Logging Equipment and Systems

Thinning in the Most Effective Manner While Minimizing Stand Impact

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Logging Equipment and Systems

Presentation Outline

• Overview of equipment and systems for thinning
• Costs of thinning systems
• Matching technologies to timber conditions
• Minimizing stand damage and soil compaction
Skyline Thinning Equipment and Systems
Equipment & Carriage Options

**Standing Skyline & Slackpulling Carriage**

- Uphill yarding preferred
- 1000 – 1500 ft. yarding distance
- 2,000 – 5,000 pound payload capacity
- $50,000 - $450,000 equipment cost
- Yarding crew size from 2 – 6 people
Purpose-Built Small Wood Yarders

Examples
Koller 501
Skylead
Christy
TMY 40
Versatile Mobile Yarders

Madill 071

Diamond 210 Swing Yarder
Non-Guyline Yarders

Yoader
Tong-Thrower

Photo Credit: Pete Bailey, Skyline Thinning Company
Koller MultiMatick Yarder/Processor

Photo Credit: Koller and Lee Miller,
Miller Timber Services
Automatic Operating Cycle

Start of the automatic outhaul by key press and the control is passed on

Arrival at the starting point and lowering the load onto the landing

Automatic inhaul starts and the control is transferred again

Arrives at target point. The operator starts slack-pulling

Break out by the operator (Choker Setter)

Photo Credit: Koller and Miller Timber Services
Equipment & Carriage Options

- Mechanical Slackpulling
- Manual Slackpulling
Multispan Skyline Carriages
Other Thinning Harvesting Systems

Cut-To-Length System

Forwarder

Single-Grip Harvester
Other Thinning Harvesting Systems
Other Thinning Harvesting Systems
Costs of Thinning Systems
Harvesting Cost Components

**Felling, Yarding, Loading**
- Fixed costs
- Variable costs including labor
- Move-in costs (seasonal restrictions)
- Supervision, administration
- Equipment utilization (SMH vs PMH)

**Road Construction and Maintenance**

**Transportation**
Variables that Affect Harvesting Cost

Some Examples

✓ Yarding, skidding or forwarding distance
✓ Tree size
✓ Volume removal or residual basal area
✓ Terrain conditions (topography)
✓ Landing size and layout
✓ Road conditions
✓ Guyline anchor availability
Typical Productivity and Costs

- **Low to High Thinning Costs**
  - Horse
  - Chainsaw felling and skidding
  - Cut-to-Length
  - Cable
  - Helicopter

- **Daily Range of Productivity**
  - 1 – 10 truck loads (3 - 5 loads common)
  - 4 – 40 MBF per day - stump to truck

- **Daily Costs**
  - $1,000 - $25,000 ($2,500 - $4,500 common)

- **Cost per MBF (felling, yarding loading)**
  - $100 to $500 ($200 - $250 common)
Some Examples

Variables that Affect Thinning Costs

✓ Equipment Versatility and Utilization

Rick McKay Logging
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Cost in $/Net Cunit

- **Move In/Out**
- **Yarding**
- **Felling**
Thinning Cost Comparison

Mid-size yarder
8 person crew

Small yarder
5 person crew
12% lower yarding cost
Prebunching Logs for Skyline Thinning Operations

Two-Step Thinning System

Step 1. Prebunching with Single-Drum Winch.

- Area Yarded to Skyline Road
- Skyline Corridor
- Single-Drum Winch
- Spar Tree

Step 2. Swinging Prebunched Decks with Mobile Yarder.

- Haul Road
- Mobile Yarder
- Prebunched Log Decks
- Skyline Corridor
Prebunching Equipment Alternatives
Early Commercial Thinning Systems
Native Forest ReGrowth
Eucalyptus Thinning
Australia

Questions:

- What are the productivity and cost impacts – small trees and thinning?
- Where/how can productivity be increased?
- How do alternative harvesting systems compare?
- What are the niche areas for different harvest systems?
Research Results

How do small trees affect thinning costs?

![Graph showing the relationship between DBH (cm) and unit cost ($/tonne) for different harvesting methods.](image)
Early Commercial Thinning

“Best” Harvesting Options:

- Cut-to-length system
- Small skyline yarder
- Whole tree yarding
- Prebunching for bigger equipment & systems
Matching Harvesting Technologies to Timber Conditions
Small Commercial Thinning Timber

<100 bf/tree; 10-14 in DBH; 30-40 yrs D. Fir

Harvesting System Alternatives

- Cut-to-length
- Small skyline yarder (>35% slopes)
- Horse
- Crawler Tractor
Medium Commercial Thinning Timber

<100-150 bf/tree; 12-16 in DBH; 35 - 50 yrs D. Fir

Harvesting System Alternatives

- Cut-to-length
- Medium skyline yarder (>35% slopes)
- Crawler Tractor
- Small or Medium Size Helicopter
Large Commercial Thinning Timber

>150 bf/tree; 16-24 in DBH; 40 - 70 yrs D. Fir

Harvesting System Alternatives

- Chainsaw Felling or Feller Buncher and Crawler Tractor
- Medium Skyline Yarder (>35% slopes)
- Medium-Size Helicopter (>35% slopes)
Minimizing Stand Damage and Soil Compaction
Different Equipment, Expertise and Harvest Planning

Clearcutting vs. Thinning
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Strategic and Tactical Harvest Planning for Different Systems

Photo Credit: Cheryl Bright, BLM
Operational Planning
(Unit, Sale, Project)
Skyline Yarding Roads and Landings

CENTRALIZED LANDING

CONTINUOUS ROADSIDE LANDING

CORRIDORS

LANDING

ROAD

PARALLEL CORRIDORS

Image of equipment and forest setting.
Skyline Corridor Field Layout

Photo Credit: Pete Bailey, Skyline Thinning Company
Skyline Corridor Layout
Skidding and Forwarder Trail Planning

Skidding Pattern

Forwarding Pattern
Minimizing Residual Stand Damage During Logging Operations

- Skyline corridor layout
- Felling pattern
- Crew experience & techniques
- Slackpulling carriage control
- Skyline corridor spacing (100 – 150 ft)
- Use of intermediate supports & tailtrees where needed
- Rub trees along the corridors
- Tree pads when needed
- Extra care during sap flow
Thank you