

BRIMS INFORMATION BULLETIN

January 29, 2013

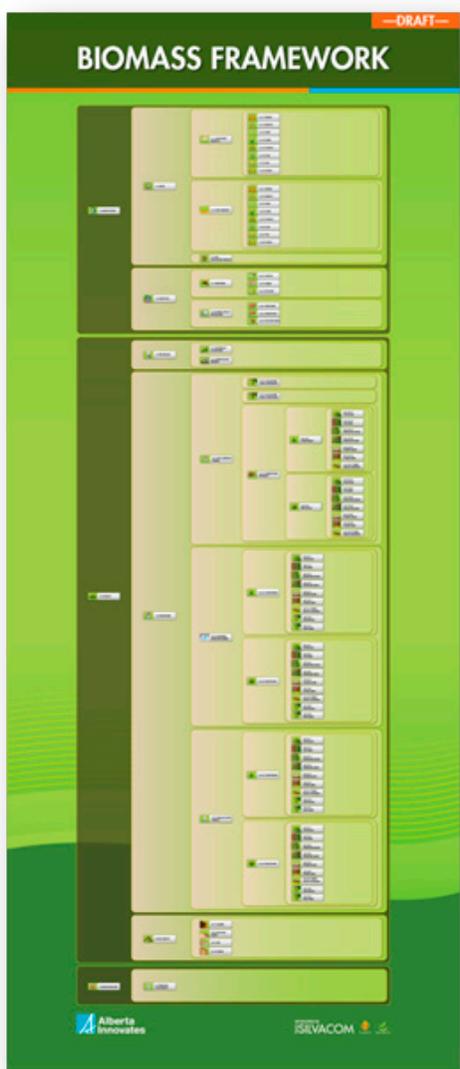
Society enjoys a wide range of benefits from the resources and processes supplied by nature. These ecosystem services include the maintenance of biodiversity as well as the production of important ecosystem goods such as industrial products, forage, wildlife, chemicals and pharmaceuticals. As market preferences shift to green products, there is increasing interest in biomass, one of Alberta's key and most abundant ecosystem products. Existing forestry and agricultural operations in the province are constantly being approached by potential investors to consider collaboration in biorefining initiatives. Significant efforts are being invested in basic science, logistics and engineering associated with refining biomass feed stocks into useful and saleable products. What's missing is dependable, investment-grade information about (a) how much biomass exists, (b) where it's located, (c) what its components and quality are, (d) what costs, constraints and commitments are associated with its extraction and (e) what environmental implications there are for managing these resources.

A BioResource Information Management System (BRIMS) is clearly needed to spur innovation and provide business and government with quality data to guide policy and make solid investment and logistical decisions. Alberta Innovates Bio Solutions engaged Silvacom Ltd and Green Analytics Corp. to design and develop a world-class approach and integrated system for managing provincial biomass information. The intent was to address biomass first, then expand the system to include the remaining ecosystem services and products.

The first phase of BRIMS, completed in 2012, included a number of parts - the first of which was a thorough evaluation of the current state of the science and data associated with biomass inventory assessments. A comprehensive literature review and jurisdictional scan of over 30 countries worldwide revealed that:

- There are no harmonized guidelines, standards or definitions regarding biomass inventories
- No one has designed a comprehensive biomass data model that covers all biomass sources and components
- There is widespread lack of knowledge and operational experience concerning the design and implementation of spatially explicit, integrated biomass resource assessments
- There have been very few working relationships established between biomass producers and consumers in different sectors (e.g. forestry vs. agriculture) or geographic areas
- Most biomass inventories have been undertaken for scientific research on a project-specific basis with no long-term plan for sustainment
- Biomass information, where available, has been primarily derived from modeling approaches (not empirical data)
- In Alberta, there have been few attempts to integrate biomass data from all geographies (e.g. green/forestry and white/agricultural zones) into a consistent, geo-referenced product – there is some data, but it's of varying resolutions, not connected, not complete, not up-to-date and not standardized
- No one has developed an integrated, online information management system that includes forestry, agriculture and municipal solid waste sources – very few business relationships have been forged to facilitate the exchange of information and ideas (particularly from the data standpoint)
- Sustainably-funded data repositories have not been built and Alberta is the only jurisdiction with a unique Public-Private-Partnership (Spatial Data Warehouse) to facilitate management and distribution of ecosystem services data from multiple private and public sources

Having both identified the gaps in knowledge and the current “state-of-the-art” associated with biomass information, the next step was to develop a new, completely specified data framework that identifies each possible constituent of biomass from forest, agriculture and municipal sources. This innovative framework, which addresses gaps and harmonizes standards, now provides the foundation on which to capture, assemble and integrate biomass from a myriad of provincial data sources across all land bases, including the white/agricultural and green/forestry areas of Alberta.



Fully-Specified Biomass Framework – Breakdown of Biomass Pools

Using the learnings from the scan of leading practices in the world, the work shifted to designing and testing a measurable proof-of-concept for a new, integrated biomass information system. To advance the new system, the following steps were undertaken:

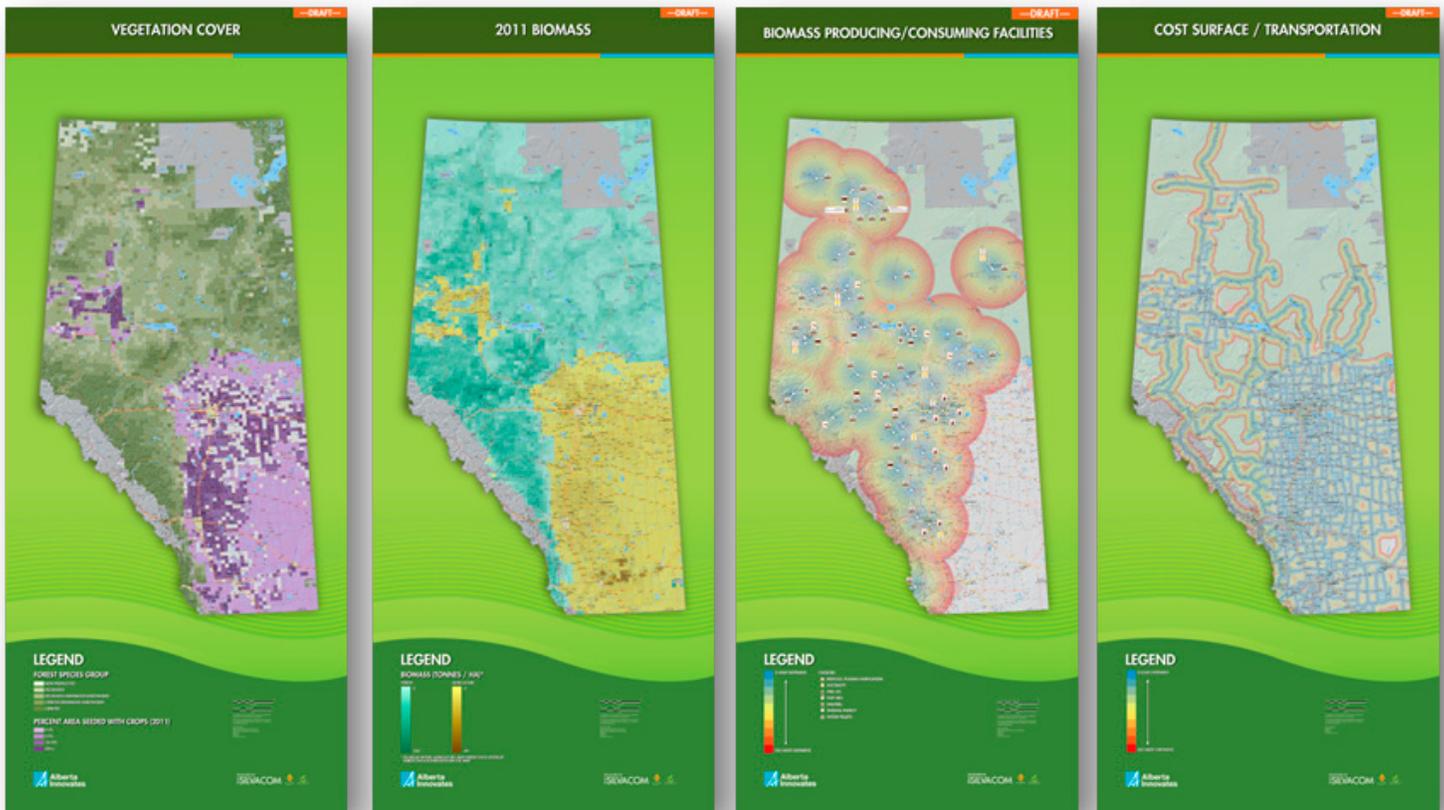
1. Creation of new partnerships, and the leveraging of existing relationships, to access the best available biomass data
2. Development of experimental maps and visualizations of biomass components and related features derived from existing sources in Alberta (at a variety of geographic scales and product resolutions)
3. Design and pre-build specification of an integrated “prospectus generator” as a means to deploy and distribute biomass information in an online environment – with design concepts for open-source collaboration and scenario analysis
4. Development of an animated video to communicate the BRIMS initiative and its relevance to the Alberta policy context concerning ecosystem services

Data sharing agreements are critical components associated with building natural resource-based accounts. As part of Phase 1 of the BRIMS initiative, data sharing agreements were signed with key stakeholders in the forestry and agricultural sectors enabling Team Silvacom to access new, heretofore unavailable biomass information. This facilitated the compilation and integration of unique biomass data sets which are far more detailed than those from currently available sources.

Development of experimental maps first required scouring existing data sources, documenting source information, and standardizing database attributes to facilitate (a) integration in the bioresource assessment framework and (b) visualization of features across broad landscapes. Biomass for the green/forest zone was derived from above ground forest biomass equations (stem, bark, tops, branches etc.) which were linked to georeferenced forest inventory data and summarized by individual township. Over 200 separate databases comprising more than four million polygon records of forest inventory (4,355 individual townships), including both forest stand and specific attribute data, were amalgamated and analyzed. On the agricultural land base (white zone), crop type data was derived for 19 census division units, converted to potential biomass using crop-to-residual ratios for 9 crop types, then summarized for 1,490 individual townships. In the process, agricultural biomass estimates were standardized between sources to report the same units (dry tonnes/ha).

In addition to developing initial biomass estimates, a series of additional spatial analyses were undertaken to characterize important aspects of the provincial picture. Individual biomass consuming and producing facilities were identified and georeferenced. Tenure allocations, including Forest Management Agreement areas, were mapped. Spatial proximity analyses based on transportation routes were also conducted to generate cost surfaces for scenario assessments.

Innovative visual products and maps of the information are shown in the following figures.



Forest Species Group and Agricultural Production Aggregated by Township

Biomass Aggregated by Township - Compiled from Forest Inventory and Crop Type and Residual Data

Location and Proximity Analysis of Biomass Producing and Consuming Facilities

Relative Proximity of Biomass Sources to Major Transportation Infrastructure



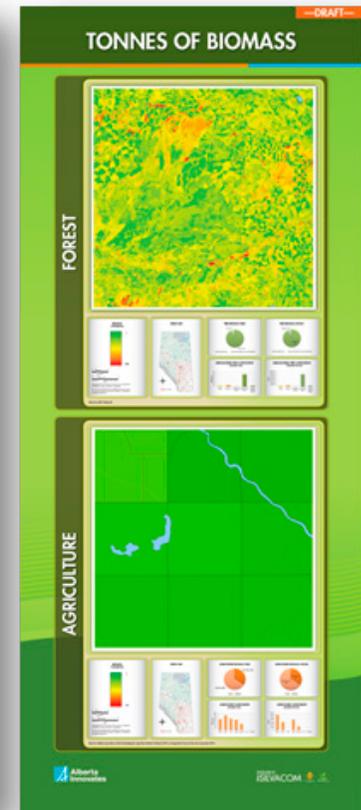
Location of Potential Biomass Associated with Anthropogenic and Natural Disturbance



Illustration of Land Tenure and Commitments in Alberta

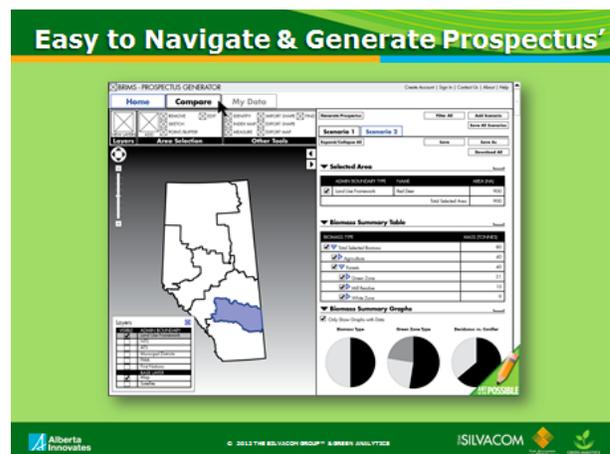
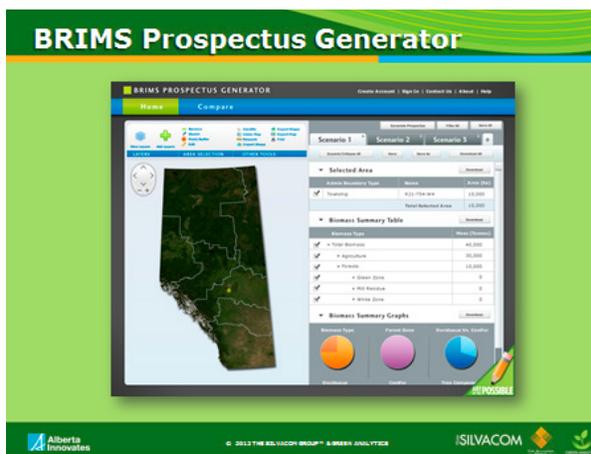


Derivation of Carbon Stock Yields by Township for Forest and Agricultural Lands



High Resolution Biomass Analysis Within FMA Townships (Derived from Detailed Forest Inventory Data)

The "Prospectus Generator" is an innovative approach to online management and distribution of biomass data contained in BRIMS. The concept is to provide an easy-to-use, web-based portal to facilitate the display of potential biomass, from a variety of sources, for user-defined areas. Pre-build wireframes of the Prospectus Generator have been designed. Functionality includes organization and storage of the data as well as online tools to display and analyze opportunity scenarios for agriculture and forest biomass supply from user-defined areas – nested from a local township to a region (e.g. county) and ultimately at a provincial scale.



Besides the innovative technical and business modeling work associated with BRIMS, another “first” was the development and distribution of an animated video describing ecosystem services and the specific topic of biomass inventories. This video, available at http://www.youtube.com/watch?v=-Jw9dPYVT_Y, was a pioneering effort to explain complex scientific facts in a simple, accessible manner for business, technical and general audiences. One of the interesting developments is that the Alberta Distance Learning Centre (ADLC), a world leader in distributed learning is for Grades 1-12 with over 50,000 students in Northern and Western Canada, has incorporated this video in their science curriculum. This is a clear demonstration and validation of methodology and the need to provide improved scientific content through modern online media.



Ecosystem Services and BRIMS Animated Video (at http://www.youtube.com/watch?v=-Jw9dPYVT_Y)

In summary, the first phase of the BRIMS initiative has, for the first time, (a) identified best practices associated with biomass inventories, (b) defined a comprehensive and data-centric framework for acquiring and organizing biomass information, (c) provided a clear blueprint for standardization and integration of complex data sets across both the green/forest and white/agricultural zones of Alberta, (d) introduced an innovative web portal design for generating user-specified biomass prospectuses, (e) described a workable hosting and distribution platform, as well as a sustainable business model and (f) introduced a new way of communicating complex scientific issues through an animated video. A significant breakthrough involved the establishment of working relationships and data-sharing agreements between corporate sources of biomass in the forest and agriculture industries, as well as provincial and federal agencies. Biomass data resides in different places: Silvacom and Green Analytics found innovative solutions to overcome inherent jurisdictional issues concerning data ownership and distribution.

There has been tremendous advancement towards the goal of providing Alberta with a world-class bioresource information management system. Progress-to-date has spurred considerable interest from both industrial and public sector partners who support the continuation of the BRIMS initiative. The next phase of the BRIMS initiative is designed to capitalize on the proof-of-concept designs and innovative data visualizations to operationalize and distribute biomass data to support development of Alberta's bio-economy.

To communicate with the project team feel, please feel free to contact:

CAROL BETTAC, PROJECT SPONSOR

Executive Director

Alberta Innovates Bio Solutions

(p) 780.638.3721

(e) carol.bettac@albertainnovates.ca

JOHN PETERS, PROJECT MANAGER

Energy and Environment Group Manager

The Silvacom Group

(p) 780.462.3238

(e) john.peters@silvacom.com

MIKE KENNEDY, PROJECT DIRECTOR

CEO/President

Green Analytics

(p) 780.462.3235

(e) mike.kennedy@greenanalytics.ca



ABOUT ALBERTA INNOVATES BIO SOLUTIONS

Alberta Innovates Bio Solutions (AI Bio) invests in research and innovation to grow prosperity in Alberta's agriculture, food and forestry sectors. AI Bio is a board-governed corporation that works with partners to identify, coordinate and fund research projects. The organization helps to solve industry challenges with solutions that deliver economic, environmental and social benefits. More information is available at www.bio.albertainnovates.ca.



ABOUT SILVACOM

The Silvacom Group™ was founded in 1983 and serves clients in the energy, forestry, utility and government sectors. Silvacom's core business is data and includes consulting to help solve problems related to surface land planning and development, as well as building world class web enabled geospatial systems. Silvacom has demonstrated a unique ability to produce results using location-based business analytics and highly effective design and visualization. Visit www.silvacom.com for more information.



ABOUT GREEN ANALYTICS

Green Analytics is an independent consulting firm that specializes in the social and economic dimensions of land, resource, and environmental management. With offices in Edmonton, Alberta and Guelph, Ontario, Green Analytics supports policy analysis and management strategy development for governments, corporations and non-profit organizations. Visit www.greenanalytics.ca for more information.