IRVING WOODLANDS SINCE 1882

Precision Forest Inventory in Strategic and Tactical Planning

Remsoft User Group, March 2026

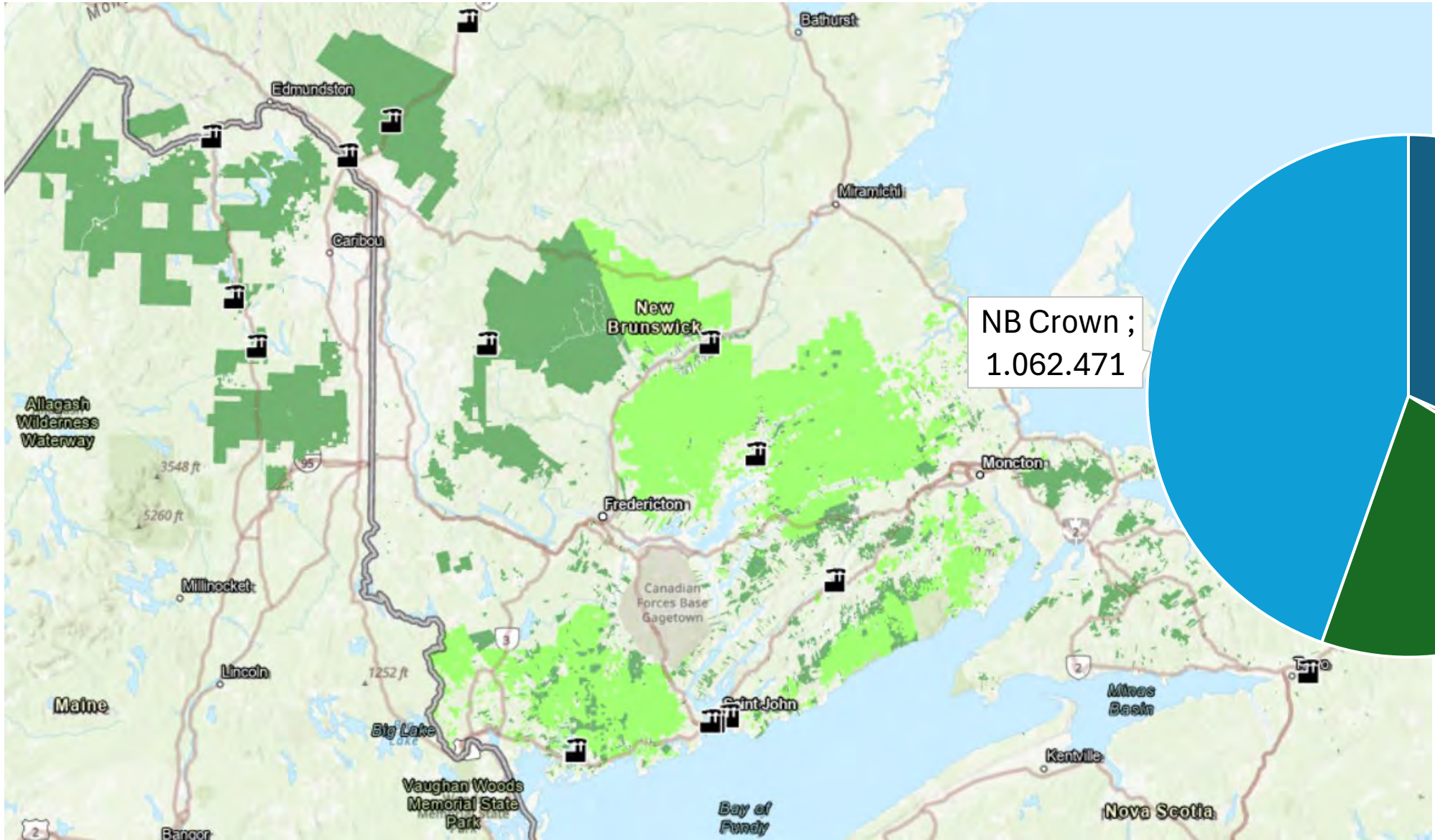
Overview

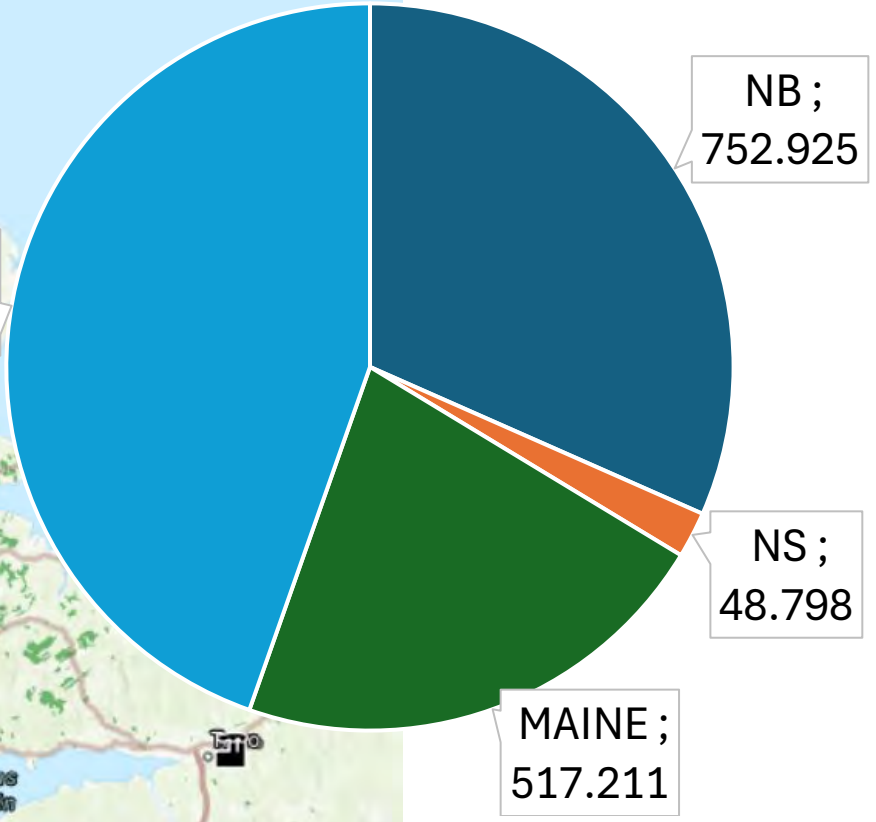
- JDI & Irving Woodlands
- Our Approach to Forest Inventory & GIS
- Forest Planning
  - Strategic Planning
  - Tactical Planning
- Wrap-up
- Questions

Themes

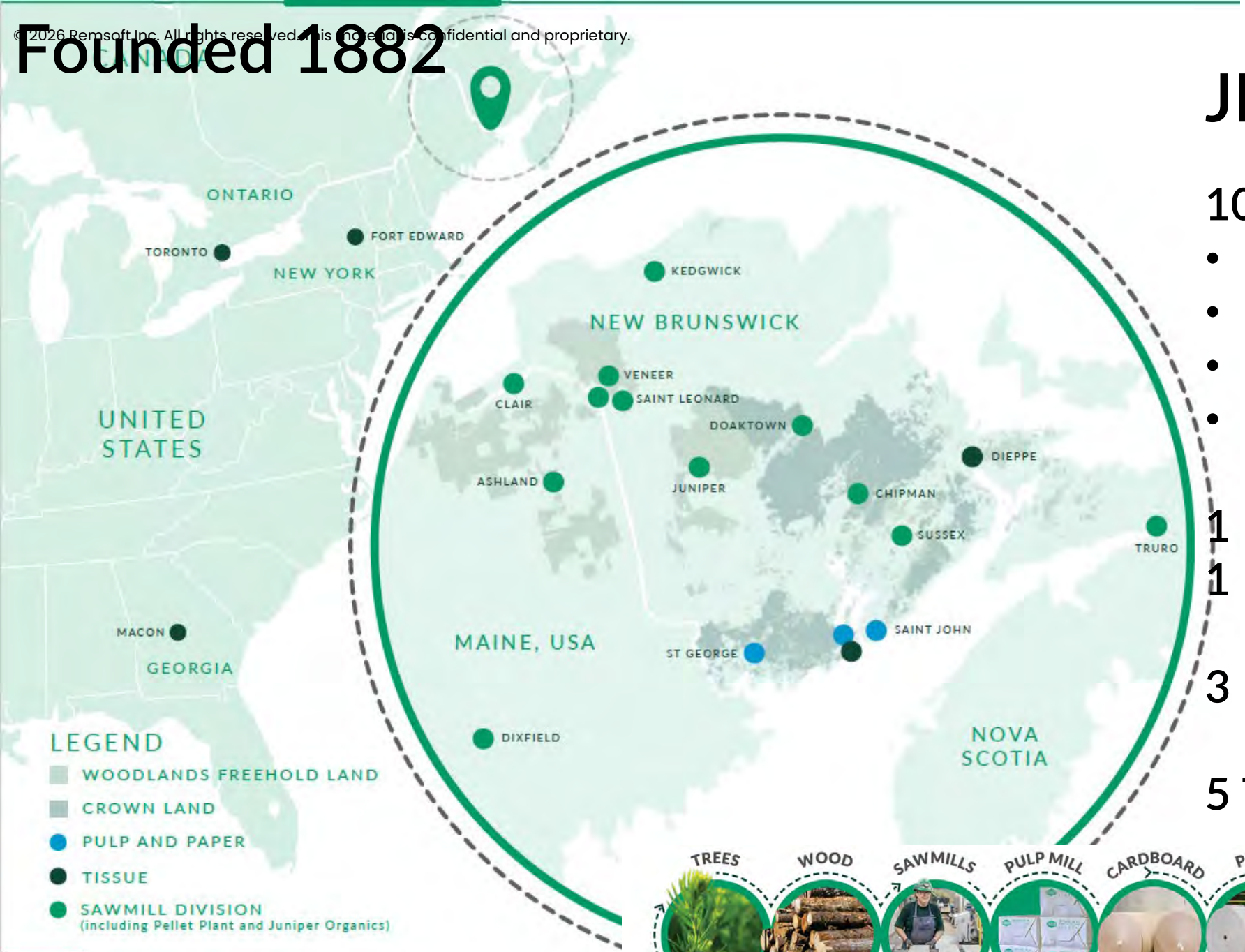
Precision with Purpose	Resolution applied where it changes decisions
Inventory as Planning Infrastructure	EFI as a database feeding models & tools
From Data to Decisions	EFI embedded in strategic and tactical planning
Scale Without Scale-Up	Automation, small teams, big impact

JDI MANAGED LANDS





Founded 1882



JDI Facilities

10 Sawmills
- 2 White Pine Specialty
- 1 Hardwood
- 1 Cedar
- 6 SFJ Sawmills

1 Pellet Mill
1 Peat Production Facility

3 Pulp and Paper Mills

5 Tissue Converting Facilities

Irving Woodlands

Woodlands division is a team of nearly 2,000 dedicated employees made up of:

- 400 Full-Time
- 300+ Students and Seasonal
- 435 Contractor Partners
- Over 800 Machine Operators, Truck Drivers, Manual Thinning Saw Operators Etc.

Digitalization

Getting better at what we do by leveraging technological innovation

1) Better understanding the resource
   - Better or new, timely information at scale

2) Becoming more efficient
   - Digital Supply Chain
   - Stem files from harvester head
   - Automation
   - Autonomation

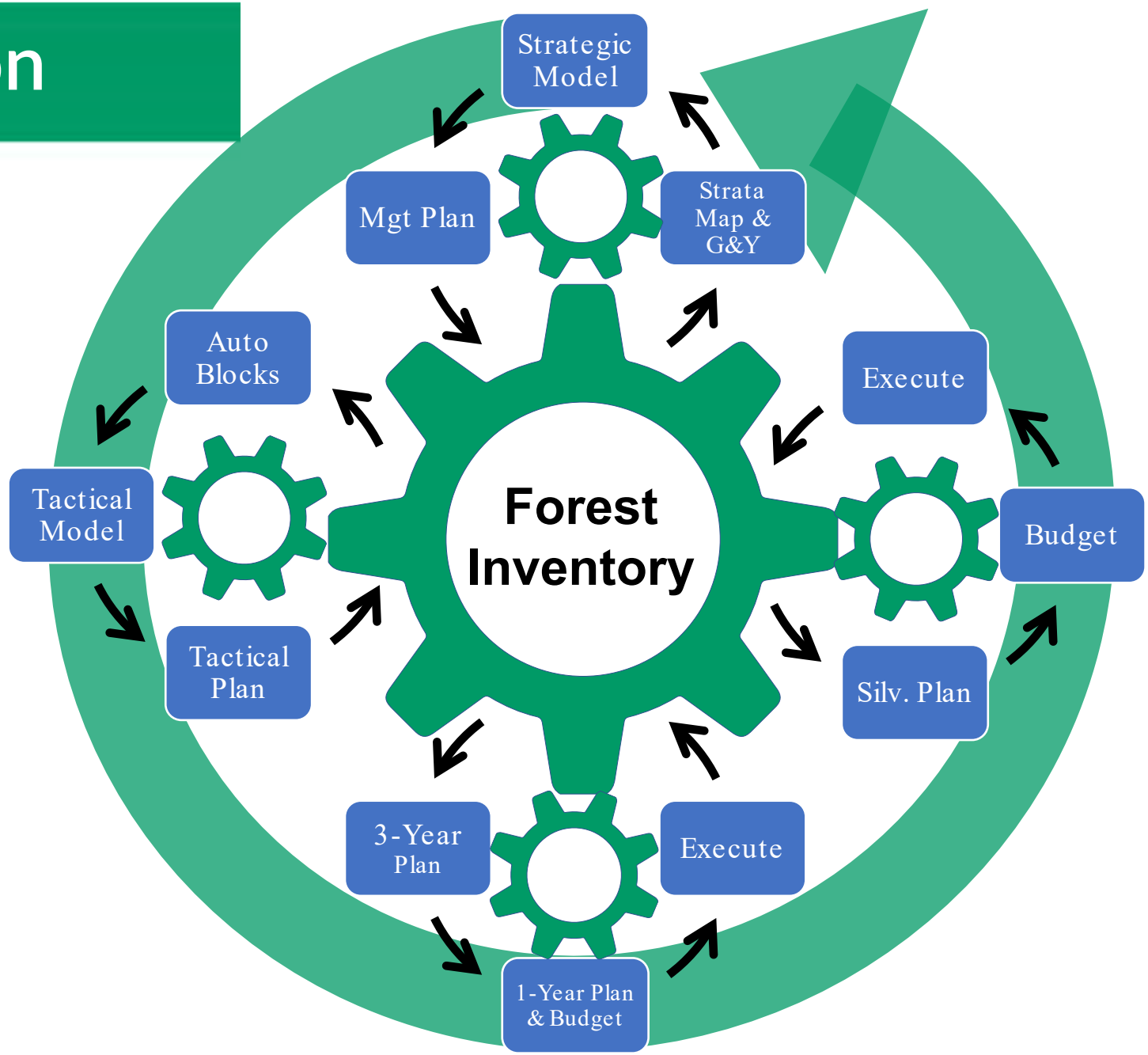
Forest Management Vision

Goals:

- Secure, low cost, high quality growing wood supply for our manufacturing facilities
- Practice world-class environmental stewardship

Challenges:

- Inventory Management & Governance:
  - Backbone of the value chain
- Keeping up with demand:
  - desire for insight higher than ever



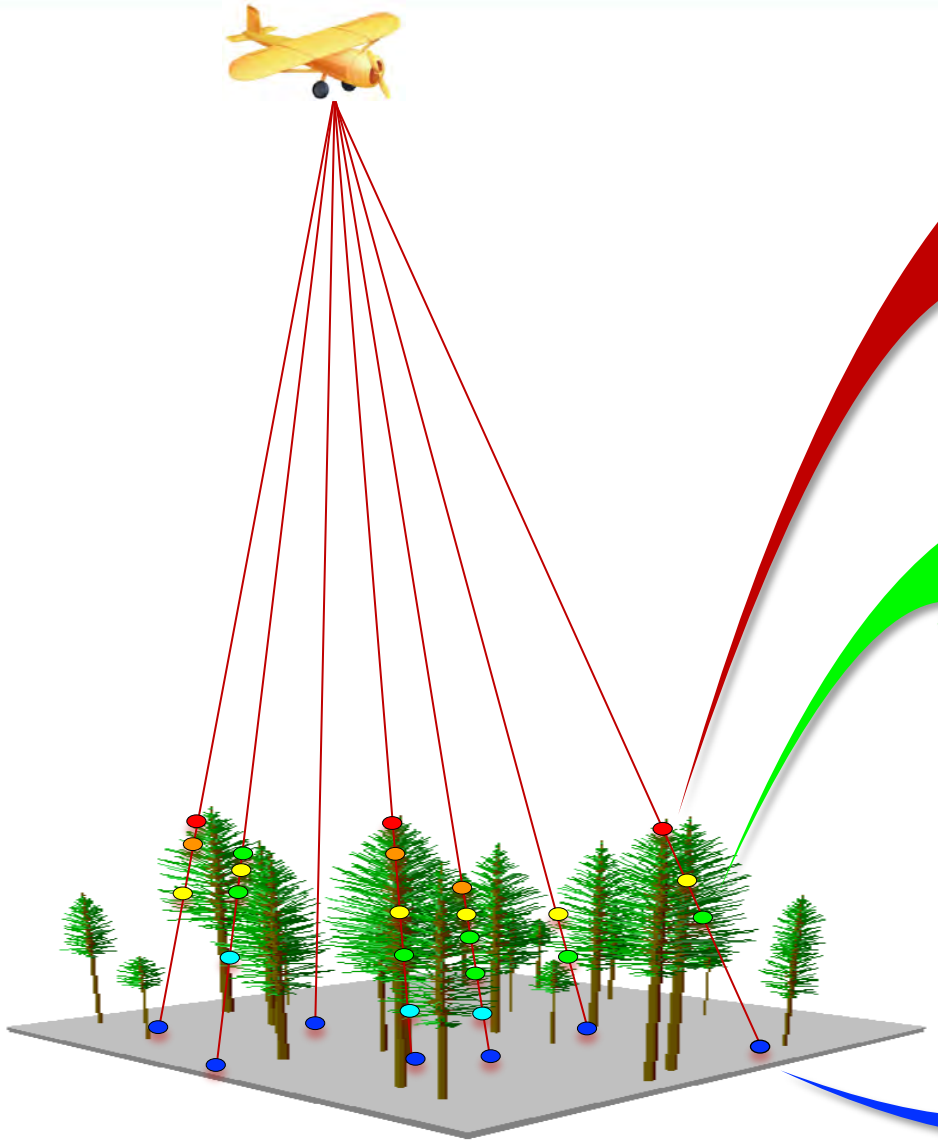
JDI Approach to Inventory

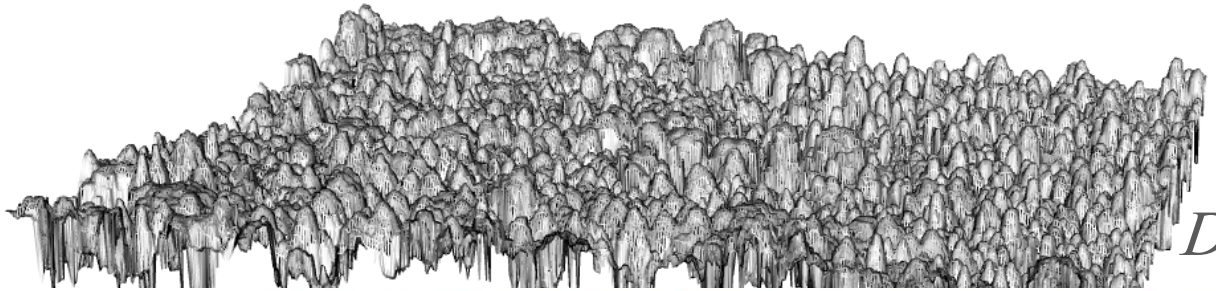
- Bulk captures on an 8-10-year cycle.
  - Wall-to-Wall coverage across the full landbase

- Foundation of Digital Supply Chain
  - Strategic Planning
  - Tactical Planning
  - Operations
  - Digital Supply Chain

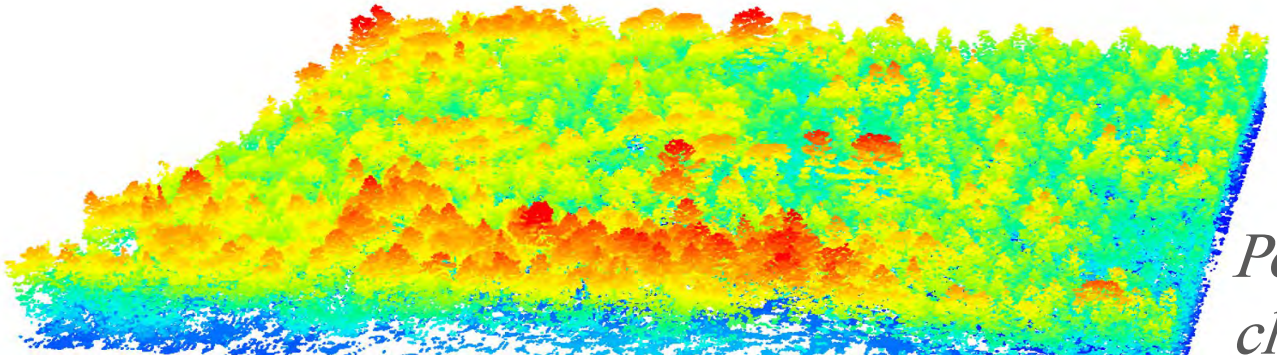
How: Airborne Laser Scanning aka LiDAR?

IRVING WOODLANDS

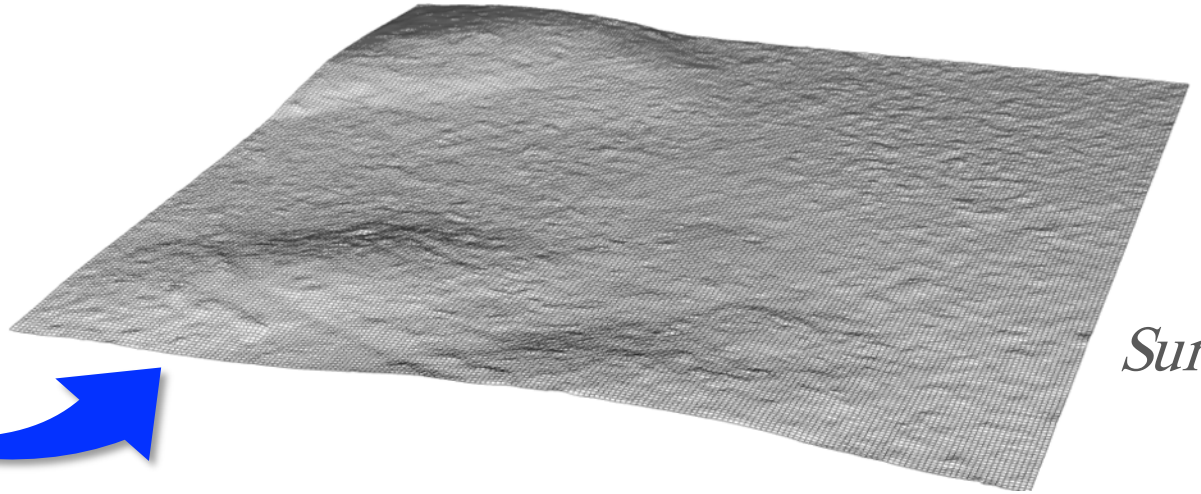




DSM

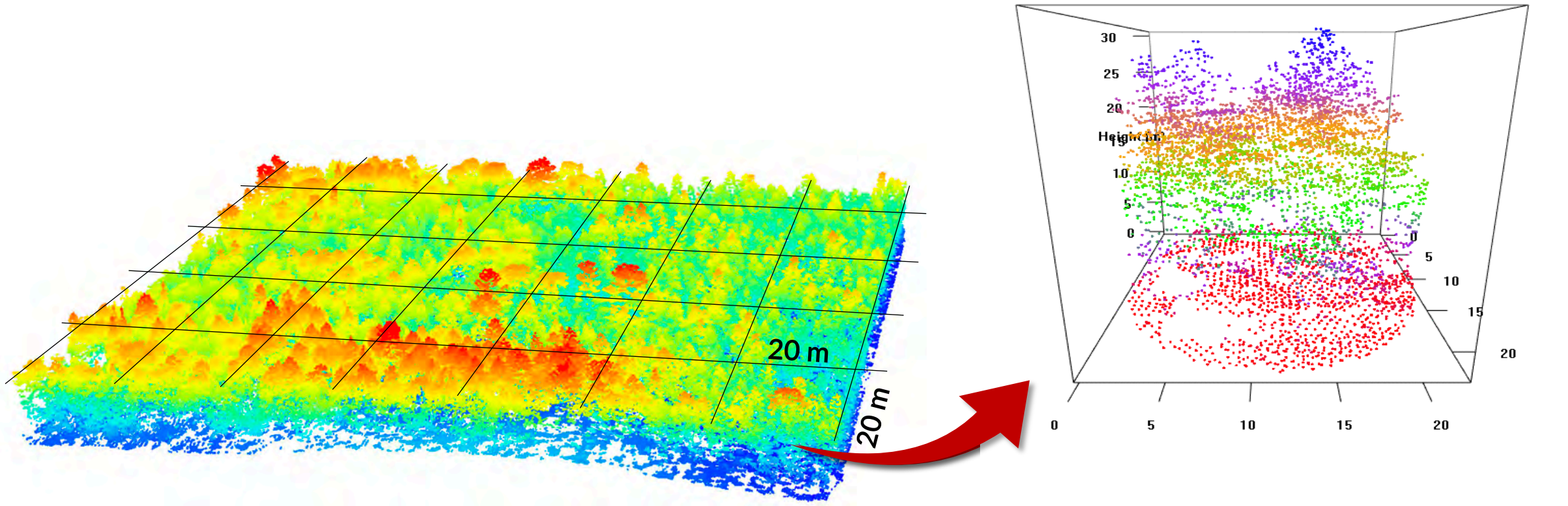


Point cloud



Surfaces

Wall-to-wall forest measurements



Summarize statistically at the grid-cell level…

Turning this into "forest inventory"…

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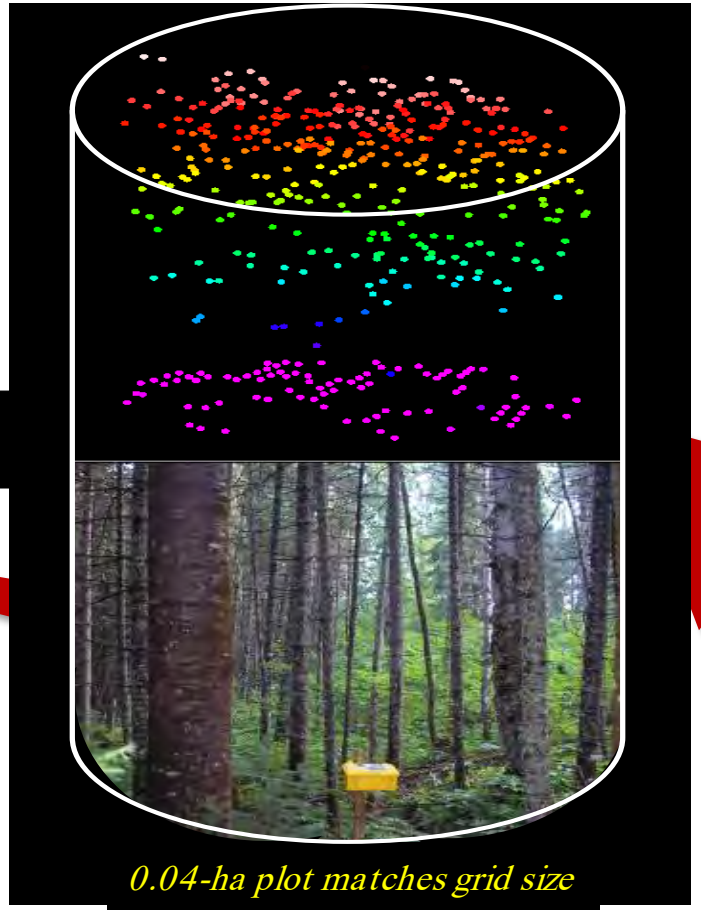
~77 Point-cloud statistics ("*X*")

- mean
- 95th percentile height
- 90th percentile height
- ⋮
- cover above 20m
- cover above 19m
- ⋮
- vegetation complexity index
- ⋮
- merchantable tree count

..the *population* enumeration of "*X*" allows use of a *regression* estimator.



…Field sample to relate *X* and *Y*;

~ 22 inventory variables ("*Y*")

- ave.-tree *height*, *diameter*, *stem volume*;
- per ha *volume*, *basal area*, *number of trees*

Wall-to-wall measurements of forest structure

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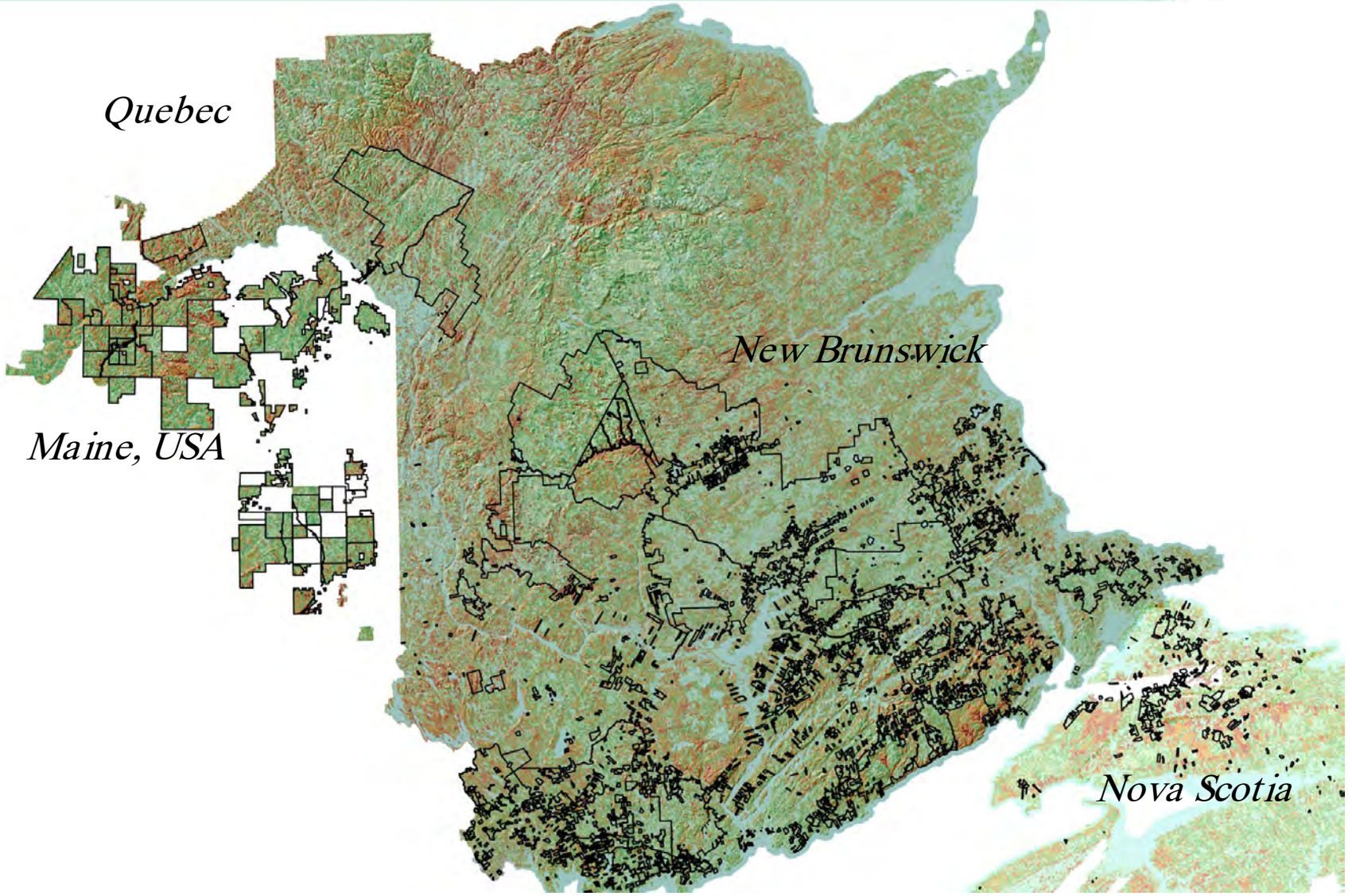

Forest Inventory

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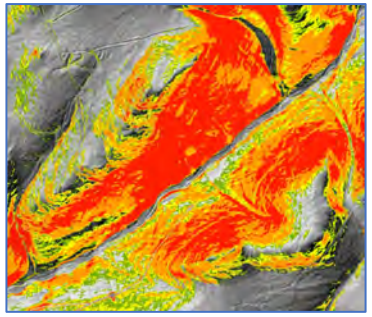
HILLSHADE

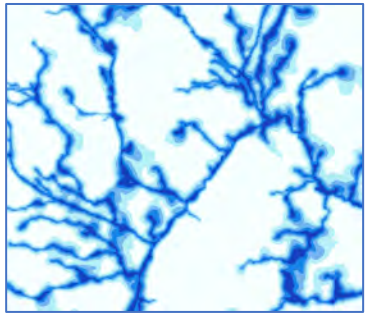
DEM

CANOPY HEIGHT

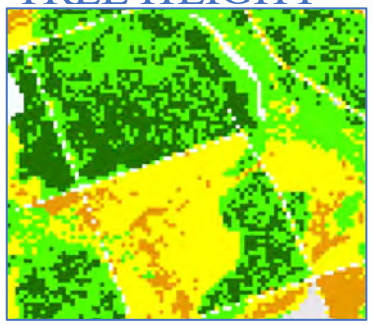
SLOPE



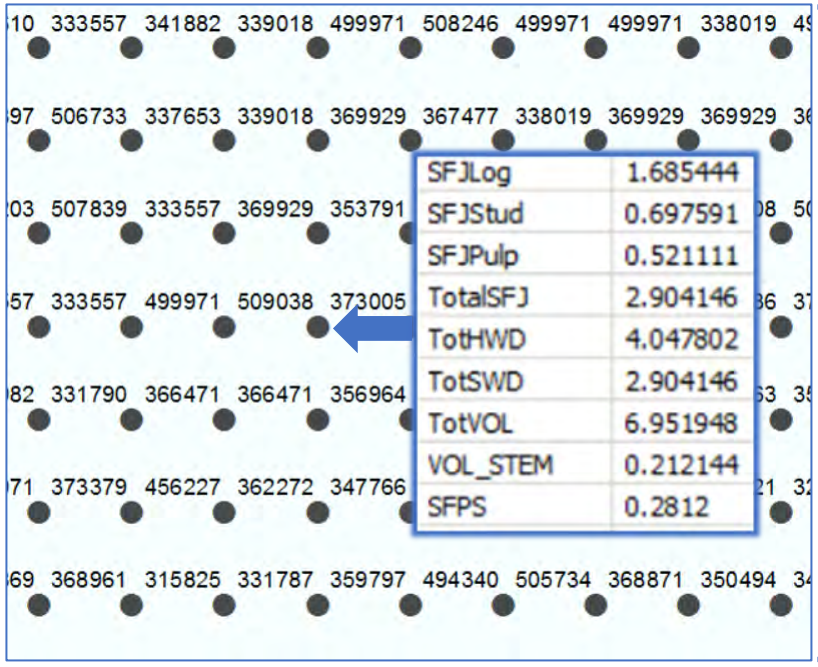
WAM



TREE HEIGHT



PRECISION FOREST



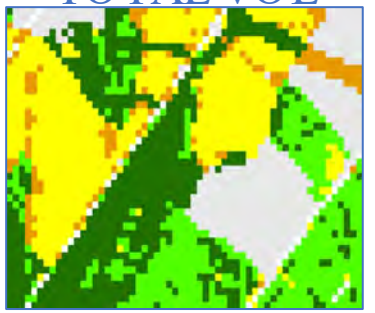
Database

- 200+ Million Observation Points
- 20 Meter Interval
- 100+ Attributes on each point
- 20 Billion Data Cells

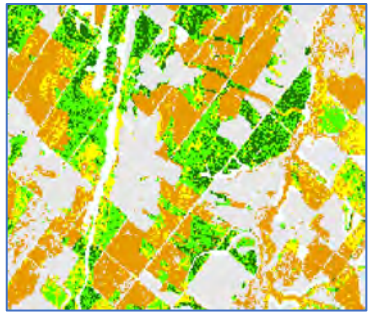
Content

- LiDAR EFI Metrics
- Growth & Yield
- Biology - Tree Species…
- Treatment History
- Wildlife Habitat & Protected Area
- Riparian Zones & WAM
- Unique Sites
- Topography
- Soils & Drainage
- Site Index

TOTAL VOL

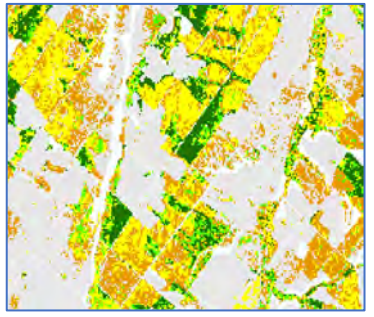


SWD STUDS



PIECE SIZE

SWD LOGS



Forest Inventory Management

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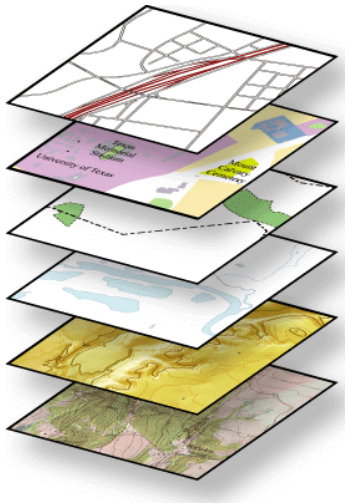


Precision Forestry Inventory

Traditional GIS

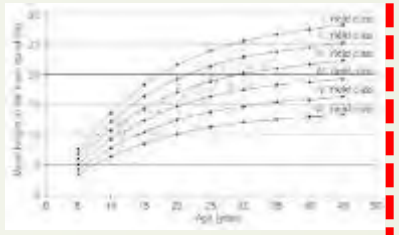
- Forest Inventory
- Watercourse Buffers
- Inoperable Areas
- Deer Wintering Areas
- Protected Areas
- Reserved Areas
- Unique Sites
- Late Successional

LIDAR

LIDAR Data (EFI):
Volume
Basal Area
Trees
(size, height, density)
Slope

Growth

- Tree Species
- Growth & Yield Curve Nearest Match
- Product Slasher



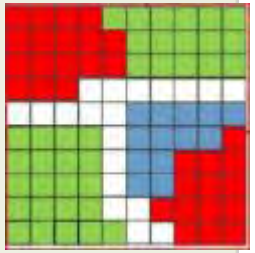
- Annual Growth

Update

- Harvest & Silviculture Updates

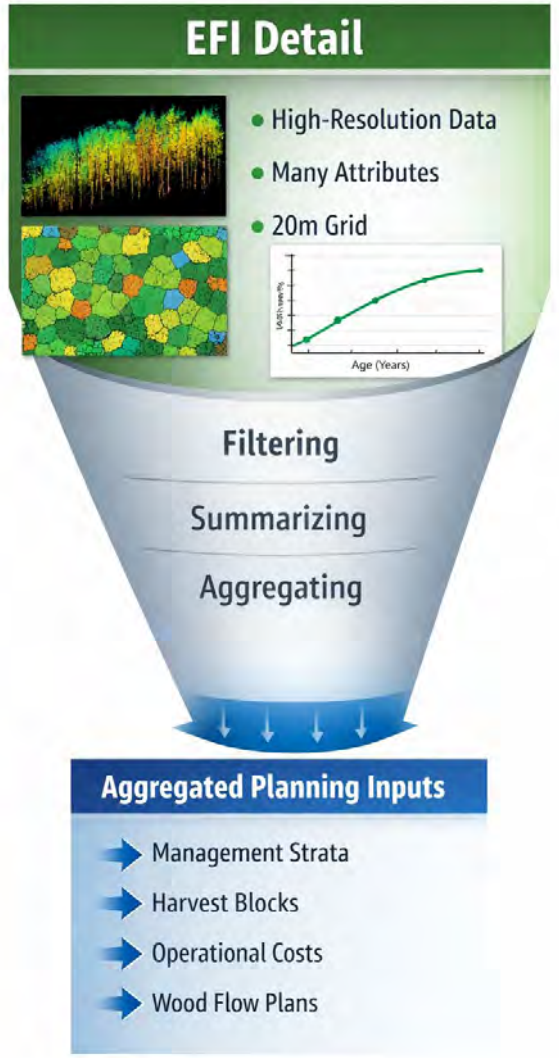
PFI

- PFI Database



Managing Resolution

- The paradox of Enhanced Forest Inventory
  - More detail than we can – or should – plan with
- Still needs to fit in the 'box':
  - Constrained by LP/Solver and Technology
  - Simple enough to understand
- Precision with Purpose
  - Apply detail where it impacts decisions
  - Aggregate elsewhere



Old Idea, Better Data: Hierarchical Planning

Strategic – long-term. large-scale. big picture.

Tactical – mid-term. moderate scale.

Operational – short-term. execution.

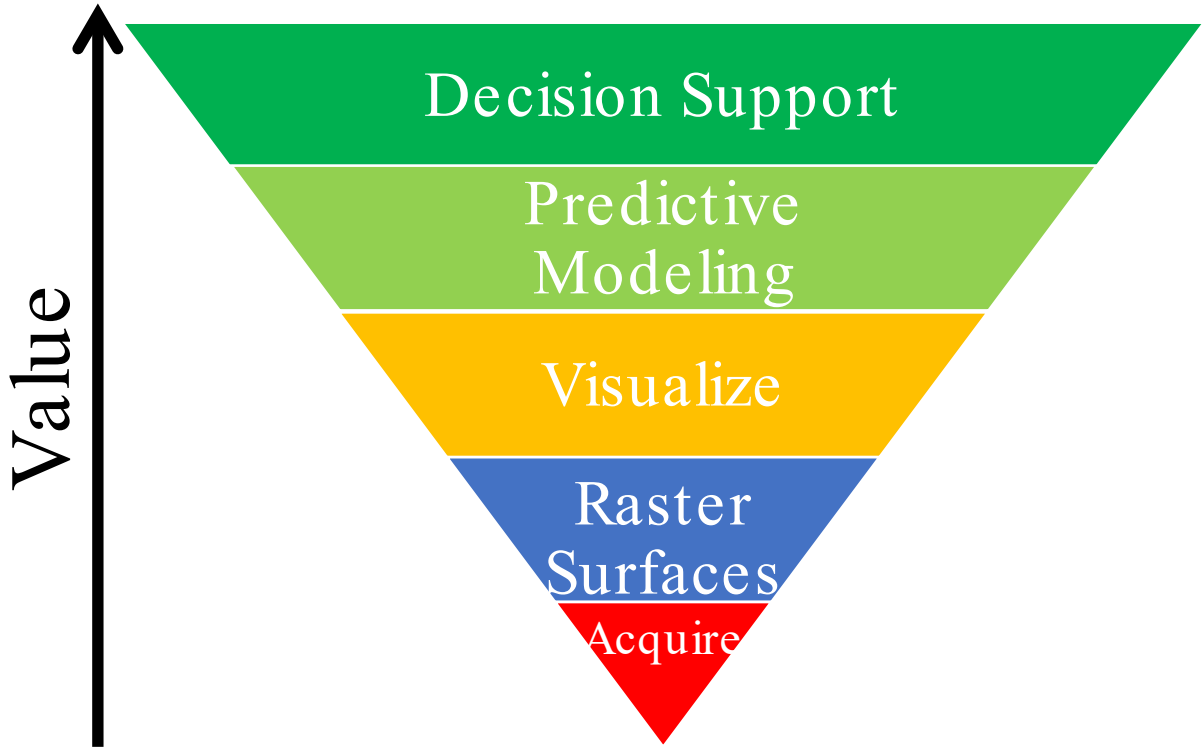
JDI-Remsoft Engagement

Focus:

- Modernize planning capabilities to align with modern forest inventory

Goals:

1) Build out enterprise strategic modeling framework
2) Build an enterprise tactical model



Strategic Planning

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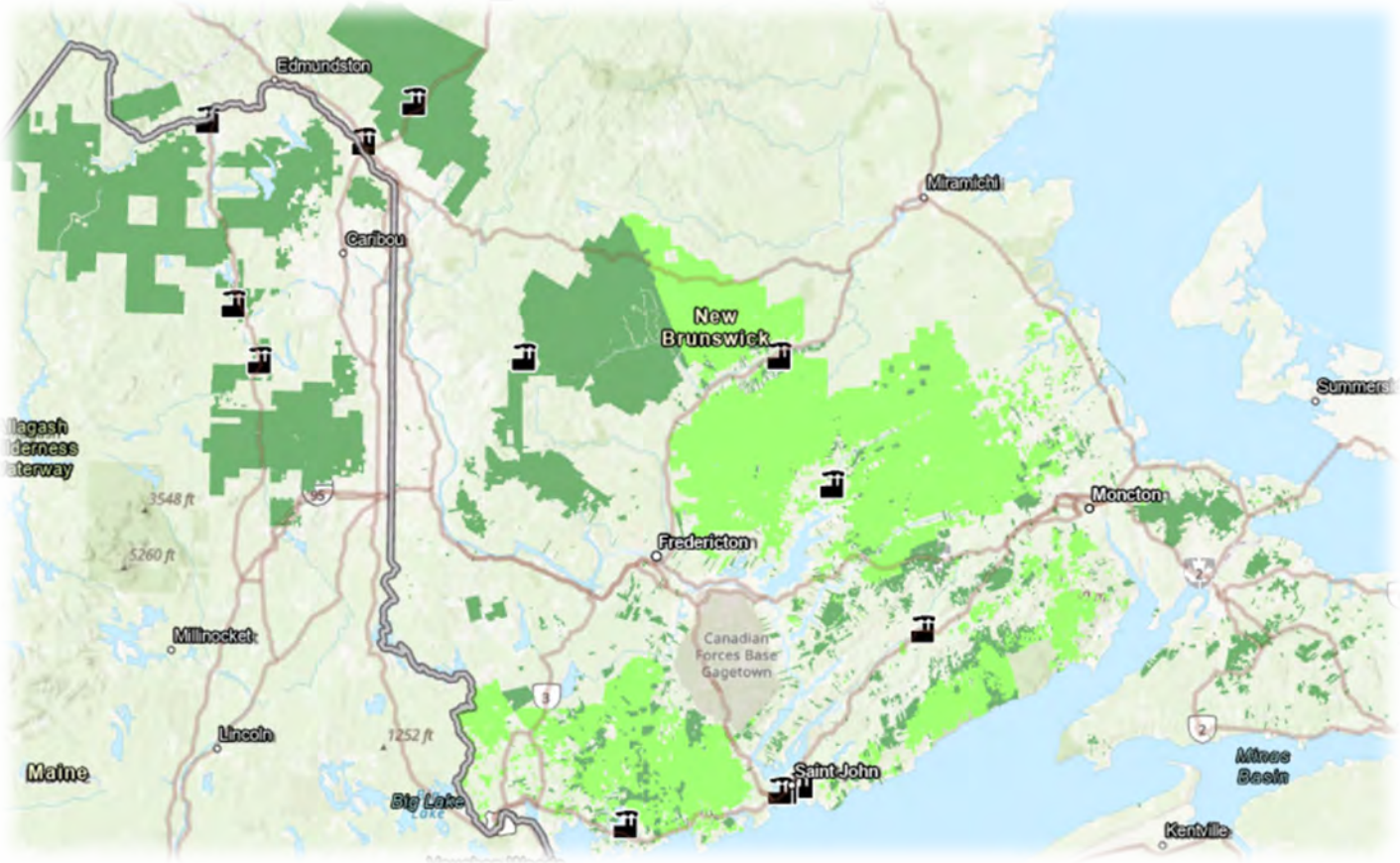
Time Horizon – 80 Years, Area – Full landbase



Focus:

- Long term sustainability (Areas and Volumes)
- Silviculture Strategies
- Carbon Valuation or Credit Flows
- Conservation

Precision with Purpose

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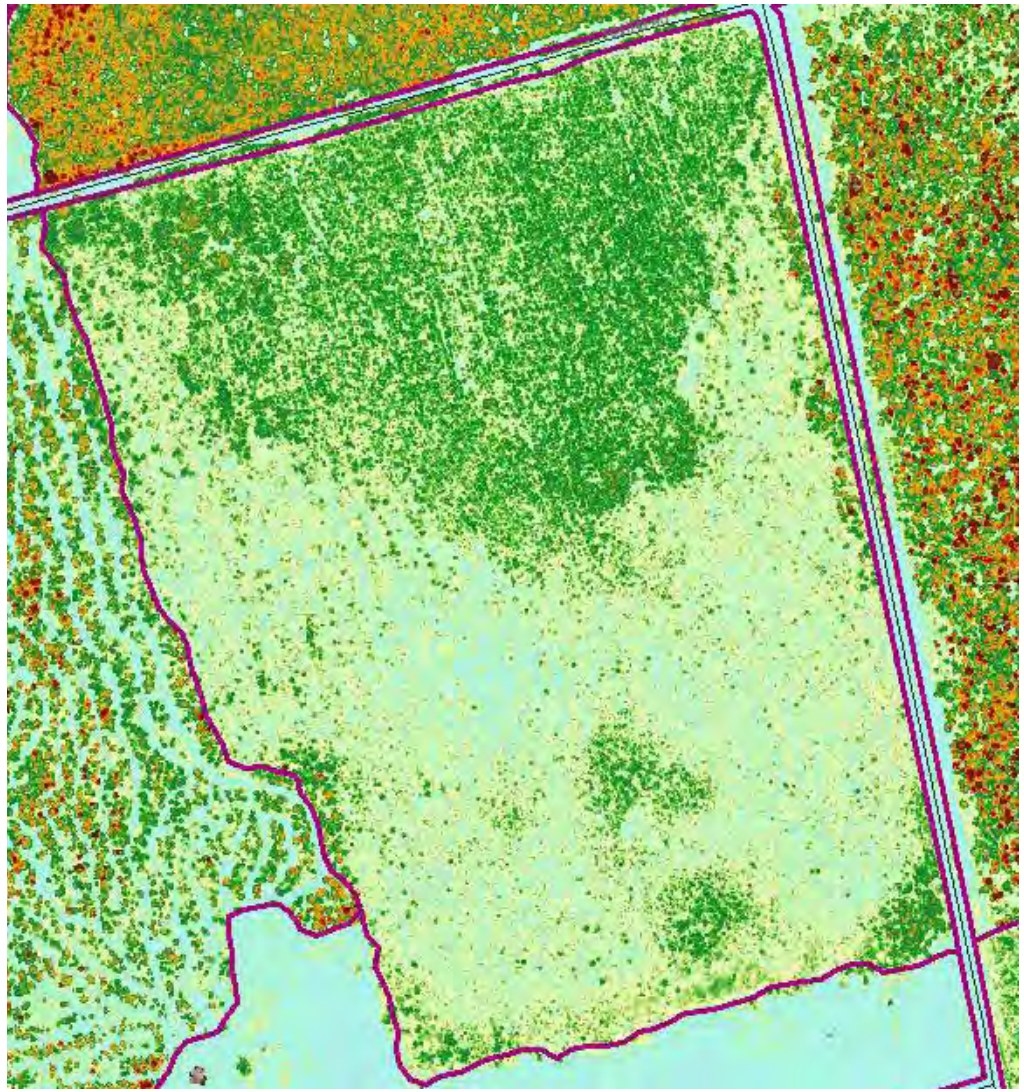
- Leverage precision where it counts

Example:

- Spruce plantation: 1996
- Average volume: 80 m^3/ha
- Front section: 120 m^3/ha
- If it can be isolated, it can be managed differently. Otherwise, it's lost in the average.



Precision with Purpose

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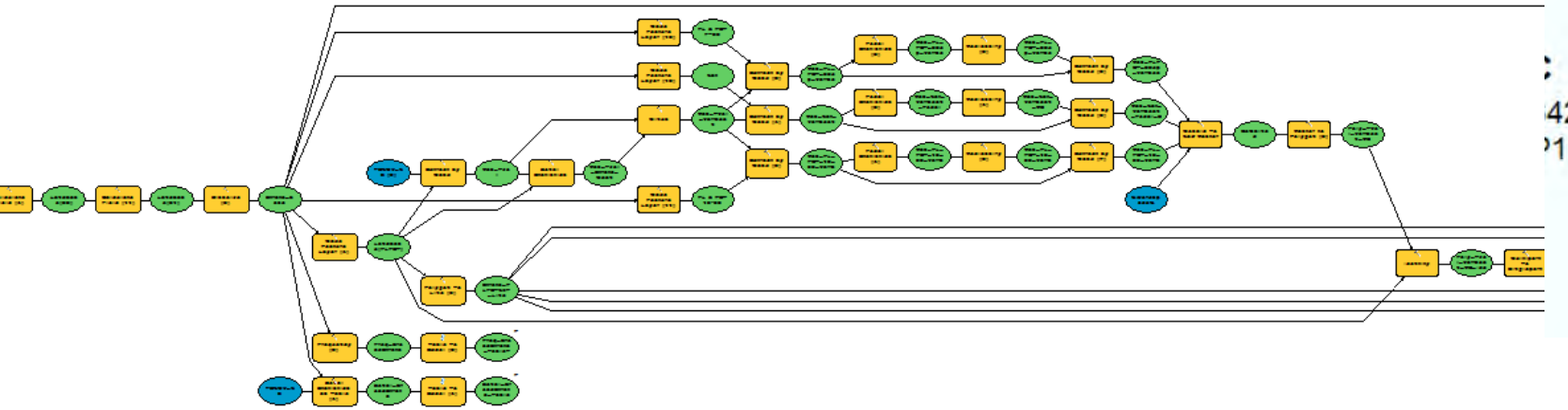
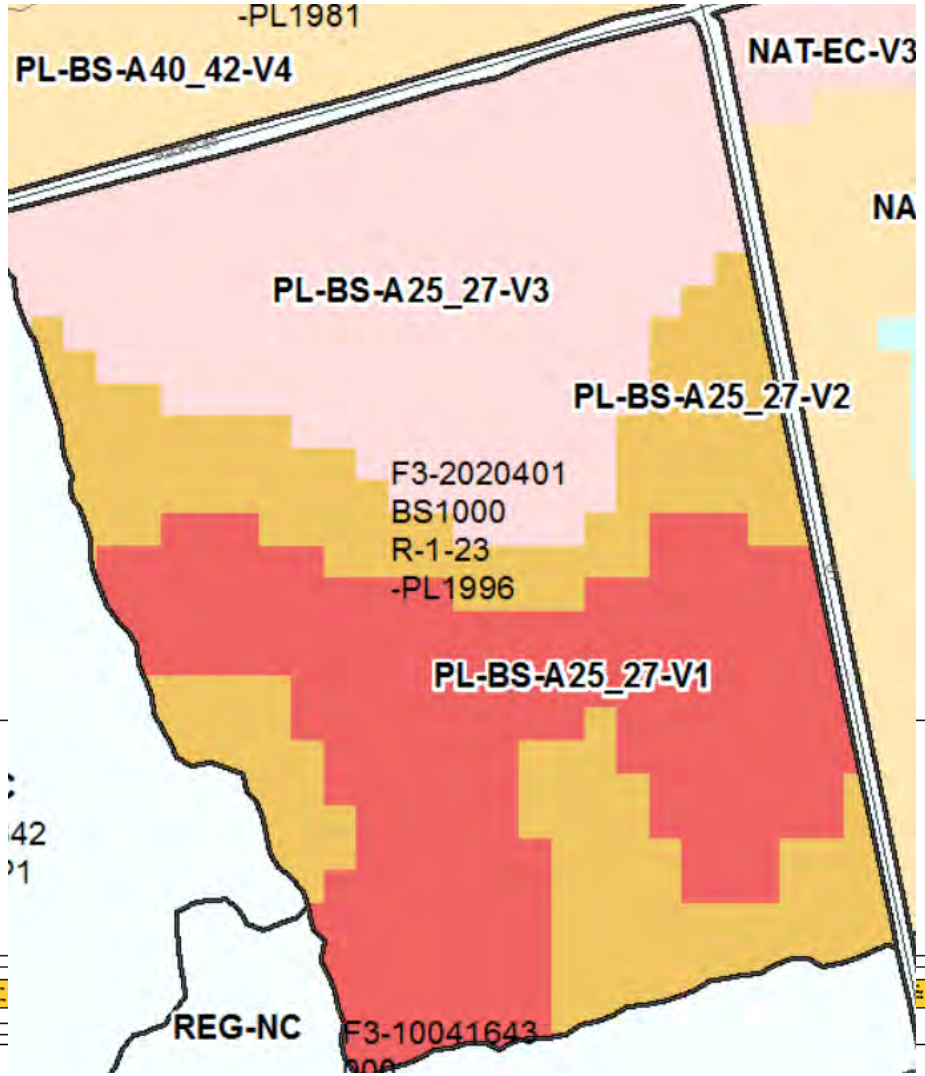
- Group landbase into management units based on:
  - Management Type
  - Species/Genetics
  - Stand/Forest Condition
  - Site Class
  - Zoning
  - Maturity
  - Location..etc.

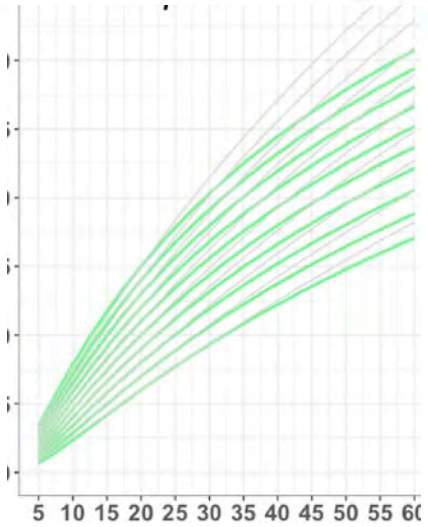


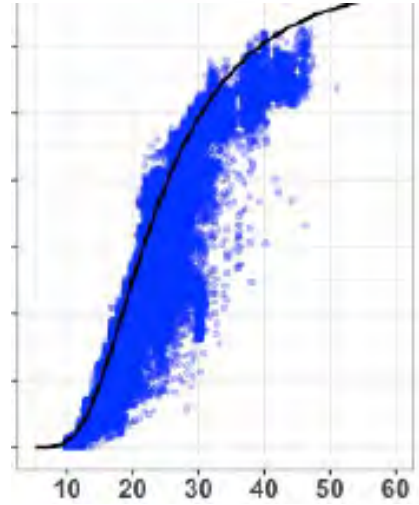


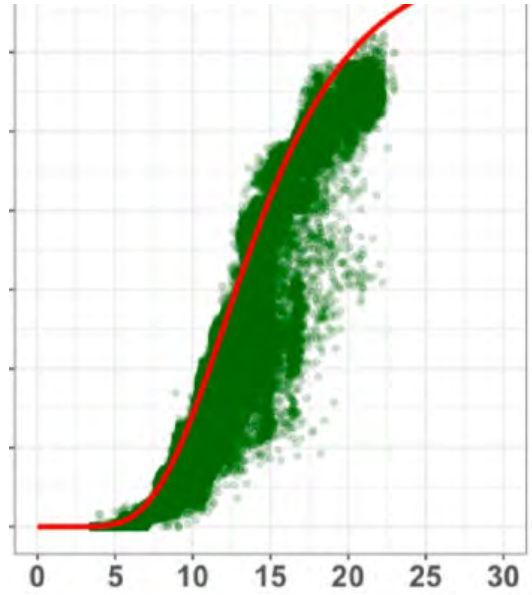
G & Y Opportunity

Quick aside on Growth and Yield:

- Repeat LiDAR captures = novel G&Y opportunities.
- Growth measured at unprecedented scale
- Census vs sample.







Tactical Planning

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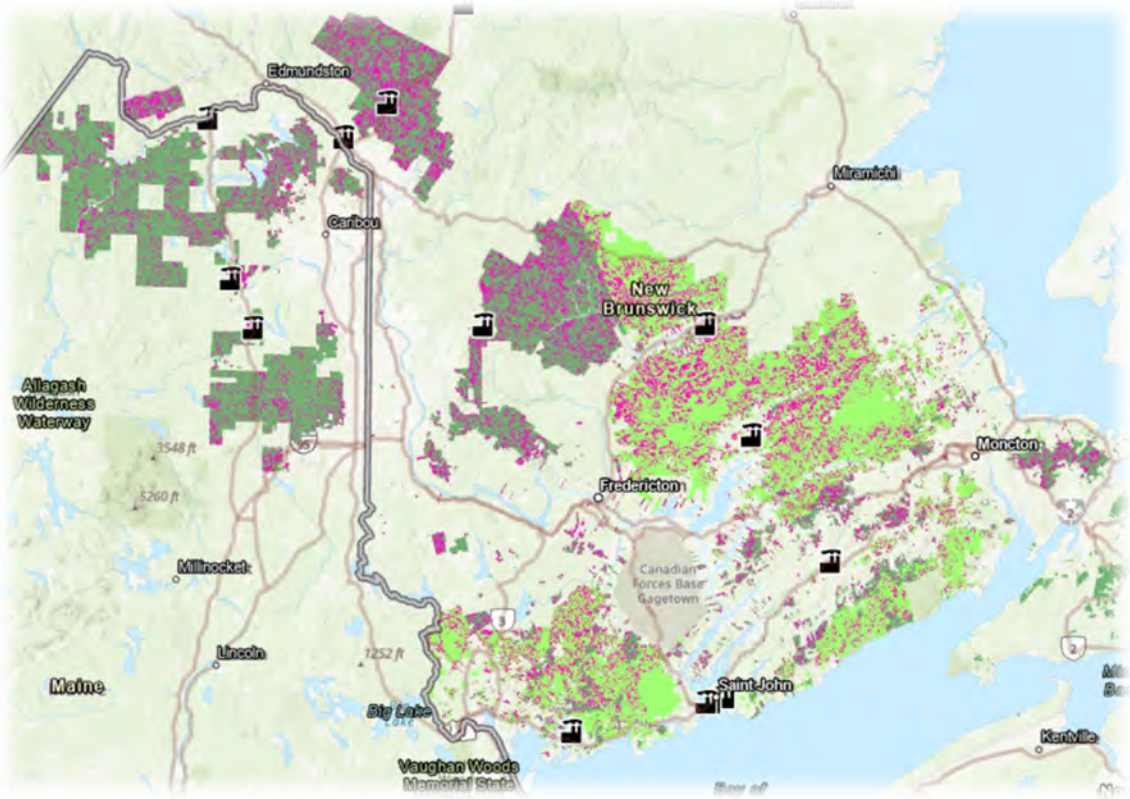
Time Horizon – 5-10 Years, Land base – Blocked forest

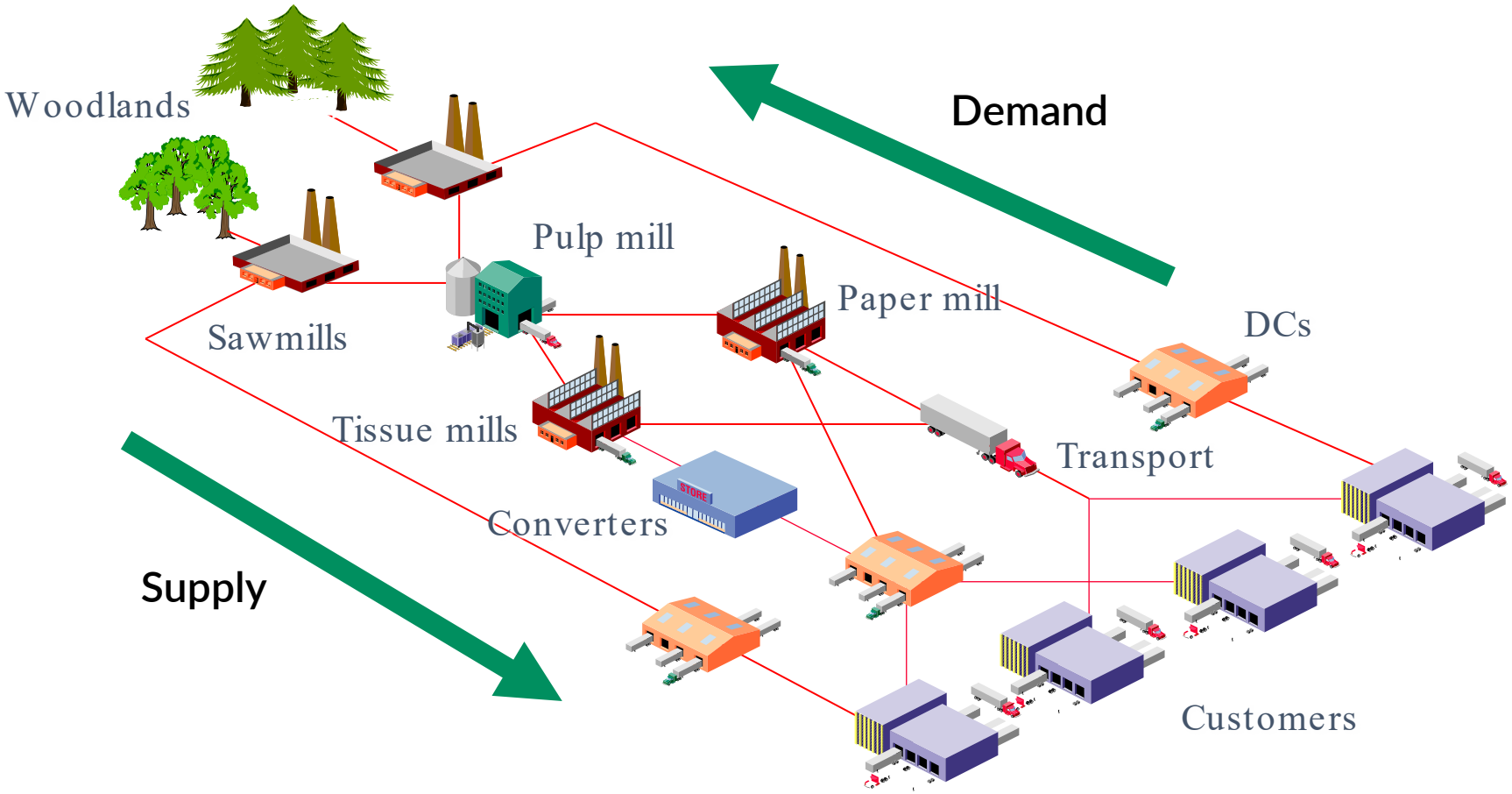


Focus:

- Harvest Scheduling
- Mill Demand & Woodflow
- Costs
- Capacity Planning
- Capital Investment Planning
- Procurement Planning

Tactical Model

End-to-End Optimized Digital Forest Supply Chain



Module Checklist

- Integrator
- Allocation Optimizer
- Roads Tool / Optimizer
- Woodstock
- Database & ETLs
- Very structured, but effective.

Precision with Purpose: Auto Blocking

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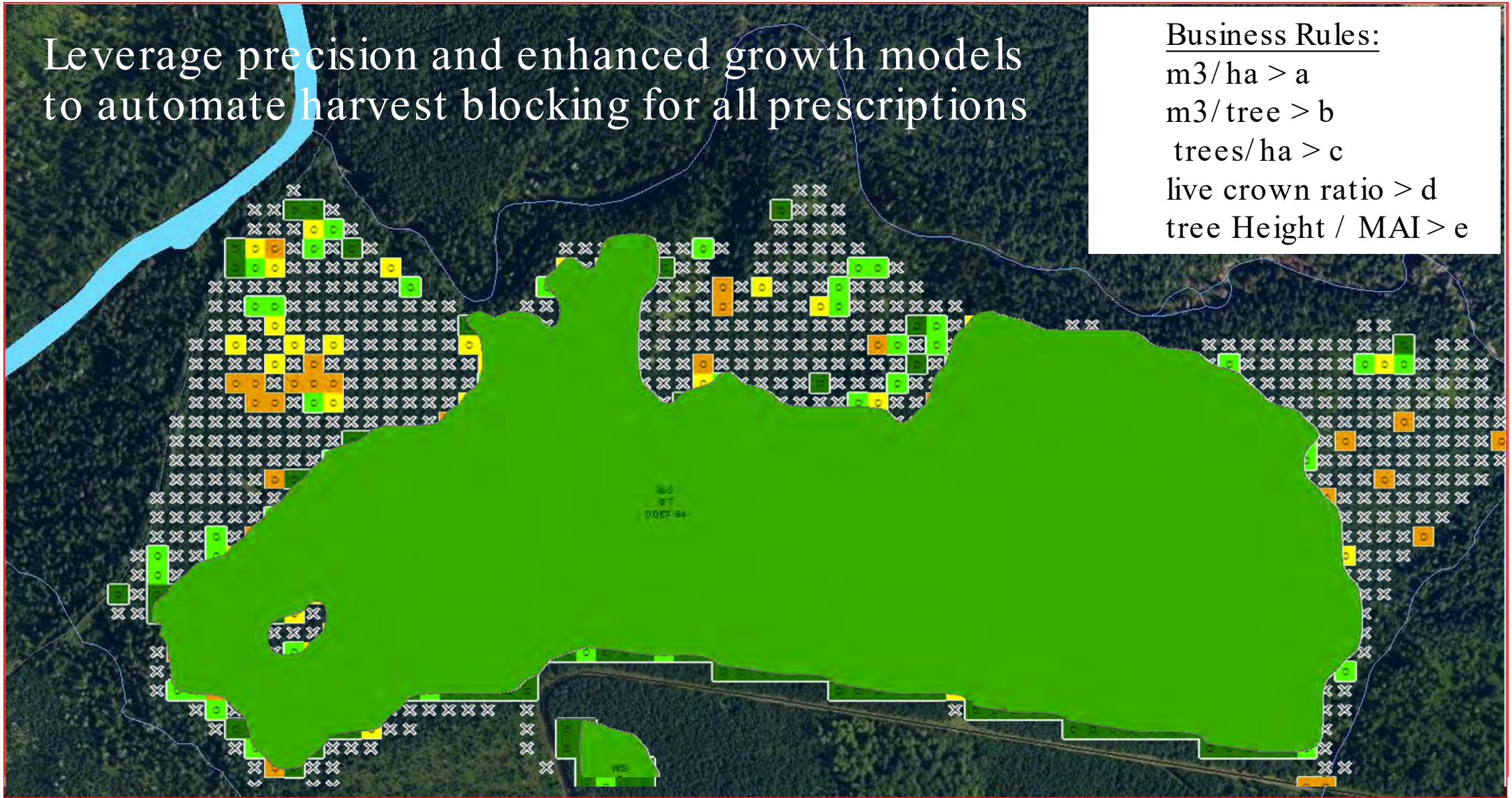
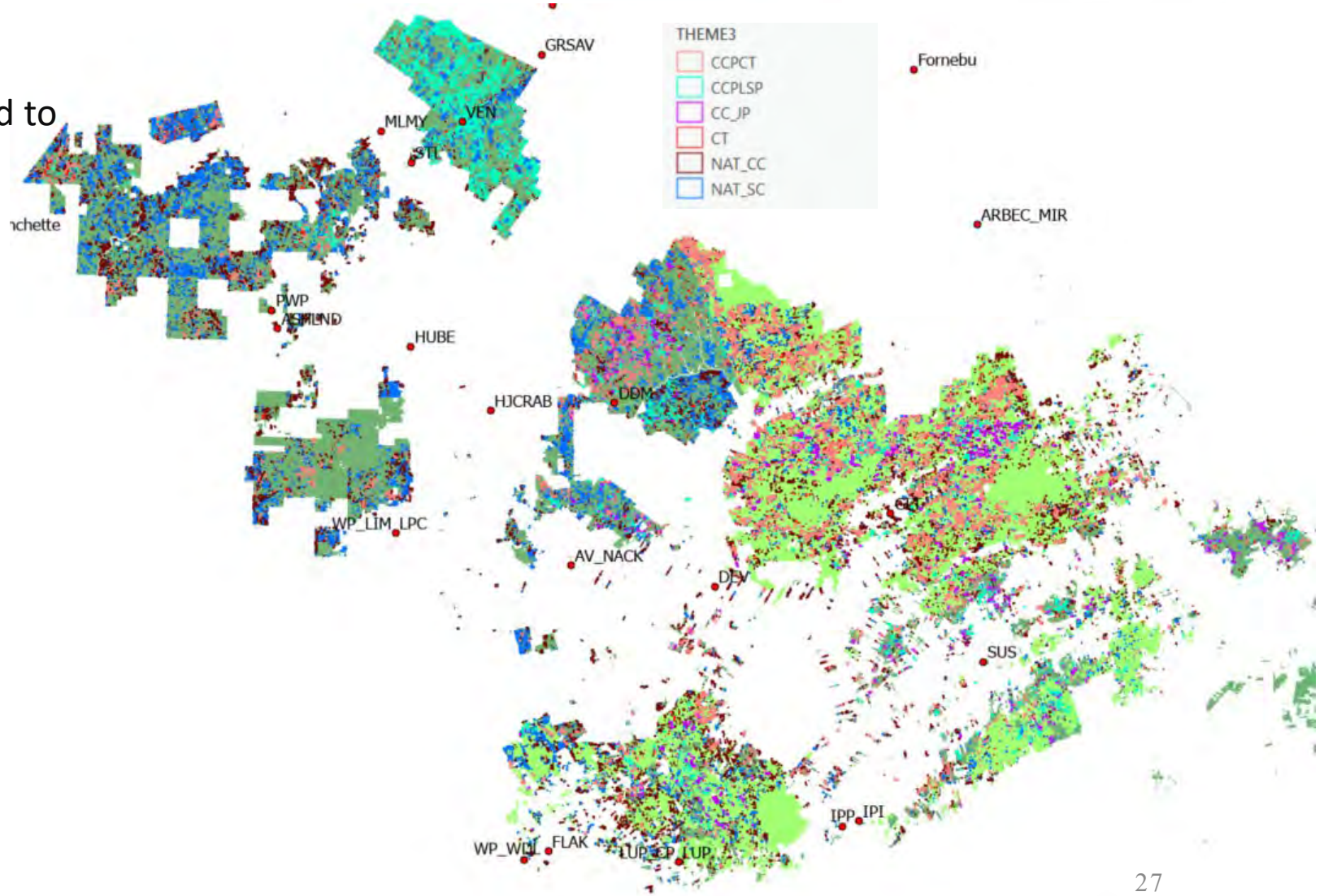


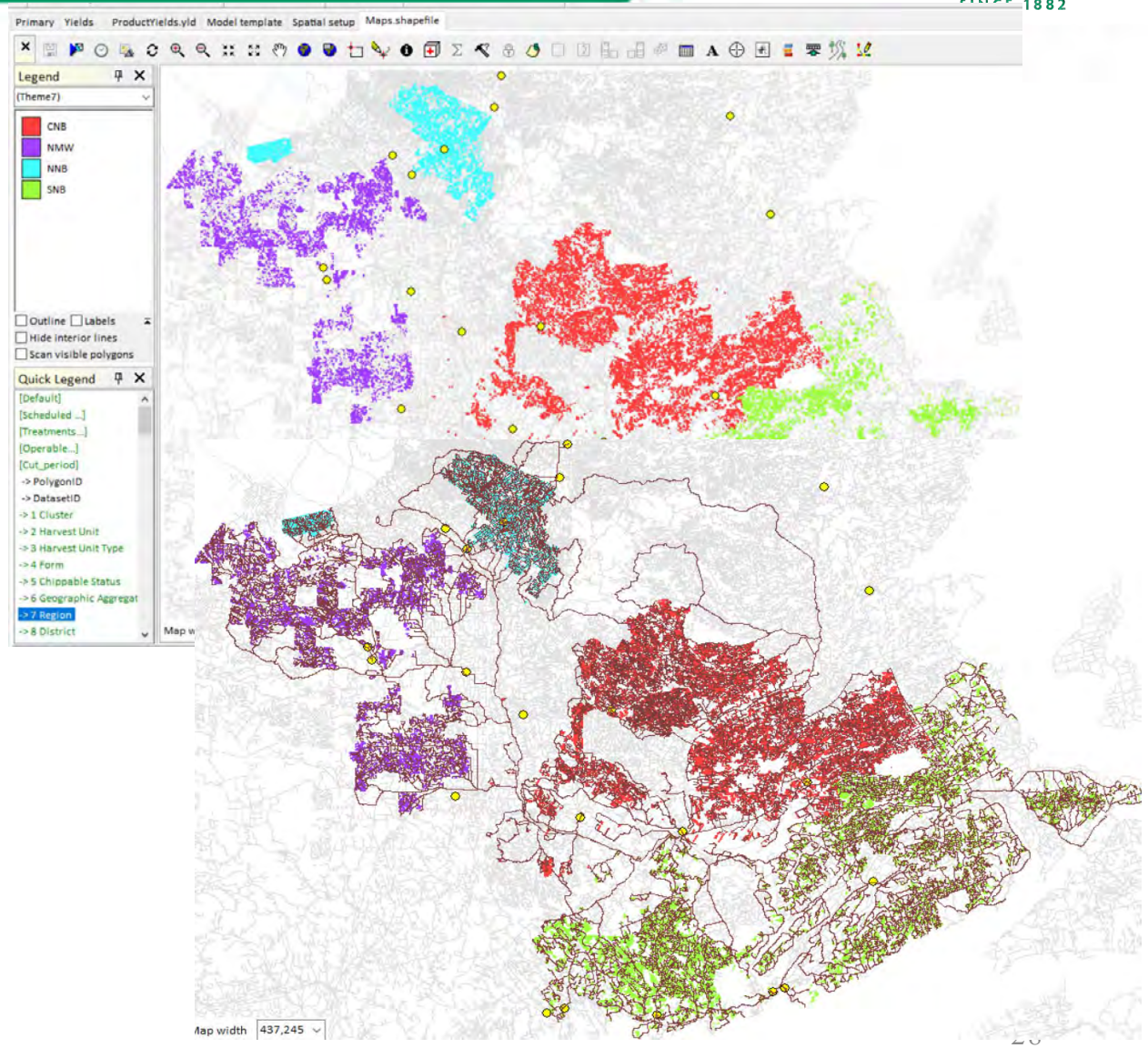
Tactical Modeling – Wood Supply

The model's primary wood supply comes from Autoblocks derived from business rules applied to the inventory that define operability.

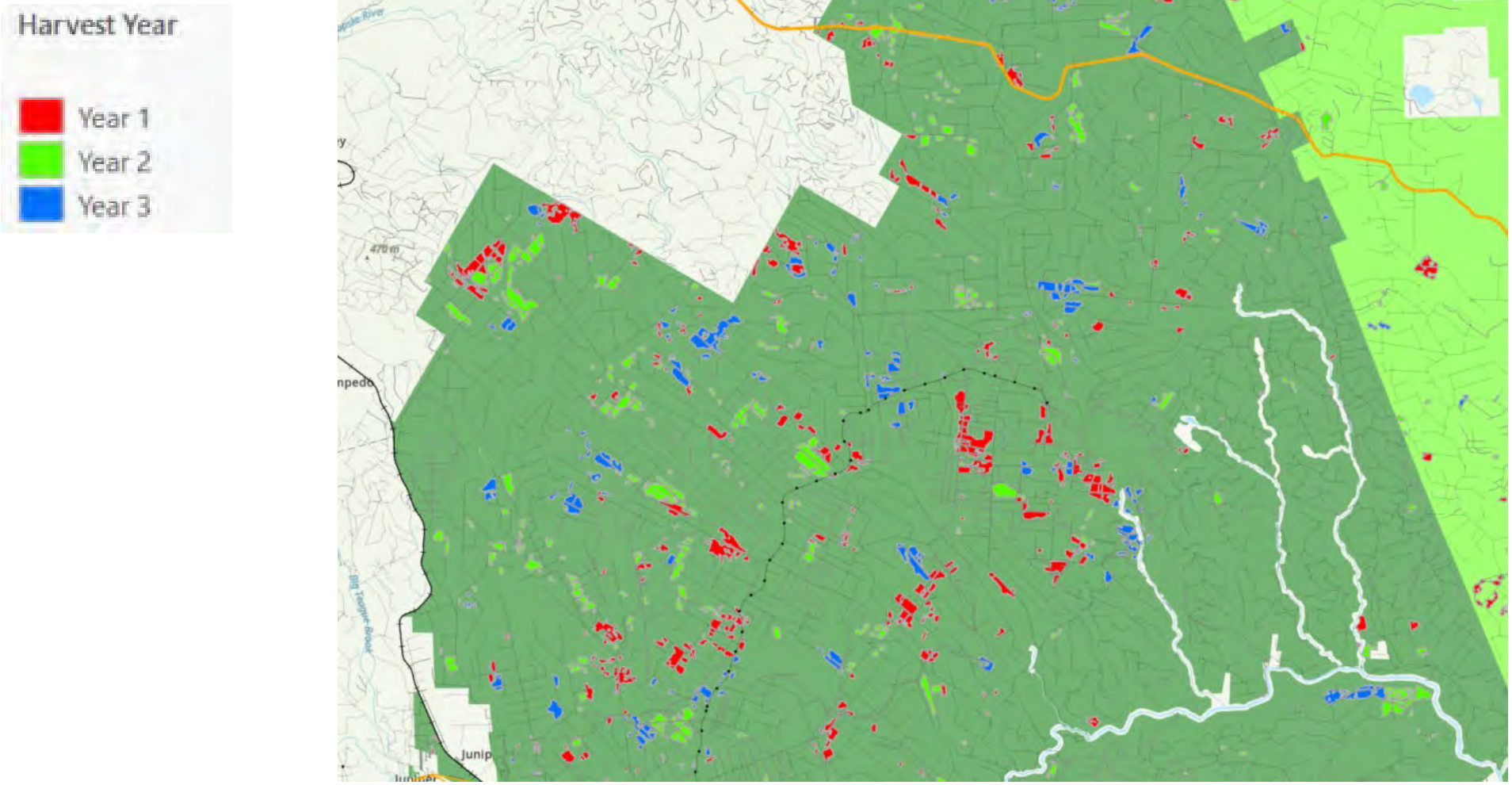


Roads & Routes

- Leveraging the Roads tool to generate Origin-Dest. Matrix
- Promote block clustering via road maintenance constraints



Harvest Schedule



Implementation Challenges

- Technology is the easy part.
  - Data, models, and tools scaled faster than people and process
- Process and people change in the hard part.
- Trust had to be built
  - Trust in inventory
  - Trust in model
  - Trust in technology
- Working against the way we've always done it.

Take Aways

- More stable, defensible solutions
- Scaled tactical planning and blocking with a few staff
- Operationally usable precision
- Resolution where it drives decisions
- Trust and change management matter as much as data

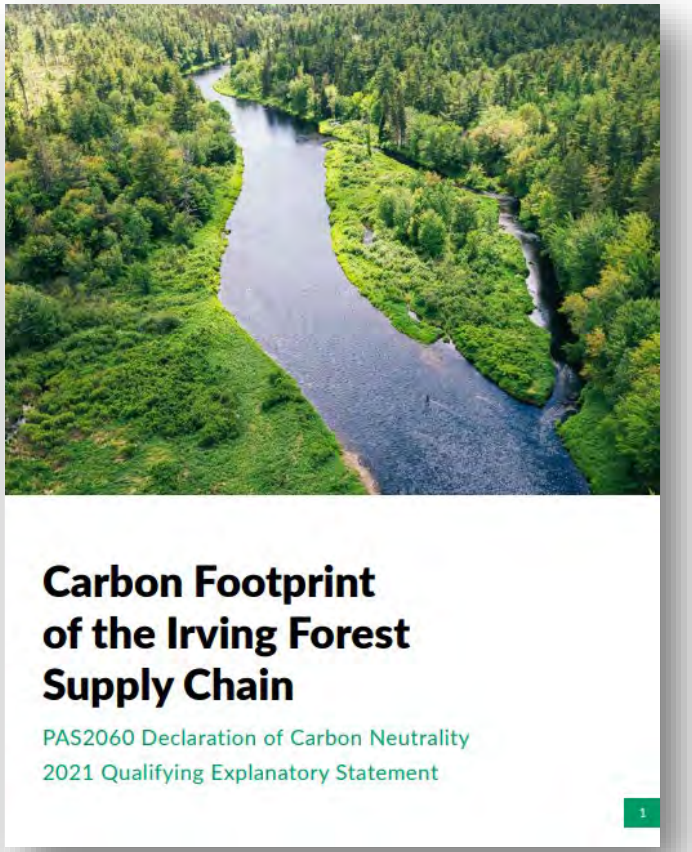
What changes with better inventory?

- AAC confidence increased
  - Reduced within-strata variability and more defensible long-term supply
- Block definition improved
  - Operability driven by inventory conditions, not averages or rules of thumb
- Cost optimization improved
  - Better harvest timing, clustering, and woodflow decisions
- Planning cycles shortened
  - Automation replaced manual iteration and rework
- Small teams scaled impact
  - Precision applied where solvers and decisions actually matter

Better Inventory, Better Story

- Sustainability, Certification, Carbon Neutrality

CARBON TRUST
CARBON NEUTRAL
NEUTRE EN CARBONE



CARBON NEUTRAL
NEUTRE EN CARBONE
Royale

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