UNIVERSITÉ DE MONCTON
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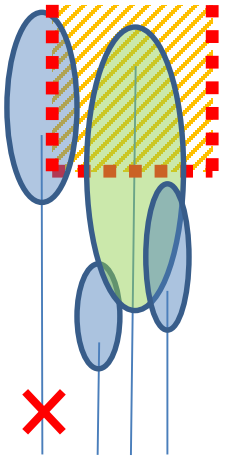
École de foresterie



Productivity and cost of using a clearing saw designed for *top spacing* in a delayed precommercial thinning context

Michel Soucy and Martin Béland

August 2nd 2017

COFE 2017 annual conference

Forest Engineering, from Where We've Been, to Where We're Going

Source: husqvarna.com

Precommercial thinning (PCT) in New Brunswick

- Release target around 2000 stems / ha
- Expensive
  - 686 $ / ha thinner and saw
  - 872 $/ ha when adding supervision and overhead
- Slow
  - 17,6 hours / ha

Little improvement in worker productivity and cost of PCT

- Mechanization of PCT did not produce big improvements
- Motor-manual PCT is still the common option


Woodbusiness.ca


Source: husqvarna.com

Recommendations for PCT in shade Tolerant Hardwoods

1. Use of a crop tree release approach
   - Release of 125 to 500 stems / ha

“Crop tree release” PCT is not common!

- It has challenges
  1. Worker mobility in a dense stand
  2. Worker navigation

Recommendations for PCT in shade Tolerant Hardwoods

2. Delayed timing
   - Promotes self pruning
   - Promotes better stem form

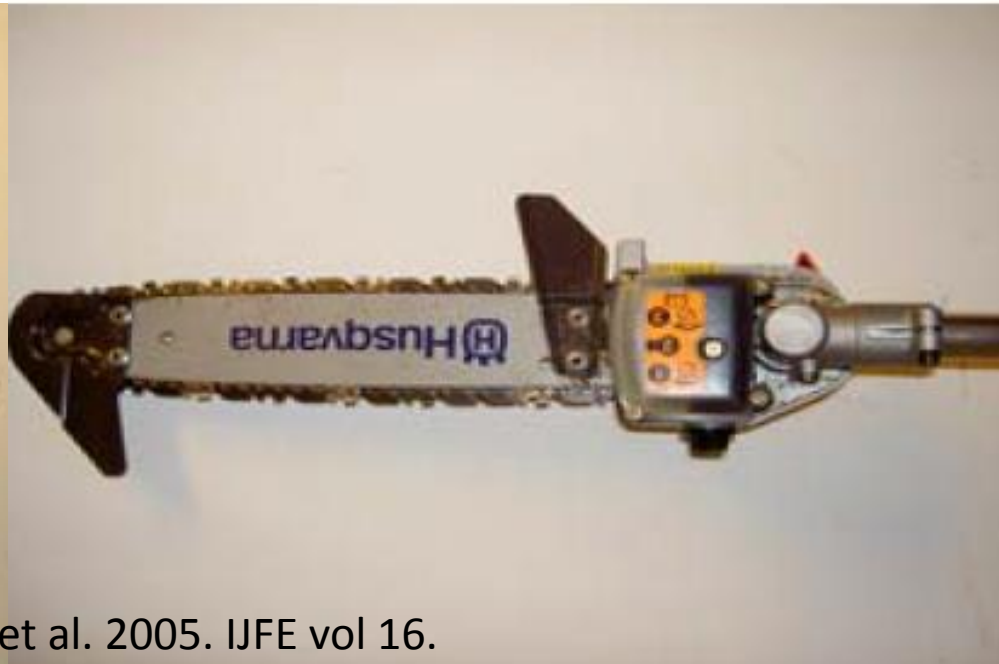
Delayed timing of PCT

- Larger diameter of stems to cut
  - Productivity of brush saw is greatly affected
    - Effective up to 6 - 8 cm in stump diameter

Source: husqvarna.com

Spacing saw development

- Early 2000's, Husqvarna tested prototypes of a chain saw equipped spacing saw
  - Competitive with the common brush saw, especially in stems with a diameter greater than 4 cm



Source: Ligné et al. 2005. IJFE vol 16.

Husqvarna 535fBx clearing saw

- Engine mounted on a back rack

Source: husqvarna.com

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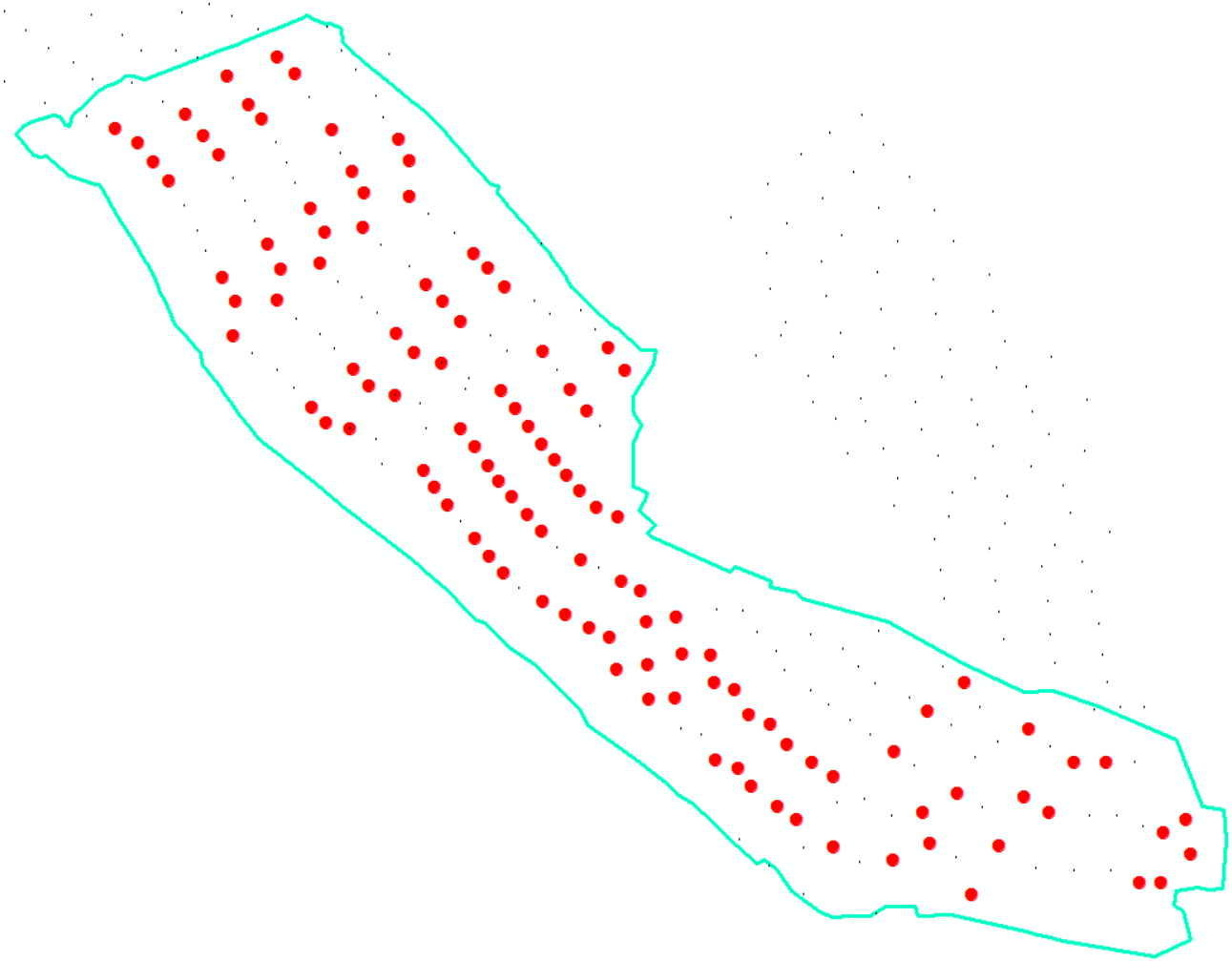
New tool = new opportunities?

Is this saw adapted for delayed, crop tree release, precommercial thinning?

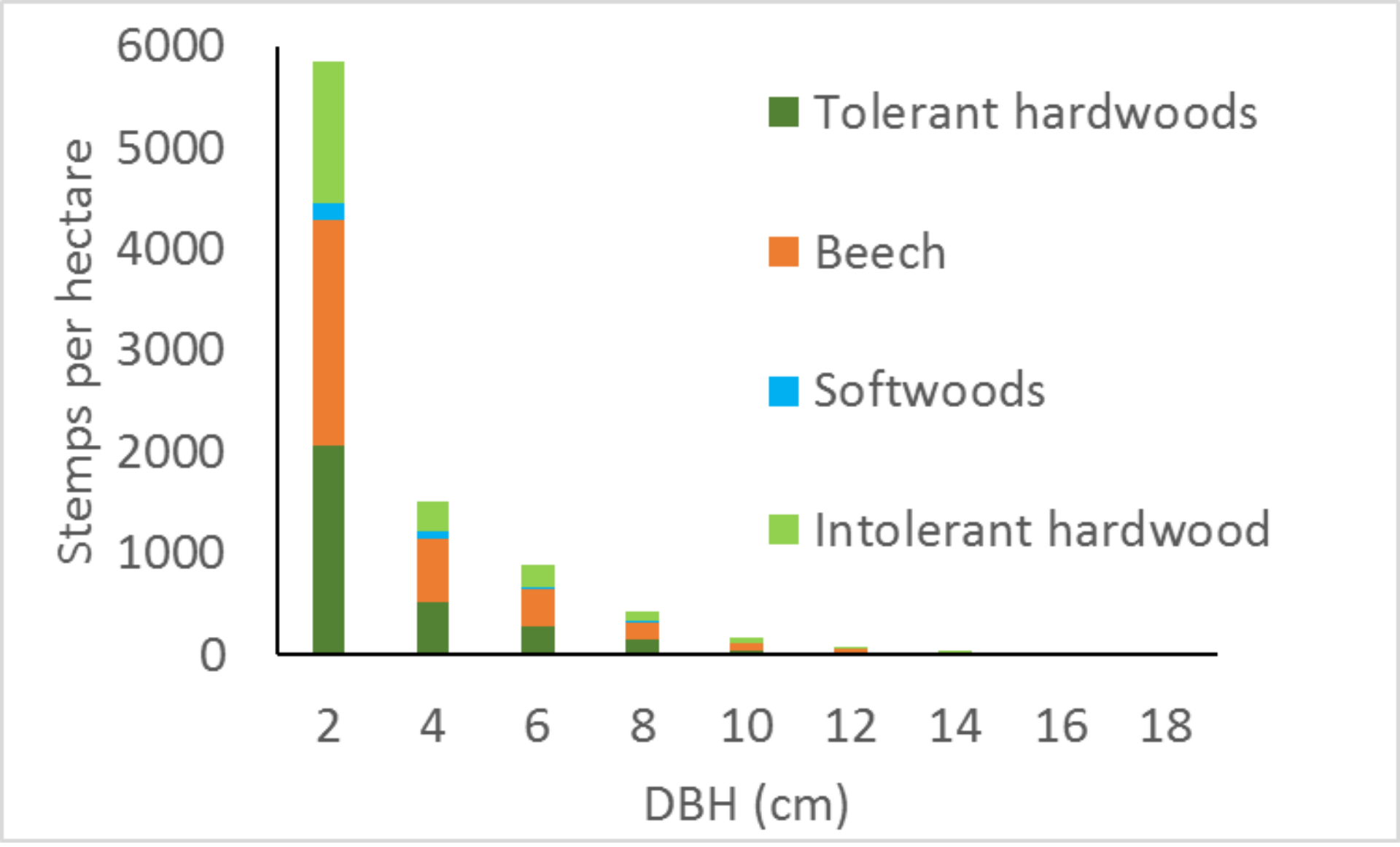
2016 – Field trial

Measurements

- 234 pre and post treatment inventory plots

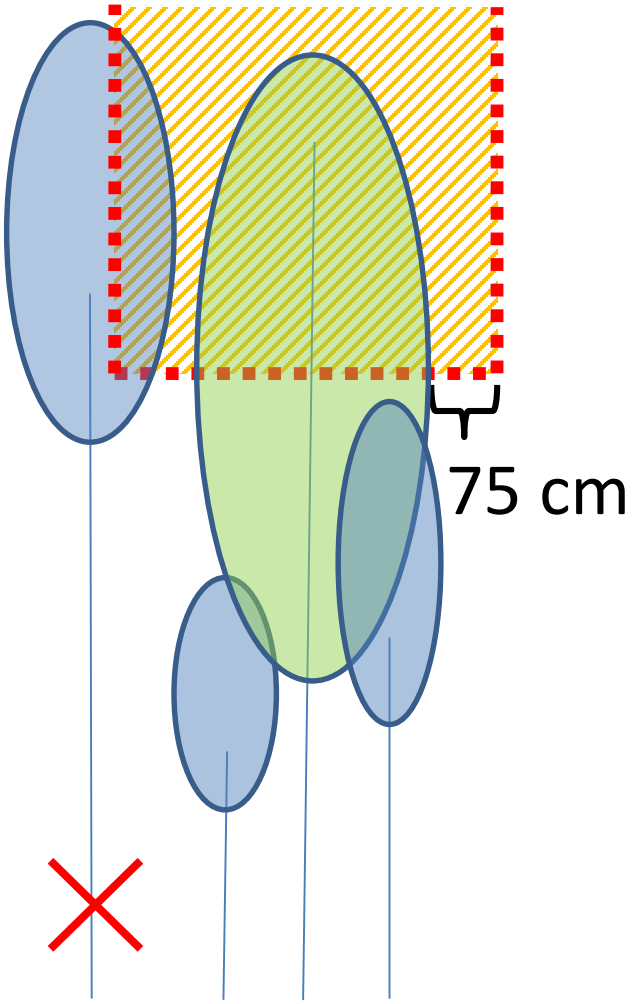


8940 stems per ha



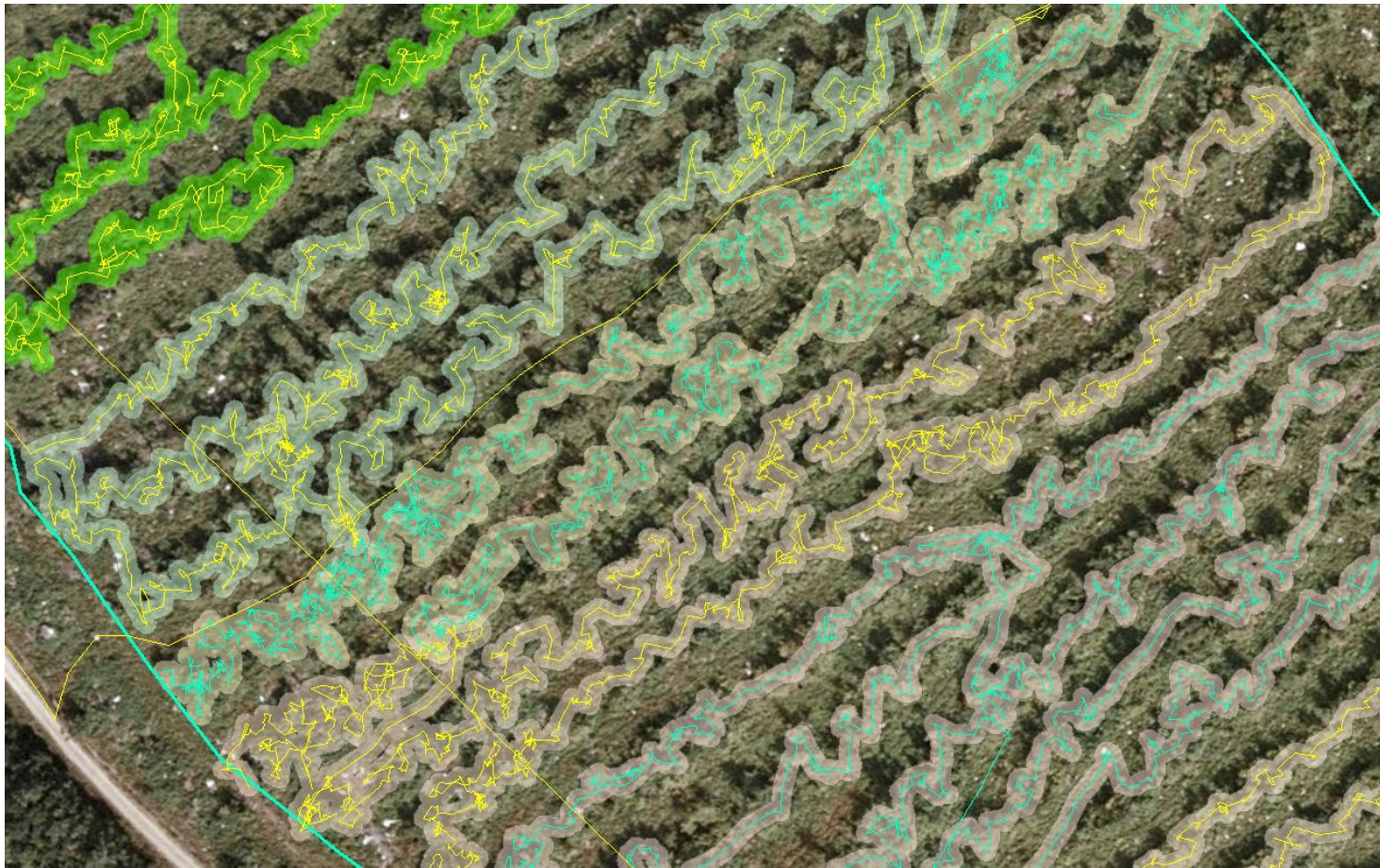
Treatment

- Maximum of 400 crop trees per ha
  - 5 m spacing
  - Sugar Maple or Yellow Birch



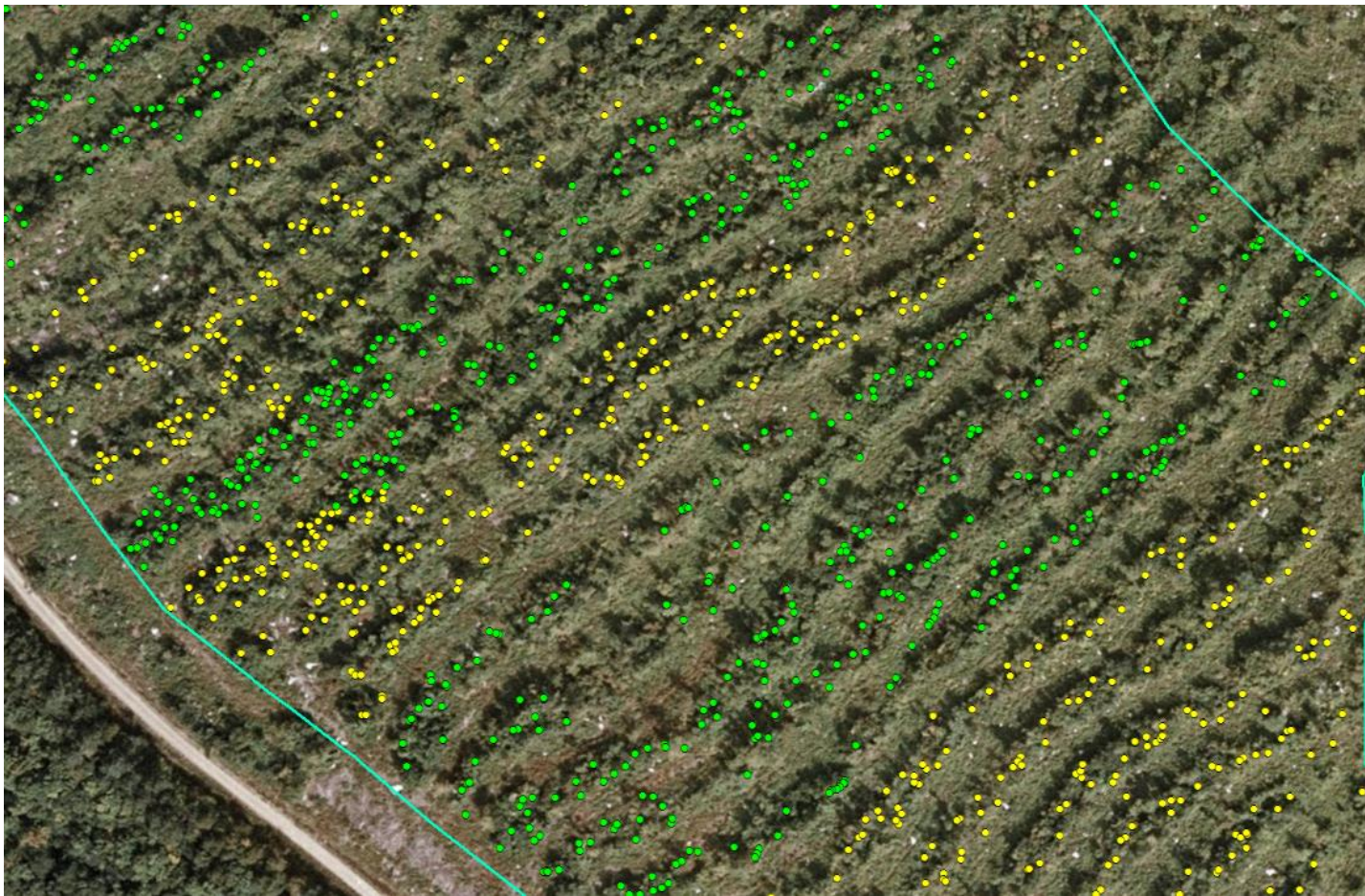
Measurements

- GPS tracking
  - 2,5 meter buffer on each side for area covered by worker



Measurements

- GPS point of each crop tree released
  - Time stamped
    - Crop trees released per hour



Measurements

- Detailed time and motion study
  - Every second day

3 variants tested

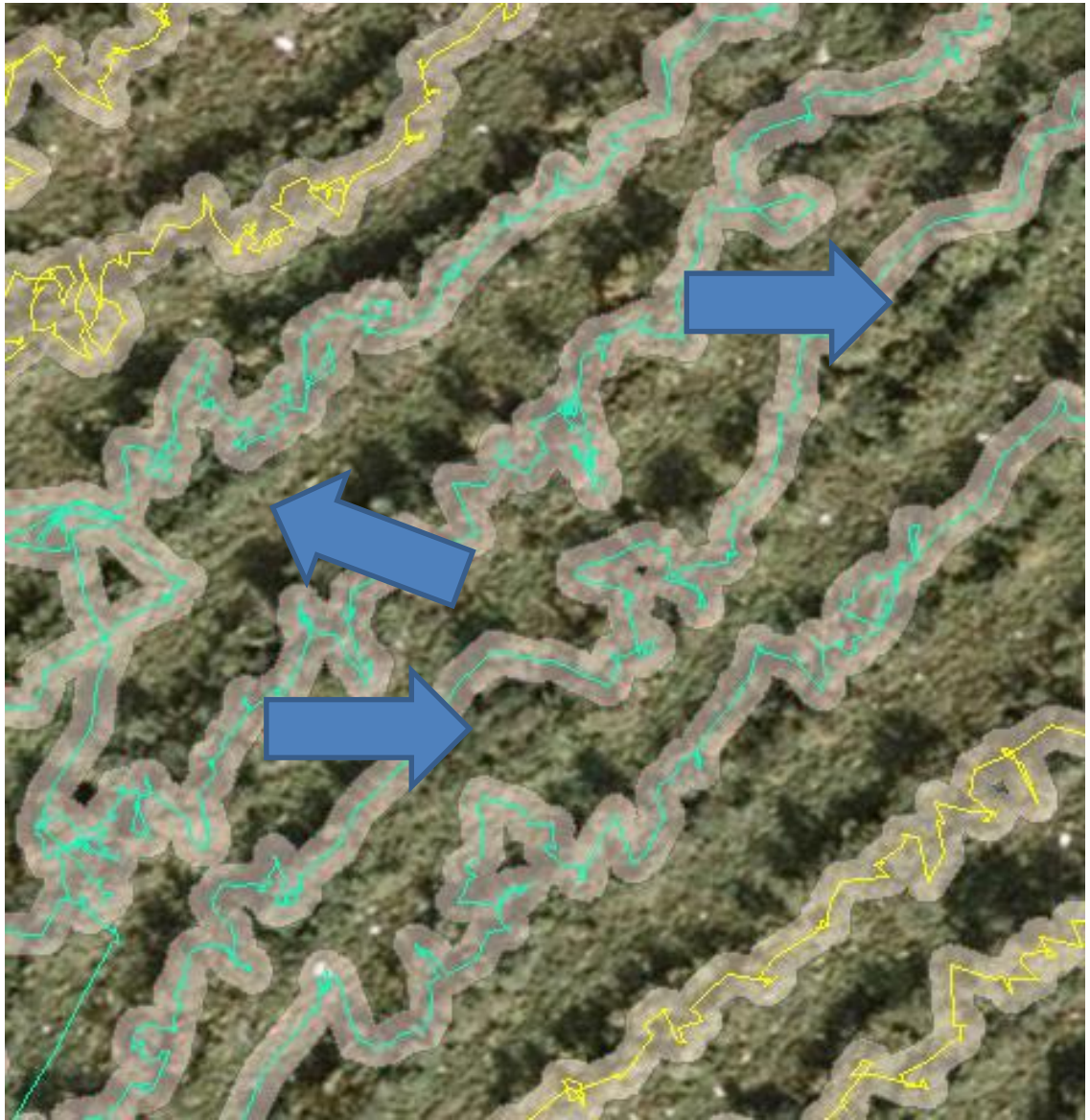
1. Thinning + GPS point of crop trees + Paint marks
2. Thinning + GPS point of crop trees
3. Thinning only

Results

Productivity : Area treated per hour

Variant	Area treated (ha) Leave strips	Area treated (ha) GPS buffer	Total productive time (hours)	Hours / ha (leave strips)	Hours / ha (GPS buffer)
PCT & GPS & Paint	7.9	5.6	35.3	4.5	6.3
PCT & GPS	4.7	2.8	15.3	3.2	5.4
PCT only	6.2	3.8	13.3	2.1	3.5
Total	18.8	12.2	63.4	3.4	5.2

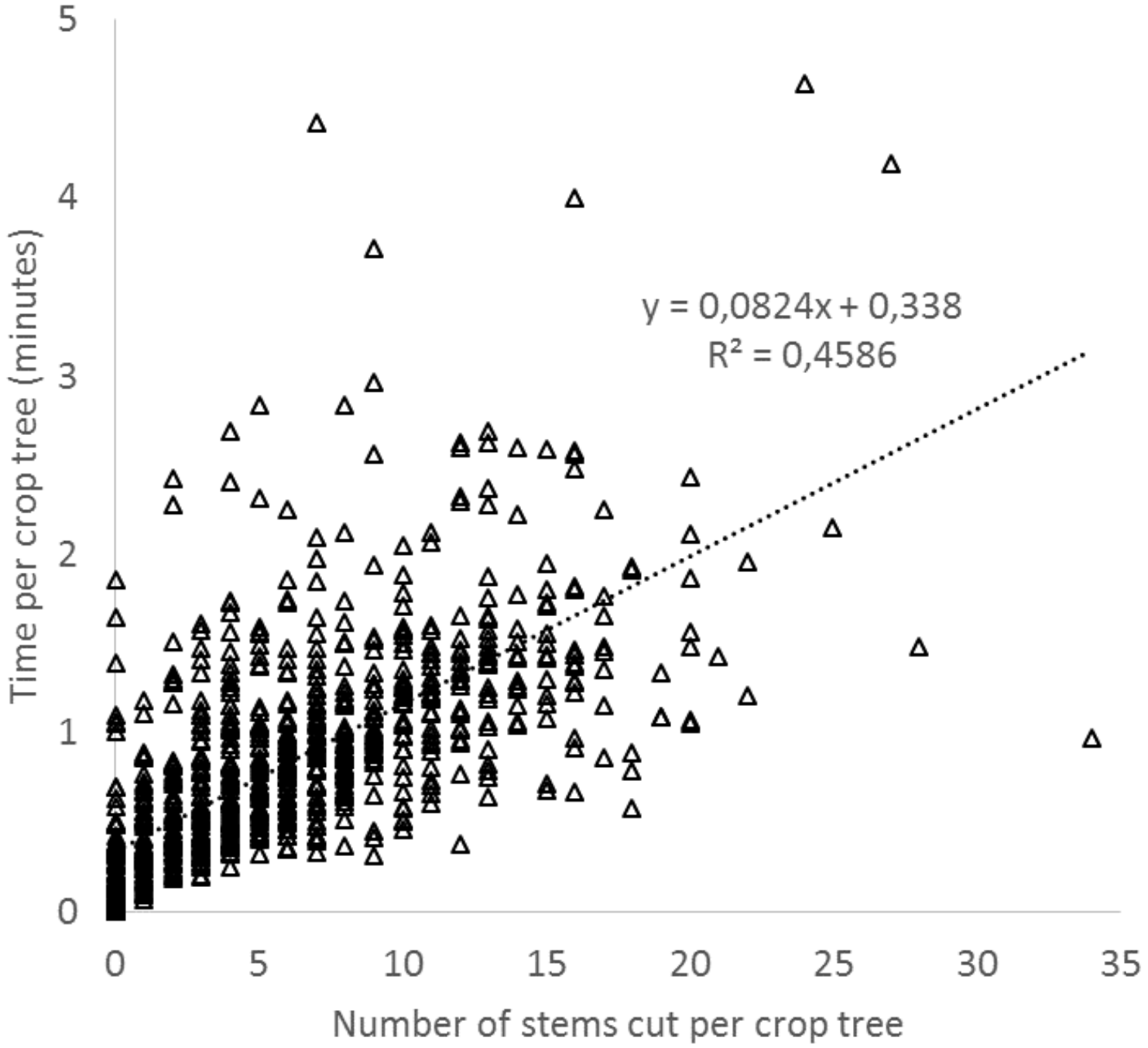
Worker did not walk through areas with low probability of finding a crop



- Entire leave strip was “treated”

Time consumption

Variant	Productive time per crop tree (seconds)	Trees cut per crop tree	Moving and searching for crop trees	Cutting	GPS	Paint
PCT & GPS & Paint	72,0	6,1	29%	61%	5%	5%
PCT & GPS	65,1	7,7	34%	59%	6%	-
PCT only	48,0	5,6	33%	66%	-	-


y = 0,0824x + 0,338
R² = 0,4586
Time per crop tree (minutes)
Number of stems cut per crop tree
0
1
2
3
4
5
0
5
10
15
20
25
30
35

Time consumption

Variant	Productive time per crop tree (seconds)	Trees cut per crop tree	Moving and searching for crop trees	Cutting	GPS	Paint
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PCT only	48,0	5,6	33%	66%	-	-

Cost estimates

Adjusted the cost model used in New Brunswick

- More expensive saw
  - 2000 $ compared to 1400 $ for regular brush saw
- Added cost of GPS and batteries

Cost estimates

- If area treated = area of leave strips

Variant	Cost of walking and selecting trees ($/ha)	Cost to release individual crop trees ($ / crop tree)	Crop tree density per ha	Total cost for thinner (Leave strips area) ($/ha)
PCT & GPS & Paint	58,76	0,66	222	205,25
PCT & GPS	42,52	0,43	195	123,80
PCT only	33,82	0,39	180	102,49

Effects of high stumps?

Conclusions from this first CTR-PCT trial

1. Technically feasible
   - Husqvarna 535fBx spacing saw is highly maneuverable
   - Use of GPS to navigate and to mark crop trees is effective
2. Higher productivity than traditional brush saw in same conditions
3. Lower cost per hectare, but higher cost per tree released

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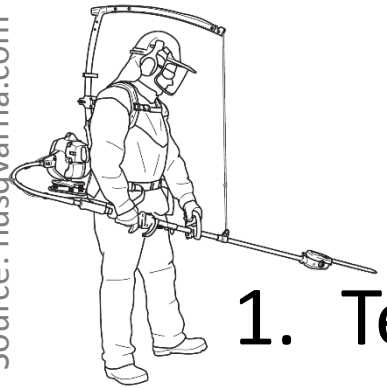

Source: husqvarna.com

Conclusions from this CTR-PCT trial

1. Technically feasible
   - Husqvarna 535fBx spacing saw is highly maneuverable
   - Use of GPS to navigate and to mark crop trees is simple
2. Higher productivity than traditional brush saws in same conditions
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