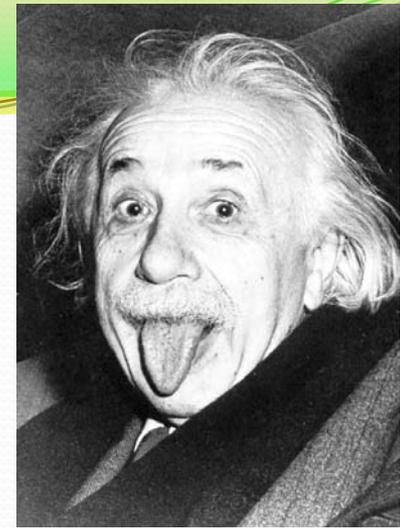


# Operational Concerns



# Economics and Physics



- Historical Harvesting Methods
- Ground Based Operations
- Cable Yarding
- Helicopter Yarding
- Details (MBF/ac., Haul, Road Construction, etc.)
- Operational Restrictions

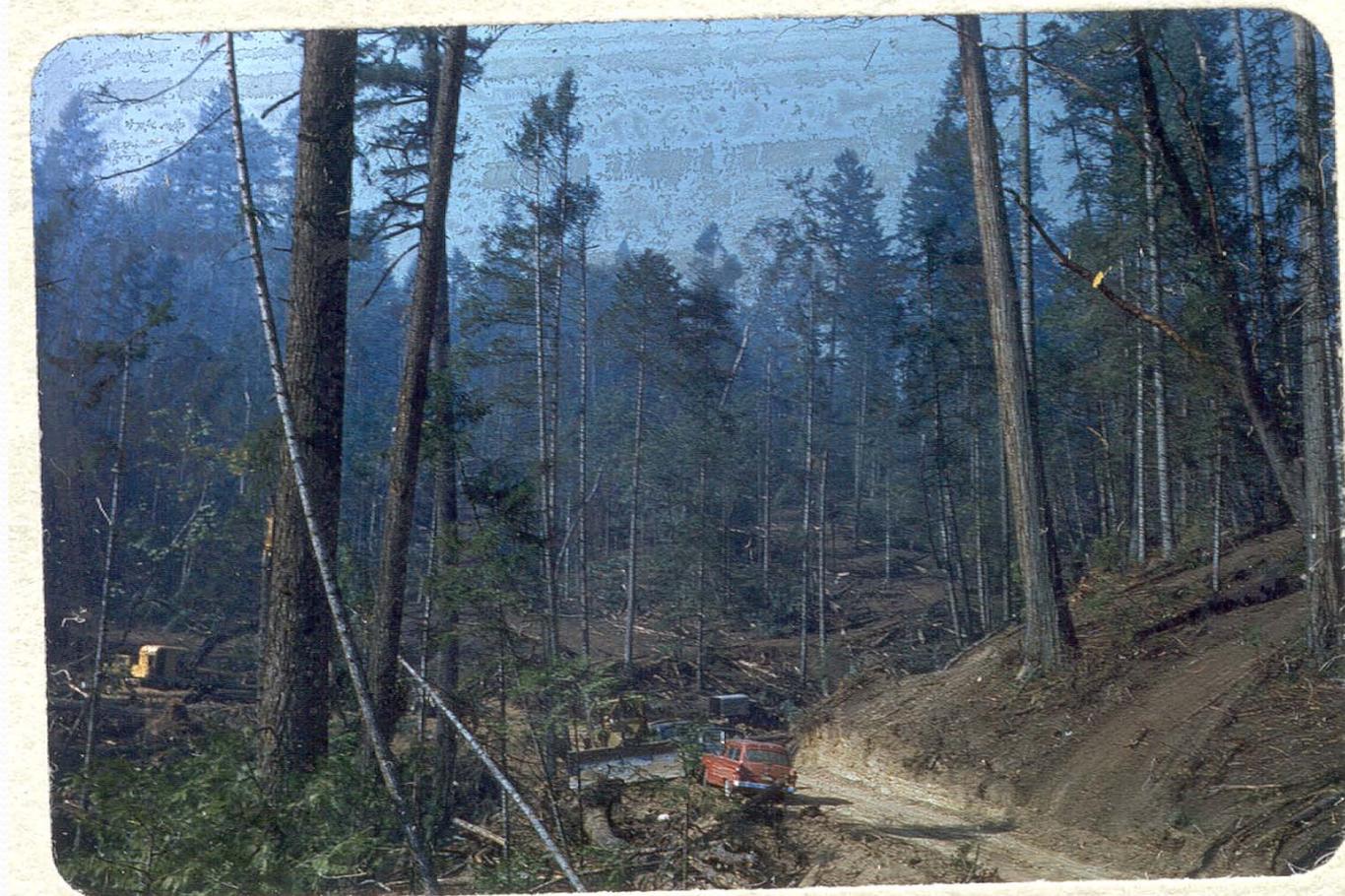
# Historical Harvesting Methods

- CAT yarding on steep slopes
- Large tower cable yarding to one landing
- Stream cleaning
- Splash Damming



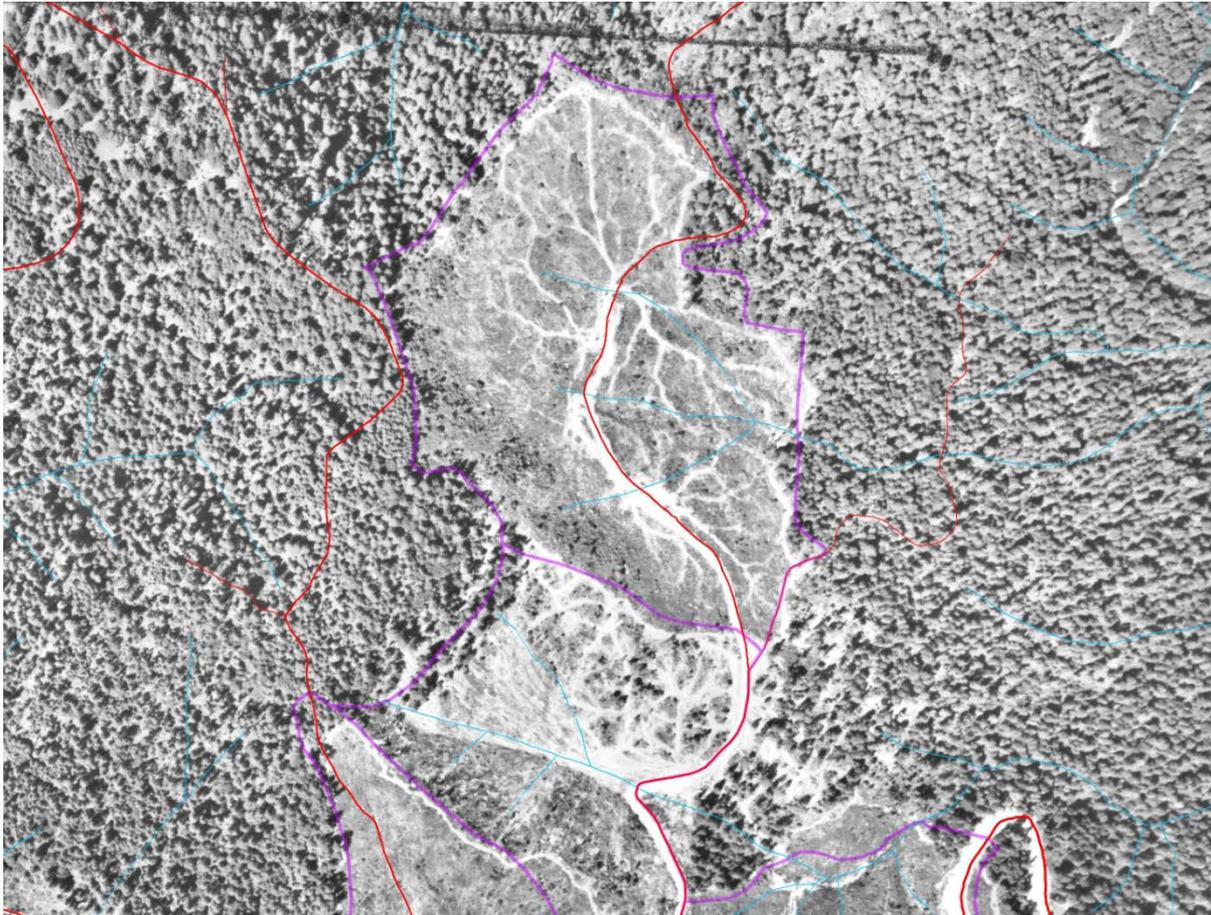
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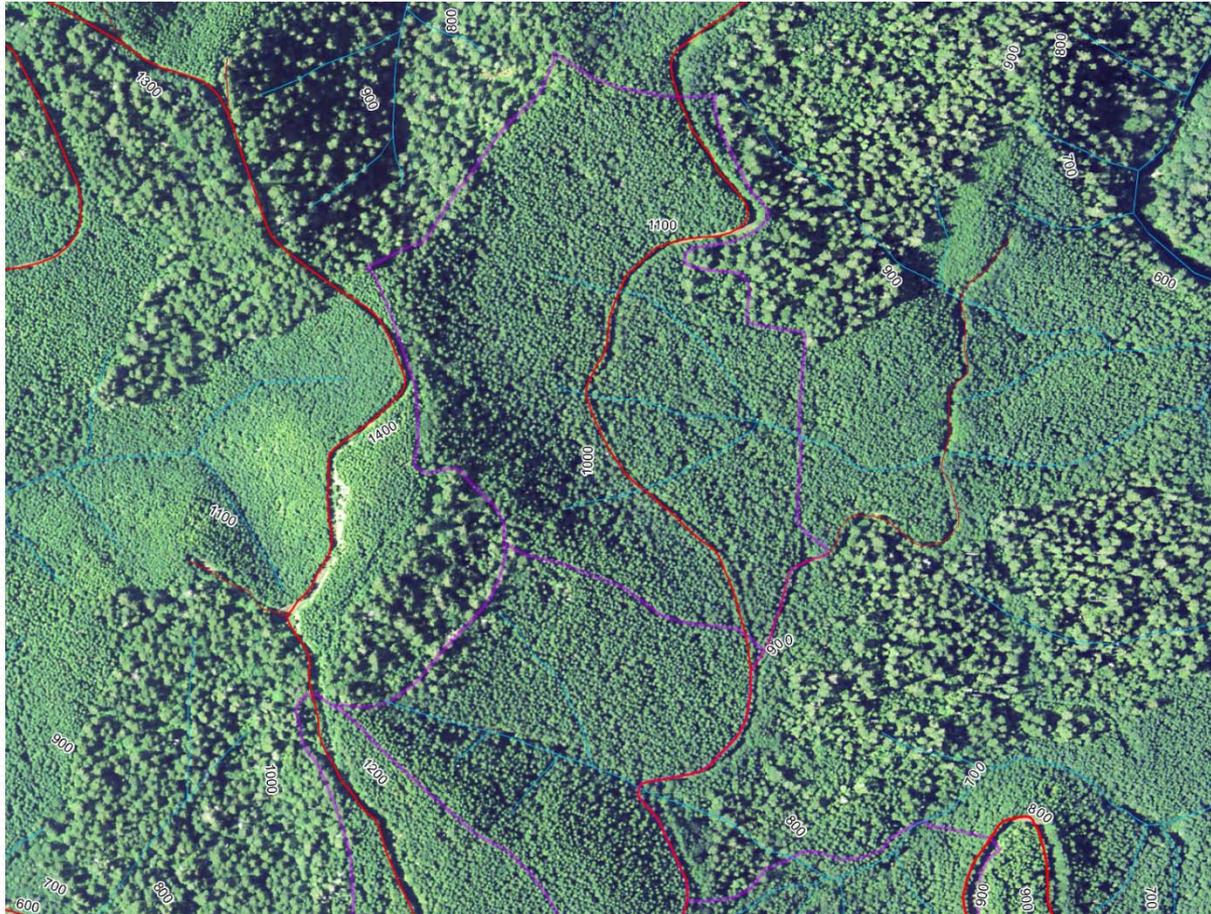
# Historical Harvesting Methods

1964



# Historical Harvesting Methods

2009



# Current Harvesting Methods



# Ground Based Operations

- Best Management Practices

- Generally restricted to slopes <35%
- Seasonally restricted to the dry season (May 15 – Oct 15\*)
  - \*can be waived or extended depending on weather
- Seasonally restricted between to reduce stand damage for the “bark slip” period (April 15 – July 15\*)
  - \*can be conditionally waived
- Maximum of <10 % of unit area soils to be compacted post-harvest
- Stream crossings approved by specialists
- Pre-Approved logging plan
- “No touch” riparian buffers



# Ground Based Operations

- Equipment

- Skidder (Rubber Tired or Tracked)

- 600' Maximum favorable (downhill) economical yarding distance
- Maximum adverse (uphill economical yarding distance around  $\frac{1}{2}$  of favorable distance)
- Relatively inexpensive

- Harvester/Forwarder

- 2000' Maximum favorable economical yarding distance
- Less soil compaction when equipment piles slash in trails

- Shovel logging

- 450 ' Maximum swing distance
- Best suited to wide residual tree spacing



# Cable Yarding



# Cable Yarding

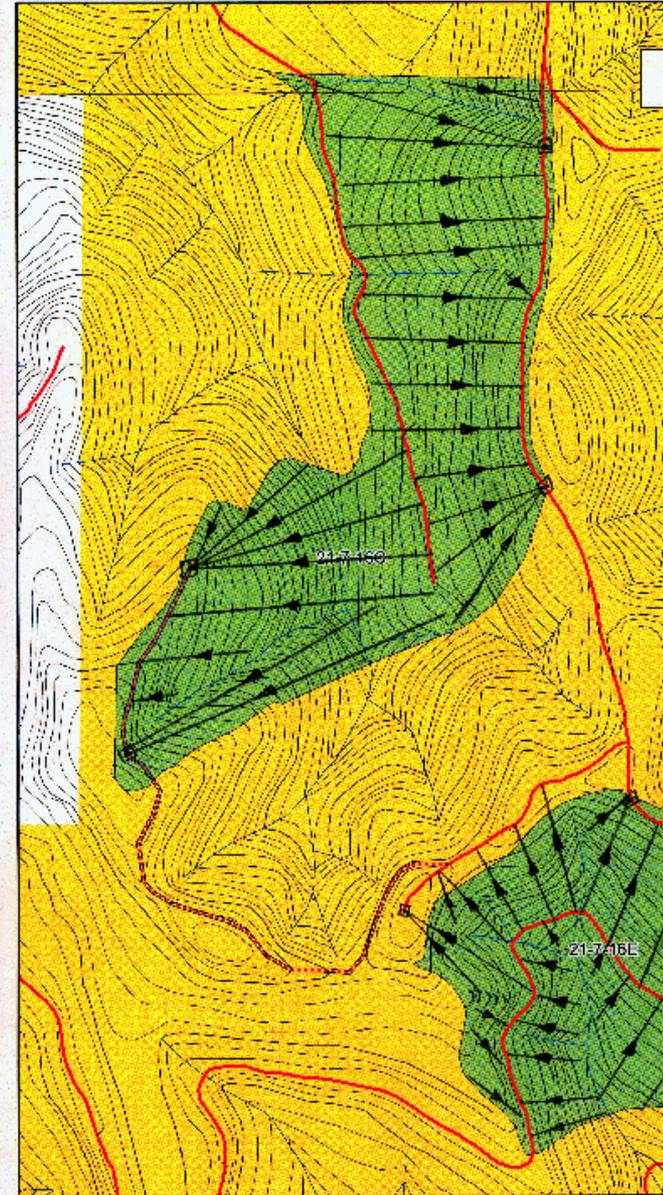


# Cable Yarding



# Cable Yarding

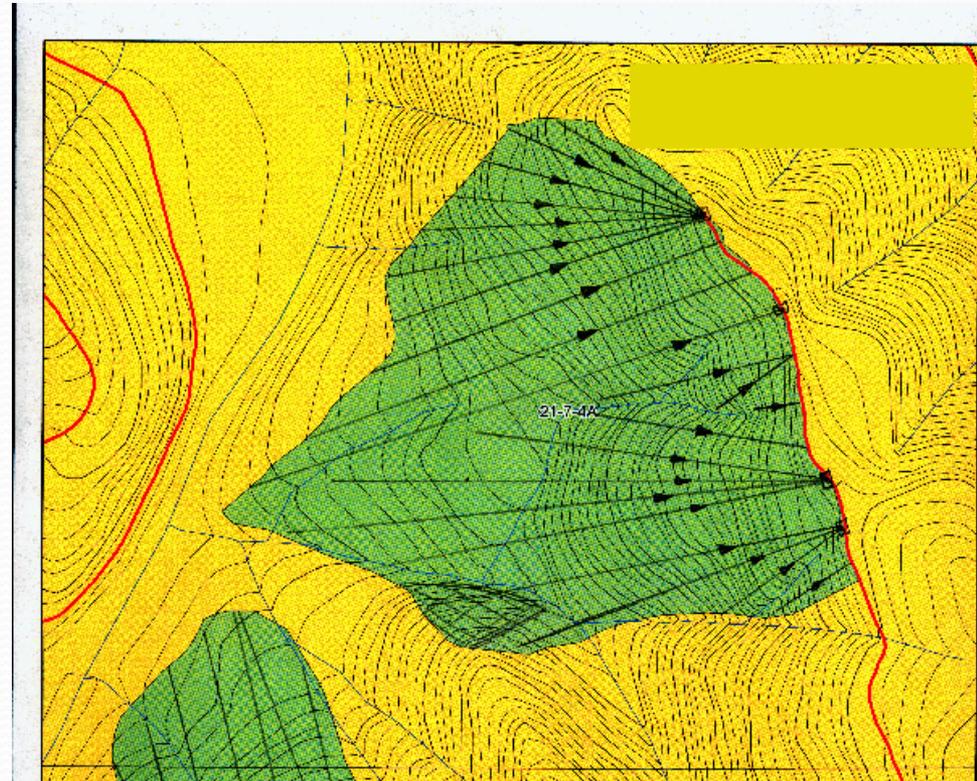
- Best Management Practices
  - Yarding corridors spaced 150' apart
    - Generally perpendicular to the contour
      - this reduces residual stand damage and soil disturbance
  - At least one end suspension
  - Smaller towers preferred in thinnings (keeps cables out of tree tops)
  - Full suspension can be required over sensitive areas (if physically possible)
  - Pre-Approved logging plan required
  - “No touch” riparian buffers



# Cable Yarding

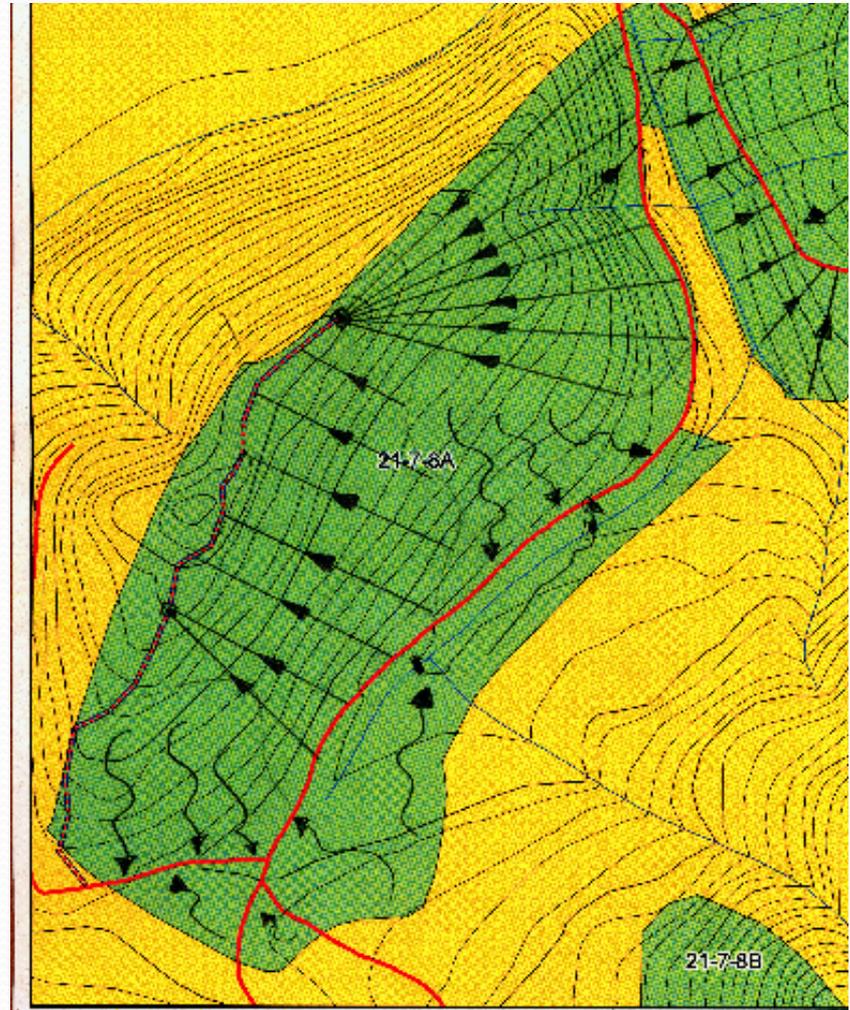
- Limitations

- Yarding corridors must be straight (cannot yard around corners, generally)
- Distance (depends on equipment and terrain)
  - 1200' to 2300' maximum long corner distance uphill (distance to furthest log)
  - 600' to 1000' maximum long corner distance downhill
    - Downhill yarding is only used in ideal circumstances (it can be dangerous and expensive)



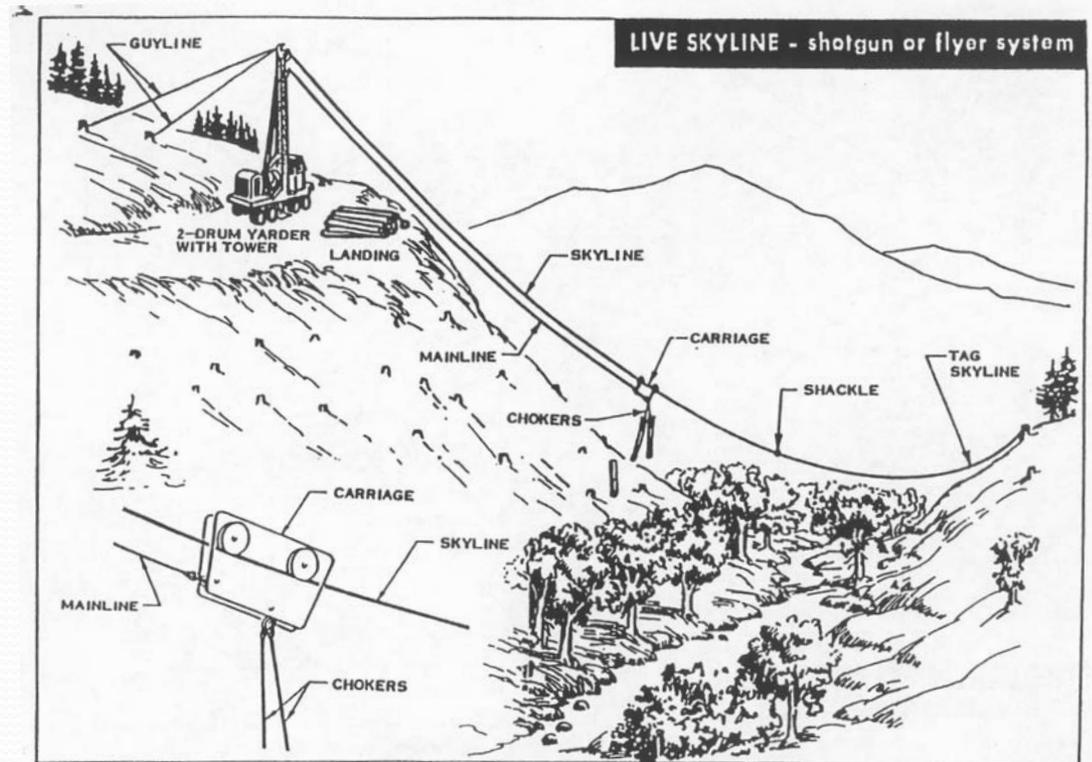
# Cable Yarding

- Limitations
  - Yarding Corridors 10-20' wide
  - No treatment areas can block out entire portions of units
  - Openings and heavy thinning areas may make more sense in some places than others
  - Physics



# Cable Yarding

- Limitations
  - Lay of the land
  - Concave slope
  - Convex slope
  - Constant slope
  - Deflection/ payload



Taken From: FE 370 Course Pack OSU COF 2006

# Cable Yarding

- Limitations
  - Guylines
    - Location depends on yarder
    - OSHA regulations require these to be cut for safety
    - OSHA also requires dangerous snags around landings to be cut

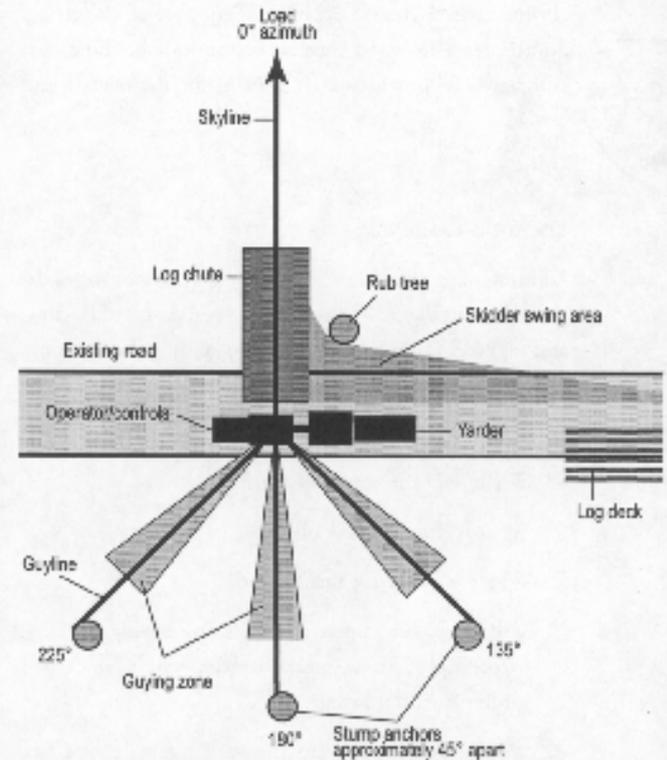


Figure 10. Landing operations diagram for a Koller 300 yarder and rubber-tired skidder swinging logs from the chute to a decking location. Consult the manufacturer, the appropriate Safety Code, or both for exact specifications.

# Helicopter Yarding

- Best Management Practices
  - Pre-Approved logging plan required
  - “No touch” riparian buffers
  - Seasonally restricted between to reduce stand damage for the “bark slip” period (April 15 – July 15\*)
    - \*can be conditionally waived



# Helicopter Yarding

- Pros
  - Access to otherwise inaccessible areas
  - Low soil/ground disturbance
  - High production rate
  - 1.5 mile maximum yarding distance



# Helicopter Yarding

- Cons
  - High cost per unit wood volume (\$/MBF)
  - High noise/disturbance distance for wildlife
  - Large flat landings needed (two days of production plus service landing)
  - Dangerous in thinnings (maneuvering helicopter around residual trees)



Image from: USFWS

# Operational Concerns

- Market Fluctuations
- Average volume per acre
  - Minimum production level or logging not profitable
- Haul Distance (Location, distance from mill)
  - Longer haul detracts from log value
- Accumulating restrictions (detracting from profitability)
  - Seasonal restrictions (wildlife, soils, botany, etc.)
  - Operating restrictions
  - Environmental mitigations
  - Procedural hurdles











# Operational Concerns

Wet Season Restriction

Bark Slip Restriction

Marbled Murrelet Restriction

Fire Season?

## Seasonal Restriction Matrix

Sheet 2 of 2

EXAMPLE

- Restricted Times are Darkly Shaded
- Daily Operating Restrictions (DOR) are Lightly Shaded  
(operations must begin two hours after sunrise and must conclude two hours before sunset)

Sale Area	Activity	Jan		Feb		Mar		Apr		May		June		July		Aug			Sept			Oct		Nov		Dec		
		1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	6	15	1	15	1	15	1	15	1	15	1	15
Unit 8	Falling and bucking <sup>2,4</sup>																	D	O	R								
	Cable yarding on rock road <sup>2,4</sup>																	D	O	R								
	Ground-based yarding <sup>1,2,3,4</sup>																	D	O	R								
	Loading or hauling on rock road																											
Unit 9	Falling and bucking <sup>2,4</sup>																	D	O	R								
	Ground-based yarding <sup>1,2,3,4</sup>																	D	O	R								
	Loading or hauling on rock road																											
Unit 10	Falling and bucking <sup>2</sup>																											
	Cable yarding on rock road <sup>2</sup>																											
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Unit 11	Falling and bucking <sup>2</sup>																											
	Cable yarding on rock road <sup>2</sup>																											
	Ground-based yarding <sup>1,2,3</sup>																											
	Loading or hauling on rock road																											
Unit 12	Falling and bucking <sup>2</sup>																											
	Cable yarding on rock road <sup>2</sup>																											
	Ground-based yarding <sup>1,2,3</sup>																											
	Loading or hauling on rock road																											
Unit 13	Falling and bucking <sup>2</sup>																											
	Cable yarding on rock road <sup>2</sup>																											
	Loading or hauling on rock road																											
Rd. No. 30-9-1.0	Road renovation <sup>1,4</sup>																	D	O	R								

<sup>1</sup>Wet season restrictions may be shortened or extended depending on weather conditions.

<sup>2</sup>Bark slip seasonal restrictions may be conditionally waived.

<sup>3</sup>Some areas designated for ground-based yarding could be cable yarded, thus negating the need for wet season restrictions.

<sup>4</sup>Refer to **Exhibit E** for unit restrictions in regards to Marbled Murrelet disruption.

# Operational Concerns

Wet Season Restriction

Bark Slip Restriction

Marbled Murrelet Restriction

Fire Season?

Owl Restrictions

## Seasonal Restriction Matrix

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# Operational Concerns

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# Summary

- Harvest methods have changed
- Each logging system has its own limitations
  - Silviculture combines operational and ecological to meet objectives
- Accumulating restrictions, mitigations, and procedures can reduce or eliminate economic viability of any project

# Questions

