

In-woods Chipping

- ◆ Popular in the early 1970's
- ◆ Big demand for pulp fiber and wood for industrial fuel

In-woods Chipping

- ◆ Chippers:
 - Produce whole-tree chips
 - Grind/chip the entire above ground portions of trees including limbs and tops
- ◆ Two advantages:
 - Provide economical opportunities for converting stand types
 - Reduce site preparation costs considerably

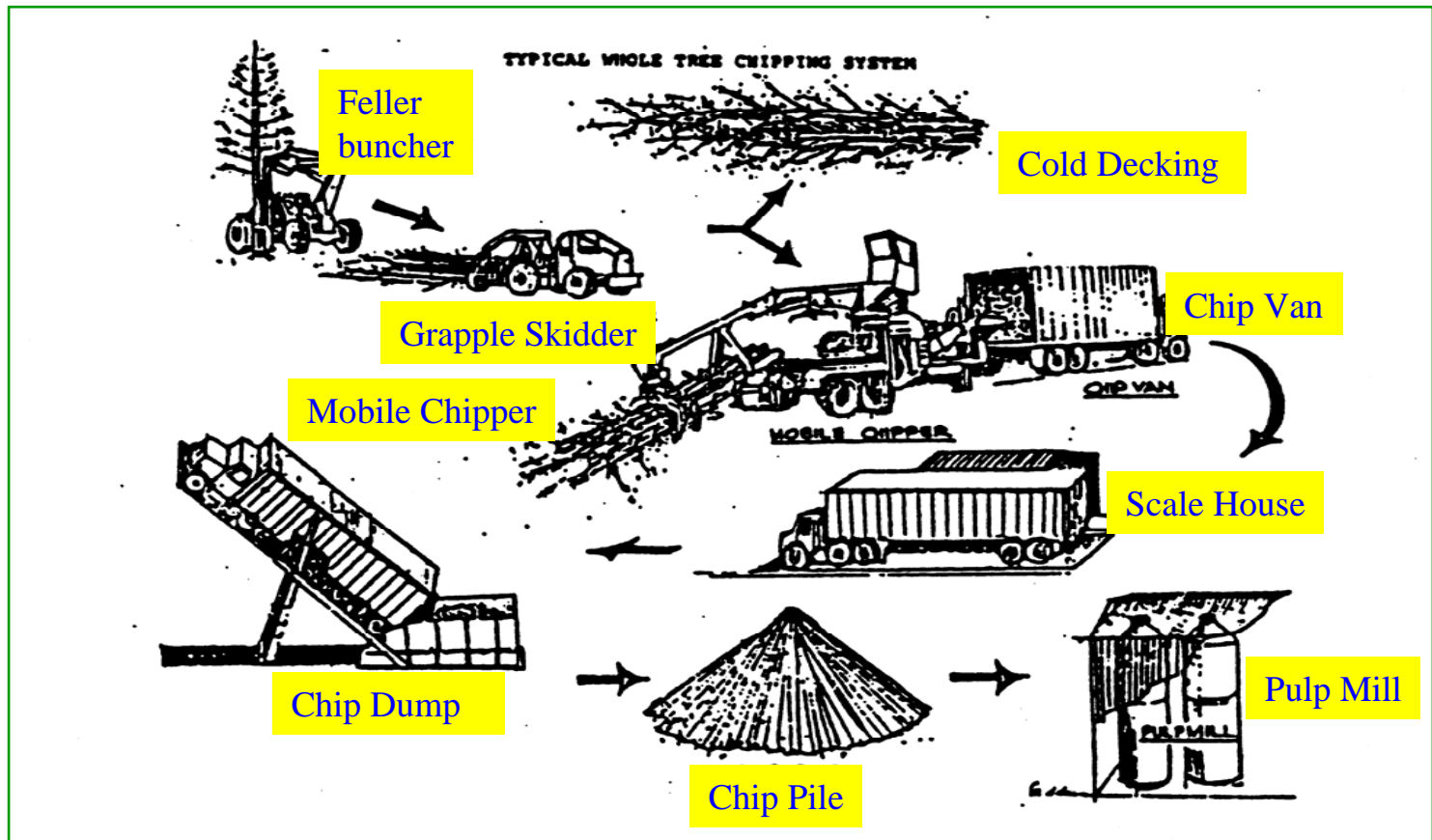
In-woods Chipping

- ◆ When chain flail debarkers were introduced in the late 1980's,
 - “clean” chips could be produced, and
 - many mills (in the South) now purchase significant volumes of these chips
- ◆ Without whole-tree chipping,
 - the woody material is left on site
 - it is usually in large piles adjacent to the roadside landing

What is a Chipping System?

- ◆ A chipping system is a tree-length system with extra equipment – chipper, debarker, and chip van.
- ◆ A chipper typically
 - Costs \$250,000 to \$325,000 to purchase, and
 - Needs a highly mechanized harvesting system to support it

A Typical Mechanized Whole-tree Chipping System



(Source: Greene and Reisinger 1999)

Chipping System



Whole-tree Chipper



The DDC 5000-G whole-tree chipper is made by Peterson Pacific Corp.



Chipper



Crew Organization

Mechanized Whole-tree Chipping System

Total 14 people

Production:

- 2 - Feller-buncher operators
- 3 – Grapple skidder operators
- 1 – Debarker operator
- 1 – Chipper operator
- 5 – Truck drivers

Support:

- 1 – Foreman
- 1 - Maintenance person

Equipment

Mechanized Whole-tree Chipping System

- ◆ Capital investment \$1.25 – 1.50 million
- ◆ Production:
 - 2 – Hydro-Ax 411 Feller-bunchers
 - 3 – Timberjack 450B Grapple skidders
 - 1 – Peterson Pacific Chain flail debarker
 - 1 – Morbark 22 RXL Chipper
 - 5 – Mack Truck tractors
 - 8~10 – Van trailers
- ◆ Support:
 - 1 – Maintenance/parts truck
 - 1 – Fuel/oil truck

Productivity

Mechanized Whole-tree Chipping System

- ◆ 8 – 10 van loads/day (24 tons/load)
- ◆ 960 – 1200 tons/week (5-day work week)

Hot vs. Cold Operations

- ◆ **Hot operations** – little time or inventory between functions.
- ◆ **Cold operations** – more or substantial time or inventory between functions.
 - keep longer time of timber in woods
 - have problems of moving of feller-buncher or other machines
 - can dry a little of wood

Chipping?

- ◆ Chipping operation is a hot logging operation.

Clean vs. Dirty Chips



- ◆ Clean chips – less than 2% bark.
 - Making paper
- ◆ Dirty chips – more than 2% bark.
 - Mainly using for fuel

Uniformity of Chips

- ◆ Uniform chips are required to make paper
- ◆ The uniformity is identified by:
 - Chip size, thickness, and length
- ◆ And determined by:
 - The number of knives in the chipper
 - Knife angle
 - Revolution per minute

Pros and Cons In-woods Chipping

- ◆ The advantages of chipping are:
 - Socially accepted – the chipping van vs. log trailer
 - Good for site preparation
- ◆ However, it requires:
 - Larger landing
 - Higher break-even production
 - Larger sale
 - Lots of capital and more equipment

Wetland Systems

- ◆ Wet soil can:
 - reduce operational efficiency
 - affect costs and profits
- ◆ Unacceptable residual effects on the site also degrade:
 - site productivity,
 - water quality, and
 - aesthetics.

Wetland Systems?

- ◆ The forest industry and loggers realize the value of minimizing site damage.
- ◆ They are looking for low-impact harvesting systems – wetland harvesting systems.

Wetland Systems

- ◆ New cost-effective and environmentally acceptable methods include:
 - Feller-bunchers (tracked or wide tires),
 - Larger forwarders
 - Clambunk skidders
 - Two-stage hauling, or mats
 - Cable systems
 - Helicopters
 - Towed vehicles and air-cushioned vehicles

Felling on Wet Sites

Swing boom with felling head



Tracks

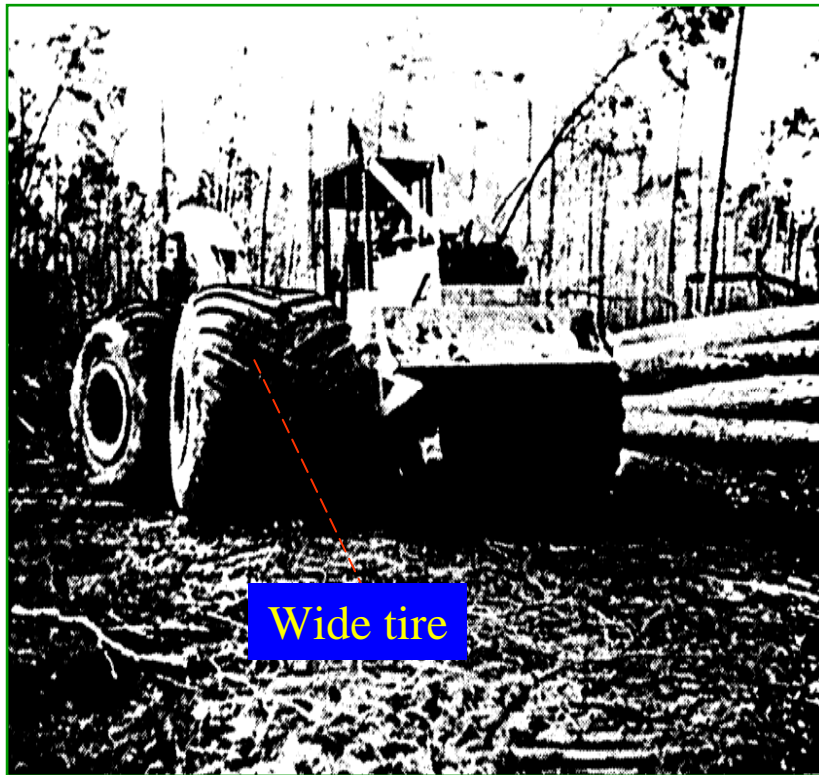
(Source: Stokes and Schilling 1997)

- ◆ Use swing, tracked feller-bunchers
- ◆ Costly, reduce disturbance
 - by limiting the amount of travel on the site and
 - by using wide tracks
- ◆ On extremely wet sites, portable mats can be used
 - to increase mobility on the site
 - to reduce the amount of site disturbance

Felling on Wet Sites

- ◆ Integrating limited processing and piling into the felling function
 - can reduce the subsequent negative effects of removing the felled trees from the site.
- ◆ A grapple-saw on a tracked feller-buncher
 - is a new development to be tested for felling on such difficult terrain.

Skidding on Wet Sites



(Source: Stokes and Schilling 1997)

- ◆ In the 1970's, **flexible track machine**,
 - adapted from the military,
 - was designed for wet site applications.
- ◆ Due to the cost of tracked machine,
 - **the skidder with wide tires** was later introduced.
 - it is a widely accepted method.

Skidding on Wet Sites

- ◆ Rubber-tired cable-grapple skidder is an option for use on wet sites because:
 - the cable skidder is able to operate under extremely difficult conditions and
 - the grapple skidder is highly productive and relatively safe
- ◆ Using dual tires is another option to improve the skidding floatation on wet sites.



Cable-grapple Skidder



Skidding on Wet Sites

- ◆ The use of clambunk is becoming more feasible.
- ◆ A recent introduced four-wheel drive clambunk skidder:
 - is capable of skidding a load of about **14 tons**
 - has been successfully used to skid felled trees with the distance of about **a mile**

Clam-bunk Skidder



Skidding on Wet Sites

(two-stage hauling)

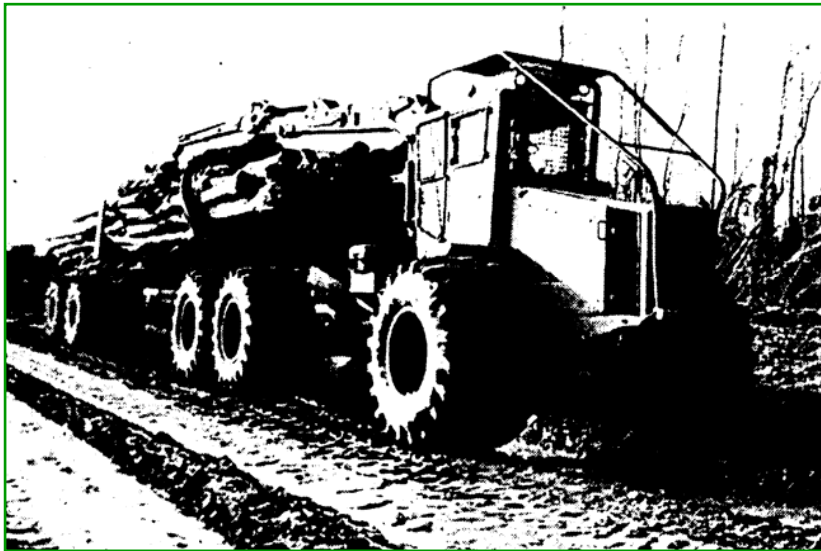
- ◆ In Stage I, in the woods
 - uses conventional rubber-tired skidders or clambunk skidders
 - skids to a remote landing
- ◆ In Stage II, at the remote landing
 - logs are loaded onto a tree-length forwarder
 - load is carried long distances to an all-weather road
 - then the load is put onto a haul truck

Skidding on Wet Sites

(two-stage hauling)

- ◆ Reduces road construction dramatically
- ◆ Keeps skidding distances at a productive level

Forwarding on Wet Sites



- ◆ Large forwarder
 - has larger payload
 - reduces the number of passes required on the same trail

Forwarding on Wet Sites

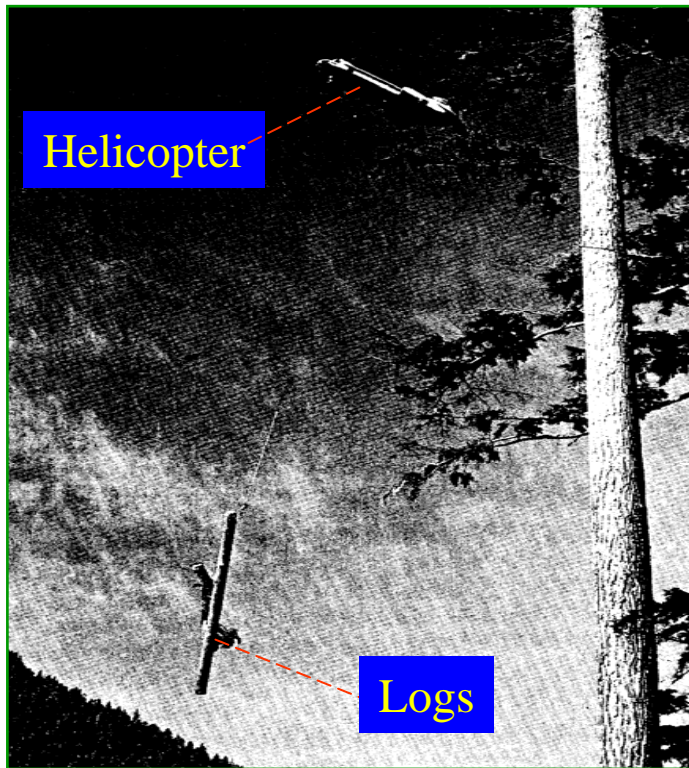
- ◆ Tree-length forwarder with wide tires:
 - moves payloads of up to 22 tons
 - has a loaded static pressure
 - is able to move felled timber up to distance of 5 miles

Forwarding on Wet Sites

In eastern Canada, wide-tired forwarders have shown:

- ◆ Increased access to timber without building roads
- ◆ Improved stability, safety, and comfort
- ◆ Adaptability to wet season logging
- ◆ Less maintenance and higher productivity
- ◆ Reduction of residual damage to the site

Aerial Systems on Wet Sites



- ◆ Helicopters are being used more frequently on wet sites.
- ◆ They cause the least site disturbance except for building of decks and roads.

Aerial Systems on Wet Sites



- ◆ May be cost-effective in certain situations
- ◆ Are not the answers to all the problems of harvesting wet sites
- ◆ Because of their:
 - higher costs,
 - material and weather sensitivity, and
 - implementation problems

Helicopters



Other Harvesting Methods

- ◆ Towed vehicles
- ◆ Special matting and lifting devices
- ◆ Air-cushioned vehicles
- ◆ However, more research is required to
 - Completely understand these methods
 - Properly select and apply the technology as it is developed