

SHORT STORIES OF INNOVATIONS FROM OUR CANADIAN FORESTRY OPERATIONS

SWEDEN CANADA INNOVATION DAYS 2024
ONTARIO INVESTMENT AND TRADE CENTER,
TORONTO
OCTOBER, 2024

Pierre Cormier
Vice-President, Forestry and Woodland Operations Quebec-Ontario
Resolute Forest Products

Pour usage interne seulement.



PAPER EXCELLENCE GROUP

STRONGER TOGETHER



Resolute Forest Products' roots spread out across two centuries, over 20 predecessor companies, multiple countries and hundreds of communities.

On March 1, 2023, Resolute began the next chapter of our 200-year history as we joined the Paper Excellence family of companies. The Paper Excellence Group is a private holding company that oversees individual pulp, paper, packaging and wood products business units. Founded in 2006, the Group has grown through acquisitions, in Canada, Europe, Latin America and the United States.



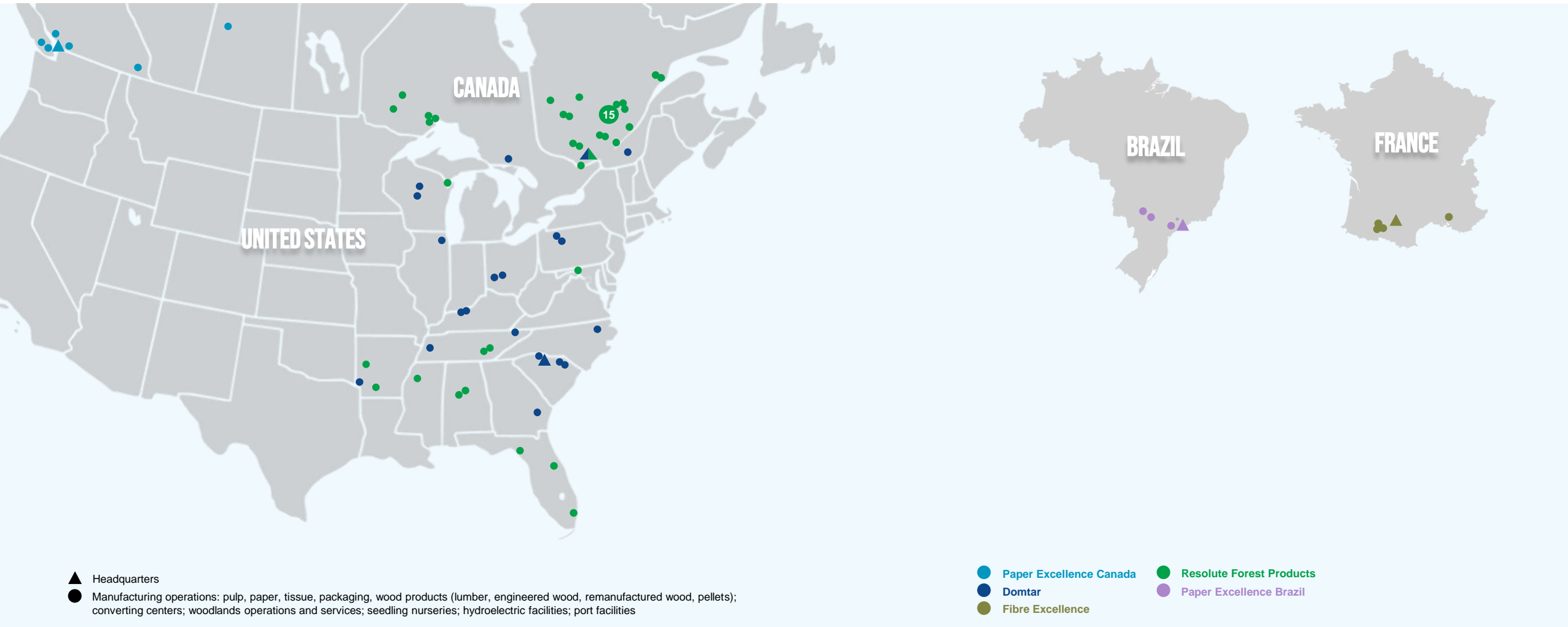
The Group is comprised of:

- 2006: Paper Excellence Canada (Canada)
- 2010: Fibre Excellence (France)
- 2017: Paper Excellence Brazil (Brazil)*
- 2021: Domtar (Canada, U.S.)
- 2023: Resolute Forest Products (Canada, U.S.)

* Paper Excellence Group currently owns 49.41% of the Eldorado mill and has a contractual right to purchase the remaining 50.59%.

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PAPER EXCELLENCE GROUP LEADERSHIP TEAM

The Paper Excellence Group is a privately held manufacturer of pulp, paper, packaging, tissue and wood products, with a workforce of more than 21,300 in some 60 locations across the Americas and Europe. The Group has an annual production capacity of more than 12 million metric tons of pulp, paper, packaging and tissue, as well 3.1 billion board feet of lumber and other wood products.



Pulp

Northern bleached softwood kraft (NBSK), northern bleached hardwood kraft (NBHK), southern bleached softwood kraft (SBSK), southern bleached hardwood kraft (SBHK), bleached chemi-thermomechanical (BCTMP), recycled bleached kraft (RBK), bleached eucalyptus kraft (BEK), unbleached kraft (UKP), fluff, airlaid nonwovens



Papers

Uncoated mechanical, uncoated freesheet, coated groundwood, communication (printing and writing), newsprint, technical and specialty, food service, directory



Wood products

Lumber (studs and random lengths, premium and select grades, machine stress rated (MSR), decking boards), remanufactured wood (finger-jointed lumber, furring strips, bed frame components), engineered wood (flooring I-joists), wood pellets



Packaging

Recycled containerboard (linerboard, corrugated medium, sack kraft, other grades), industrial packaging



Tissue

Bath tissue, paper towels, facial tissue and napkins (for retail and away-from-home markets), tissue and towel dispensers

PAPER & PACKAGING BUSINESS UNIT*

PRESIDENT: STEVE HENRY

Canada

- Crofton, BC
- Port Alberni, BC
- Windsor, QC

United States

- Ashdown, AR
- Hawesville, KY
- Johnsonburg, PA
- Kingsport, TN
- Marlboro, Bennettsville, SC
- Nekoosa, WI
- Plymouth, NC
- Rothschild, WI

*Additional Locations

- Jesup, GA
- West Carrollton, OH
- Ariva Canada
- 8 converting facilities
- 10 regional replenishment centers



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resolute



Paper & Packaging business unit composed of legacy Domtar pulp, paper and packaging operations
+ legacy Paper Excellence Canada Crofton and Port Alberni mills

PULP & TISSUE BUSINESS UNIT*

PRESIDENT: RICHARD TREMBLAY

Canada

- Alma, QC
- Clermont, QC
- Dolbeau, QC
- Gatineau, QC
- Howe Sound, BC
- Kénogami, Saguenay, QC
- Meadow Lake, SK
- Saint-Félicien, QC
- Skookumchuck, BC

United States

- Calhoun, TN
- Coosa Pines, AL
- Grenada, MS
- Hialeah, FL
- Menominee, MI
- Sanford, FL

*Additional Location

- Hagerstown, MD
(tissue converting facility)



Pulp & Tissue business unit composed of legacy Resolute pulp, paper and tissue operations
+ legacy Paper Excellence Canada Howe Sound, Meadow Lake and Skookumchuck pulp mills

WOOD PRODUCTS BUSINESS UNIT*

PRESIDENT: LUC THERIAULT

Canada

- Atikokan, ON
- Château-Richer, QC
- Comtois, Lebel-sur-Quévillon, QC
- FP Mauricie, La Tuque, QC
- Girardville, QC
- Ignace, ON
- La Doré, QC (2 facilities)
- Larouche, QC
- Maniwaki, QC
- Mistassini, QC
- Opitciwan, Obedjiwan, QC*
- Outardes, Pointe-aux-Outardes, QC
- Saint-Félicien, QC
- Saint-Prime, QC
- Saint-Thomas, QC
- Senneterre, QC
- Thunder Bay, ON (2 facilities)

United States

- Cross City, FL
- Glenwood, AR

*Additional Locations

- Normandin, QC (planer mill)
- Saint-Prime, QC (lumber drying facility)
- Talladega, AL (chip mill)



* Société en Commandite Scierie Opitciwan is an unconsolidated entity in which Resolute has a 45% interest.



WHO WE WERE AS RESOLUTE- 2023



North American forest products company with a leading market presence

2023 sales
\$2.1 billion¹

Products marketed in
over **60** countries

100%
of managed woodlands certified
by independent third parties

6,000+
employees

INNOVATION

Commercial cellulose filaments, a sustainable biomaterial made from wood fiber, produced at our Kénogami (QC) paper mill

Truck platooning, involving a convoy of trucks linked together electronically, all operated by an experienced driver in the lead truck. The rest of the trucks in the convoy respond to the lead driver's movements through a drive-by-wire and autonomy system.

MARKET PULP 3 facilities²

794,000 mt/year of capacity

PAPER 6 facilities

1.2 million mt/year of capacity

TISSUE 4 facilities

128,000 st/year of capacity
(116,000 mt/year)

4 tissue machines
15 converting lines

WOOD PRODUCTS

Lumber (17 sawmills):
2.9 billion FBM/year of capacity

Remanufactured wood (2 facilities):
82 million FBM/year of capacity

Engineered wood (2 facilities):
90 million linear feet/year of capacity

Wood pellets (1 plant):
45,000 mt/year of capacity

ENERGY 12 facilities²

315 MW of total installed capacity

7 hydroelectric facilities
5 cogeneration/thermal power facilities

1. The 10-month period beginning March 1, 2023.

2. Excludes Paper Excellence Canada – Howe Sound (BC), Meadow Lake (SK) and Skookumchuck (BC) – pulp mills.

Note: Unless otherwise noted, amounts in this presentation are in U.S. dollars, and data reported is as at December 31, 2023.

Forest Operations Critical Skills and Valued Services



Transportation and Infrastructure

- Transportation efficiencies through higher payloads (introduction of new configurations, route approvals, vehicle dynamics, regulatory approvals, infrastructure impact assessments)
- Reducing GHGs and fuel consumption (testing and derisking LEV and ZEVs, tech integration, systems and infrastructure analysis, total cost of ownership assessments).
- Increasing the performance and longevity of resource roads (road design, maintenance, knowledge exchange, BMPs.)

Harvesting and fibre supply

- Maintaining resilient fibre supply (analytical platforms for modeling fibre supply cost and biomass assessments, deploying partial cutting systems, protecting communities from wildfire)
- Improving harvesting productivity and value delivery (productivity of harvesting systems, contractor training and BMPs, harvester head calibration, setting rate models)

Automation and Digital Transformation

- Using data to automate key functions, detect complex issues and identify root causes (Modeling, Data Analysis & Algorithm development, DigiHarvest, DigiTransport)
- Mitigating labor shortage through automation (integrating platooning/autonomous vehicles in operations, automating mill yard functions (loading/unloading and fibre movement) with automation, robotics and teleop technologies)

SHORT STORIES OF INNOVATIONS FROM OUR CANADIAN FORESTRY OPERATIONS

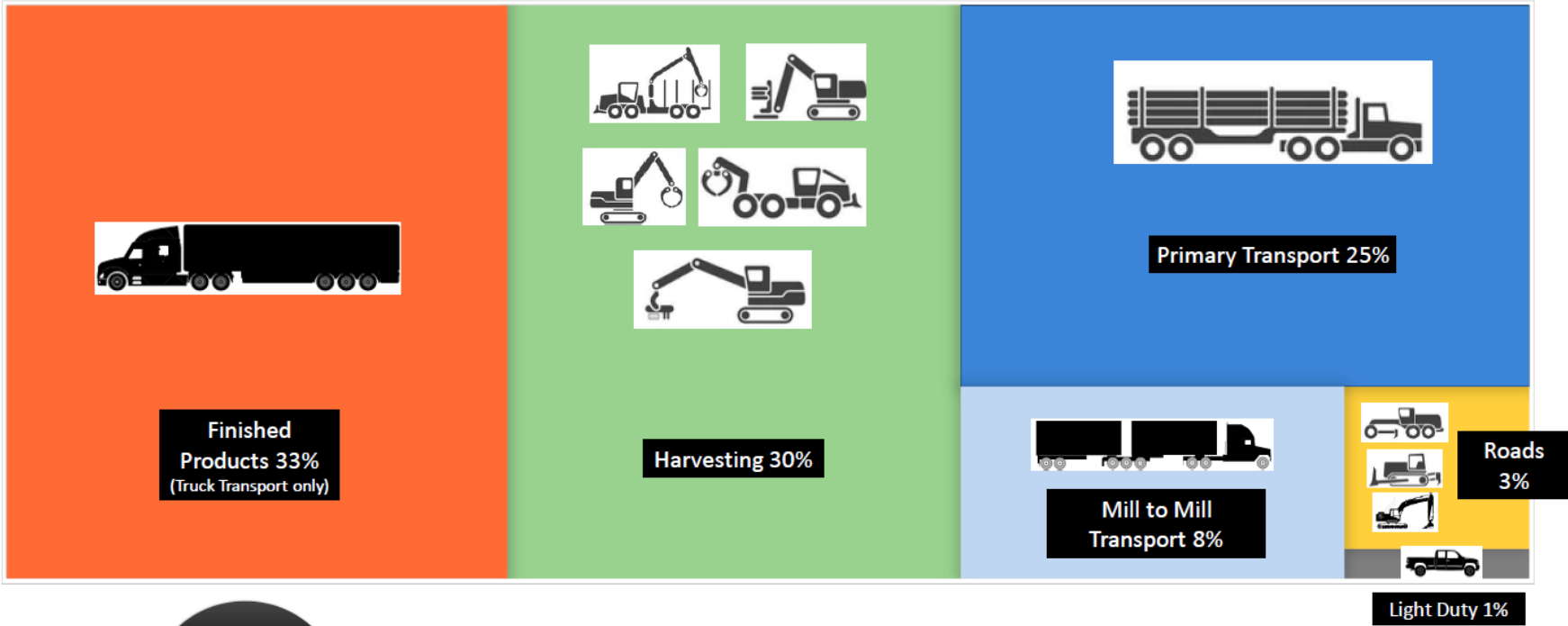


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GHG EMISSIONS BY ACTIVITY

95



66%
Transportation

Total GHG emissions: 6.7 MT CO₂ eq/year
~2.49 Billion L of Diesel (@2.7 kg CO₂e/L Diesel)

Sources: GHG emissions based upon FPInnovations GHG Benchmark data. Harvest levels as stated in The State of Canada's Forests – Annual Report 2019, Natural Resources Canada

Hybrid planetary trucks (Potential reduction fuel consumption 10 to 15%)

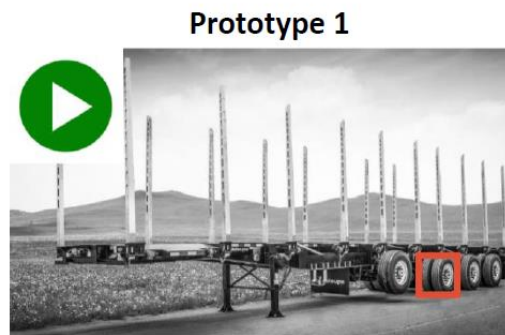


Truck	Consumption (L/100km)	Load (t)	Energy Intensity (L/t-100 km)
4-axle standard	62	35	1.77
4-axle lightweight	62	36	1.72
B-train	65	40	1.63
Off-highway 150t	130	105	1.24

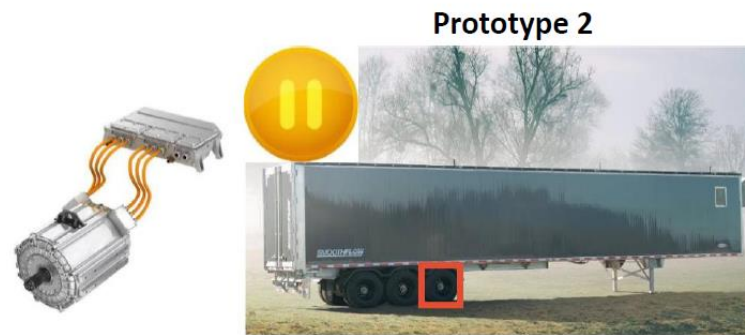
Hybrid harvester (Potential reduction fuel consumption 25%)



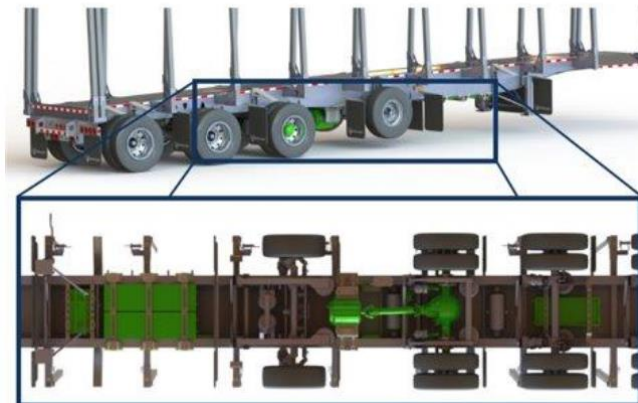
Electric trailer (Potential reduction fuel consumption 10%)



Deloupe



TYCROP Trailers



TRANSPORTATION AND INFRASTRUCTURE



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Pour usage interne seulement



Truck driver shortages hitting Canada's forest products sector



Trucking industry facing driver shortage



Ottawa-area transportation and logistics companies say they cannot fill the need for drivers

CBC News · Posted: Jul 15, 2018 4:00 AM ET | Last Updated: July 15



Features / Harvesting Logging Frontiers

Addressing the forest industry labour shortfall

May 1, 2018
by David Elstone



You Are Here: Home > News
> Report: Driver Shortage, Labour Demographics Concerning for Atlantic Trucking

**Report: Driver Shortage, Labour Demographics
Concerning for Atlantic Trucking**

Star Business Journal

Truck driver shortage raising prices, delaying deliveries

By PAUL DAVIDSON USA Today
Fri., April 27, 2018

Features / Harvesting Logging Frontiers

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PLATOONING INITIATIVE

THE NEED

Addressing the forest sector driver shortage



Driver shortage impact on forest sector

- 25,000 vacancies in trucking in Canada
- \$450M business losses due to driver shortage in forest sector (FPAC)
- Urgent need to find solutions to avoiding mill shutdowns due to lack of drivers

A SOLUTION

Autonomous platooning trucks



RADIO COMMUNICATION

Vehicles are electronically linked



GPS

Real time positioning (when available)



RADAR AND LIDAR

Object detection



CAMERA

High-definition object detection



- Platooning is the operation of electronically linked convoy of trucks.
- This technology had been developed for use on highways, with fuel savings in mind.
- The forest sector is interested in driverless operation of the follower truck as a solution to the truck driver labour shortage:
 - Leader truck = manually driven by an experienced driver
 - Follower truck(s) = driverless

THE TECHNOLOGY BEHIND AN AUTONOMOUS TRUCK

- Two Class 8 quad axel Mack trucks, equipped with:

- Autonomy Kit (A-kit)

- Autonomy Hardware/Software Enclosure
- Navigation Unit
- V2V Radio Communications
- LiDAR Sensors
- Radar Sensors
- HD and Thermal Cameras

- Drive-by-Wire Kit (B-kit):

- Electrically-driven control system
- Steering actuation
- Brake actuation
- Throttle control



AN OVERVIEW OF PHASE 1 TESTING



Phase 1 tests consisted of:

- 2 autonomous capable class 8 Mack Granite trucks supplied by Forterra.
- Empty quad axle semi-trailer (no payload).
- Leader truck = manually driven.
- Follower truck = safety driver.
- Demonstrate platooning technology on private forest roads in Quebec.
- Controlled access (gated).
- Lead and rear escort vehicles in place for safety.

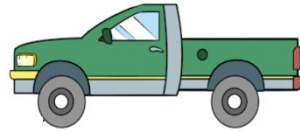
PLATOON IS A STEPPINGSTONE

Possible evolution for autonomy in the forest sector:

1st step = platooning



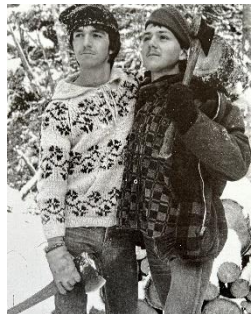
2nd step = escort
vehicle (pickup)
leading a convoy of
autonomous trucks



Fully autonomous
trucks is the ultimate
goal



HARVESTING AND FIBRE SUPPLY



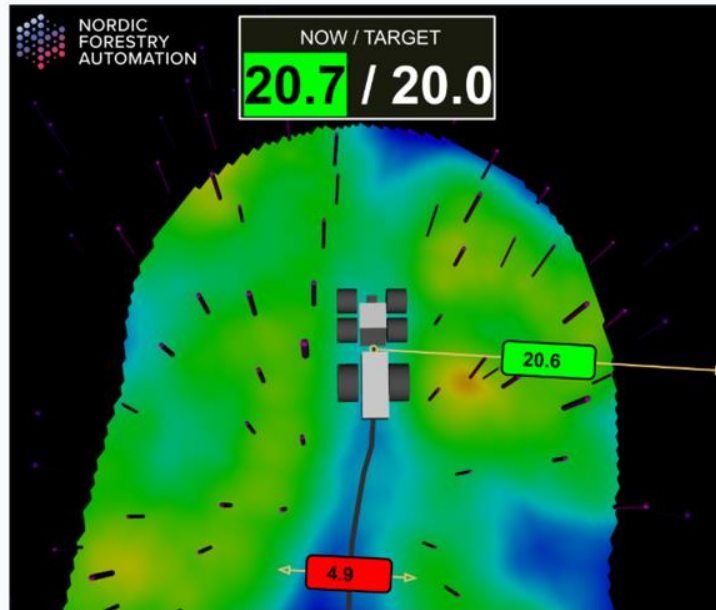
AI-powered Operator Support

The NFA operator support system continuously detects, positions, measures and classifies all trees around the machine. It also measures the position and orientation of the machine and harvester head with cm-accuracy. Using this information, the system provides:

1. Real-time feedback to the operator
2. A full before/after inventory (of individual trees) and report

Together, 1 and 2 enable systematic implementation of best practice forest management strategies, full transparency and quality assurance of the harvesting operation. The system is fully stand-alone, and can be retro-fitted to any machine.





Simple and intuitive user interface

The current user interface shows a live, third person view of the harvester, providing at-a-glance situational awareness based on the following components:

- A thinning target (top right) is automatically adjusted based on local density and height of the stand, and a harvest plan, determined by the forest owner.
- Current measurement (top left) is taken over the local area, and updated in real time when trees are being harvested. Highlighted green/red when inside/outside spec.
- A color map highlights the local tree density relative to the target (here red - too dense, blue - too sparse, green - spot on).
- Also, the interface shows red/green markers indicating whether lane width and distance is within spec.

The default view follows the cabin movements in real time, such that there is always a clear connection between the user interface and the view outside the machine.

LAC ST-JEAN WOODLAND TEST PARTIAL CUTTING



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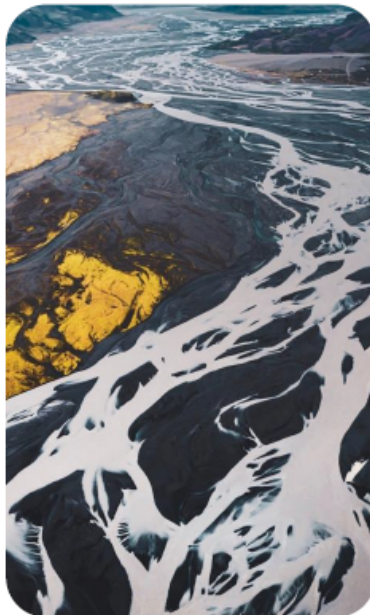




Founded by **world leading researchers and experts** within optimization and forestry

Built on the **vision to bridge the gap** between **advanced research** and **practical application**

Offers **world leading technology and solutions** within analysis and optimization in forestry and supply chain



Optimization,
already ahead

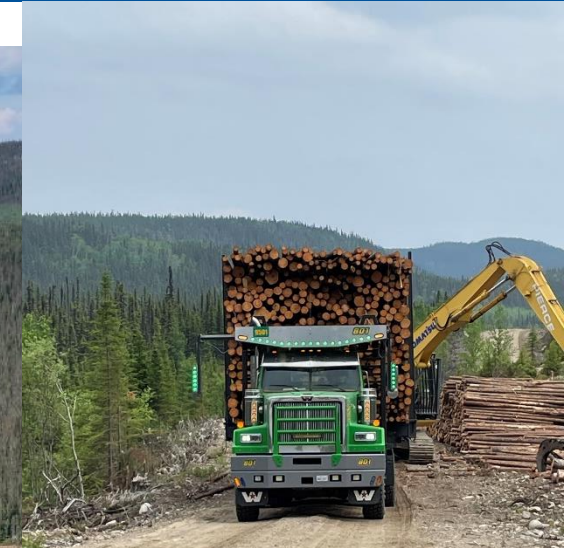
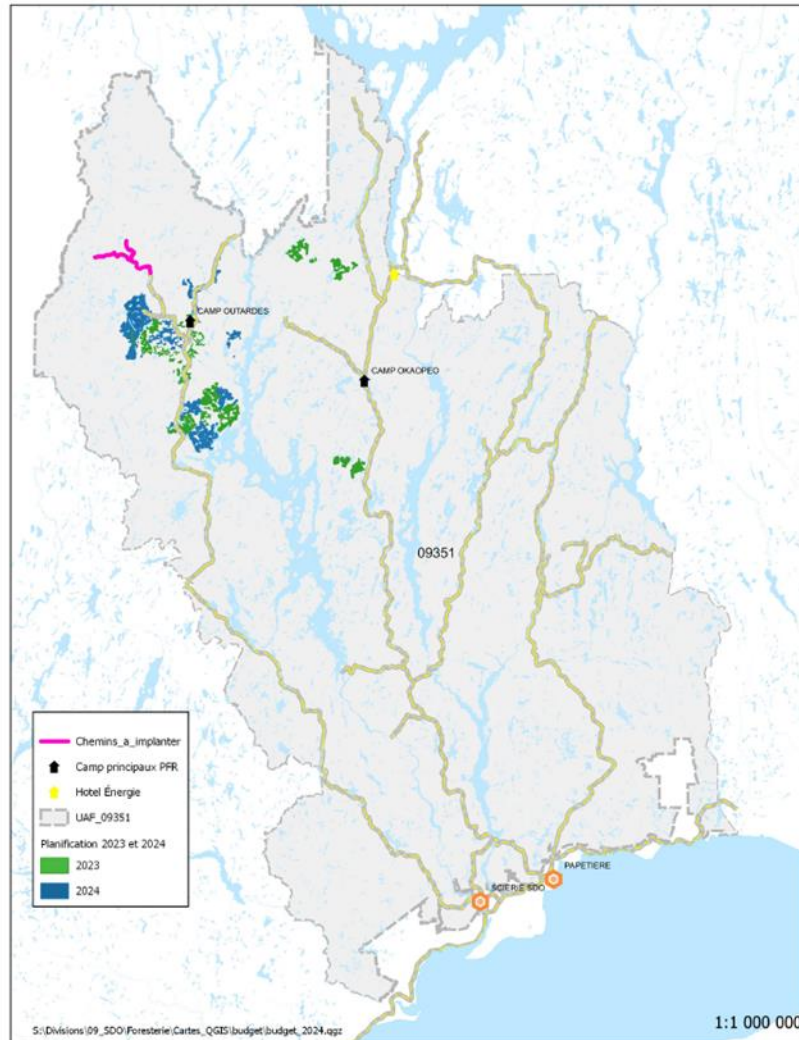


Think new.
Keep it
simple.
Share
insights.
Have fun.

NORTH SHORE OPTIMIZATION



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Timbertrail

Optimization enabling more efficient
harvesting in forest operations



Optimal extraction routes/roads



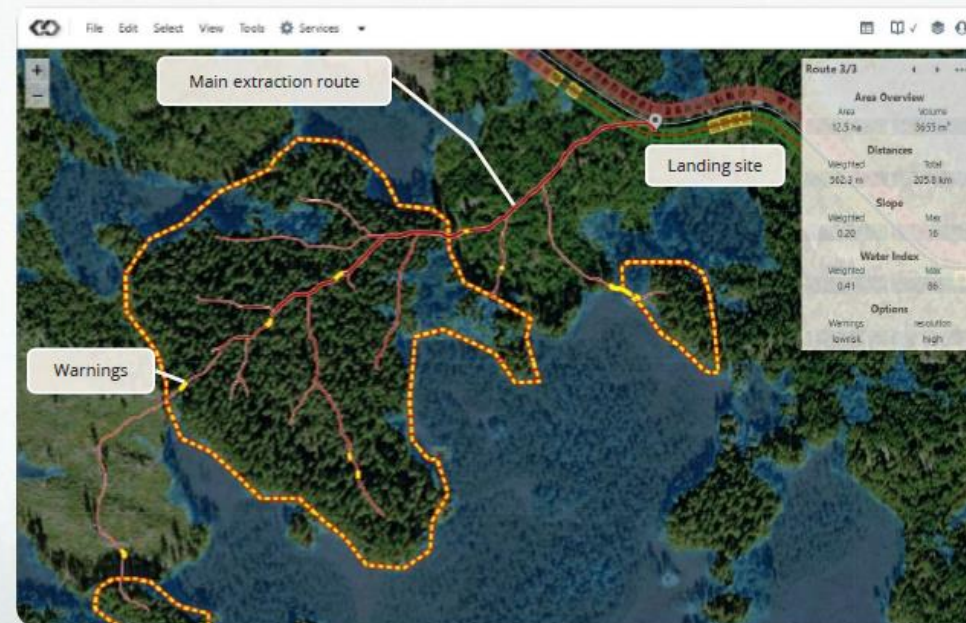
Minimize the risk of soil damage



Better and more efficient planning



Reduced energy consumption





OFFENSIVE TRANSFORMATION NUMÉRIQUE: SUIVI INTELLIGENT DE LA PRODUCTION À DISTANCE (SIPAD)

septembre 2023



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AUTOMATION AND DIGITAL TRANSFORMATION



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Stratégie à trois volets

- Garantir la précision
- Standardisation des données
- Communication

AVANTAGES

- Exemple concret pour un entrepreneur
 - Maintenance pro-active, état de fonctionnement de la tête optimal
 - 1 L/heure économie de carburant (3500 HMP/an)
 - Augmentation de la précision des longueurs
 - Bonus touché en augmentation de $.25\$/m^3$ (60 000 m^3 /an)
 - Avance payée à 95%, moins de problèmes de “cash flow”
 - Capacité de voir en “temps réel” la production de son équipement
- 3500 litres à $2\$/L = 7\ 000\ \$$
- 60 000 m^3 à $.25\$/m^3 = 15\ 000\ \$$
- Total des bénéfices à 22 000\$/an





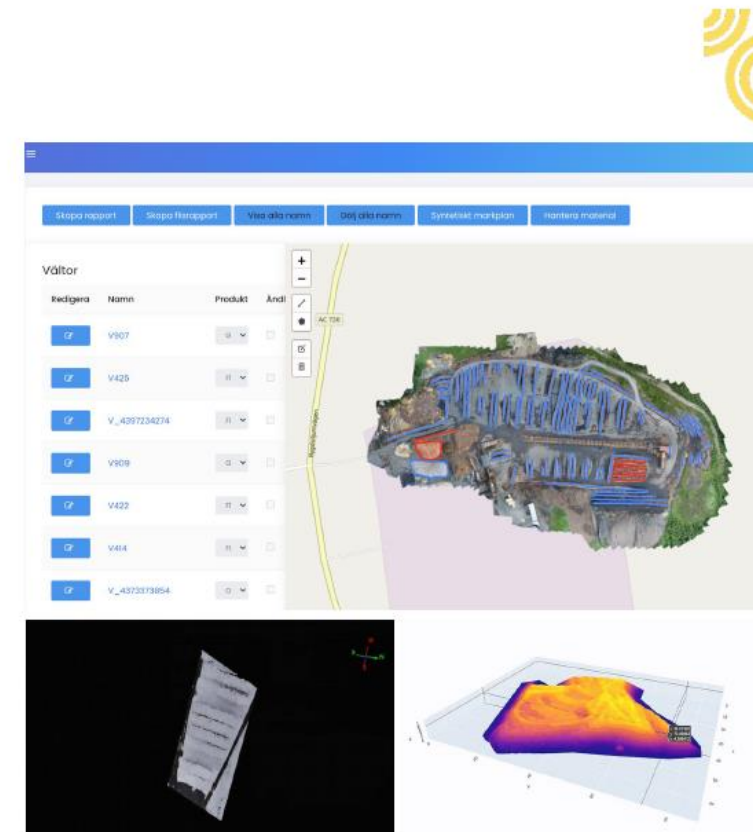
Quick, transparent & precise inventory
management of timber and woodchips

LumberScan – The platform

A self service platform to perform inventories of raw materials on storage areas

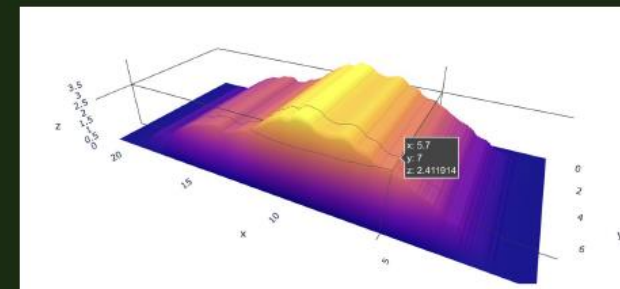
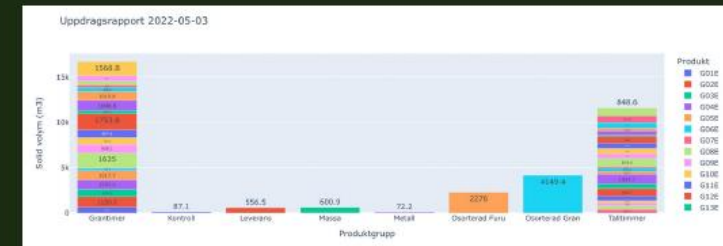
Useful for inventory of e.g

- Round wood
- Wood chips and shavings
- Garbage and recycling
- Gravel and other filling materials
- Return paper at ball and free range

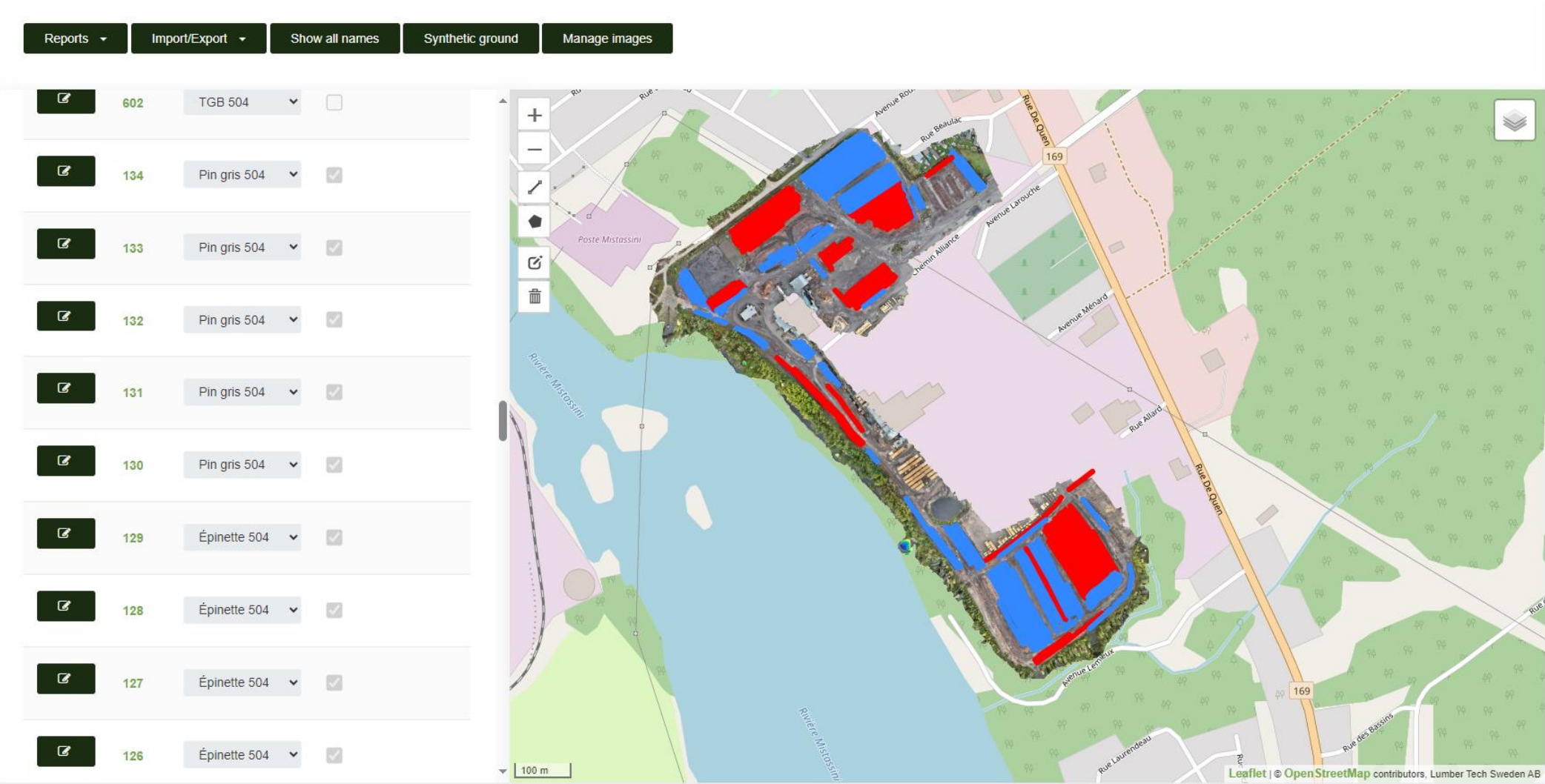


Transparent, traceable results

- Break down figures from totals to individual log stacks and measurements
- Ensure that the ENTIRE timber stand is included in the inventory results
- Easily correct mistakes without the need for an entirely new flight



COLLABORATION WITH LUMBERSCAN CHRISTOFFER ELDSKOTT LAC ST-JEAN PROJECT



COLLABORATION WITH LUMBERSCAN CHRISTOFFER ELDSKOTT LAC ST-JEAN PROJECT



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Reports ▾

Import/Export ▾

Show all names

Synthetic ground

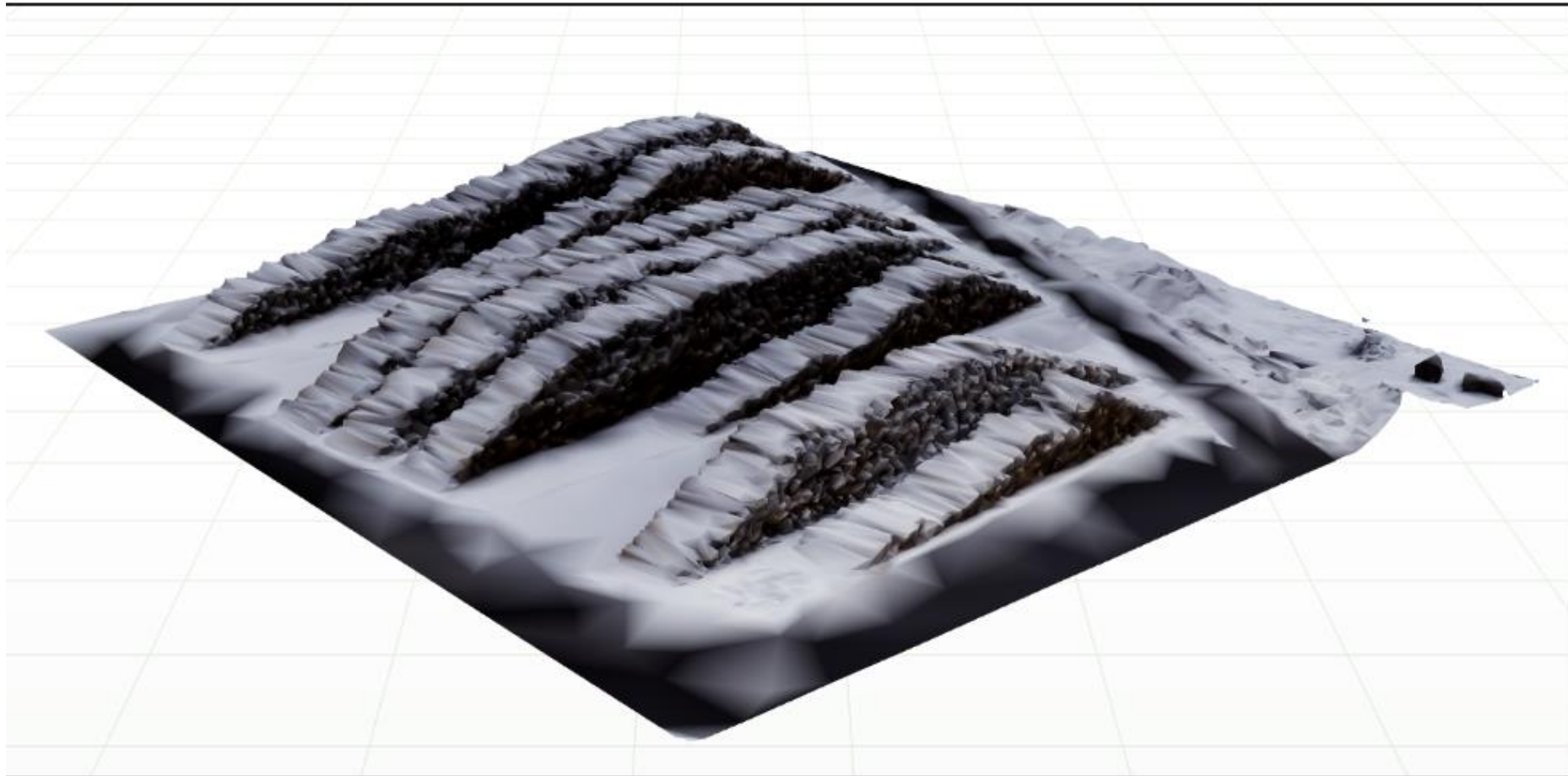
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	40A	Épinette ▾	<input type="checkbox"/>
	58-1	Épinette ▾	<input type="checkbox"/>
	R1	Épinette ▾	<input type="checkbox"/>
	G-D	SEPM-1 ▾	<input type="checkbox"/>
	G-E	SEPM-1 ▾	<input type="checkbox"/>
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COLLABORATION WITH LUMBERSCAN CHRISTOFFER ELDSKOTT LAC ST-JEAN PROJECT





DRIAD AI



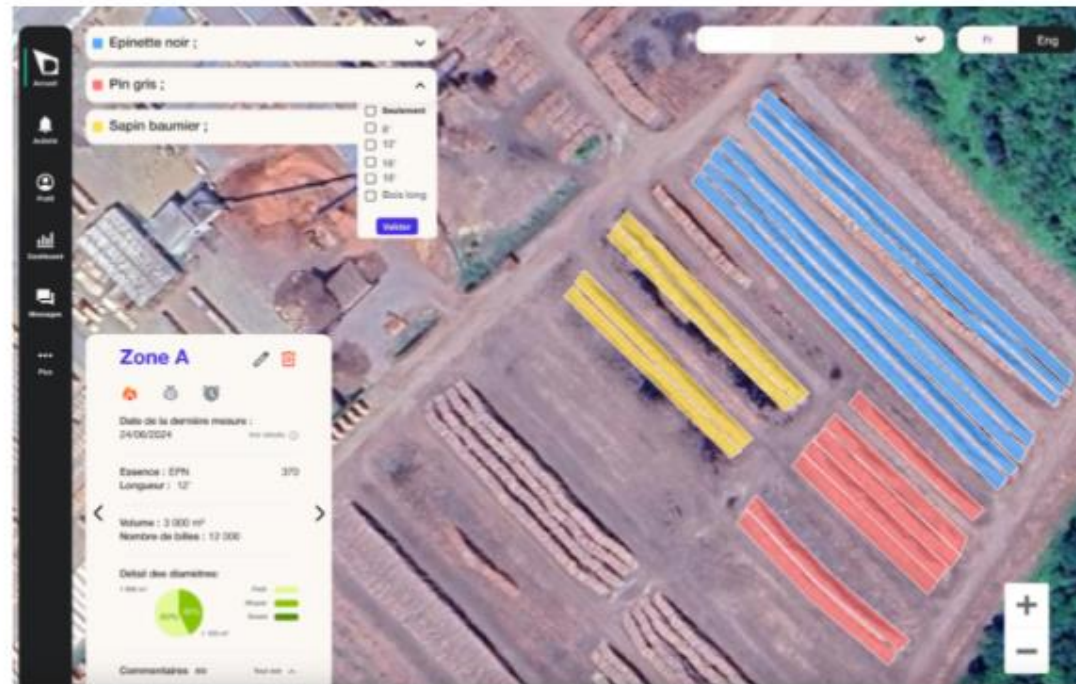
Christophe Gallant : christophegallant@driadai.com - 514-974-3001 - 6666 Rue St-Urbain, Montreal, H2S 3H1

Digitize Your Supply Chain: **AI, Scanners, and Woodyard Stock Management**



Stock interface

An interface designed for a quick overview of the available fiber stock in the woodyard or forest worksites. It differentiates between various products and provides detailed information about each woodpile. For example: total volume, number of logs, diameter sizes, reminders, comments, geolocation and more.



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At the end of the day...

- More collaborations
 - More innovations
 - More optimizations

 - Less machinery
 - Less operators
 - Less GHG
 - Lower cost

 - LET'S GO TO WORK. STEP BY STEP!!!
-

For a sustainable forestry !



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Sweden-Canada Innovation days
2024

