Early Age (3yr) Productivity Assessments

Highlights from the 2021 & 2022 trials and insights into the implementation process

Why complete a 3yr stand assessment?

Benchmark Productivity at age 3 – Productivity Plan target

- To learn lessons and improve future decision making
- To quantify improvements in establishment techniques
- To undertake remedial activities if required – weed control
- Final stage of ensuring ETS compliance

Ultimately we are aiming to achieve fully established stands with good uniformity.

Imagery Capture

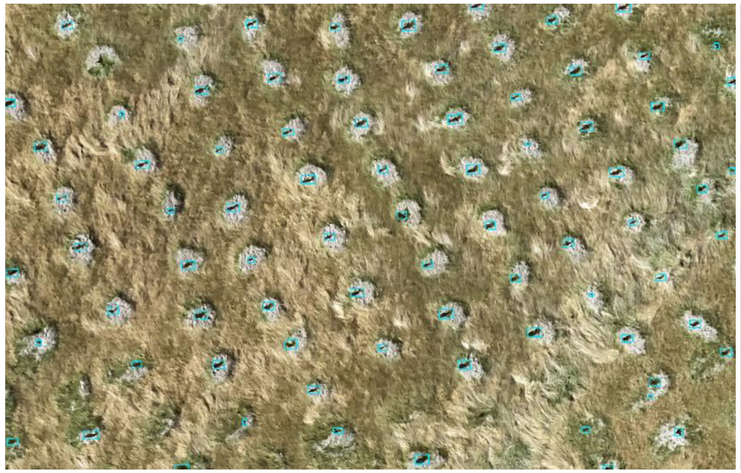
SKYCAN

- 5cm GSD
- Cessna 180/185
- 3000ft

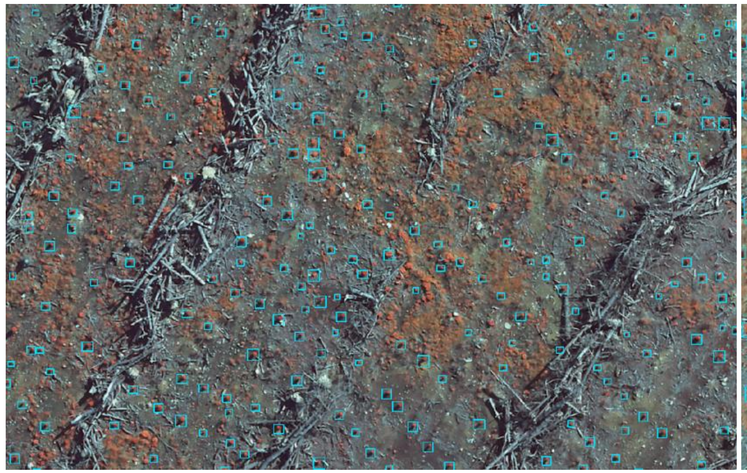
PORT BLAKELY

Tree Detection Examples

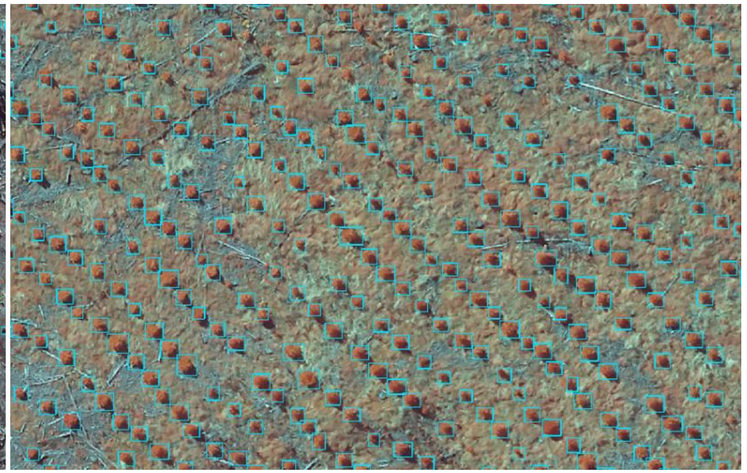
Detection of newly planted seedlings



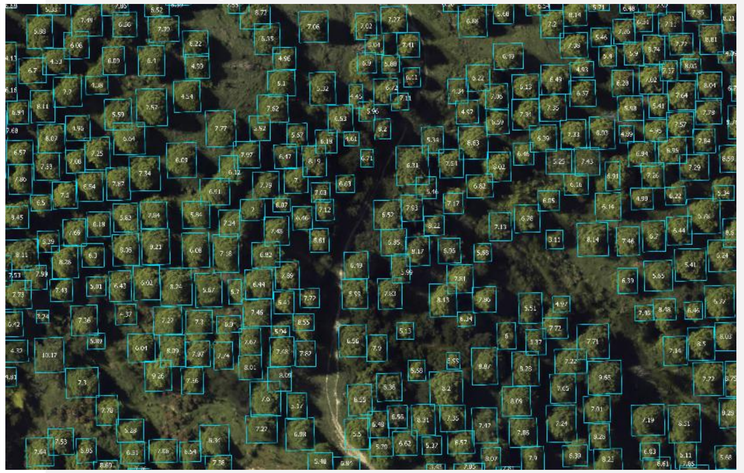
Detection of two-year old trees



Detection of three-year old trees



Detection of ten-year old trees



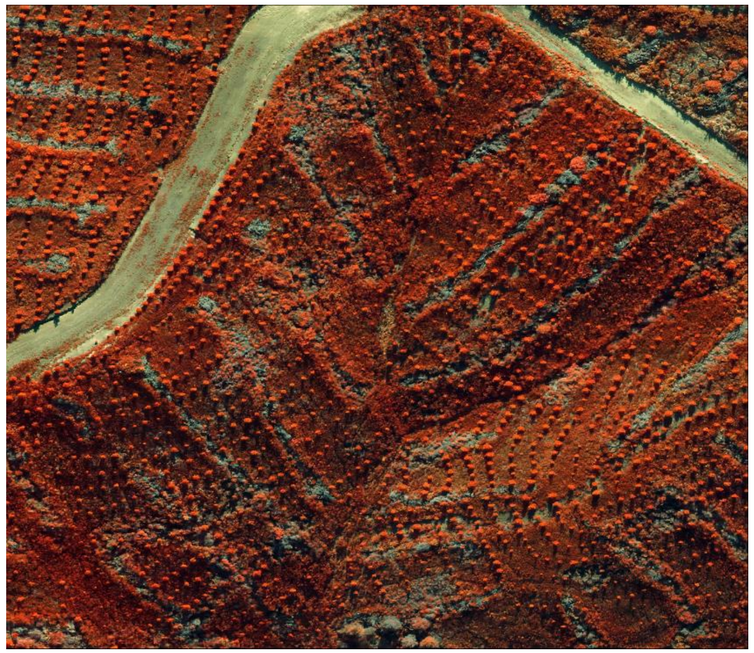
Detection Framework

Tree Detection

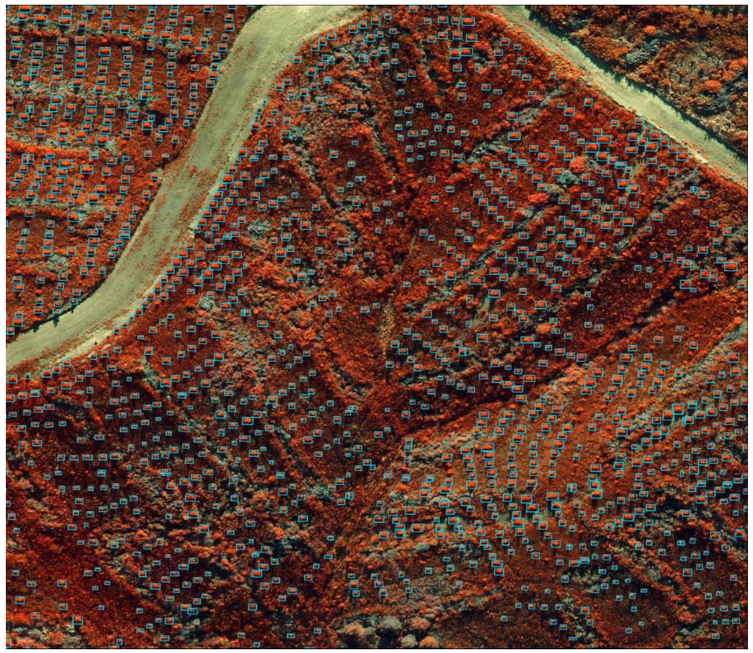
A deep learning model was trained to detect three year old trees using 5 cm (CIR) imagery.

Tree Height

Derived from LiDAR Digital Surface Model (DSM), each tree detection is allocated its maximum height value from the Canopy Height Model (CHM) to return tree height per detection.



5 cm CIR



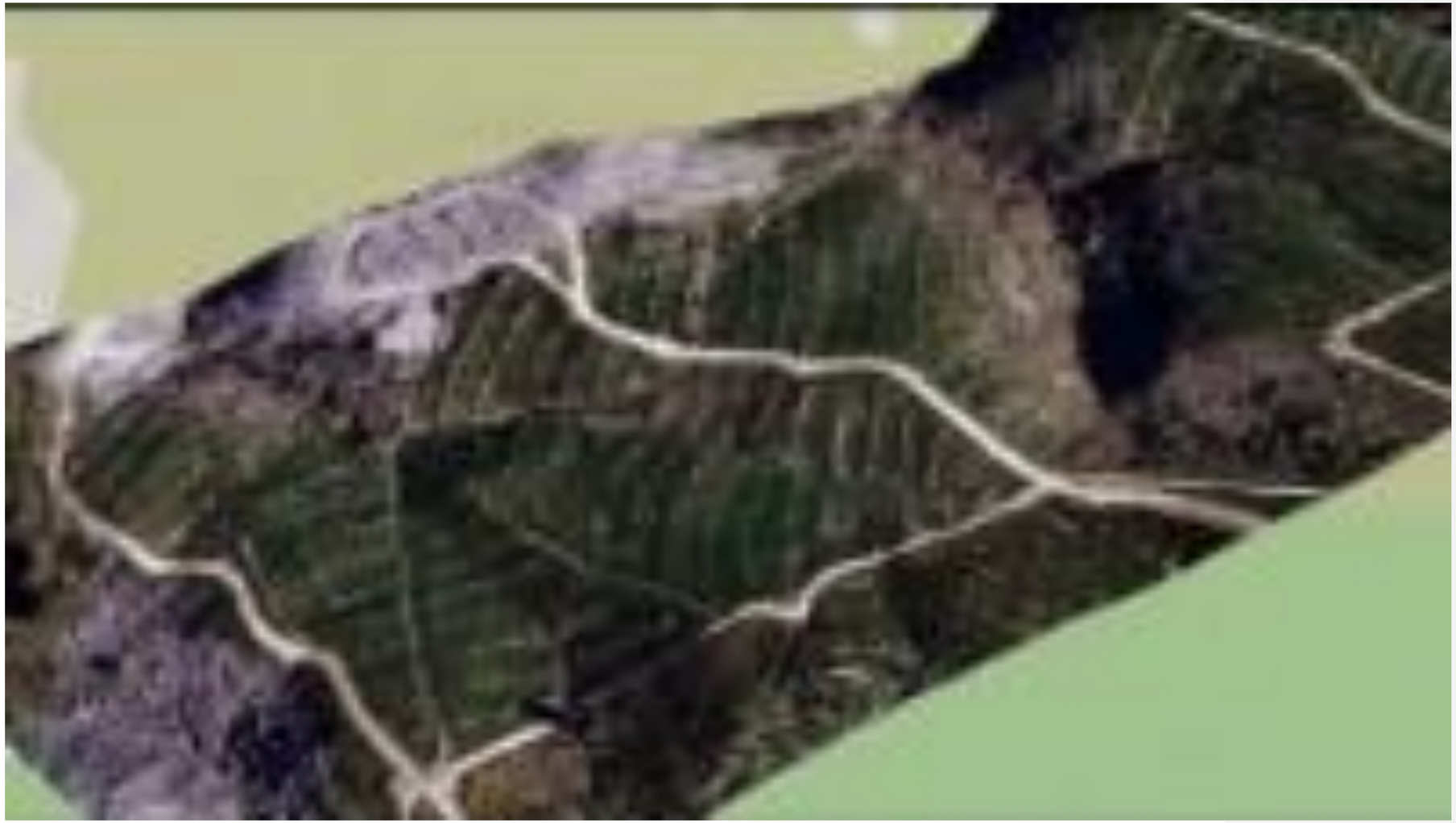
Tree Box Detection

Tree Detection & Height from point cloud

Indufor

Flyover Example

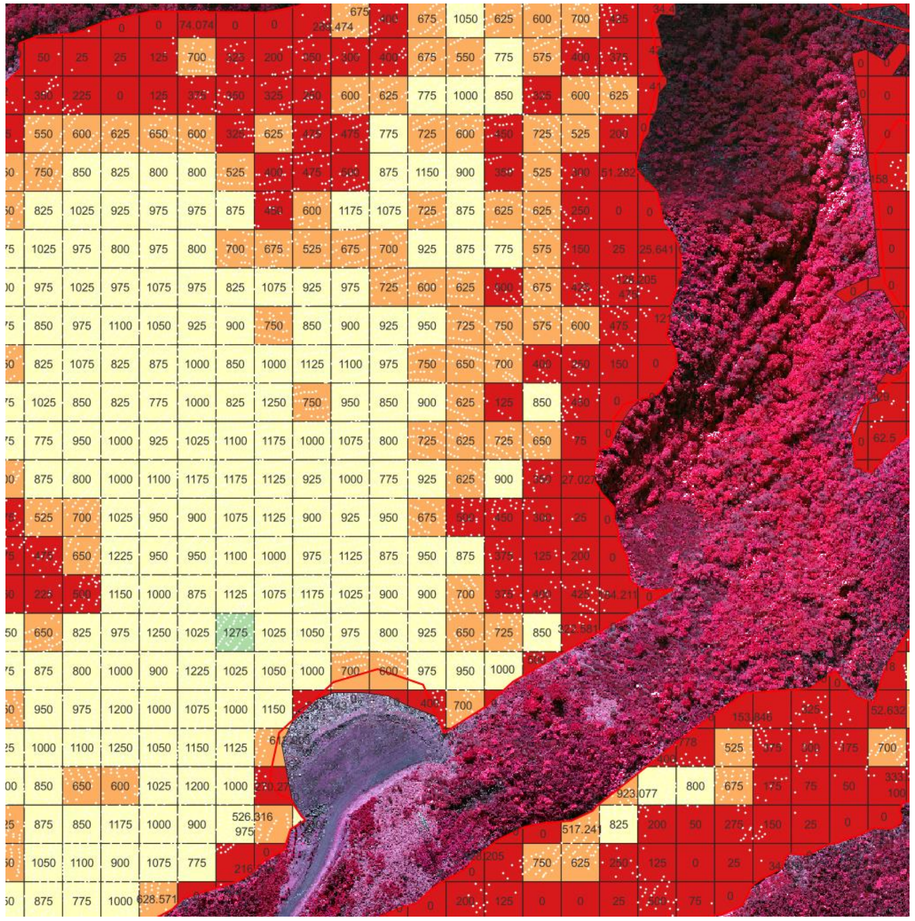
Seedling Detection and Photogrammetric Derived Tree Height



Indufor

Uniformity Assessment

Indufor’s Grided SPH Approach



Spatial layers showing stocking variability across the stand was generated by dividing the area into 20 m x 20 m grids (0.04 ha) to align closely with an inventory plot. Smaller edge grids < 0.02 ha were omitted.

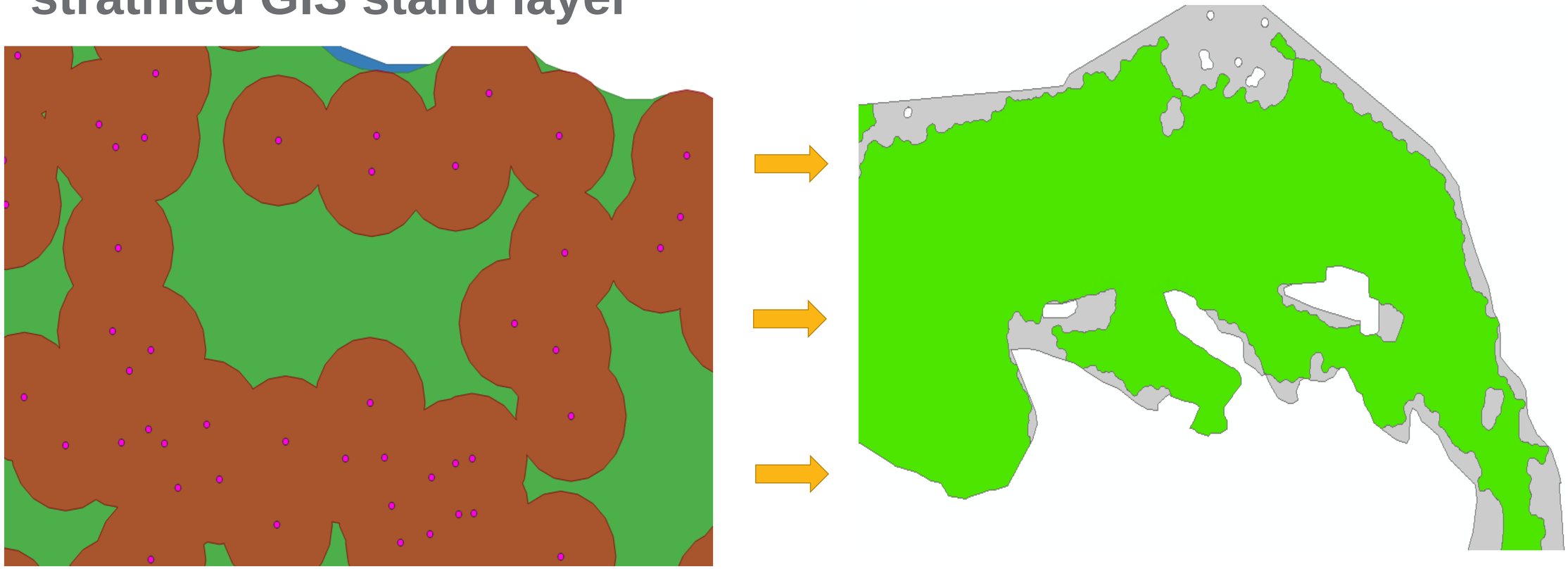
Return a tree count for each grid and derive into a SPH value.

Heatmap is useful for land managers to identify areas with low stocking, underperforming trees, or trees mixed with thick undergrowth.

Indufor

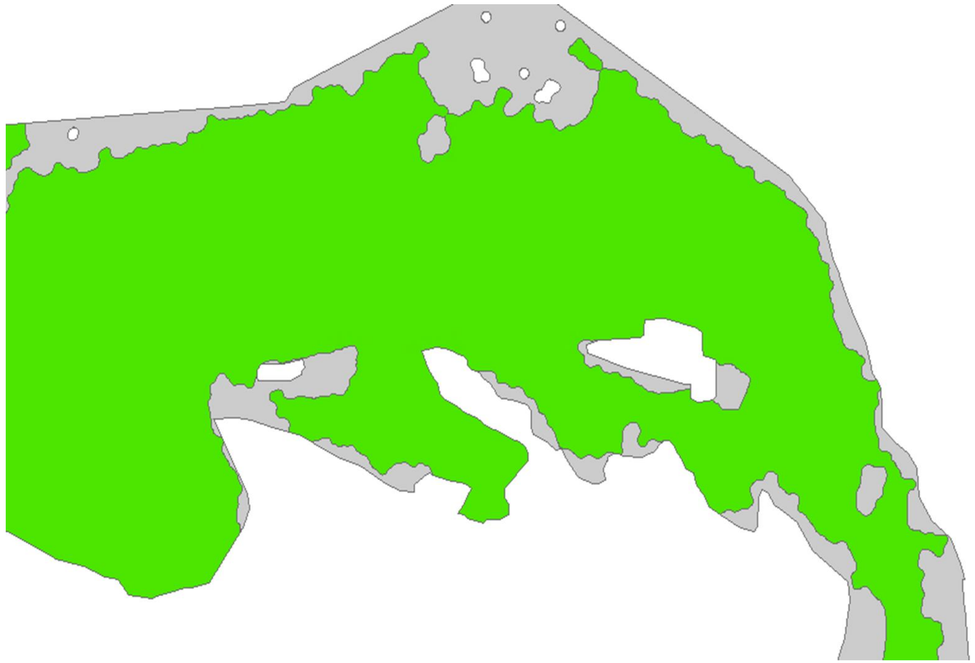
Tree Buffering & Stratified GIS stand layer

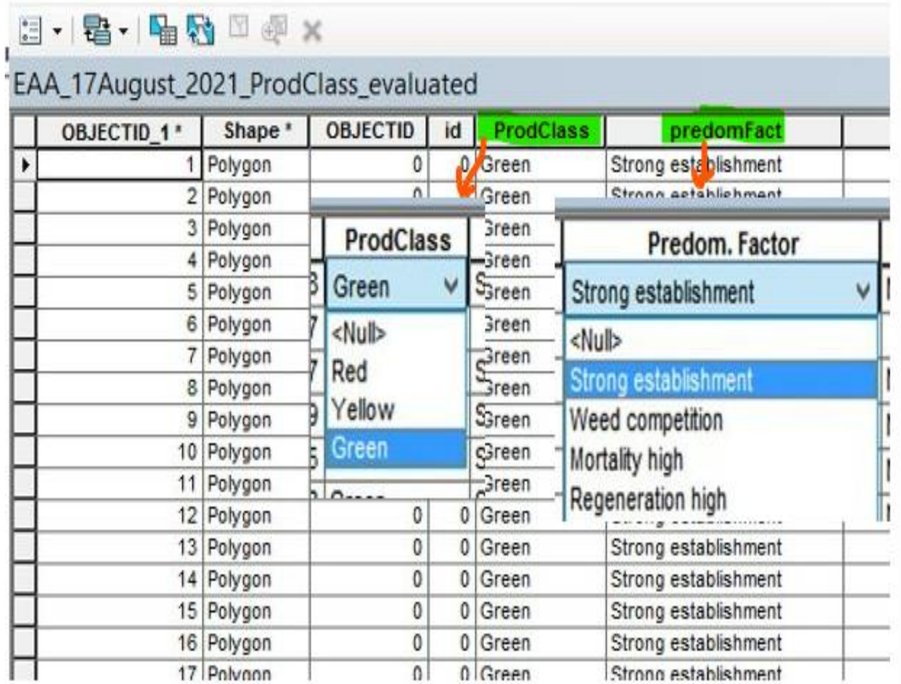
Buffering technique applied to individual trees, allowing the removal of small internal gaps (< 0.1ha) and the creation of an **internally stratified GIS stand layer**



Silvicultural Operations Assessment

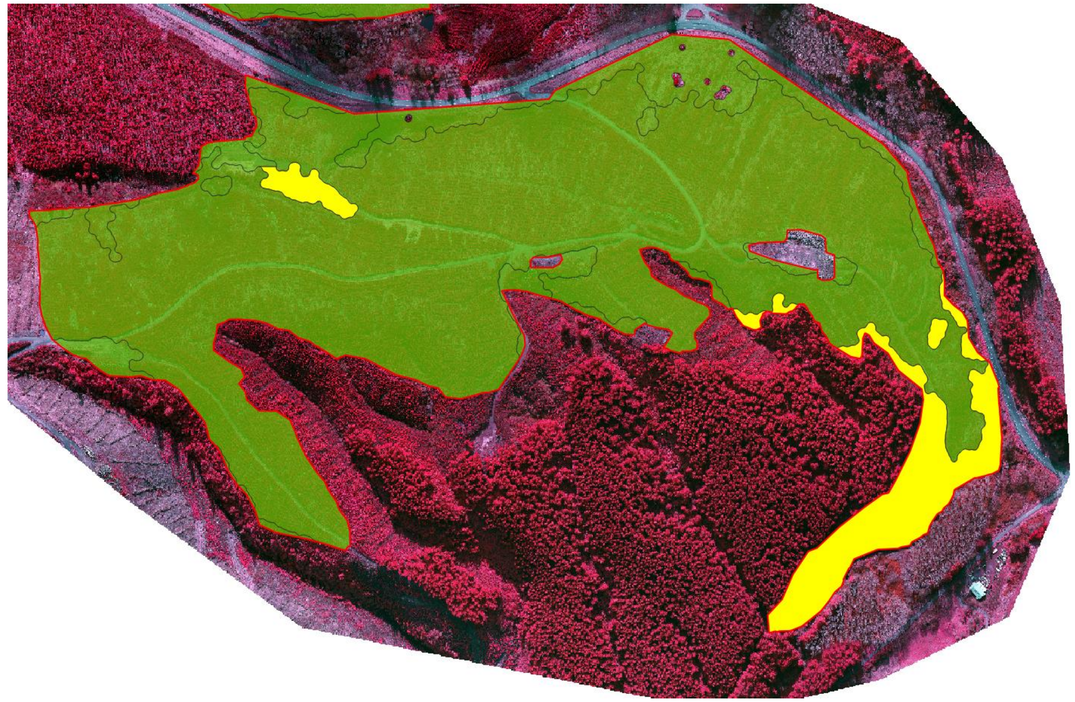
Shapefile formatted with drop-down boxes to allow easy validation and editing by silvicultural operations staff.





Silvicultural Operations Assessment

Once the operational assessment is completed, each internal polygon is scored using a Traffic-light system.



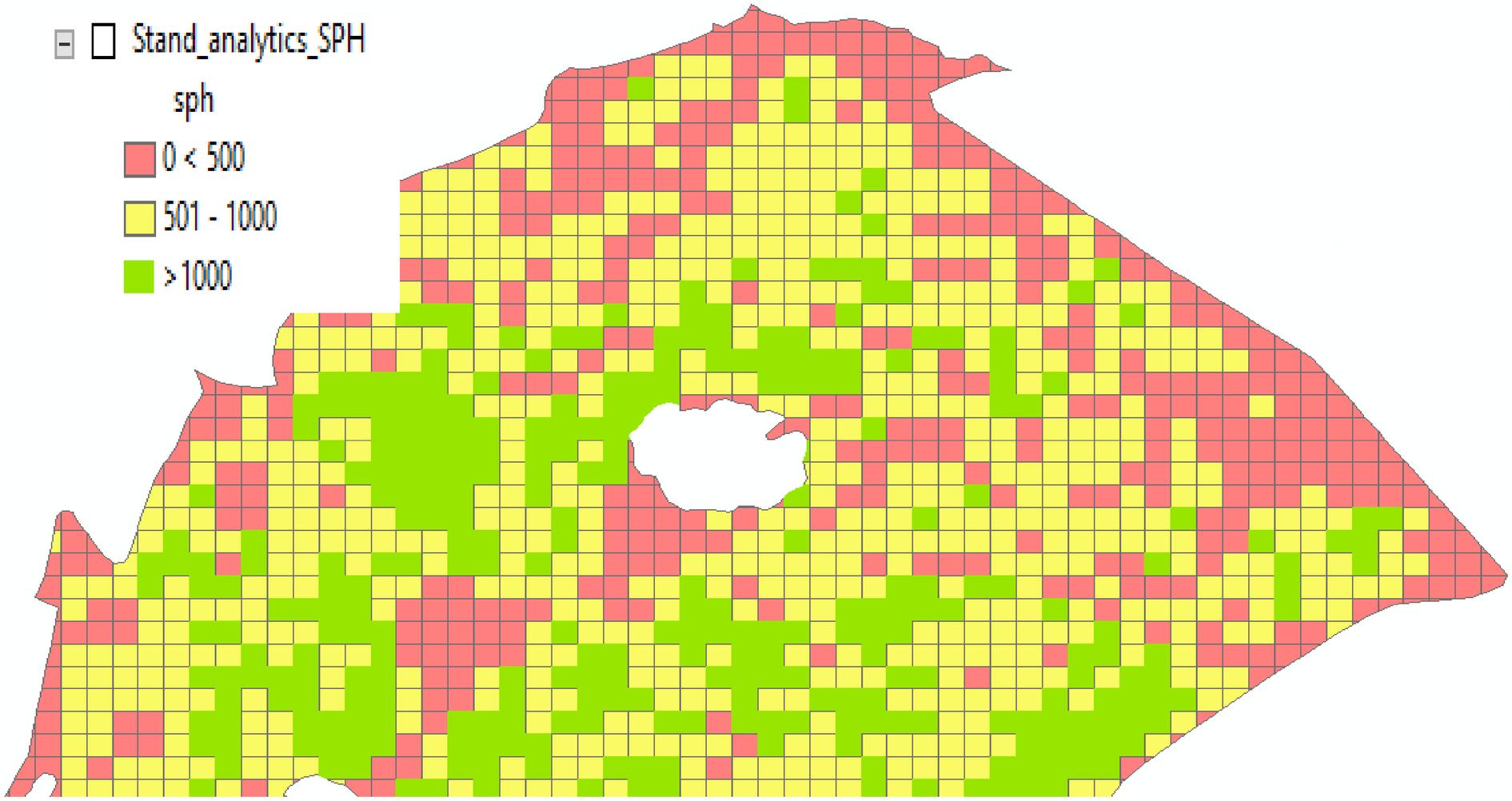
3yr Productivity Reporting

- Establishment success measure – operations classification

	Forest level (ha)			
ProdClass 2022	GRLD	HERB	WMTE	%
Green	241	206	170	98%
Yellow	3	1	11	2%
Red	0	0	0	0%

	Forest Level (ha)			
PredomFactor 2022	GRLD	HERB	WMTE	%
Weed competition	2.6		2.7	1%
Mortality high	0.6	1.0	5.1	1%
Strong establishment	237.6	206.1	168.3	97%
Road	0.4		0.4	0%
Edge			0.2	0%
Other (add comment)	1.4	0.3	3.3	1%
Low productivity			0.7	0%

SPH Classification (Indufor)



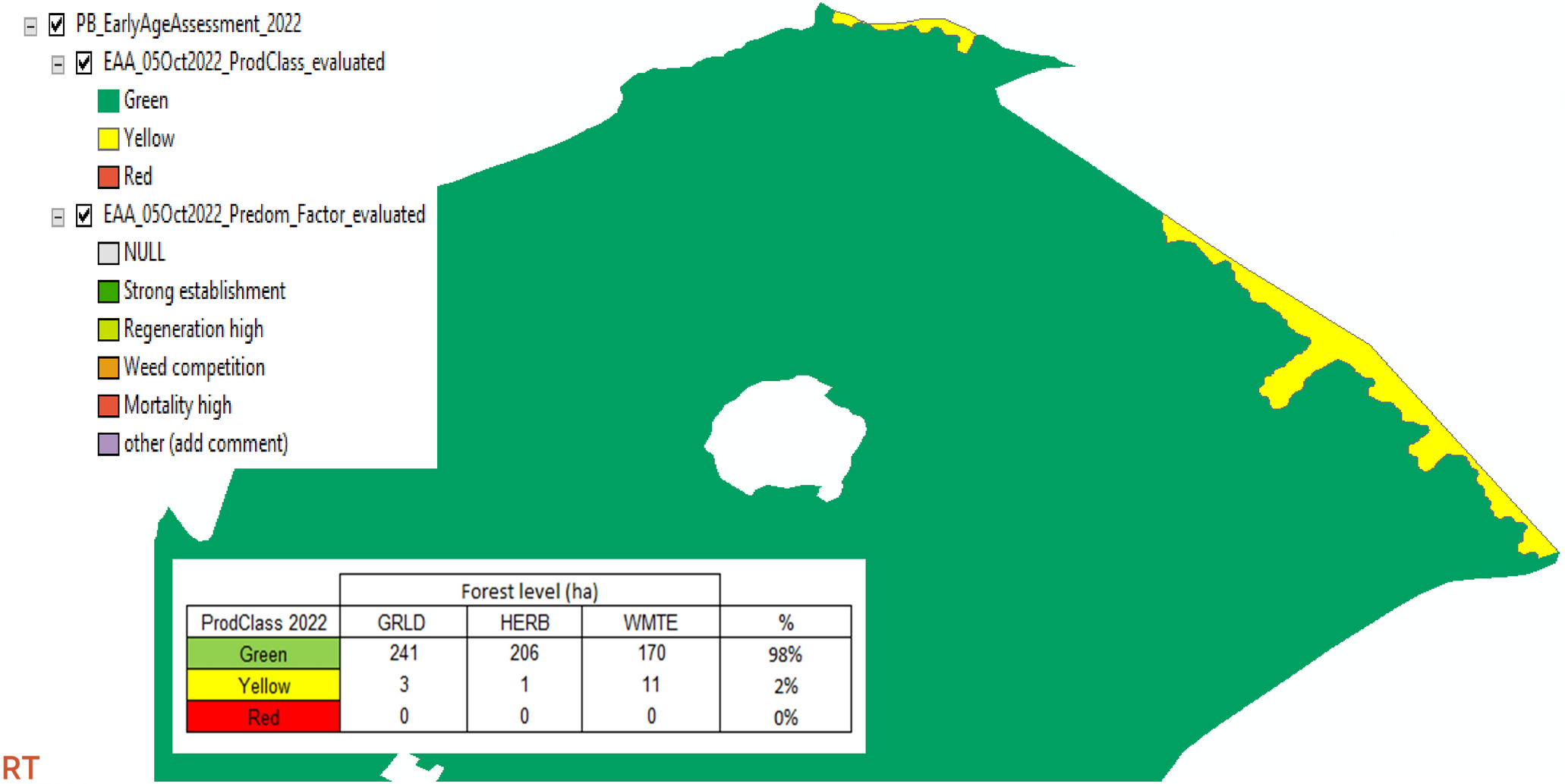
PORT BLAKELY

3yr Productivity Reporting

- Uniformity success measure – SPH classification

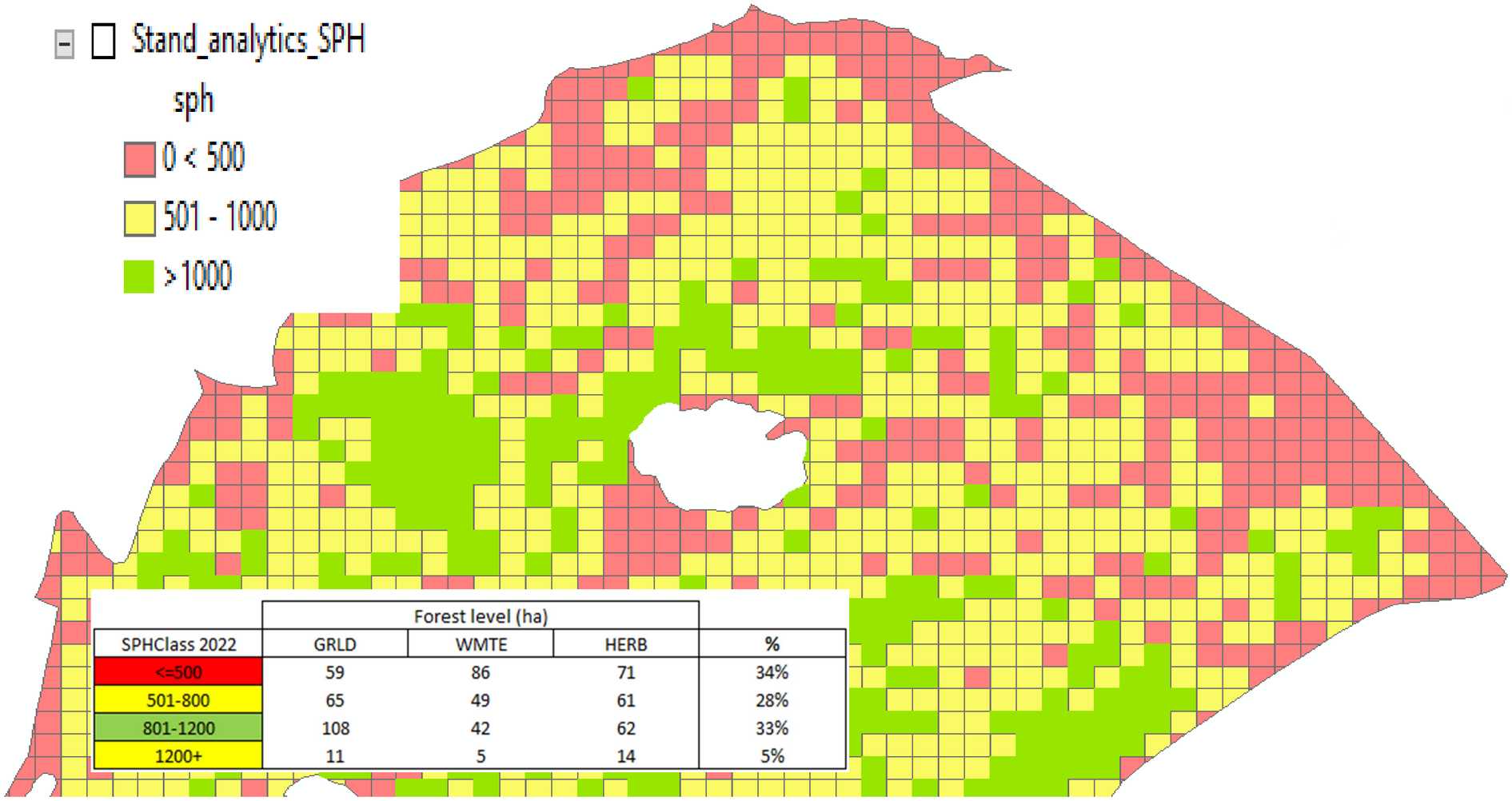
	Forest level (ha)			
SPHClass 2022	GRLD	WMTE	HERB	%
<=500	59	86	71	34%
501-800	65	49	61	28%
801-1200	108	42	62	33%
1200+	11	5	14	5%

Operations Classification – establishment success measure



	Forest level (ha)			
ProdClass 2022	GRLD	HERB	WMTE	%
Green	241	206	170	98%
Yellow	3	1	11	2%
Red	0	0	0	0%

SPH Classification - uniformity success measure



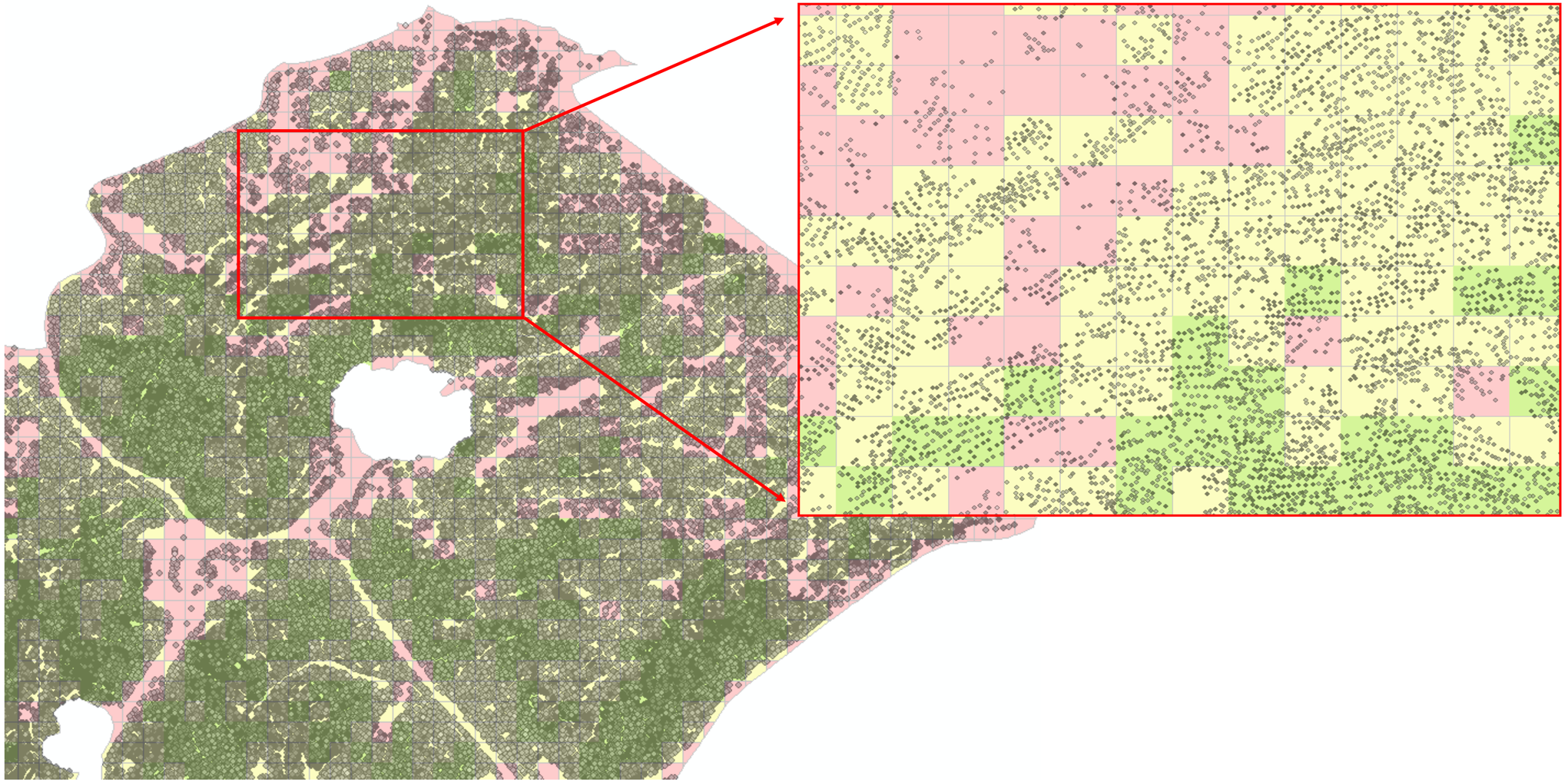
	Forest level (ha)			
SPHClass 2022	GRLD	WMTE	HERB	%
<=500	59	86	71	34%
501-800	65	49	61	28%
801-1200	108	42	62	33%
1200+	11	5	14	5%

PORT BLAKELY

Individual tree locations (Indufor)

PORT BLAKELY

Tree locations + SPH (Indufor)



PORT BLAKELY

Next Steps

- Complete another season of capture in the SI and refine processes
- Work with Indufor to improve regen detection
- Evaluate tree height assessments
- Consider the utility of DL techniques in other stand assessments – mortality assessment /thinning operations

Thanks

- **The Indufor Team** – Pete Watt, Abdullah Madawi, Chaplin Chan & Andrew Holdaway
- **Ulrich Von Werder** - Port Blakely's ETS/GIS technical forester
- **Jack Burgess** – Port Blakely's silvicultural forester
- **SkyCan** – David Napier