new research projects, breaking results and technologies, and pending research and policy questions. The *Briefs* are another BIOCAP effort to further link the Canadian university researchers, who are working to find the answers to our biosphere GHG questions and government and industry, who are working to develop the policies and business models for a future sustainable Canada. *BIOCAP Briefs* are sent electronically to over 3000 stakeholders.

Also launched in March, *In The News* is a weekly digest-style news service that provides readers with synopses of research news in the areas of biosphere solutions to climate change and related climate change policy. In just a few short weeks, *In The News* has engaged over 300 subscribers and continues to grow each week. Archived issues of both *In The News* and *BIOCAP Briefs* are available online at www.biocap.ca. To receive *BIOCAP Briefs* and/or to subscribe to *In The News*, log on to www.biocap.ca and use the subscribe function at the top of the page.

In addition to these new communication initiatives, BIOCAP staff remained committed to communicating face-to-face with Canadian and international stakeholders and represented BIOCAP at over 60 climate change and biosphere research related events and workshops. Speaking engagements for BIOCAP included: International Energy Agency Conference (Paris, France), World Forestry Congress (Quebec City, Quebec), Bacon & Eggheads Parliamentary Lecture Series (Ottawa, Ontario), Royal Society of Canada Symposium: The Carbon Cycle & Biosphere Solutions (Ottawa, Ontario), and the Canada/Britain Science Policy Colloquium (London, England).

Over the coming year, BIOCAP will endeavor to further increase our outreach capacity by listening to the needs of our stakeholders and responding with new and innovative ways to deliver biosphere greenhouse gas research results and insights.



BIOCAP Quiz

11. Biodiesel can be produced from which of the following feedstocks:

A. Virgin canola oil

B. Agricultural crop residues

C. Beef renderings

D. Used deep fryer grease

E. All of the above

BIOCAP Canada Foundation

Sponsors & Partners

BIOCAP Research Partners

Abitibi-Consolidated Inc.
Agriculture & Agri-Food Canada
Alberta Pacific Forest Industries
Atofina Canada
Boreal Laser Inc.
Boreal Ecosystems Research Ltd.
Bowater Inc.
Canadian Agri-Food Research Council (CARC)
Canadian Cattlemens' Association
Canadian Forest Products Ltd.
Canadian Forest Service
Canadian Foundation of Climate and Atmospheric Sciences (CFCAS)
Corner Brook Pulp and Paper
Ducks Unlimited Canada
Environment Canada
Meteorological Service of Canada
National Hydrology Research Centre
Parks Canada
Fraser Inc.
Government of Alberta
Government of British Columbia
Government of Manitoba – Manitoba Agriculture
Government of Ontario - OMAF
Government of Saskatchewan - SRC
Industry Canada
J.D. Irving Ltd.
Lignol Innovations Corporation
Neoteric BioFuels Ltd.
Nexfor Inc.
Natural Resources Canada
Canadian Forest Service
Energy Sector
Earth Sciences Sector
Natural Sciences and Engineering Research Council of Canada (NSERC)
Ontario Soil and Crop Investment Association
Saskatchewan Canola Development Commission
Slocan Forest Products Ltd.
Social Sciences and Humanities Research Council (SSHRC)
Sustainable Forest Management NCE
Tembec Industries Ltd.
Terre Vista Earth Imaging
University of Alberta
University of Guelph
University of New Brunswick
Weyerhaeuser Company

Note: BIOCAP partners are defined as organizations which are providing cash and/or in-kind contributions to BIOCAP-funded research projects or initiatives.

Financial Statement Highlights

For the Year Ended March 31, 2004

A. Summarized Statement of Operations (Revenues, Expenditures and Fund Balances)(see page 28):

1. **Financial Resources** (i.e., revenues) totaled $3,268,050 in FY 2003-04 verses $2,933,733 in FY 2002-03, an increase in large part because advances from the Federal Government were up from $2.4M to 2.7M. This amount maximized the available $6M in federal funds available over the three years of Phase One of the Federal Government Contribution Agreement. Contributions from all other sponsors amounted to $376,250 in FY 2003-04. ($474,490 the in FY 2002-03) Targeted revenue from contracts for specific research grants, projects and workshops significantly increased from $37,000 in the prior year to $173,160 this year. Other revenue from investment income and cost recoveries totaled $10,928 last year and $7,911 this year.

Program Activities – 86% of total expenditures:

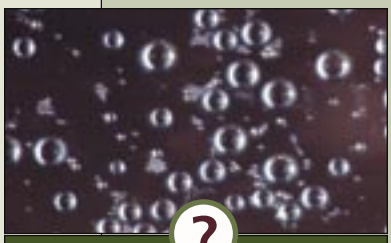
2. **Research grants / funding** disbursed to university networks and researchers amounted to $1,943,666 from federal funds, and $138,160 from industry/provincial funds for a total research investment of $2,081,826 representing 65% of total expenditures, a value that was virtually the same level as that in the previous year. These BIOCAP research grants / investments were matched by funding of $4,112,753 from partners to achieve a 2 to 1 leveraging. See the diagram on page 30-31.
3. **Communication activities** with stakeholders, the scientific community, and the general public through the web site, a newsletter, public launches and media events totaled $265,732 which paid for staff, travel, teleconferences, external contractors, and sponsorships. This represents 8% of expenditures and is similar to the prior year amount of $258,626.
4. **Research networking activities** totaled $384,706 ($353,770 in FY2002-03) represents 12% of total expenditures, is the cost of putting the networks together, organizing workshops, monitoring research, gathering results, and reporting. This includes salaries and benefits for network facilitators, external consultants, allocation of in-kind cost for the Research Director, travel, telephone, and teleconferencing costs.

Supporting Activities – 14% of total expenditures:

5. **Administration** amounted to $453,348 or 14% of the total expenditures in FY 2003-04. Costs include salaries for two staff, the $20K cost of a new computer back-up system and telephone equipment, board of director meetings and directors' fees for certain NGO approved members, office supplies, equipment rental, communications, and net overhead to Queen's amounting to $123,217 ($97,543 the prior year) to cover use of office facilities, assistance with financial, research contract, and human resources administration. Overhead to Queen's is a percent of non-research funding which increased.
6. **Fund Balances (i.e., net assets)**: The bottom of the statement shows the excess (deficiency) of revenues over expenditures for all individual funds totaling $76,279, which together with the beginning balances of $483,562, equals the ending fund balances for a combined fund total of $559,841. See below for a breakdown of this balance into various individual fund classifications.

B. Summarized Statement of Financial Position (Balance Sheet)(see page 29):

7. **Assets** of $997,941 are made up of cash on deposit at Queen's - $274,996, holdback receivable from Env. Canada - $76,336, and other sponsors - $217,160, cash on deposit at a bank - $181,876 in GICs, and an amount invested in provincial government bonds - $200,000, other receivables and prepaid expenses, and the net book value of capital assets - $30,621.
8. **Current Liabilities** at $348,100 as at March 31, 2004 are research grants payable, supplier invoices owing, overhead to Queen's University.
9. Deferred Revenue of $90,000 represents contributions received from sponsors in FY 2003-04 but designated for use in FY 2004-05.
10. **Net Assets** (or fund balances) are the difference between assets and liabilities. The total is broken down into various separate classifications (funds) as follows: (a) capital assets fund $30,621 at the 2004 year-end includes the net book value of computers, equipment, furniture and fixtures used in operations, (b) $(7,120) externally restricted fund deficiency (i.e., expenditures slightly exceeding the maximum advances from the Federal Government under Phase One of the Contribution Agreement) – the deficiency to be carried forward to the next fiscal year to come from Phase Two funding, (c) $270,000 internally restricted by the Board of Directors in a reserve fund, (d) $266,340 of unrestricted funds available for new programs or activities.



12. Hydrogen production from biomass can be maximized by a process known as:

A. Fast Pyrolysis

B. Transesterification

C. Fischer-Tropsch

D. Gasification

BIOCAP Quiz

Summarized Statement of Operations

All Funds Combined - For the Year Ended March 31, 2004

	"A" BIOCAP Canada Funds @ Queen's University - Kingston	"B"	"C" Outside Queen's (separate legal entities)	"D"	"E" Combined All Funds		"F" Combined All Funds
	Env. Can. Queen's / BIOCAP Fund	BIOCAP @ Queen's University Fund	BIOCAP Canada Foundation	BIOCAP Canada Charitable Foundation	Managed by BIOCAP Canada Foundation		Managed by BIOCAP Canada Foundation
	to account for the F.G.C.A.	in the direct support of the F.G.C.A.	to manage extend the F.G.C.A.	to extend the F.G.C.A	**Total 2004** (A+B+C+D)		**Total 2003** (comparison)
Revenues:							
Contributions:							
Federal sponsors	$2,710,729	--	0	--	2,710,729		$2,411,315
Provincial sponsors	--	--	130,000	--	130,000		130,000
Industry sponsors	--	49,250	130,000	--	179,250		277,490
Individuals	--	1,000	--	--	1,000		1,000
Queen's U. in-kind	--	66,000	--	--	66,000		66,000
Targetted	--	--	173,160	--	173,160		37,000
Other:							
Investment income	48	--	6,083	--	6,131		1,696
Cost recoveries	0	611	1,169	--	1,780		9,232
	2,710,777	116,861	440,412	0	3,268,050		2,933,733
Expenditures (by functions):							
Program Activities:							
Research Funding (Sch. A)	1,943,666	10,000	128,160	0	2,081,826	65%	2,114,164
Communication	262,175	0	3,557	0	265,732	8%	258,626
Research Networking	246,647	66,000	72,059	0	384,706	12%	353,770
	2,452,488	76,000	203,776	0	2,732,264	**86%**	2,726,560
Support Activities (Admin.)	422,769	8,423	22,156	6,159	459,507	**14%**	380,861
	2,875,257	84,423	225,932	6,159	3,191,771	**100%**	3,107,421
Excess (deficiency) of revenues over expenditures	(164,480)	32,438	214,480	(6,159)	76,279		(173,688)
Balance, beginning of year	173,970	144,519	165,073	0	483,562		657,250
Balance, end of year	$9,490	176,957	379,553	(6,159)	559,841		$483,562

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, and are consistent with them in all respects. For more details see "Notes to Summarized Financial Statements," pages 32-34

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

Summarized Statement of Financial Position

As at March 31, 2004

	"A" "B" BIOCAP Canada Funds @ Queen's University - Kingston		"C" "D" Outside Queen's (separate legal entity)		"E" **Combined All Funds**	"F" **Combined All Funds**
	Env. Can. Queen's / BIOCAP Fund	BIOCAP @ Queen's University Fund	BIOCAP Canada Foundation	BIOCAP Canada Charitable Foundation	Managed by BIOCAP Canada Foundation	Managed by BIOCAP Canada Foundation
	to account for the F.G.C.A.	in the direct support of the F.G.C.A.	to manage extend the F.G.C.A.	to extend the F.G.C.A.	**Total 2004** (A+B+C+D)	**Total 2003** (comparison)
Assets						
Current Assets	$239,732	191,891	535,697	0	967,320	$610,068
Capital Assets	16,610	3,685	10,326	0	30,621	36,910
	256,342	195,576	546,023	0	997,941	646,978
Liabilities and Net Assets						
Current Liabilities:						
Accounts payable and accrued liabilities	241,301	1,960	104,139	700	348,100	63,416
Deferred revenue		50,000	40,000	0	90,000	100,000
Due to (from) other funds	5,551	(33,341)	22,331	5,459	0	0
	246,852	18,619	166,470	6,159	438,100	163,416
Net Assets:						
Invested in capital assets	16,610	3,685	10,326	--	30,621	36,910
Externally restricted	(7,120)	--	--	--	(7,120)	160,809
Internally restricted	--	105,000	165,000	--	270,000	180,000
Unrestricted	--	68,272	204,227	(6,159)	266,340	105,843
	9,490	176,957	379,553	(6,159)	559,841	483,562
	$256,342	195,576	546,023	0	997,941	$646,978

These summarized financial statements have been prepared from information in the complete audited annual general purpose financial statements (which are available upon request) of each of the individual funds, and are consistent with them in all respects. For more details see "Notes to Summarized Financial Statements," pages 32-34

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

BIOCAP's Research Investments and Leverage

as at March 31, 2004

The past, present, and future commitments for BIOCAP research investments are summarized below. In FY 2003-04 BIOCAP invested $2.1M in research , an amount that is almost identical to that invested in FY 2002-03.

BIOCAP Investments / Commitments

Research Initiative	Phase 1		Phase 2			Total
	FY '02-3	FY '03-4	FY '04-5	FY '05-6	FY '06-7	02-'07
Fluxnet Canada Research Network - FCRN	$600,000	130,000	70,000	200,000	0	1,000,000
Sustainable Forest Management Network Initiative on GHGs and Carbon - SFMN	147,500	153,100	75,000	75,000	0	450,600
Human Dimensions of Biosphere Greenhouse Gas Management Network - HDN	1,044,730	395,270	300,000	0	0	1,740,000
NSERC Strategic Research Grant Joint Initiative with BIOCAP - NSG	239,934	1,215,296	428,907	217,610	0	2,101,747
Landscape Scale Cropping Systems (LSCS), Research Grants & Short-Term Projects and Papers	82,000	188,160	5,000	5,000	0	280,160
	$2,114,164	**2,081,826**	878,907	497,610	0	**5,572,507**

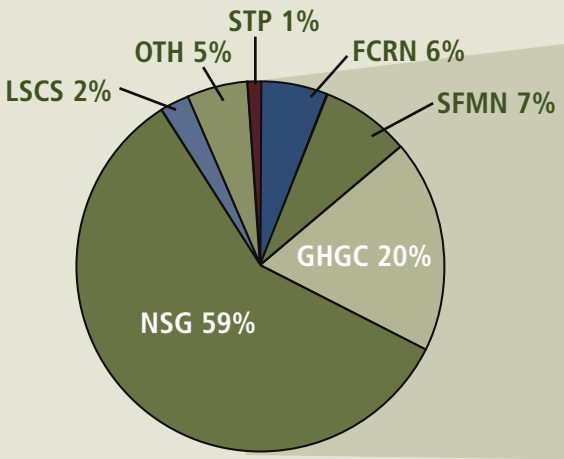
Legend: FCRN, Fluxnet Canada Research Network; CFCAS, Canadian Foundation for Climate and Atmospheric Sciences ;SFMN, Sustainable Forest Management NCE; GHGC, Greenhouse Gas Management Canada; NSG, NSERC Strategic Grants; LSCS, Landscape Scale Cropping Systems

NOTES: The area of each circle is proportional to the dollars invested. The numbers shown in the diagram equate to the FY 2003-04 as highlighted in the table above. BIOCAP's investment total for all years is **$5,572,507** which together with **$15,118,869** from partners, results in a total research investments of **$20,691,376**.

Note that the leveraging increased from $1.45 per BIOCAP dollar in FY2002-03 to $1.95 per BIOCAP dollar in FY2003-04.

The large contribution (59%) of BIOCAP funding towards NSERC Grants in FY 2003-04 reflects major 'front-end' funding of projects.

BIOCAP FY2003-2004 $2.1M



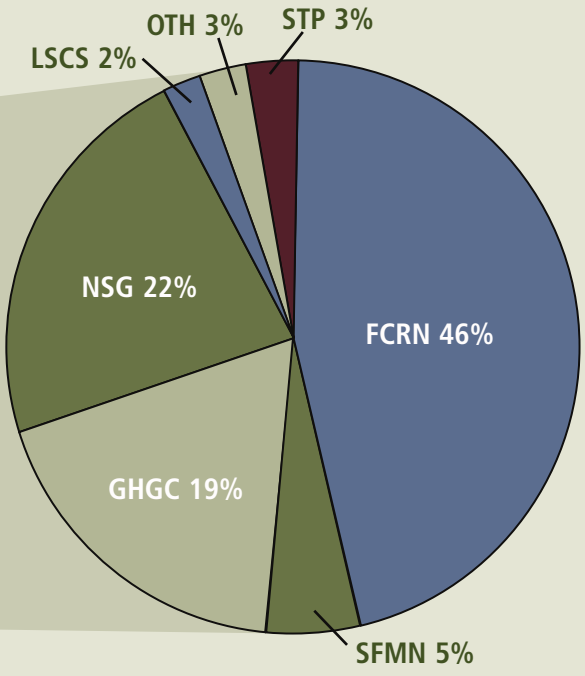
Funding Partner Investments / Commitments

Partner	Phase 1		Phase 2			Total	Grand
	FY '02-3	FY '03-4	FY '04-5	FY '05-6	FY '06-7	02-'07	Total
NSERC, CFCAS, and others	2,761,673	2,751,436	2,364,510	1,214,510	1,051,196	10,143,325	$11,143,325
SFMN	0	139,244	235,944	318,182	0	693,370	1,143,970
SSHRC	66,000	767,000	767,000	0	0	1,600,000	3,340,000
NSERC	196,138	240,948	998,323	844,816	0	2,280,225	4,381,972
VARIOUS	36,000	283,125	54,699	28,125	0	401,949	682,109
	3,059,811	**4,181,753**	4,420,476	2,405,633	1,051,196	**15,118,869**	**$20,691,376**

NOTES: In FY2003-04, BIOCAP projects received $6.3M in cash support. (Note that in many cases, the research being supported with FY2003-04 funds will be carried out in FY2004-05.)

BIOCAP investments will be reduced to about $1.3M per year in FY2004-05 and 2005-06 due to permission from the Federal Government to accelerate payments in previous years.

Total BIOCAP and Partners FY 2003-2004 $6.3M



Notes to Summarized Financial Statements

Year ended March 31, 2004

BIOCAP Canada Foundation (the "Foundation") was incorporated July 18, 2000 under the Canada Corporations Act, Part II without share capital. On December 20, 2002, the Minister of Industry issued Supplementary Letters Patent to the change in objects of the corporation from those that were charitable to not-for-profit as provided in by-law no. 2. As part of the reorganization the **BIOCAP Canada Charitable Foundation** (the "Charitable Foundation") was incorporated January 10, 2003 under the Canada Corporations Act, Part II without share capital.

The Foundation is a national university research funding organization, which directly through its own revenues, and through the management of the BIOCAP Canada Funds at Queen's University at Kingston, and the BIOCAP Canada Charitable Foundation brings together leading researchers and decision-makers from across Canada to find biology-based solutions to the challenge of climate change. There are separate audited financial statements for the BIOCAP Canada Funds at Queen's University at Kingston, BIOCAP Canada Foundation, and BIOCAP Canada Charitable Foundation which may be obtained upon request. Any excess of revenues over expenditures are to be used to promote the not-for-profit objects or charitable objects of the Foundation and Charitable Foundation respectively. The Foundation is a not-for-profit organization under paragraph 149(1)(i) of the Income Tax Act and, as such, is not subject to federal and provincial income taxes. Similarly, the Charitable Foundation qualifies for tax-exempt status as a registered charity effective May 2, 2003 under paragraph 149(1)(f) of the Income Tax Act.

1. Significant accounting policies:

(a) Basis of presentation:

All the BIOCAP Canada Funds and entities follow the accrual basis of accounting.

(b) Fund accounting:

BIOCAP Canada follows the restricted fund method of accounting for contributions.

Resources are classified for accounting and reporting purposes into funds that are held in accordance with their specified purposes, or legal obligations, or voluntary actions. All contributions are considered available for unrestricted use, unless specifically restricted by the donor or subject to other legal restrictions. BIOCAP Canada maintains three funds as described below:

(i) The **Environment Canada – Queen's/BIOCAP Fund at Queen's University** represents the research, research networking, communications and support activities funded by the federal government related to the fulfillment of the contribution agreement between the Minister of the Environment and Queen's University which provides a maximum contribution of $6 million over three years. Phase One of the original agreement expired March 2004. However, a new contribution agreement for Phase Two – fiscal years 2004-05 and 2005-06 has been signed to maintain the current level of federal funding of $2,000,000 per year. This fund represents externally restricted resources.

(ii) The **BIOCAP @ Queen's Fund** accounts for the research, research networking, communications and support activities funded by the Foundation sponsor charitable contributions through Queen's University. This fund represents unrestricted resources.

(iii) The **BIOCAP Canada Foundation Operating Fund** accounts for the research, research networking, communications and support activities funded by the Foundation sponsor non-charitable contributions. This fund represents unrestricted resources.

(iv) The **BIOCAP Canada Charitable Foundation** was set up to account for charitable contributions and activities that did not go through Queen's University. As at the first year-end the only activity was legal fees to incorporate the entity and

accrued audit fees. This fund represents unrestricted resources.

(c) Recognition of revenue:

Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured. All other restricted contributions are recognized as revenue of the appropriate restricted fund in the period received. If there is no corresponding restricted fund, contributions are recognized as revenue in the particular fund in the same period as the related expenses using the deferral method. This is the case for general operating contributions by sponsors restricted for a future period.

(d) Capital assets:

Purchased capital assets are recorded at original cost. The original cost does not reflect replacement cost or market value upon liquidation. Contributed capital assets are recorded at fair value at the date of contribution. Repairs and maintenance costs are charged to expense. Betterments, which extend the estimated life of an asset, are capitalized. When a capital asset no longer contributes to the Organization's ability to provide services, its carrying amount is written down to its residual value.

Capital assets are amortized on a straight-line basis using the following annual rates:

Asset	Useful life
Computer hardware	3 years
Equipment and furniture	5 years

(e) Use of estimates:

The preparation of financial statements in conformity with Canadian generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the period. Actual results could differ from those estimates.

(f) Research Grants:

Research grants are reflected as research funding expenses in the year of payment as approved by the Board of Directors.

2. Capital assets:

	Cost	Accumulated amortization	2004 Net book value	2003 Net book value
Computer hardware	$63,611	48,640	14,971	$17,846
Equipment and furniture	27,811	12,161	15,650	19,064
	$91,422	60,801	30,621	$36,910

Cost and accumulated amortization as of March 31, 2003 was $70,945 and $34,035 respectively.

3. Related party transactions:

On December 18, 2001, the Foundation entered into a Memorandum of Understanding with Queen's University for BIOCAP Canada Fund's administrative offices and certain services provided by the University. Under the terms of the Memorandum of Understanding, the Environment Canada – Queen's/BIOCAP Fund is required to pay overhead to the University of $123,217 (2003 - $97,543). The amount due to Queen's University related to overhead at March 31, 2003 is $46,046 (2003 - $30,153). The Memorandum of Understanding may be cancelled by the Foundation or the University on three month's notice.

There are amounts due to and (from) each of the various funds as disclosed on the Statement of Financial Position. These are for expenses in the normal course of business.

4. Inter-fund transfers and internally restricted net assets:

During the year, the Board of Directors internally restricted an additional $90,000 (2003 - $180,000) to be used for specific purposes. These internally restricted amounts are not available for other purposes without approval of the Board of Directors.

5. Commitments:

BIOCAP Canada has commitments for approved research grants to recipients amounting to $1,068,907 for FY 2004-05, $862,611 for FY 2005-06. Further research investments will be made in the future.

6. Statement of cash flows:

The changes in cash flows are readily apparent from the financial statements and as such a statement of cash flows would not provide additional useful information.

7. Fair value of financial assets and financial liabilities:

The carrying value of the cash, due from Office of Advancement of Queen's University, accounts receivable, deposits, accounts payable and accrued liabilities and due to Queen's University of Kingston approximate their carrying values due to the relatively short periods to maturity of the instruments.

8. Comparative figures:

Certain 2003 comparative figures have been reclassified to conform with the financial statement presentation adopted for 2004.

BIOCAP Quiz Answers

1. Answer: C A refrigerator and computer
A 725 Watt refrigerator running 25% of the time consumes 1588 kwh per year. A 270 Watt computer running 33% of the time consumes 788 kWh per year. The sum of these is similar to the electrical power that can be extracted through anaerobic digestion of the 1000 kg of manure produced by a cow each year, assuming 6 kwh/cow/day or 2.2 kwh/kg manure.

2. Answer: B 25 km
A cow produces 280 L of methane or 200 g of methane per day, but methane has a GHG warming potential 21 times that of CO_2, so a cow produces about 4.2 kg CO_2 equivalents per day. A car with a fuel efficiency of 7L gasoline per 100 km has a CO_2 emission of about 0.17 kg CO_2/km. 4.2/0.17 = 25 km.

3. Answer: B 69 years
The 245 million hectares of timber productive forest in Canada have been estimated to contain 15.8 billion tonnes of above-ground biomass carbon with a total energy content of about 566 exajoules. Current fossil fuel use in Canada provides about 8.24 exajoules per year, so the forest C resource is about (566/8.24) 69 years.

4. Answer: B 1.9 tonnes
Assuming 0.45 tonnes of carbon are required to reduce 1 tonne iron ore, a 30% conversion from biomass to char, and an 80% carbon content for char.

5. Answer: A 4140 L
Assuming a production of 380L ethanol/tonne corn kernels with a yield of 6 tonnes of corn per ha. Also assuming 310L ethanol/tonne biomass (corn stover) with a yield of 6 tonnes biomass/ha.

6. Answer: A 108,000km
This is assuming 0.17kg CO_2 equivalent released per kilometre and a growth rate of 10 tonnes biomass (5 tonnes C) per hectare/year.

7. Answer: D All of the above
With 7% of the world's land area, 10% of the world's forests and over 60 million hectares of agricultural land, Canada has the potential to generate cost effective biosphere solutions to reduce and sequester greenhouse gases while complimenting fossil fuel use with renewable bio-energy resources.

8. Answer: C It contains Oxygen
Oxygen presence in fuel results in a more complete combustion, thereby reducing carbon monoxide emissions and engine knocking.

9. Answer: D 20,000,000 BC
Pearson, P.N.; Palmer, M.R. (2000) Atmospheric carbon dioxide concentrations over the past 60 million years. Nature 406: 695-699.

10. Answer: D 0.4%
Every year, Canada's forest industry harvests 1 million hectares or 0.4% of the timber productive forest, containing 323 million tonnes of CO_2 equivalents.

11. Answer: E All of the above
Biodiesel can be produced from fats and oils by esterification, involving triglyceride (fat) reaction with an alcohol (ethanol or methanol). Biodiesel can also be produced from biomass by gasification of the material to a hydrogen/carbon monoxide gas and Fischer-Tropsch conversion to biodiesel.

12. Answer: D Gasification
Gasification involves the heating of biomass to 900-1200˚ C under pressure to break down the solid into a gas consisting of hydrogen, carbon monoxide, and methane. These gases can be reformed into various substances, such as oils and chemicals that can be used to replace traditional petroleum products.