

# New Developments in Winch-Assist: New Zealand



Prof. Rien Visser

NZ School of Forestry, University of Canterbury, November 2021

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# What is winch-assist?

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“Using a winch & wire rope to support harvesting operations on steep slopes...”



# Steep Terrain: NZ Issue?

- ❑ Majority ( $\approx 55\%$ ) of future harvest in NZ on 'steep' terrain ( $>40\%$ )
- ❑ Cable logging systems well developed?
  - Relatively unsafe
    - ❑ 2 - 3 fatalities/10mil.m<sup>3</sup>
  - Relatively expensive
    - ❑ US\$18  $\rightarrow$  US\$45/m<sup>3</sup>



# Step-change in harvesting: Winch-Assist = Safety?

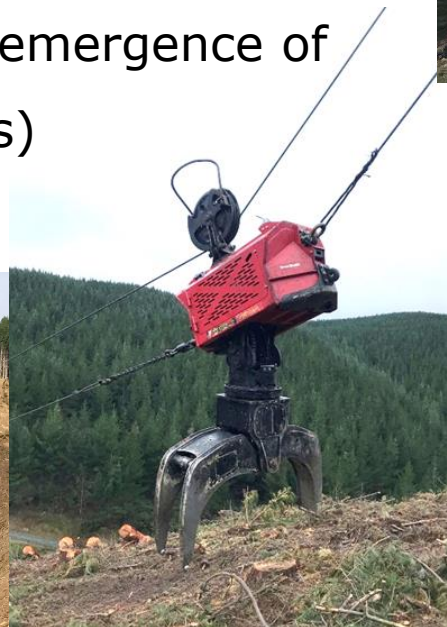
- ❑ Reducing the need for manual work



- ❑ 'Results' to date favourable
  - Approx. 50 mill m<sup>3</sup> harvested in NZ with winch-assist so 10+ lives saved...?

# WAM + Grapple Carriages

- = Full mechanisation of steep terrain
- ▣ Highly productive – also emergence of excavator based yarder(s)



# NZ Manufacture



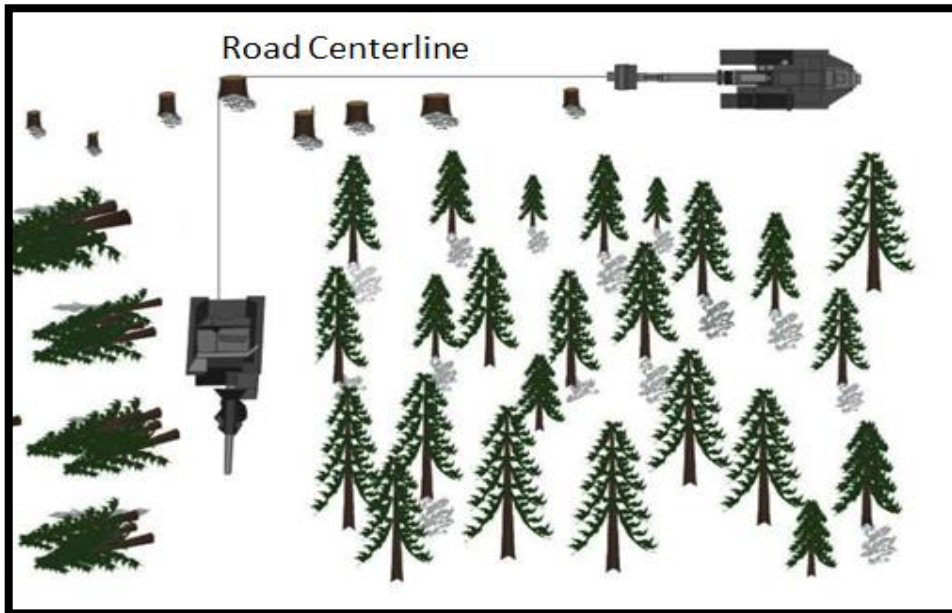
Started with R. Wood + N. Kelly / Trinder

Winch-Assist Machine System	Units in operation Total (op in NZ)
Falcon Forestry (DCEquip Ltd)	219 (95)
EMS TractionLine	187 (90)
Remote Operated Bulldozer (ROB)	32 (18)
ClimbMAX Harvester	11 (3)
Waka Eng	11 (11)
Performance and Mech Eng (PME)	5 (5)?
Other NZ developed Systems	7 (7)?
<b>Total NZ Made</b>	<b>470+ (230+)</b>

*Note:  
Approx.  
number  
at Feb  
2023*

# Harvest Planning?

- ❑ System designed to work straight up & down the hill ('in-line')
- ❑ BUT, most use trees / blocks to change rope angle & facilitate better machine utilisation



# Winch-Assist in NZ

- ❑ 230+ working full-time, 470+ made in NZ
- ❑ Mainly used for felling pre-bunching
- ❑ Now also skidder and forwarder...





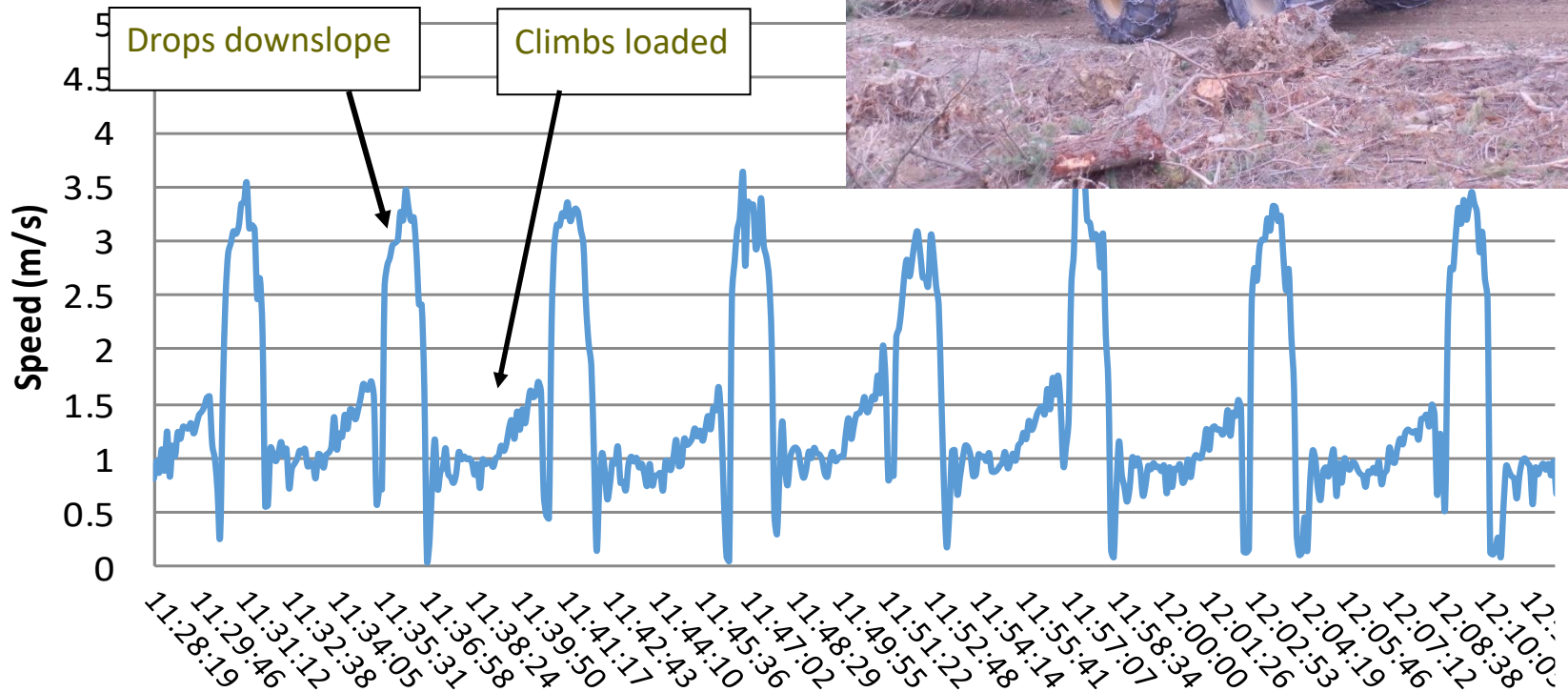
# Example: Winch-Assist Skidder



- Time and Motion study applied → high productivity (>600t/day)
- Also, soil disturbance

# Skidder speed...

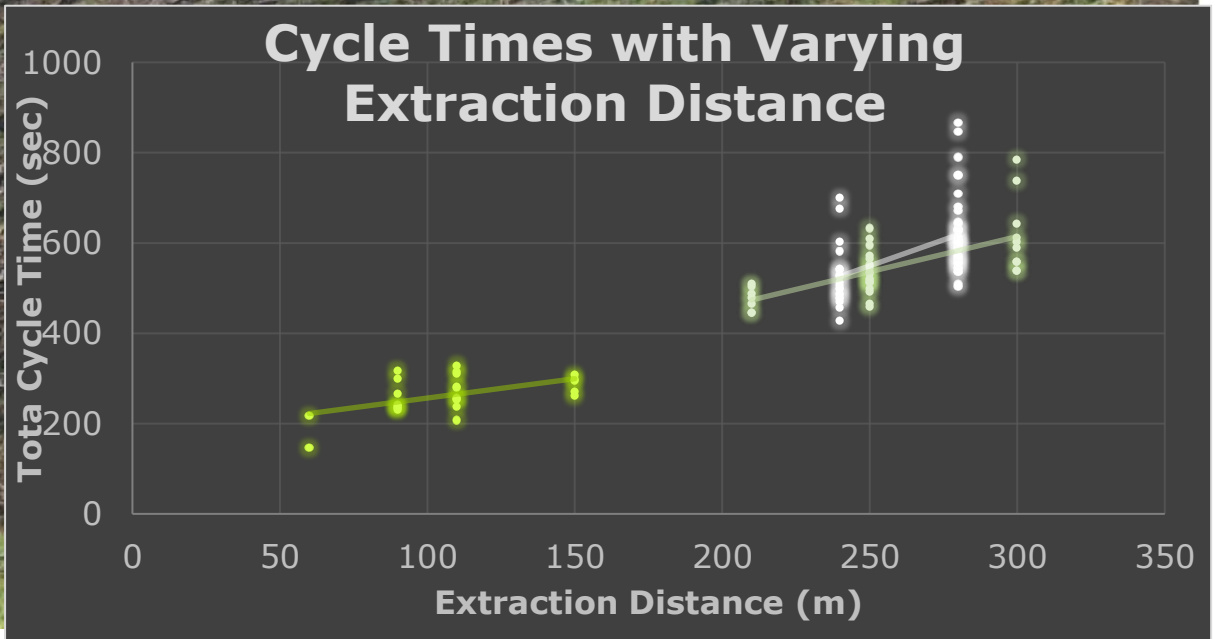
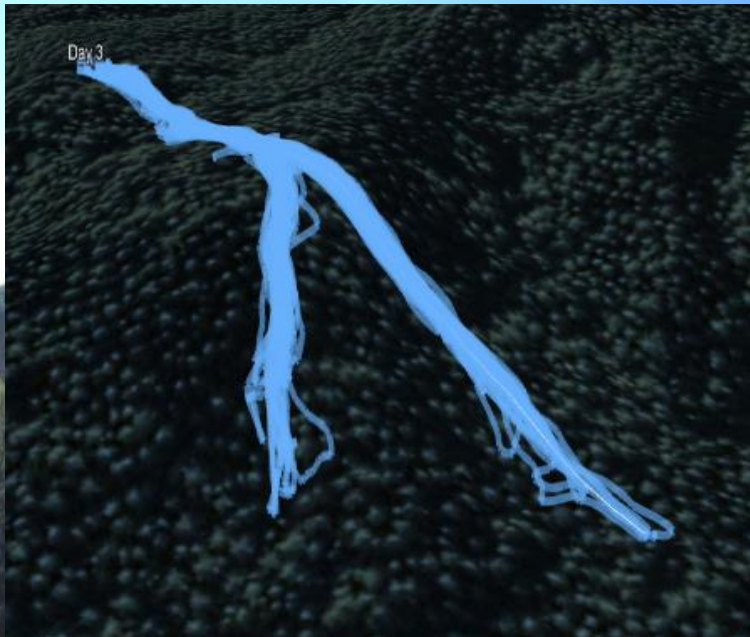
- Without winch, fast downhill but slow uphill...

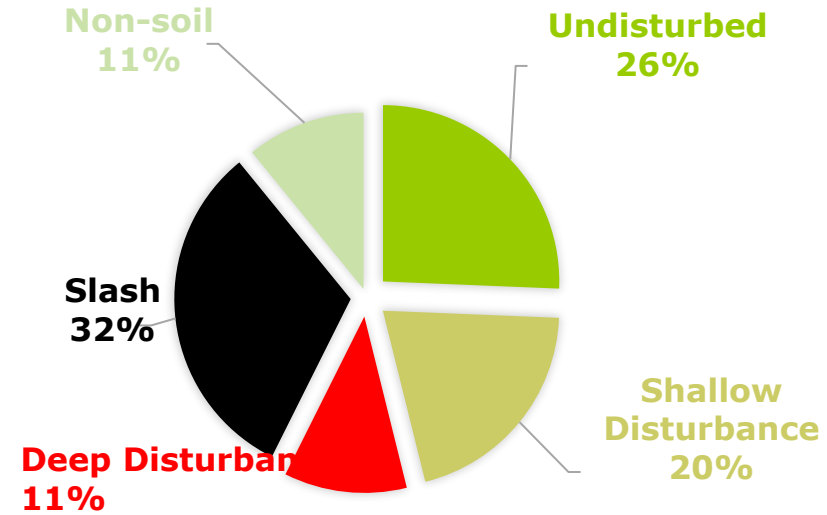


Time - Trail A, No Winch-Assist

# Winch-Assist Skidder Drone Footage







- ❑ Deep Disturbance ranged from 10% - 17%
- ❑ Shallow Disturbance ranged from 20% - 27%
- ➔ Improved operator practices, including use of slash can reduce disturbance <5%

*safetree*<sup>™</sup>

On [safetree.nz](https://safetree.nz)  
website!

# New Zealand Winch-Assisted Harvesting

## Best Practice Guide



Published July  
2022

Includes aspects  
like operator  
perspectives, risk  
assessment,  
machine  
inspection

# Protecting waterways, felling away from and shovelling uphill

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# New Developments?

## Boom design, improved stability

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# Winch Assist

## – to support grapple carriage

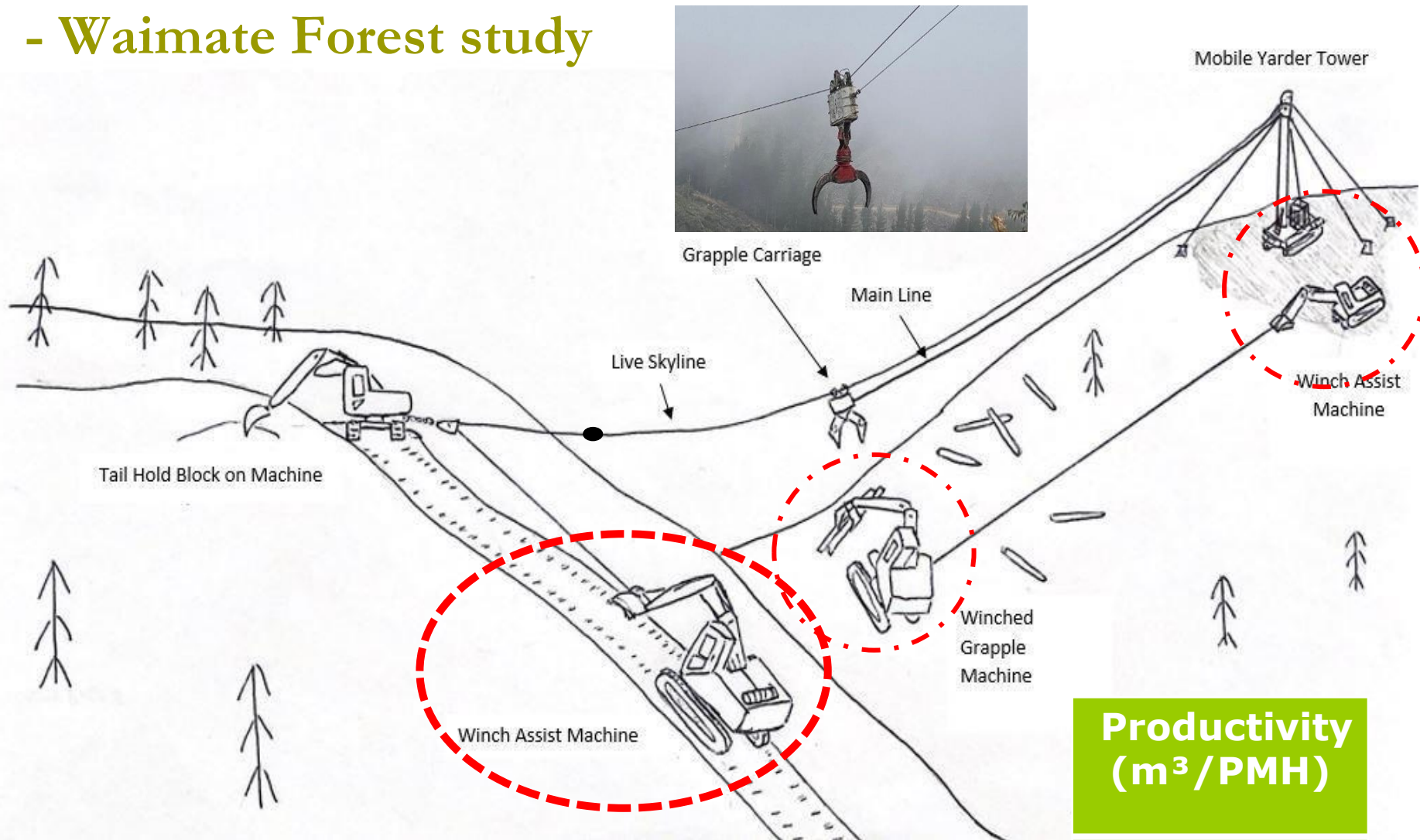


Tower yarders not always well suited to grapple carriage ops.

→ Use the WAM as both tailhold and provide skyline lift while grappling.



# Example: Live-Skyline - Waimate Forest study



*WAM remotely controlled by yarder operator*

# Winch Assist with Bridling!

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Support live skyline AND bridling for grapple carriage!



# New Developments: Grapple + Camera & Machine Learning

- ▣ Identifies stems from video + geospatial  
→ automation of pick stem up



- ▣ Set size threshold for residue extraction?

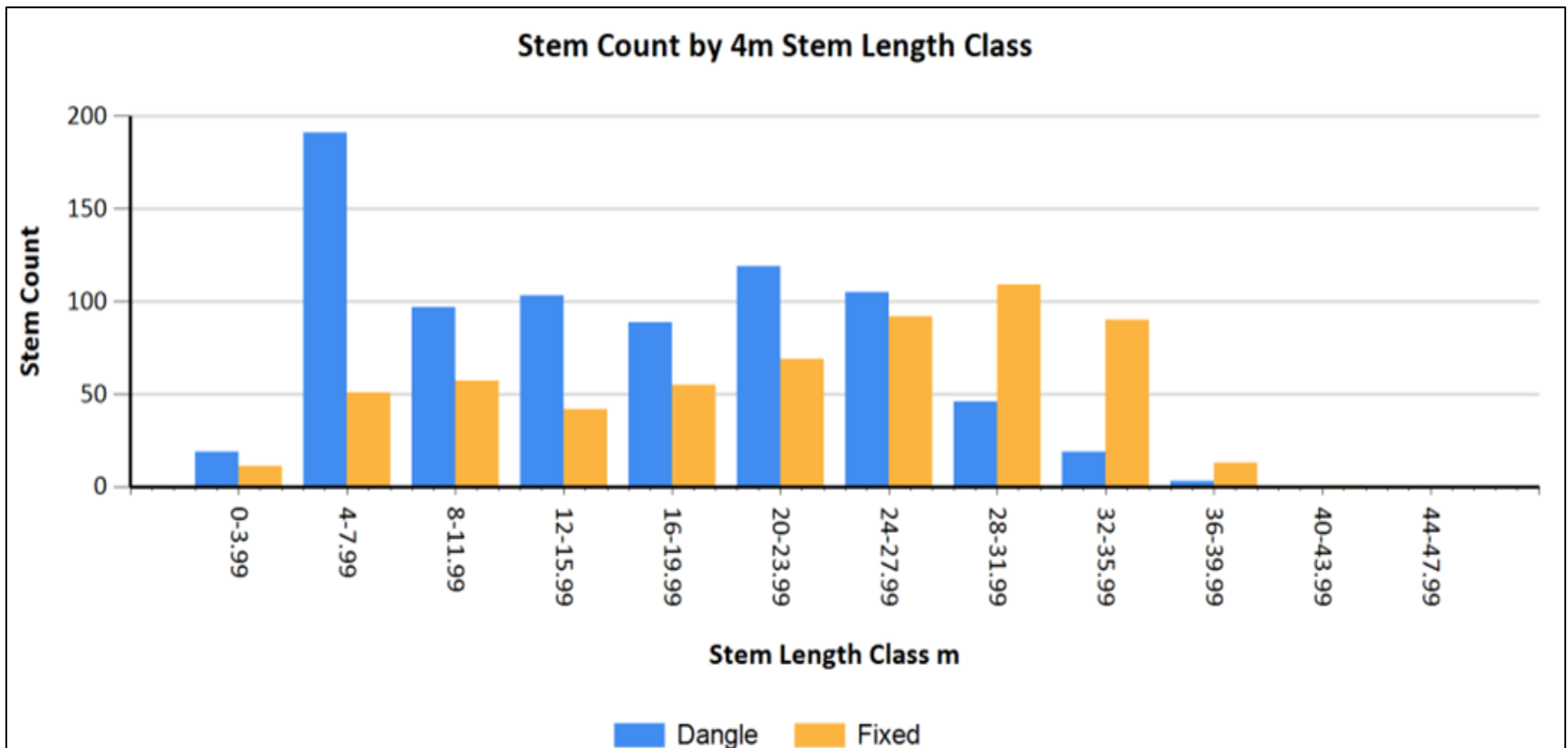
# Reducing breakage with Fixed-head felling...

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# Fixed felling head to reduce tree breakage

- Processor database shows effect on stem length coming to landing...
  - With Dangle head many 'pieces' less than 10m
  - With Fixed head most are 24m+



# Summary

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- ❑ Winch Assist now well established
    - 230+ professional systems working full-time
    - Good detail on cost and productivity
    - Best Practice Guide published
  - ❑ Improved design
    - Safety knowledge and systems
    - Anchoring systems and methods
    - WAM skidder and forwarder ops
  - ❑ New Developments
    - Technology integration
    - SMZ protection
    - Live skyline - bridling
- We continue to develop and study

