End Product-Based Inventory Valuation To Support Multi-Use Forest Management

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Outline

- Background/Roles of forests
- Forest management paradigm shifts
- Options of forest resources development
- Ideal strategy and approach of implementation
- Conditions for multiple-use forest management
- Recognition and valuation of forest inventory
- Mapping major fibre attributes
- Forest wood fibre value simulation model

Forestry in Global Economy & Human Life

- Global forest resources (FAO-FRA 2010)
  - Cover 31% of total land area (~4 billion ha) = ~0.6 ha per capita
  - 80% are publicly owned
  - Primary forests: 36%; planted forests: 7%; natural regeneration: 57%
  - Forest functions: production 30%; protection 8%; conservation 12%; multiple use 24%; social services 4%; other use or unknown 23%
  - Wood removal: 3.4 billion m3/year (~ half for wood fuel); >US$100 billion/year in 2003-07 mainly from industrial roundwood, but they have since fallen sharply
- Well-being of forest dependent and/or related communities
  - ~10 million people are employed in forest management and conservation
- Necessity of ordinary common life style
  - Housing, furniture, etc.

Reality Check / Background

- Our planet is changing – always changing in terms of climate and the way of doing business (globalization)
- Forest sector downsizing, market shrinking, demand reducing, job losing
- Climate change
  - "Paying the Price: the Economic Impacts of Climate Change for Canada" by "The National Round Table on the Environment and the Economy" - between $21 billion and $43 billion annually by 2050, focusing on threats to coastal regions, forests and human health;
  - $17 billion a year by 2050 because of forestry losses in BC
- How to meet the challenges while maintaining long-term sustainability? How to keep current generation survived?

Current Forest Conditions

- Canada has vast amount of forest resources
  - 46% coverage of total land ~ 400 million hectares;
  - 93% are public owned;
- Challenges in the responsible, reasonable, and optimal development and utilization of forest resources
- Balance between the sustainability of forest resources and competitiveness in economic opportunities

Forest Management Paradigm Shifts

- The goal of forest resources management has been shifted from sustained yield, to maximal sustainable yield, to ecosystem-based management, and to the adaptive management;
- The paradigm has also been shifted from volume-based to value-based, and from emphasizing single objective of economic maximization of forest products to the multiple objectives of both forest products and ecosystem services for balancing regional economic development and eco-environmental improvement.

Recognize Values that Forests Can Provide to Human Society

- Traditional products: solid wood, pulp and paper, veneer, plywood, etc.
- Value-added new products for meeting market demands (chemicals);
- None-traditional products: biomass, bio-energy;
- Non-timber and/or non-monetary values: habitat, biodiversity, carbon, hydrology, other ecosystem services.

Options of Forest Resources Development

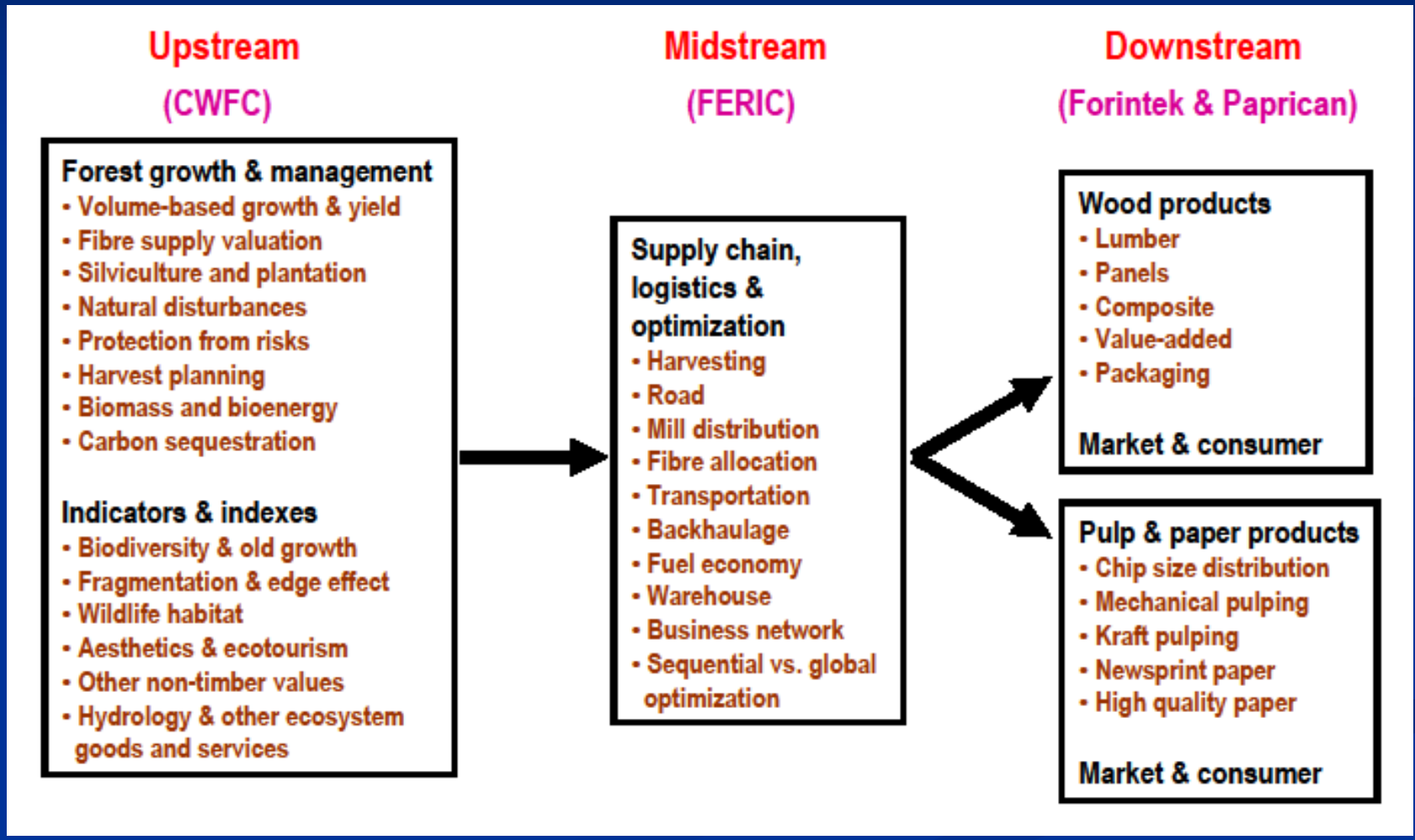
- Long-term production strategy of forest resources
  - What to produce in order to meet future needs?
    - Species for plantation or natural regeneration is enough
    - Wood fibre attributes for specific future products
  - Balance between uniformity and complexity
    - Diverse species composition or single species only
    - Variety of fibre attributes or targeted fibre attributes
  - Risk assessment of production strategies
    - Uncertain about future needs

Options of Forest Resources Development

- Short-term utilization strategy of forest resources
  - The best utilization strategy can maximize benefits from entire chain
    - Including timber & non-timber products, and ecosystem goods and services
  - Towards full, multiple, and optimal utilization strategy
    - Full: when not only the best quality wood fibre is used
    - Multiple: when the use is not limited to wood and pulp and paper products; also used for biomass production of bio-fuel and bio-refinery and it could potentially be used for carbon credit, as well as other non-timber values
    - Optimal: matches the right fibre to the right product at the right market time
  - Value-based strategic assessment
    - Forest management paradigm shifting from volume- to value-based
    - Balanced product valuation and index evaluation

Ideal utilization strategy

- Concept of forest product value chain



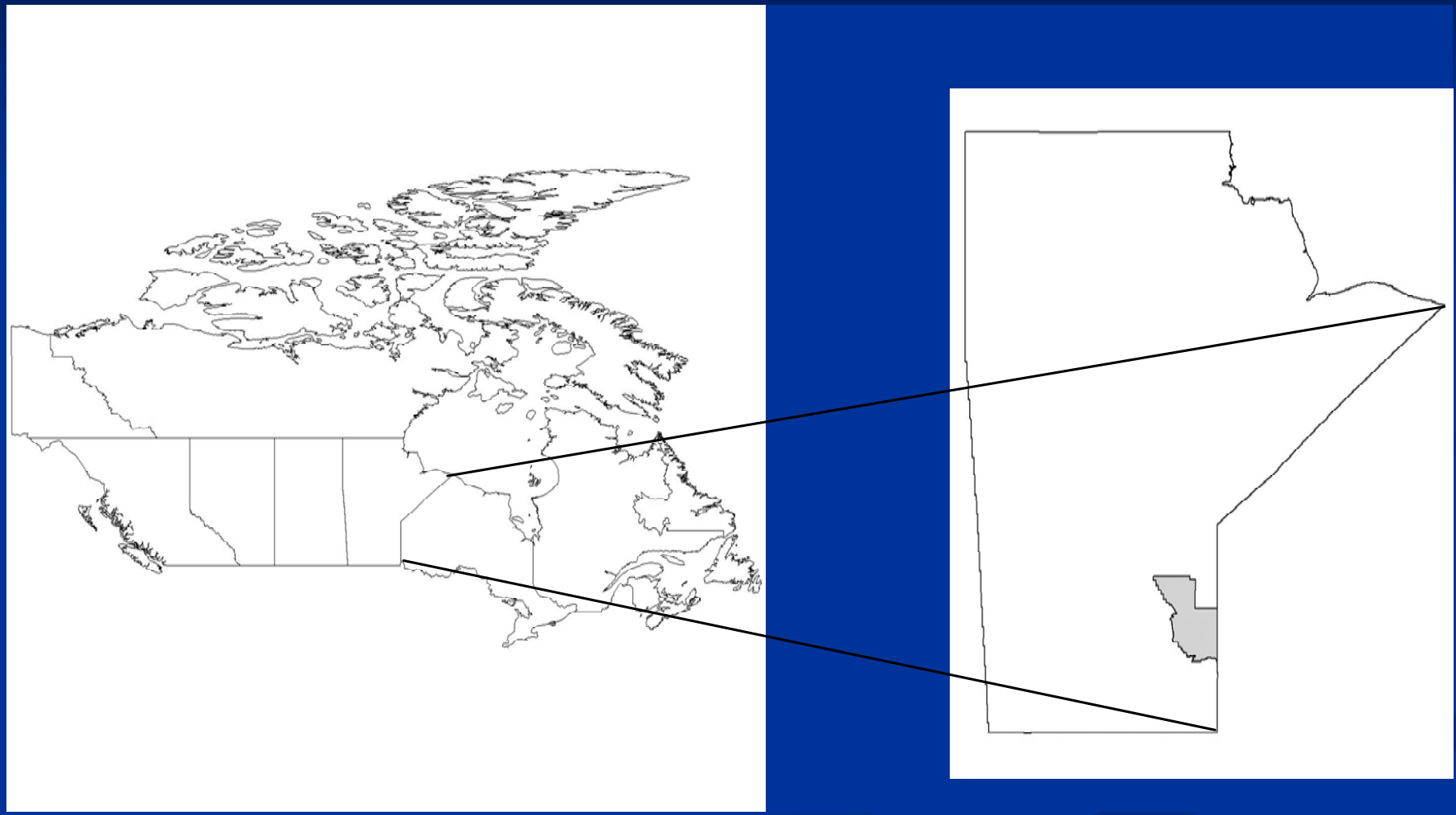
Critical Issues

- Basic information availability
  - What wood fibres are available
  - Where they are about
  - When and how many they will be available
- Wood fibre valuation under different utilizations
  - Net value = value creation – costs (supply chain optimization)
- Utilization decision making
  - To match right fibre at right place at the right market time including timing and pricing (optimization across value chain)
- Human behavior influence
  - Optimization results are not always accepted

Implementation Strategy

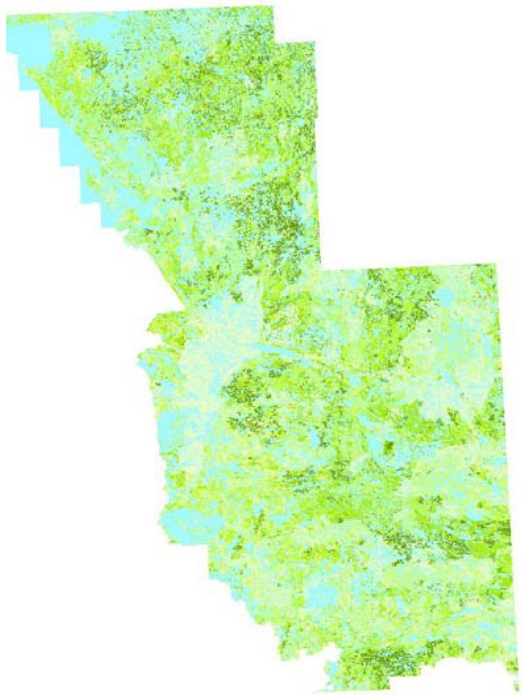
- Top-down approach:
  - Mapping major fibre attributes based on existing inventory;
  - Linking fibre attributes to crown characterizations;
- Bottom-up approach:
  - Scaling-up tree variables to plot/stand characteristics;
  - Valuating inventory by utilization and/or end products;
  - Reconstructing stand structures;
  - Simulating silviculture treatments for future production systems.

Mapping Major Fibre Attributes



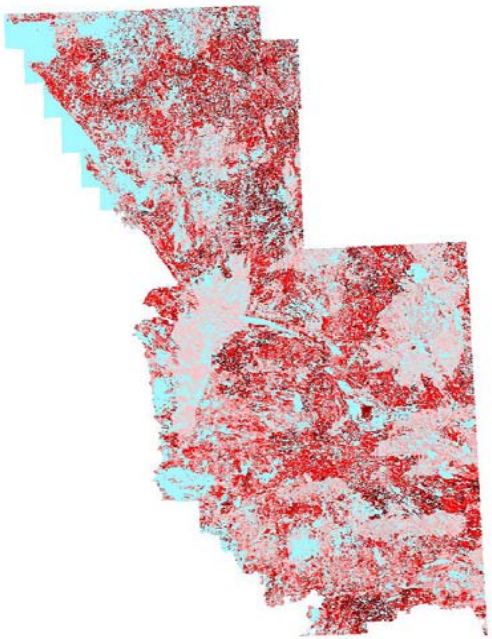
Mapped Fibre Length & Wood Density

Fibre Length (mm)
- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 3.5
- 3.5 - 4
- No Data

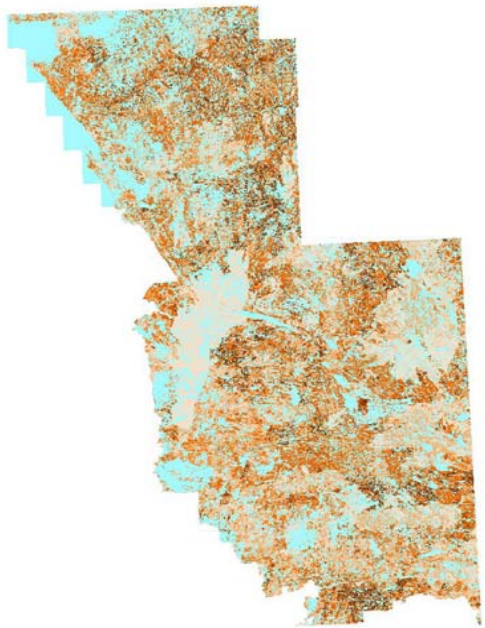


Wood Density (Kg/Ha)
- 0
- 1 - 8000
- 8000 - 16000
- 16000 - 24000
- 24000 - 32000
- 32000 - 40000
- 40000 - 48000
- 48000 - 56000
- 56000 - 64000
- No Data

Mapped Pulp Yield

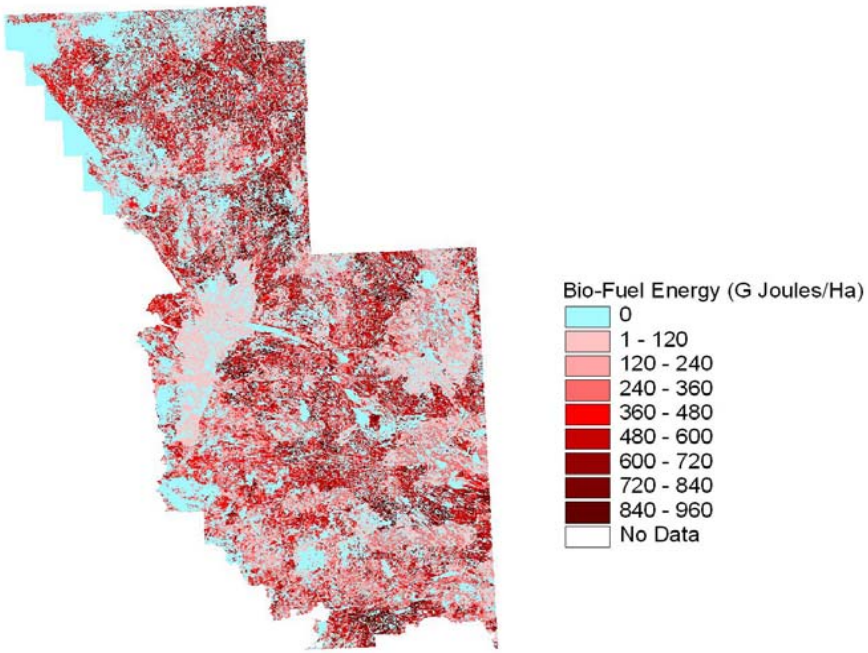


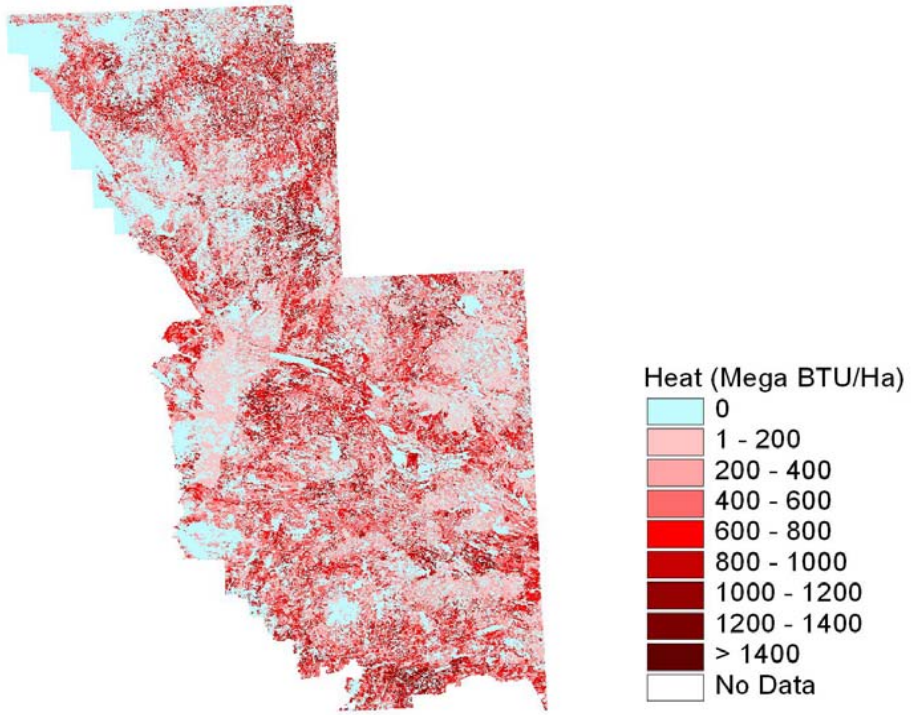
Pulp (Kg/Ha) Sulfite
- 0
- 1 - 4000
- 4000 - 8000
- 8000 - 12000
- 12000 - 16000
- 16000 - 20000
- 20000 - 24000
- 24000 - 28000
- 28000 - 32000
- No Data



Pulp (Kg/Ha) Kraft
- 0
- 0 - 3500
- 3500 - 7000
- 7000 - 10500
- 10500 - 14000
- 14000 - 17500
- 17500 - 21000
- 21000 - 24500
- 24500 - 28000
- No Data

Mapped Bio-Fuel & Heat Value





Valuation of Forest Inventory

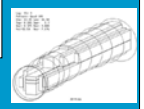
- Solid wood – dimensional lumber products;
- Chip residual – amount depending upon the lumber recovery rate, utilization standard;
- Mill waste – biomass usage;
- Whole tree biomass, bio-energy, and bio-products;
- On-site carbon stock and sequestration potential;
- Other ecosystem services:
  - Wildlife habitat – eco-tourism and recreation;
  - Biodiversity protection;
  - Hydrology and soil properties;
  - Agro-forestry and understorey (mushrooms & plant extracts).

The WFVSM is an integrated information system that links tree and stand characteristics (inventory) with internal fibre attributes, supply chain costs, and end-product based value options.

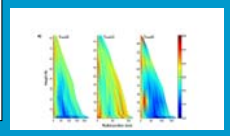
Databases → Product Options → Product Values

Levels
Plot
Operational
National

Forest Inventory
Species composition
Stand type
Stand structure
Stand mosaic

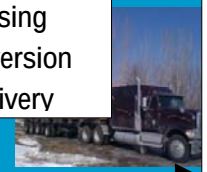


Fibre Attributes
Fibre length
Wood density
Coarseness
Strength
Uniformaty
MFA
MOE



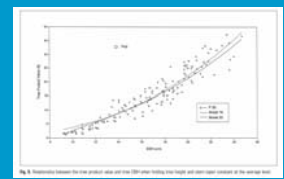
Product Options
Lumber
Pulp
Veneer
Plywood
OSB
Value-added
Sawdust
Biomass
Carbon credit
Non-timber products

Supply Chain Costs
Timber harvest
Log sort & segregation
Distance to mills
Hauling & transportation
Road investment
Log storage
Mill processing
Product conversion
Product delivery

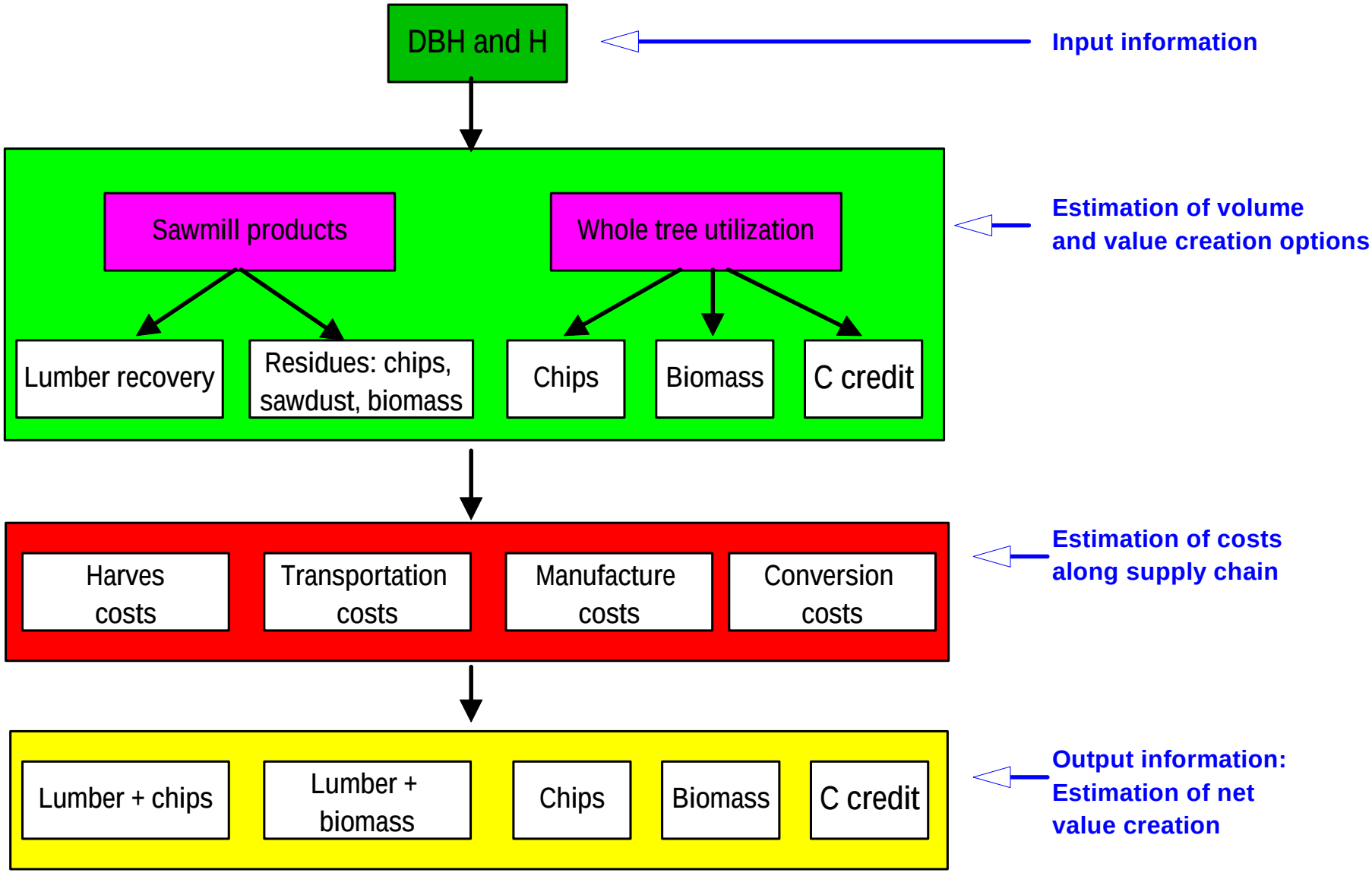


Unit Price List

Product Values
Lumber value
Pulp value
Veneer value
Plywood value
OSB value
Value-added value
Sawdust value
Biomass value
Carbon credit value
Non-timber values



Valuation of Inventory by End-Products



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File View Simulation Tools Action Window Help

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Report1

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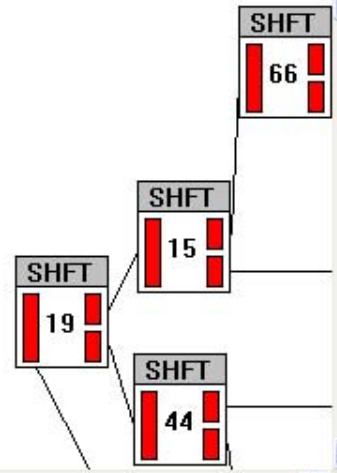

Products V7.d2x

Thickness (cm)	Width (cm)	Length (cm)	Grading ru
2.286	7.061	185.420	planche
2.286	7.061	246.380	planche
2.286	7.061	307.340	planche
2.286	7.061	369.570	planche
2.286	7.061	429.260	planche
2.286	7.061	491.490	planche
2.286	9.682	185.420	planche
2.286	9.682	246.380	planche
2.286	9.682	307.340	planche
2.286	9.682	369.570	planche
2.286	9.682	429.260	planche
2.286	9.682	491.490	planche
2.286	14.922	246.380	planche
2.286	14.922	307.340	planche
2.286	14.922	369.570	planche
2.286	14.922	429.260	planche
2.286	14.922	491.490	planche
4.369	7.061	185.420	colombage
4.369	7.061	212.090	colombage

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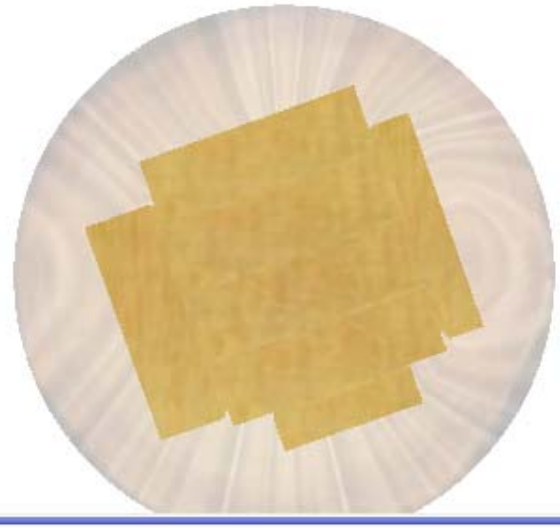

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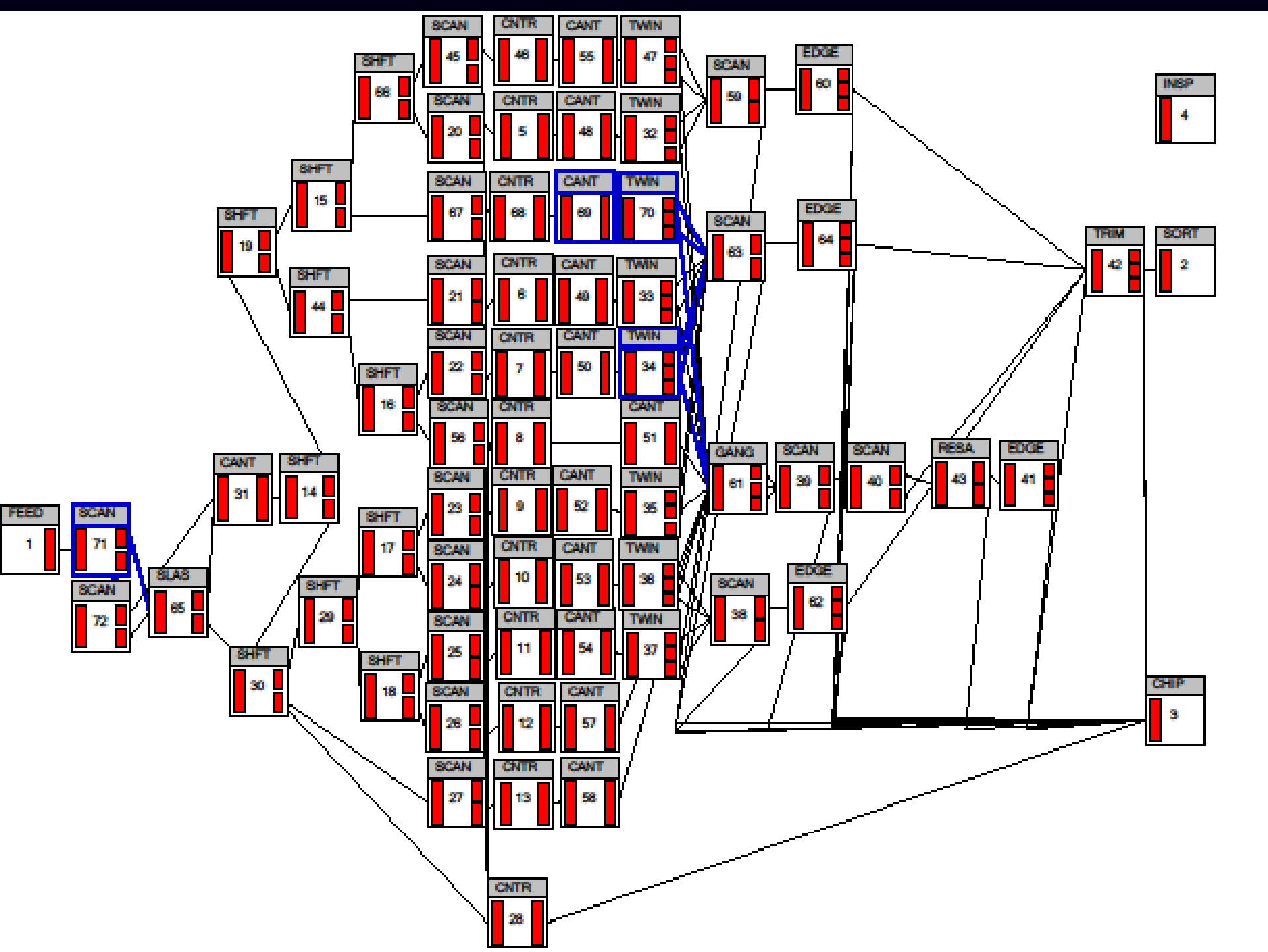
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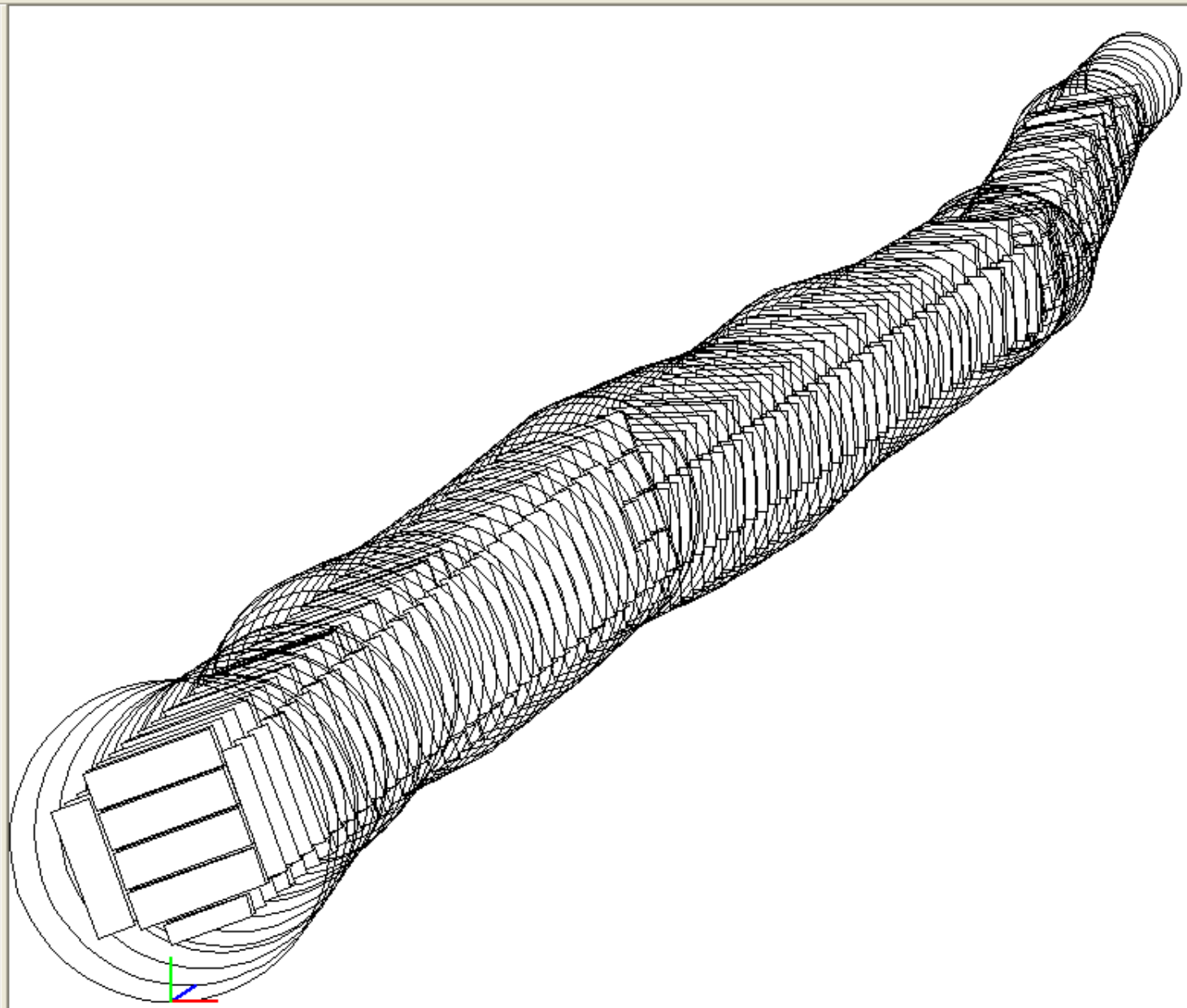

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