

# BRIMS

Bio-Resource Information Management System

Alberta's Bio-Resource Information Management System (BRIMS)

1. About Silvacom
2. The need for bio-resource information in Alberta
3. The solution: Alberta's Bio-Resource Information Management System (BRIMS)
4. Overview of the BRIMS web application
5. Summary & key takeaways
6. Questions

# Key Facts - Silvacom

- Founded 1983
- Employee owned
- Serves forestry, energy, utility, agricultural, government and Aboriginal clients
- Software, data, and professional services to improve land management
- Nearly 90 staff within Silvacom Group
  - Silvacom
  - MNC
  - AltaLIS



# Who We Work For



- Market preference shift to green products
  - Increasing interest in supply of ecosystem services
  - The provision of different forms of biomass are ecosystem services
- Biomass and other ecosystem services are abundant in Alberta
  - Forests, agriculture, municipal waste, etc.



- Missing dependable, investment-grade biomass information about:
  - How much exists,
  - Where it is located,
  - What the components and quality are,
  - What costs, constraints, and commitments are associated with extraction,
  - What are the environmental implications for managing these resources.



# Background – Barriers to Development

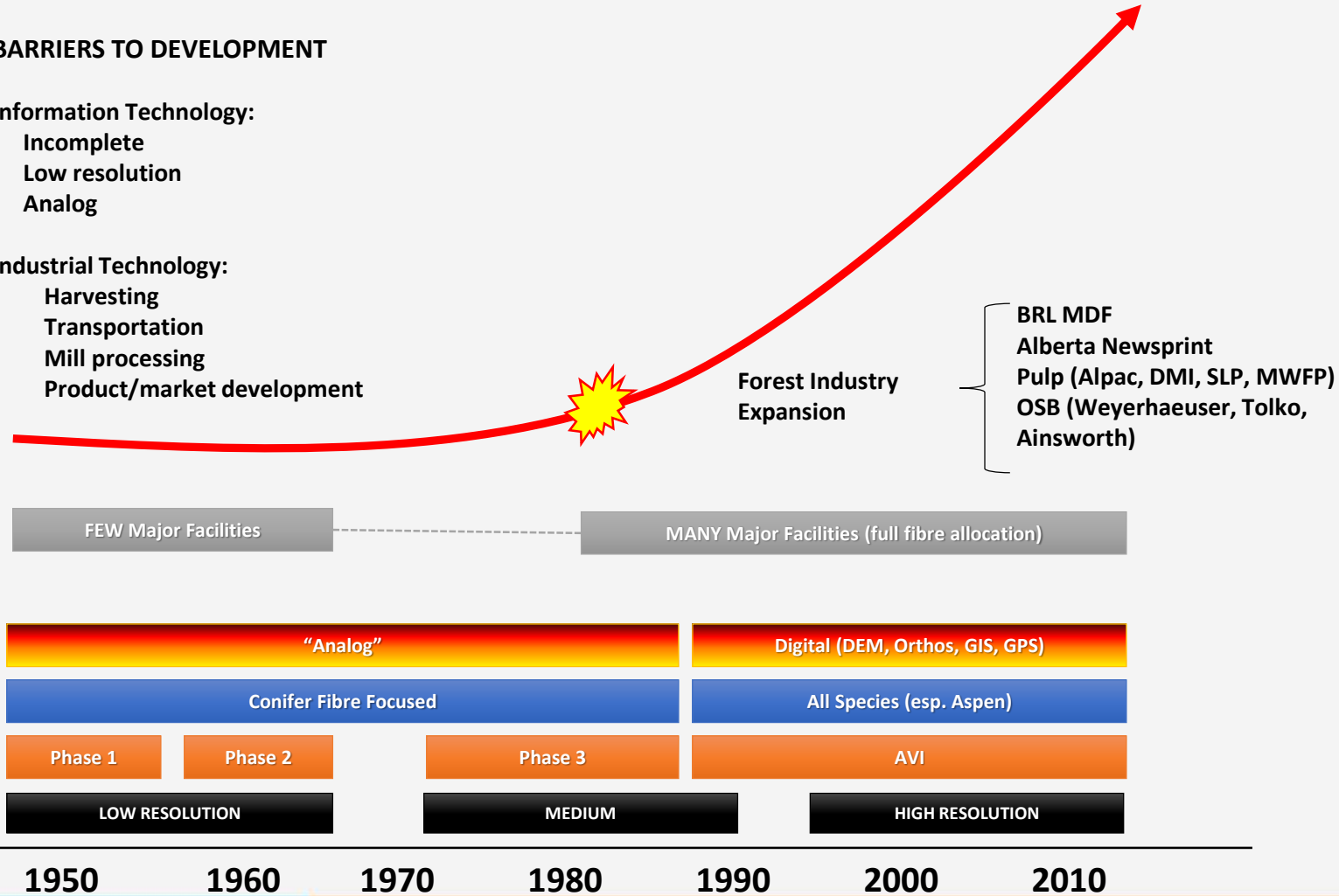
## BARRIERS TO DEVELOPMENT

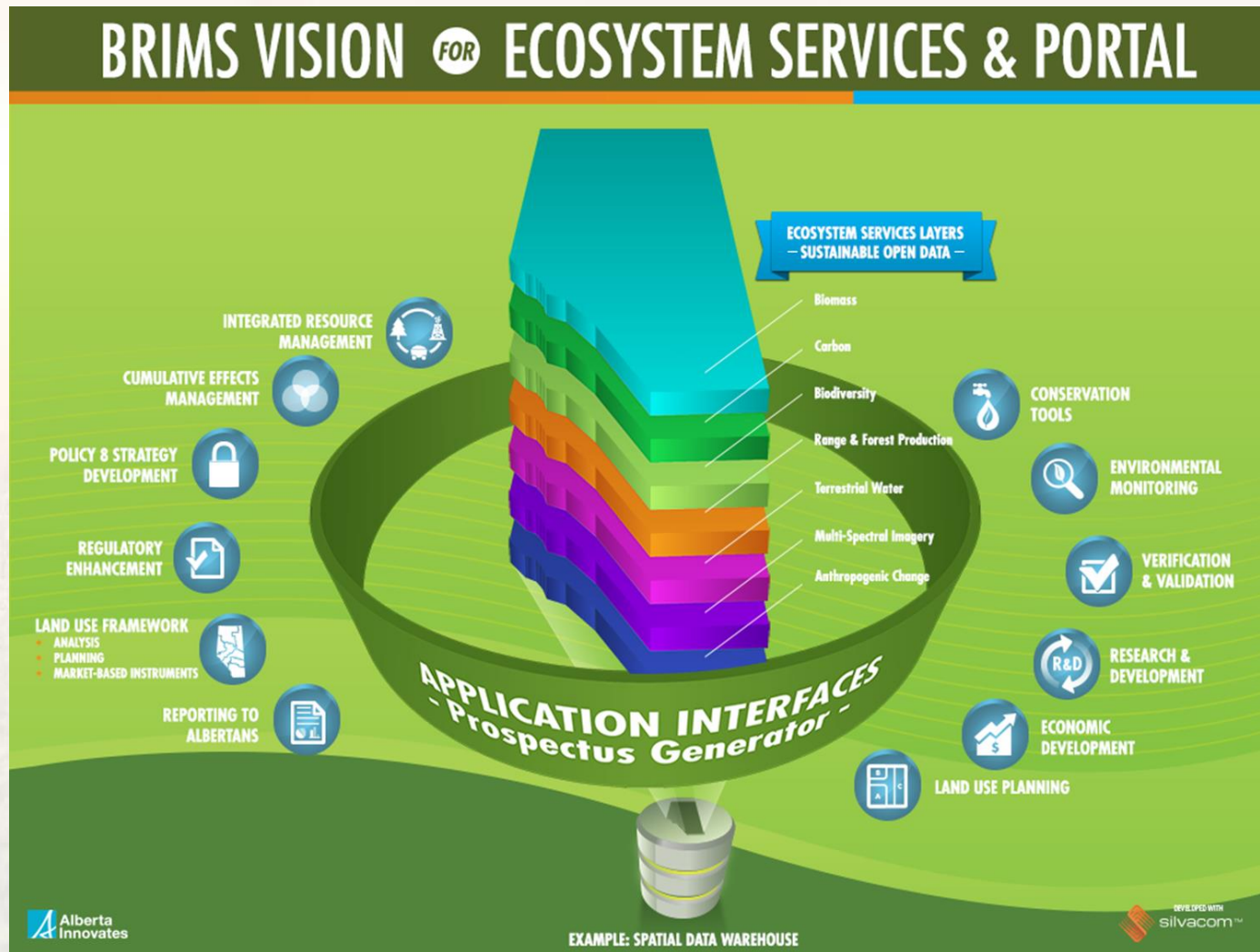
### Information Technology:

- Incomplete
- Low resolution
- Analog

### Industrial Technology:

- Harvesting
- Transportation
- Mill processing
- Product/market development







Encourage investment in the bio-industrial sector by:

- Reduce uncertainty of supply
- Provide framework to collate and share data
- Support terrestrial monitoring and reporting



# The Approach

## Historical

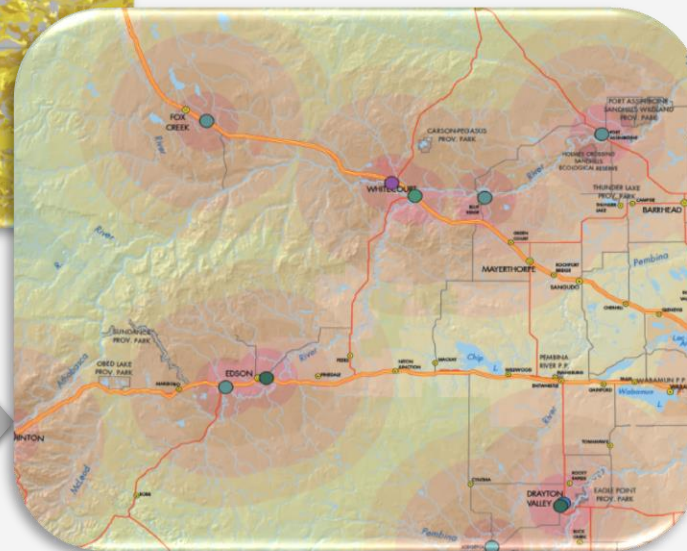
Table 2. Biomass equations selected for this study

Formula <sup>a,b</sup>	Description and comments	Data requirement	DBH <sup>c</sup> (cm)	R <sup>2d</sup>	SE <sup>e</sup>	Sample size	Application limits	Reference
1 $B = aD^b$	Exponential through origin	DBH (cm)	1-32	0.626-0.998	0.10-12.70	8-195	Single tree and components	Tre-Mikachan and Korakhan 1997
2 $B = a + bD + cD^2 + dD^3$	Polynomial	DBH (cm)	0-31+	0.28-0.99	0.17-53.79	37-61	Single tree and components	Stagh 1982, 1984a
3 $B = a + bD + cH + dD^2H + eD^2 + fD^3$	Polynomial and combined allometric variables through origin	DBH (cm), height (m)	0-31+	0.41-0.99	0.17-54.65	37-61	Single tree and components	Stagh 1982, 1984a
4 $B = a + bD^2H$	Combined allometric variables	DBH (cm), height (m)	0-31+	0.00003-0.99	0.18-59.8	37-61	Single tree and compo	
5 $B = aD^2H$	Combined allometric variables through origin	DBH (cm), height (m)	5.2-35.8	0.167-0.993	8.3-114.5	66-128	Single tree an compo	
6 $B = aD^2H^f$	Combined allometric and exponential variables through origin	DBH (cm), height (m)	0.0-34.6	NA <sup>f</sup>	NA	NA	Single tree an compo	
7a $B = a + bD^2H + cD^3H + dD^4H$	Polynomial and combined allometric variables	DBH (cm), height (m)	0.1-40	NA	7.42-23.12	173-1769	Stem v	
7b $B = a + bD^2H + cD^3H + dD^2H^2 + eD^2H^3$ for white spruce, black spruce, and trembling aspen $B = a + bD^2H + cD^3H + dD^4H + eD^2H^2 + fD^2H^3$ for jack pine $B = a + bD^2H + cD^3H + dD^4H$ for lodgepole pine, balsam fir, balsam poplar, and white birch	Polynomial and combined allometric variables	DBH (cm), height (m)	0.1-40	NA	1.85-5.75	173-1769	Stem v	

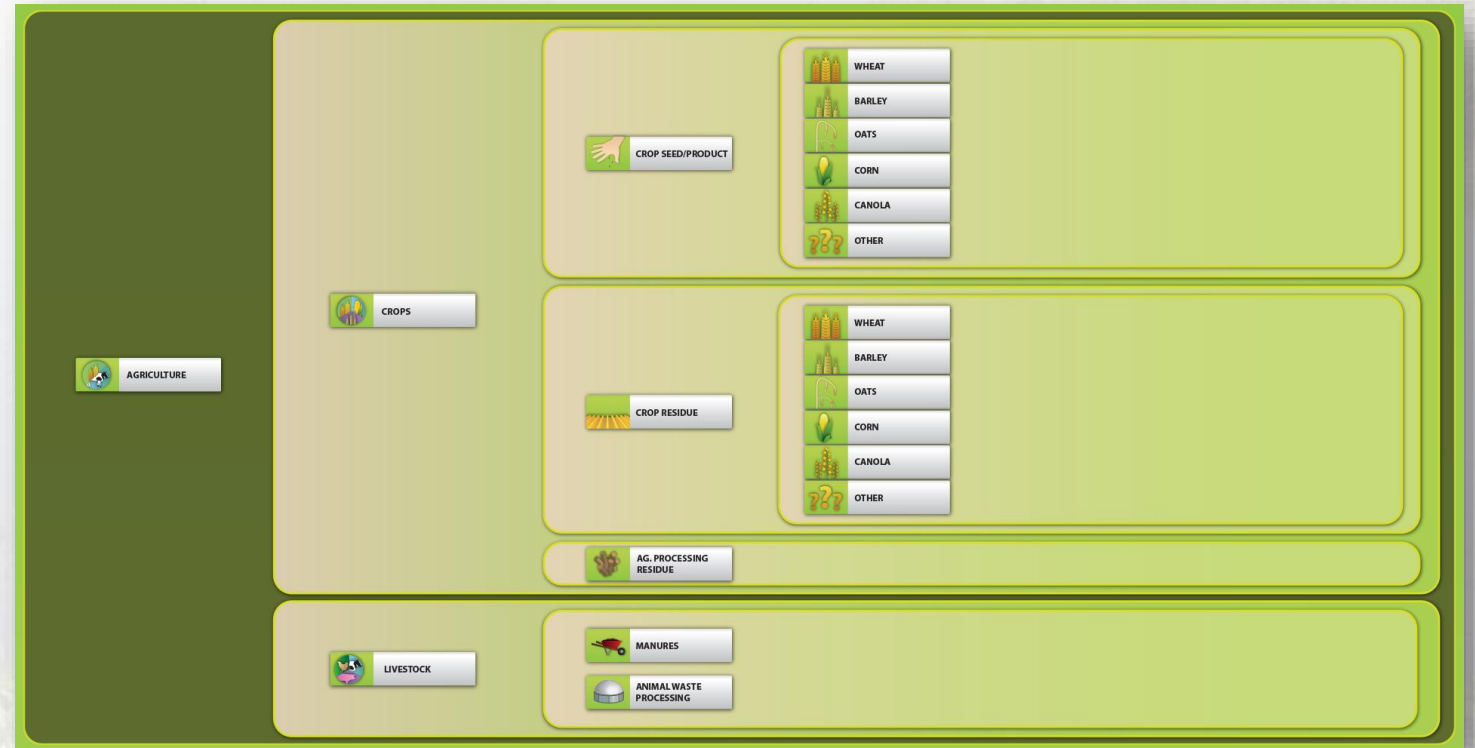
## Current



## BRIMS



- Biomass
  - Agriculture
    - Crops
    - Livestock
  - Forests
    - Tree Components
    - Landbase Allocation
    - Mill Waste
  - Municipal Solid Waste
    - Mixed Solid Waste
    - Residential Sludge



1.1.1.3 Oats

Agriculture>Crops>Crop Seed/Product>Oats

**Component Introduction:**

Oats, known scientifically as *Avena sativa*, are a hardy cereal grain able to withstand poor soil conditions in which other crops are unable to thrive. Oats are part of the grasses family, the *Gramineae*. Varieties of common white oats, *Avena sativa*, are the most widely grown and are planted in the spring for summer harvesting. In warmer climates where winters are mild, varieties of red oats, *Avena byzantina*, are sown in the autumn and harvested the following summer. There is also a hull-less (in fact loose hulled) species called Naked Oats, *Avena nuda*, but this is grown much less commonly. Many varieties of common white and red oats are available, and have names like *Clinton*, *Cherokee*, *Bonda*, *Andrew*, *Clintford*, *Otee*, *Noble*, *Stout*, *Dal*, *Orbit*, *Garland*, *Astro*, and *Pemfield*. Their qualities vary, for example *Cherokee*, *Clinton* and *Bonda* varieties are good for milling and produce a high amount of oatmeal per total weight. Other varieties include Desert oat, Slender oat, Sand oat, Wild oat and Abyssinian oat.

Oats have numerous uses in food; most commonly, they are rolled or into oatmeal, or ground into fine oat flour. Oatmeal is chiefly eaten as porridge, but may also be used in a variety of baked goods, such as oatcakes, oatmeal cookies, and oat bread. Oats are also an ingredient in many cold cereals, in particular muesli and granola. Oats may also be consumed raw, and cookies with raw oats are becoming popular. One of the most common uses is as livestock feed. Oats make up a large part of the diet of horses and are regularly fed to cattle as well. Oats are also used in some brands of dog and chicken feed.

The vast majority of Canadian oat is produced in Saskatchewan, Manitoba and Alberta. In 2010, total production of oats in Alberta was estimated at 648 thousand tonnes, an increase of 110% from 2009.<sup>9</sup> Oat accounted for 2% of the total crop production in Alberta, in 2010. Total production more than doubled from last year. Higher yields and an increase in harvested acreage were behind the gain. The provincial average yield was estimated at 79.2 bushels per acre, or 18.7% higher than in 2009, while the harvested area was up 76.7%.

Alberta has approximately 5000 oat growers and these growers are responsible for producing a globally recognized high quality oat. In the 1980s and early 1990s Alberta was the largest provincial exporter of oats in Canada, supplying oat mills in the US and Canada, and equine feed markets in the US. Unfortunately, Alberta oat production fell sharply with the removal of the WGTA subsidy in 1995. Nonetheless, oats are still seeded on nearly a million acres in Alberta each year, with a five-year average production of over 550 thousand metric tonnes (ending 2011), with an estimated 117 thousand tonnes of annual raw oat exports – mostly to the United States with approximately one-third of these oats being pony oats. Alberta oat production supports two oat mills in Alberta that process between 175-200 thousand metric tonnes of oats as well as five cleaning and processing facilities that supply food and feed markets in Canada, the U.S. and Asia. Geographically, the majority of Alberta oats are produced north of Red Deer and in the Peace River region.<sup>9</sup>

**Data Source:**

<sup>9</sup> 2010 Agriculture Statistics Yearbook  
\* [http://www.agr.gc.ca/files/AGC/PS/A/CS2/A/CS2\\_A/eng/comp/lin\\_nov2011.pdf](http://www.agr.gc.ca/files/AGC/PS/A/CS2/A/CS2_A/eng/comp/lin_nov2011.pdf)  
Reference # 16-060

To estimate the total **quantity of biomass** (tonnes), annual crop production for **Oats grain** for each Census Division in Alberta was obtained from the 2012 Agriculture Statistics Yearbook. The data in the Yearbook was compiled by Statistics and Data Development Branch of Alberta Agriculture and Rural Development. It reports oats production from 2001 to 2012 but for the purpose of this study, we report oat production for year 2012 (Table 1.1).

**Table 1.1: 2012 Oat productions (Thousand Tonnes) for Alberta Census Divisions**

Census Division	1	2	3	4	5	6 & 15	7	8	9
Production '000 tonnes	3.2	4.5	4.5	10.5	8.1	20.7	56.1	24.4	4.4
Census Division	10	11	12	13	14	16	17	18	19
Production '000 tonnes	82.9	45.1	41.8	87.3	7.5		45.7	22.1	47.6

**Biomass Estimate Formulas:**

Given that the reported weights in Table 1.1 are not oven-dry-weights, Equation 1.3 is used to transform the weights to oven dry equivalents.

**Equation 1.3**

$$Dw = W - \left( \frac{M \times W}{100} \right) \tag{1.3}$$

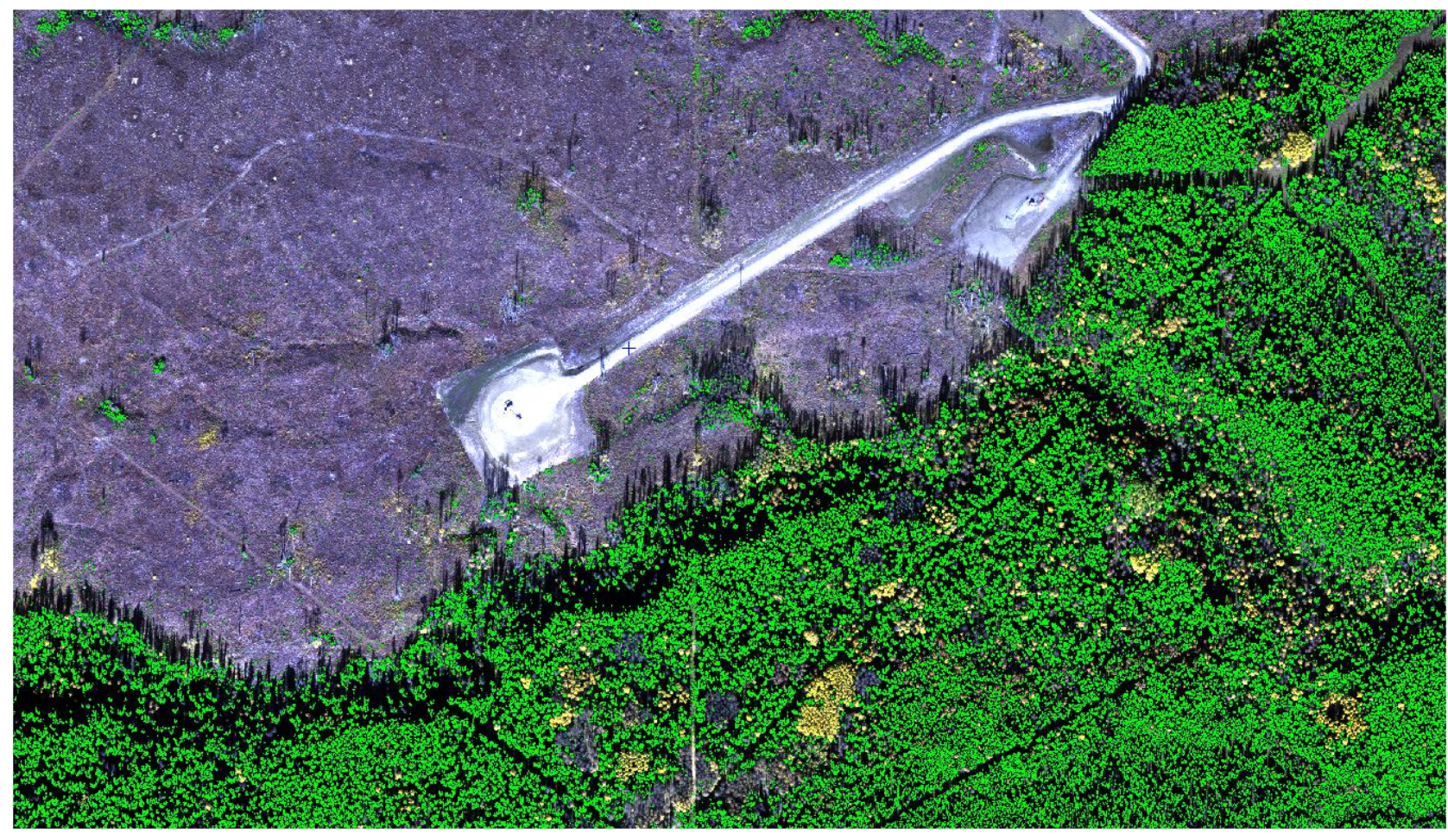
where *Dw* = oven-dry weight; *W* = Air dried weight including moisture; and *M* = moisture content on total weight basis (%). A moisture content of 8%<sup>10</sup> is assumed for wheat grain.

**Data/Science Limitations and Gaps:**

- Data is coarse:
  - The aim is to get the data to the township level but what is reported is at the Census Division level;
  - Data is not spatially explicit to the level of resolution;
  - Quality of data is not expressed;
  - Seasonal variation not reported;
  - Impact of climate on data is unknown.
- Moisture content was assumed. It comes from studies in North Dakota and Washington State.

<sup>10</sup> Frear et al. Assumes 8% moisture content for Wheat, Barley and Oats, KJAS (1996)

# Populating the Framework – Advanced Inventories



- Compositional Analysis
  - Structural carbohydrates
  - Lignin
  - Protein
  - Ash
  - Non-Structural materials
  - Phosphorus
  - Nitrogen
  - Potassium
  - .....
- Why are these important – tactically?
  - Functional Business Strategy
  - Reducing uncertainty in the bio-economy
  - Bring biomass supply and demand chains closer together



- Other Ecosystem Services
  - Working with Alberta Biodiversity Monitoring Institute to incorporate their ecosystem service modeling and mapping into the BRIMS framework.



- Capital Power
- McKenzie County
- Alberta Industrial Heartland Association
- University of Alberta Research
- Government of Alberta Economic Dashboard Team
- Olds College





- Completed 5 community biomass supply analysis leveraging BRIMS data.
  - County of Grande Prairie No. 1
  - Lethbridge County
  - Town of Whitecourt
  - Town of Sundre
  - Town of Drayton Valley





# BRIMS Web Application

**BIO-RESOURCE INFORMATION MANAGEMENT SYSTEM** SIGN IN OR SIGN UP | CONTACT US ABOUT HELP

**HOME COMPARE**

SELECT REGION PAN IDENTIFY MEASURE FIND IMPORT SHAPE EXPORT MAP

**TOOLS** FIND IMPORT/EXPORT

**LAYERS LEGEND**

**Region Layers**

- Townships
- Land Use Framework
- Counties and Municipal Districts
- FMA
- Green White Area

**Other Layers**

- Biomass Distribution
- Ecosystem Services
- Aboriginal & Métis
- Alberta Provincial Boundary
- Alberta Township System
- Department of National Defence
- Forestry
- Green/White Areas
- Hydrography
- Infrastructure

**CROP RESIDUE**

**Selected Area**

Admin Boundary Type	Name	Area (ha)
<input checked="" type="checkbox"/>	Counties and Municipal Districts Northern Sunrise County	2,187,966
<input checked="" type="checkbox"/>	Counties and Municipal Districts Municipal District of Opportunity No. 17	3,051,922
<input checked="" type="checkbox"/>	Counties and Municipal Districts Municipal District of Lesser Slave River No. 124	1,082,858
<b>Total:</b>		<b>6,322,746</b>

**Biomass Summary**

Name	Mass (tonnes)	Energy (GJ)	Nitrogen (tonnes)	Potassium (tonnes)	Phosphorus (tonnes)	Carbon (tonnes)
<input checked="" type="checkbox"/> Agriculture (21)	317,703	5,399,819	3,024	3,965	0	163,550
<input checked="" type="checkbox"/> Crops (11)	317,703	5,399,819	3,024	3,965		163,550
<input type="checkbox"/> Crop Seed (5)	0	0	0	0		0
<input checked="" type="checkbox"/> Crop Residue (6)	317,703	5,399,819	3,024	3,965		163,550
<input checked="" type="checkbox"/> Wheat	122,698	2,263,771	981	1,595		53,250
<input checked="" type="checkbox"/> Barley	0	0	0	0		0
<input checked="" type="checkbox"/> Oats	7,963	144,129	52	191		3,719
<input checked="" type="checkbox"/> Canola	139,120	2,177,226	793	1,460		84,584
<input checked="" type="checkbox"/> Tame Hay	47,923	814,693	1,198	719		21,997
<input checked="" type="checkbox"/> Other	0					
<input type="checkbox"/> Livestock (10)	0	0	0	0	0	
<input type="checkbox"/> Forestry (64)	0	0				
<input type="checkbox"/> Municipal Solid Waste (6)	0		0	0	0	
<b>Total</b>	<b>317,703</b>	<b>5,399,819</b>	<b>3,024</b>	<b>3,965</b>	<b>0</b>	<b>163,550</b>

200km 100mi | Approx Map Scale 1.9244649 | 33113.38E, 6723998.78N

**SAVE SCENARIO RENAME SCENARIO DOWNLOAD DATA**

- Growing interest in the supply of biomass and other ecosystem services
- BRIMS collates data from various sectors into a comprehensive database
- BRIMS will provide an interactive web application for mapping and reporting on biomass & other ecosystem services in Alberta



## Thank You



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Jordan.Hayes@silvacom.com