



Mechanical Tools for Fuel Reduction Treatments



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Forest Operations Research

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In addition, the Unit is involved in demonstrations, technical consultations, and public presentations. Our stakeholders include forest industry, the National Forest System, other government agencies, private landowners, contractors, equipment manufacturers, and university researchers. Many of the Unit's studies are conducted in cooperation with universities, forest industry, and independent producers.



Scientists in the Unit are nationally and internationally recognized, serving on committees and numerous professional societies. For publications or technical information, email iliordan@fs.fed.us



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- Tab M
- Biomass catalog
- FE Glossary



Outline

- ✦ Principles of tools
- ✦ Defining the task
- ✦ Overview of mechanical treatment equipment
 - BREAK
- ✦ Case Studies & Videos

Tools are transformers



Tools are adapted for a specific job



A tool for every job



You can never have too many tools



You can ~~never~~ have too many tools

- ✱ Tools that aren't functional (Doo Blaster)
- ✱ Tools that are too complicated to use (have you programmed your VCR today?)
- ✱ Duplicate tools (2 sets of hog ring pliers)
- ✱ Tools you don't need (no hogs)
- ✱ Over-priced tools (digital tape measure)

“What do you need that for?”

Principles of Tools

- ✿ There is a tool for every job
- ✿ Using the wrong tool breaks things
- ✿ Using the right tool is faster, cheaper, better
- ✿ Match the right tool to the job
 - Know the job
 - Know the tools

Damage occurs ...

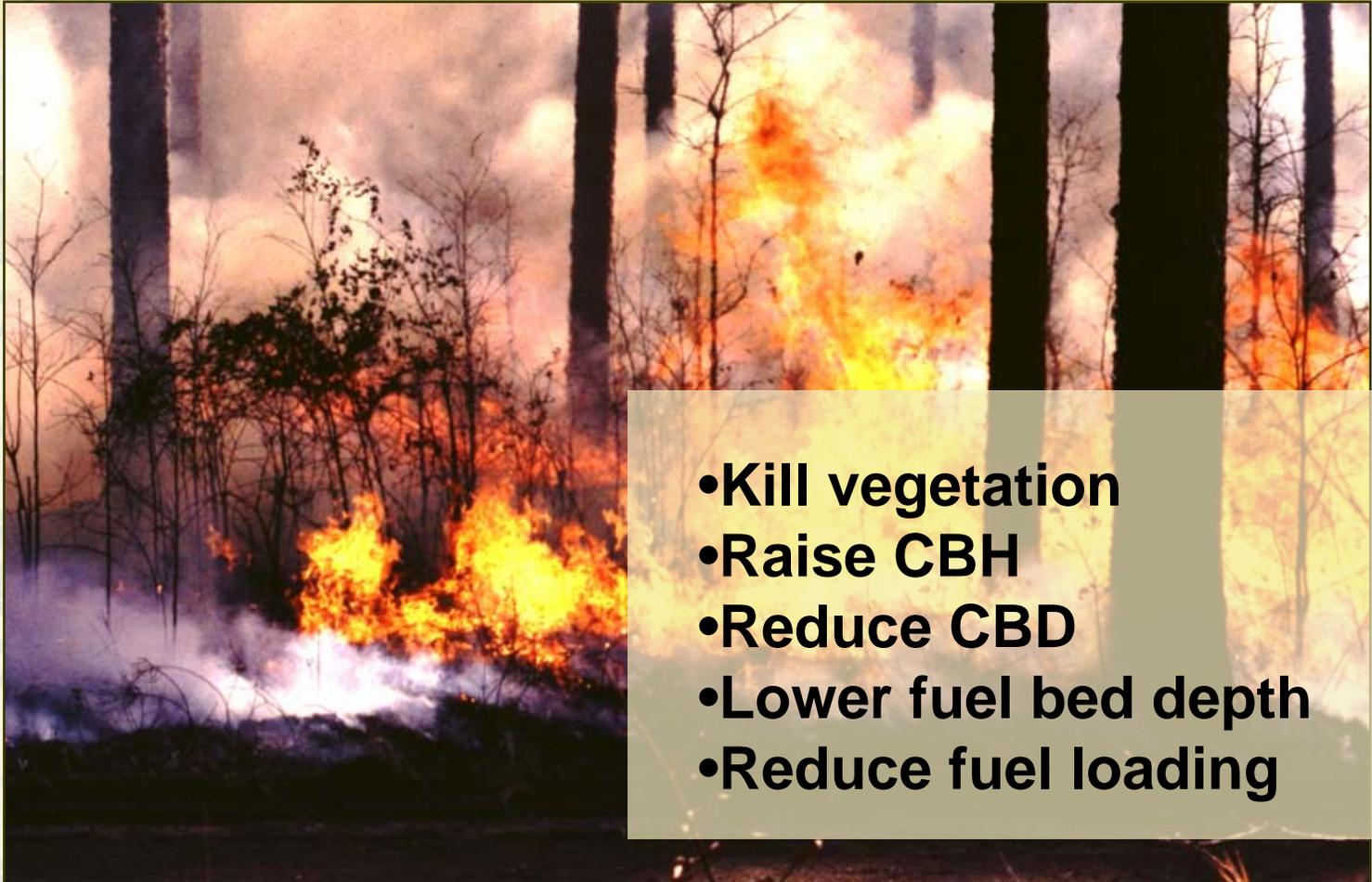


Photo: LIRO

Match the tool to the job



Defining the Task

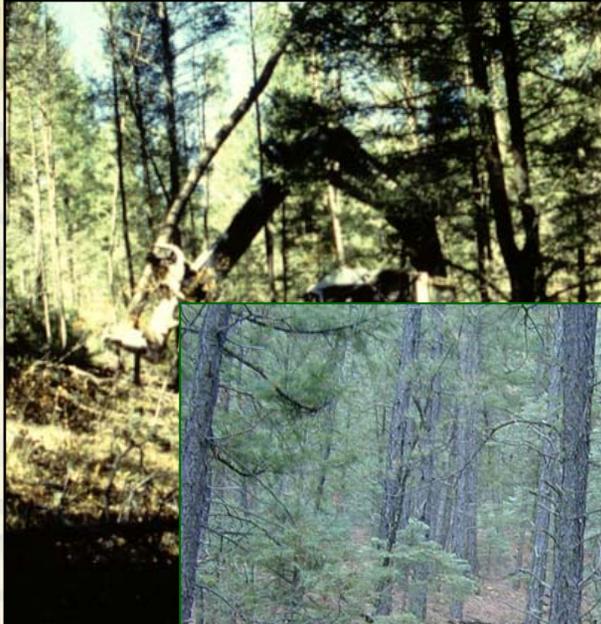


- Kill vegetation
- Raise CBH
- Reduce CBD
- Lower fuel bed depth
- Reduce fuel loading

Defining the Task

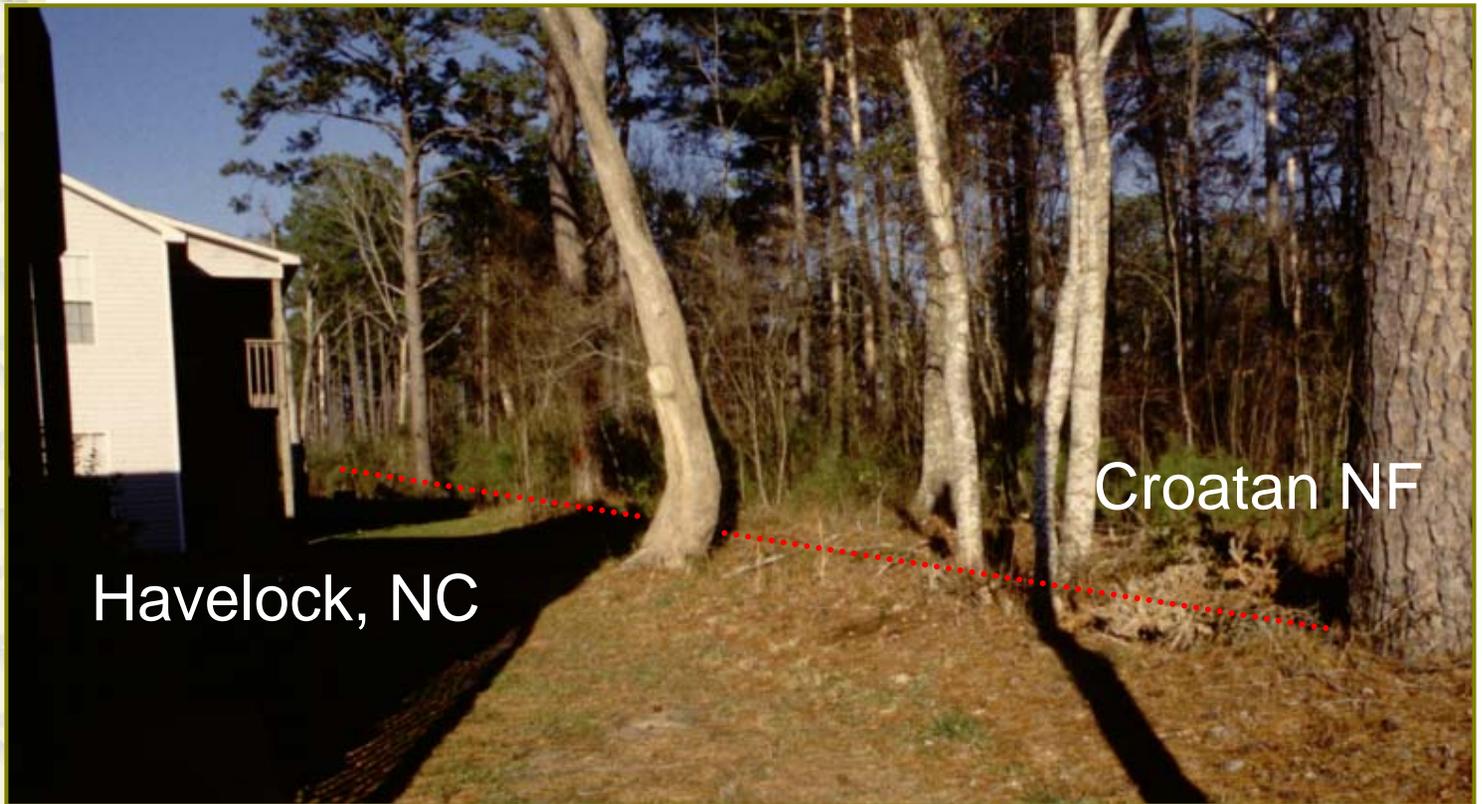


Define the constraints



Santa Fe Watershed, Santa Fe NF

Define the constraints



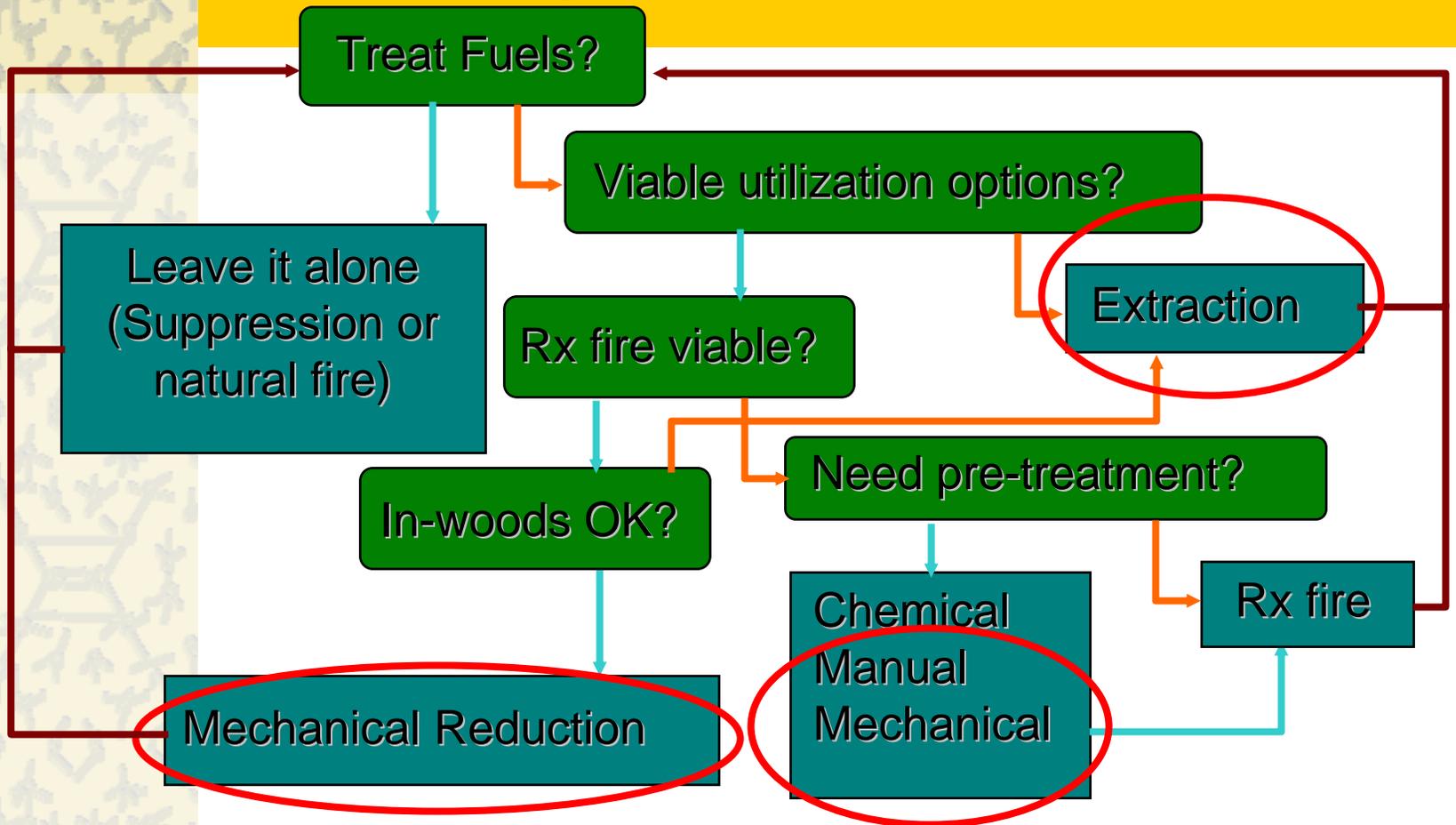


Well-defined Prescription

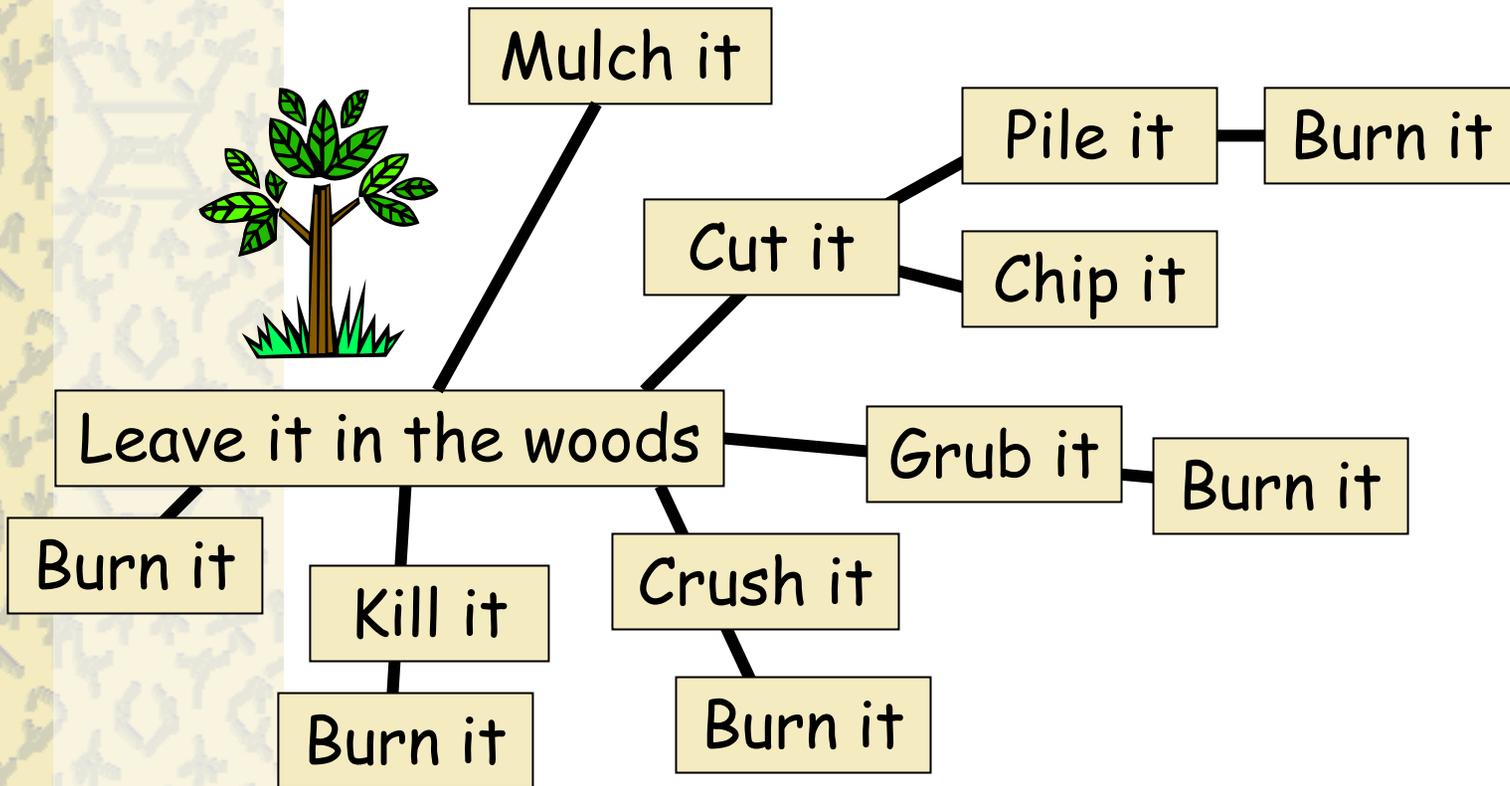
- ✿ What needs to be treated
 - Mulch, chips, or dirt
- ✿ What needs to be avoided
- ✿ What are constraints
- ✿ What are the follow-up plans

The closer the match of tool to job, the cheaper and more effective the treatment will be.

Manager's Decision Tree

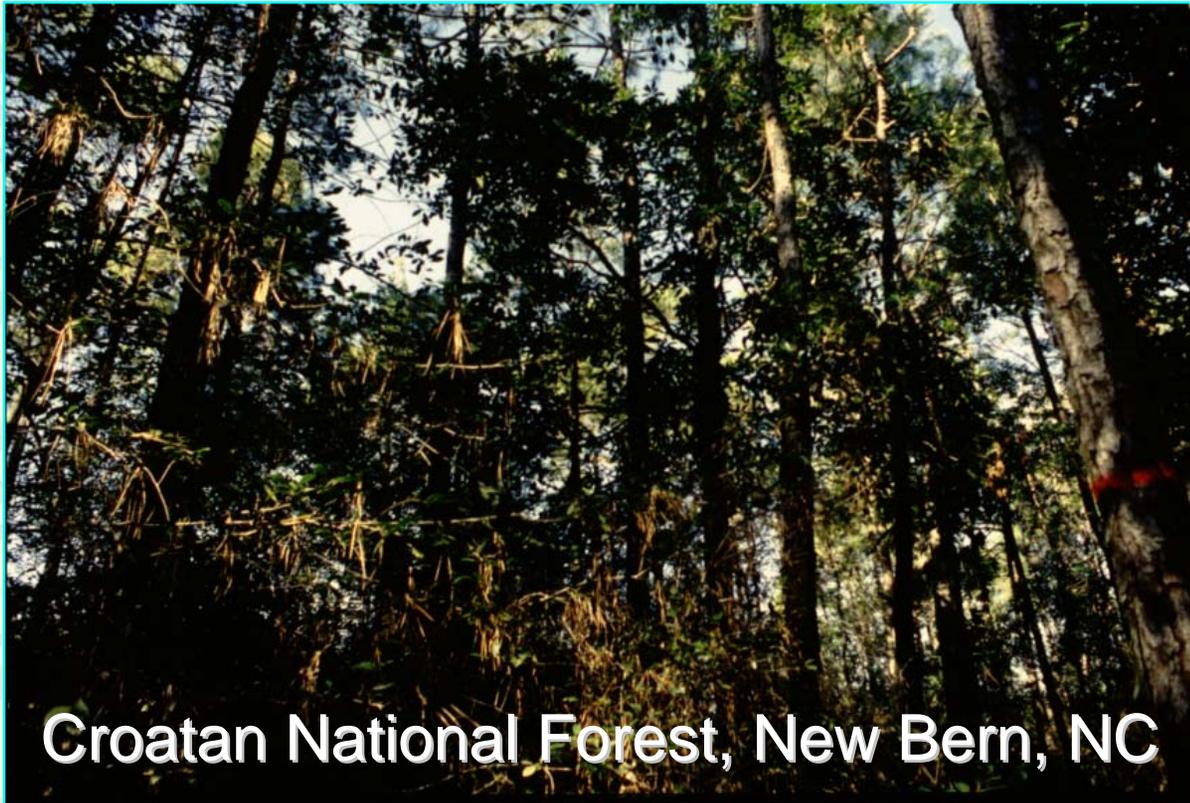


Fuel Treatment Functions



Fuel Reduction Options

☀ Leave it alone--WFURB



Croatan National Forest, New Bern, NC

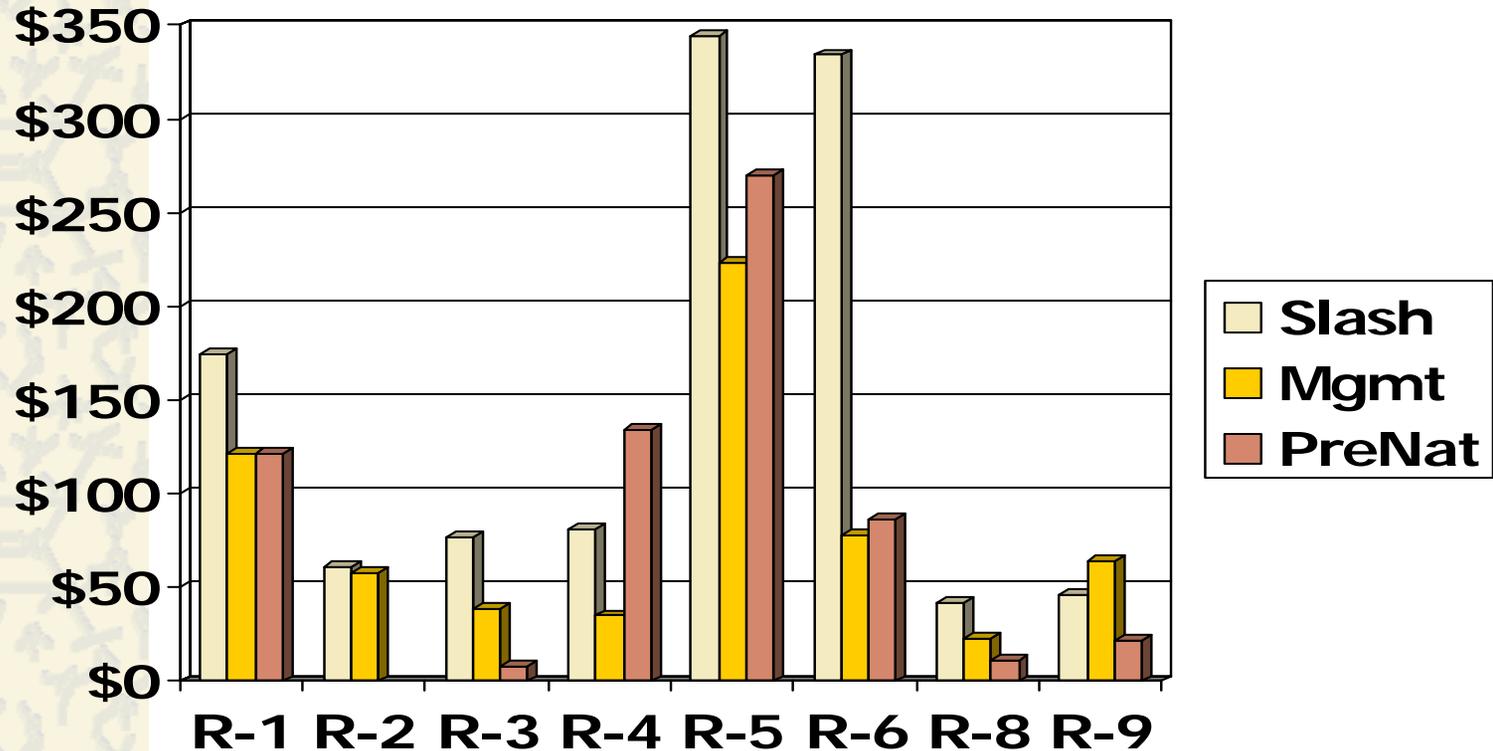
Fuel Reduction Options

☀ Rx fire



Ave. Rx Fire Cost

\$/ac (1994)



Cleaves, Martinez and Haines. GTR-SRS-37. 2000

Fuel Reduction Options

☀️ Chemical burn



Fuel Reduction Options

☀️ Chop and burn



Fuel Reduction Options

🔧 Grubbing



Fuel Reduction Options

- ☀ Hand lop (leave, scatter, or pile)



Manual Operations

- ✿ Fell and pile: \$22-30/ton
- ✿ Slashing: \$40-100/ac



Fuel Reduction Options

- ✦ Mechanical pile and burn

FB: trip & trample
\$160/ac



Dozer Piling

\$45-100/acre



Grapple Piling

Moderate slope: \$200-300/ac

Steep slope: \$500-800/ac



In-woods chipping



Fuel Reduction Options

⚙️ Mechanical reduction



Fuel Treatment Functions



Remove it from the woods

Cut it

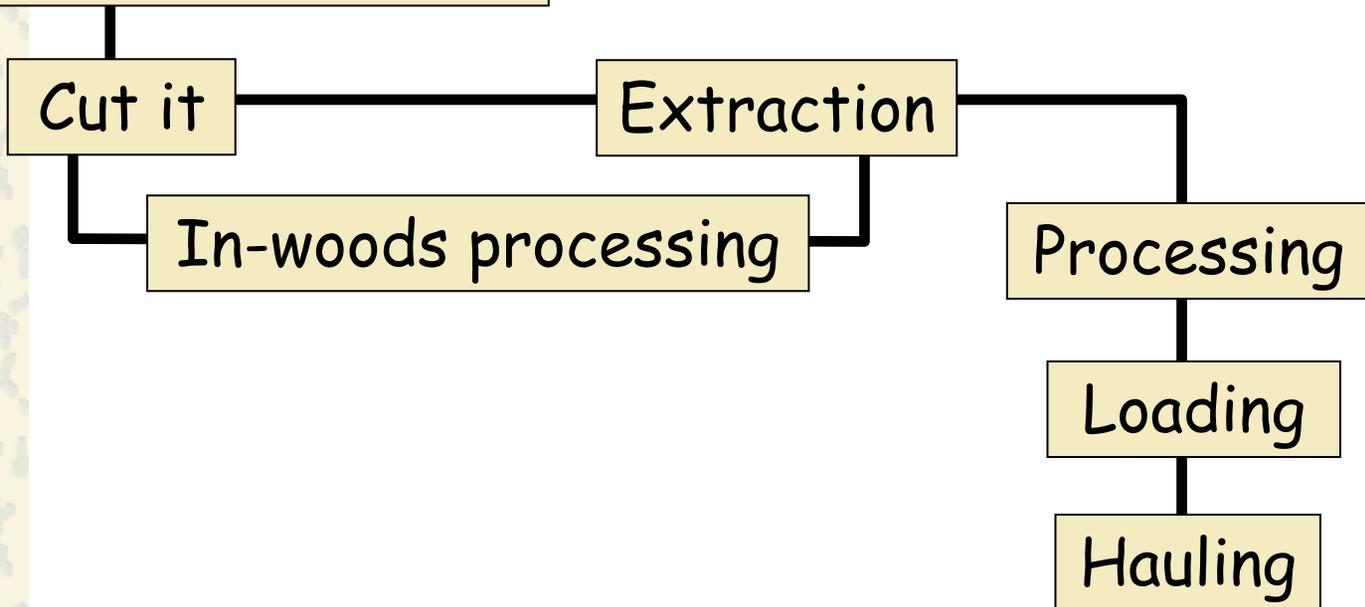
Extraction

In-woods processing

Processing

Loading

Hauling



Small-scale



A Small-scale Harvester



- # 240 hp
- # 27°/20°
- # 9' 8" wide
- # 52000 lbs
- # 7.4 psi (5.2 psi min)
- # 30' boom reach
- # Bigger
- # \$350,000



Extraction of Biomass



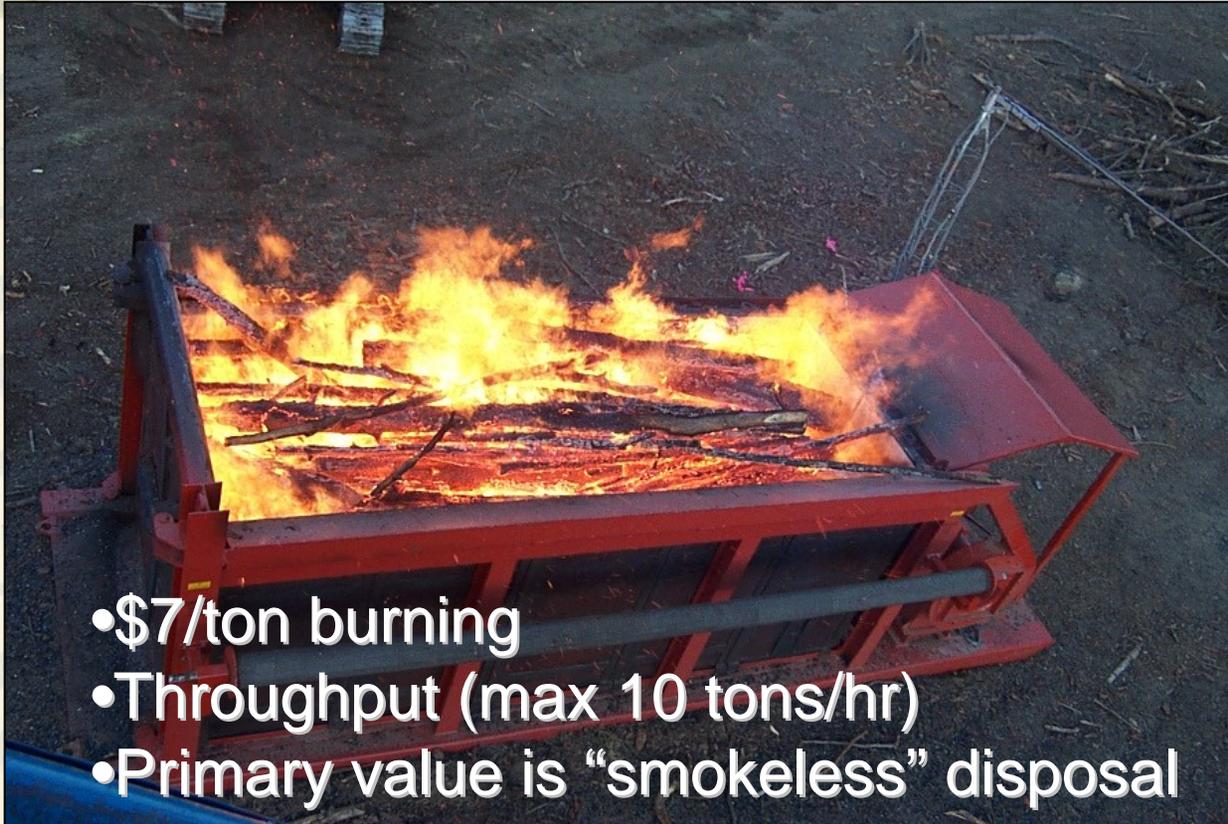
W. Juniper



Roadside disposal



Roadside Disposal

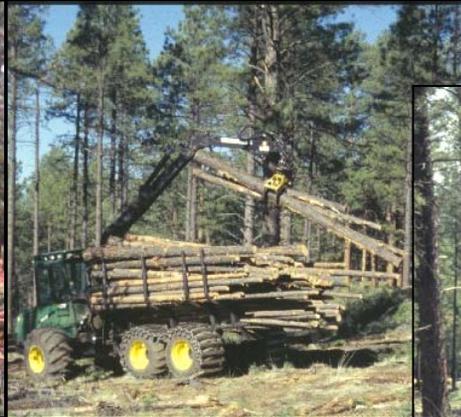


- \$7/ton burning
- Throughput (max 10 tons/hr)
- Primary value is “smokeless” disposal

Roadside processing



System of tools



System of one MACHINE



HUMAN

METHOD

Mechanical Reduction Tools

- ☀ Type of prime mover (rubber-tired, tracked, RT)
- ☀ Type of cutterhead (horiz. Vs. vertical shaft)
- ☀ Type of attachment (boom-mounted, direct)



Features

☀ Size

- Width
- Swing
- Reach
- Turn radius



Features

Weight



50000 lbs – 12 psi

Features

✦ POWER



Features

✦ Maintainability



Features



☀ Reliability

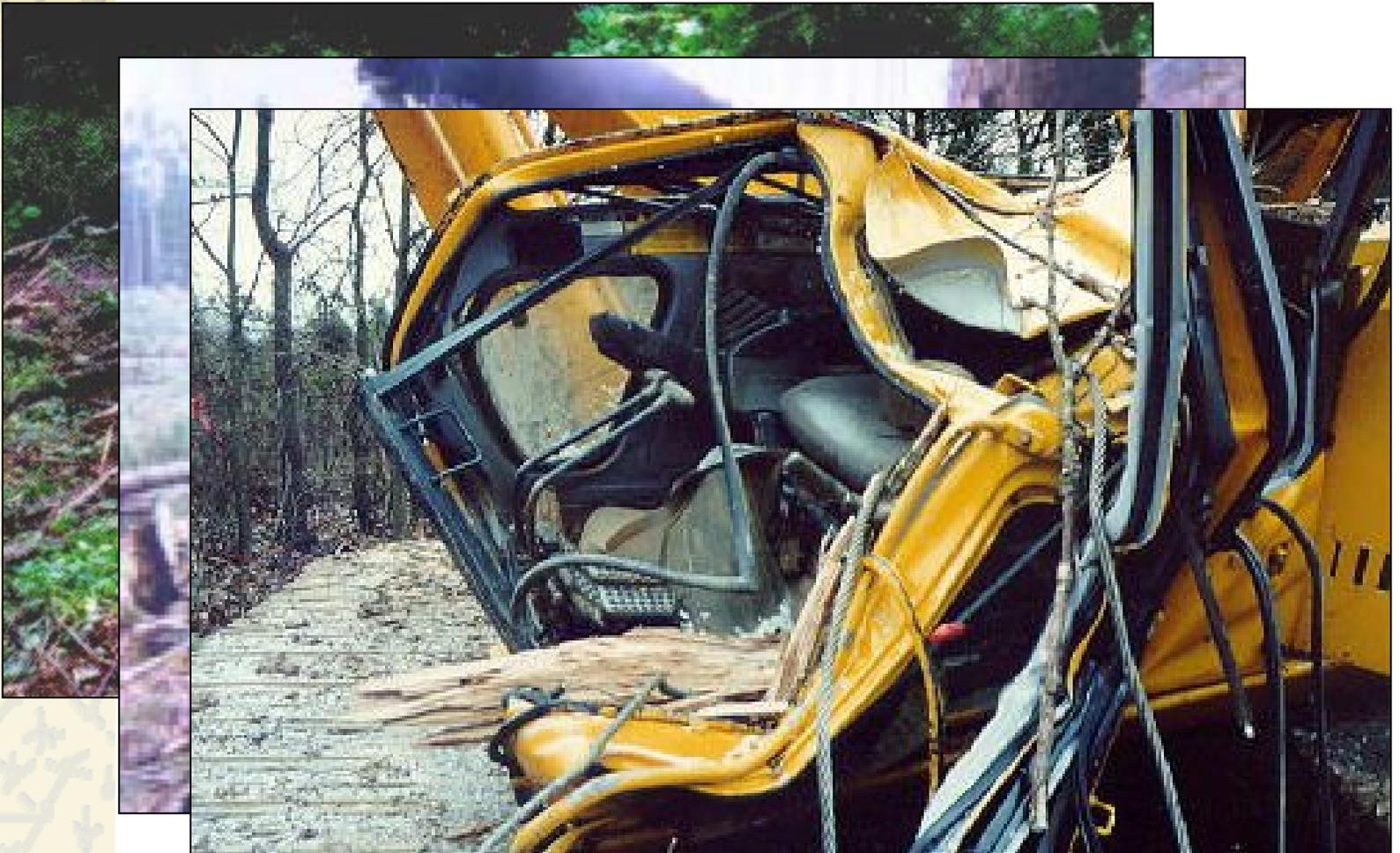
Features

🔧 Safety

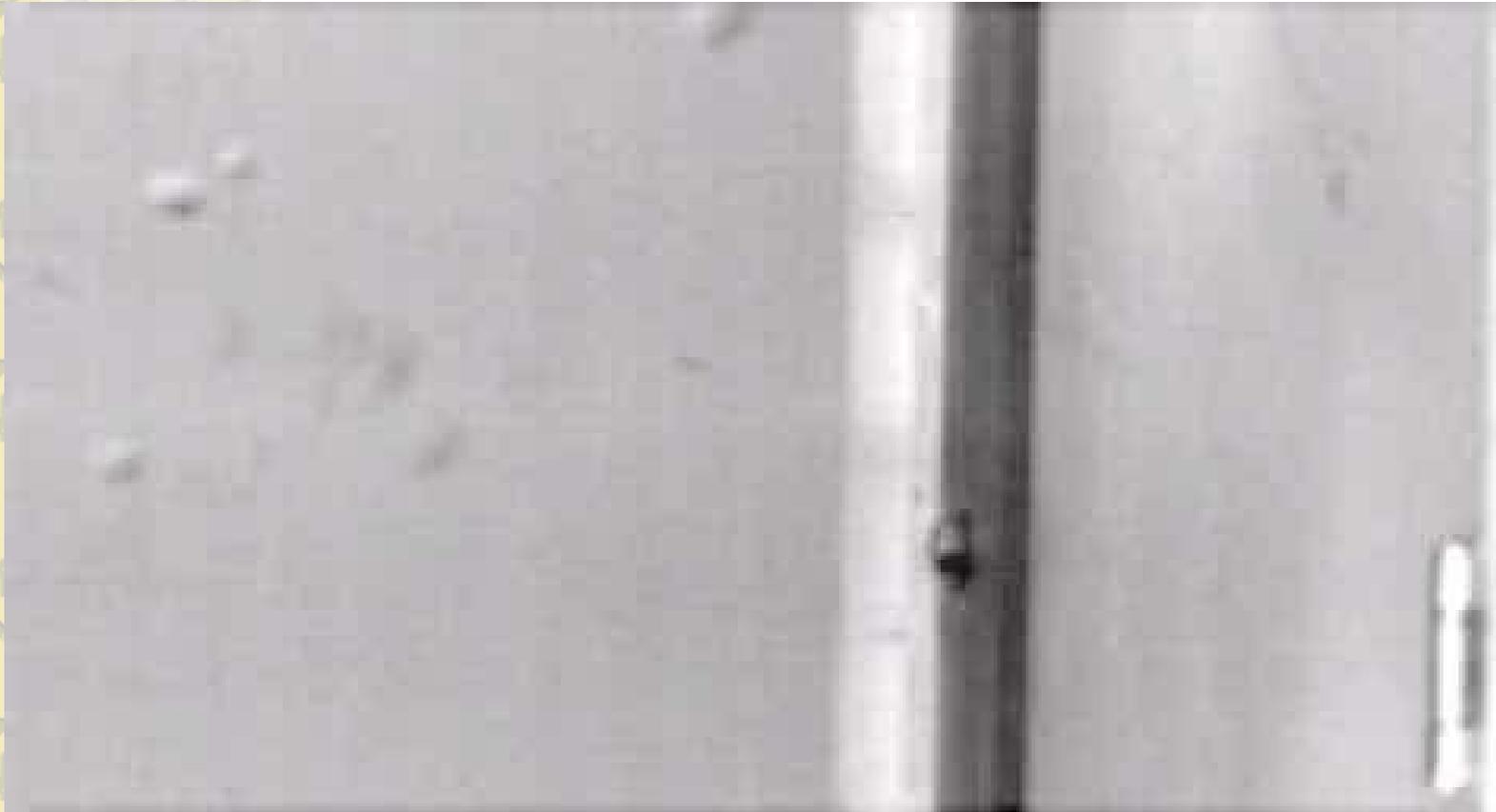
ROPS/FOPS/OPS



Safety

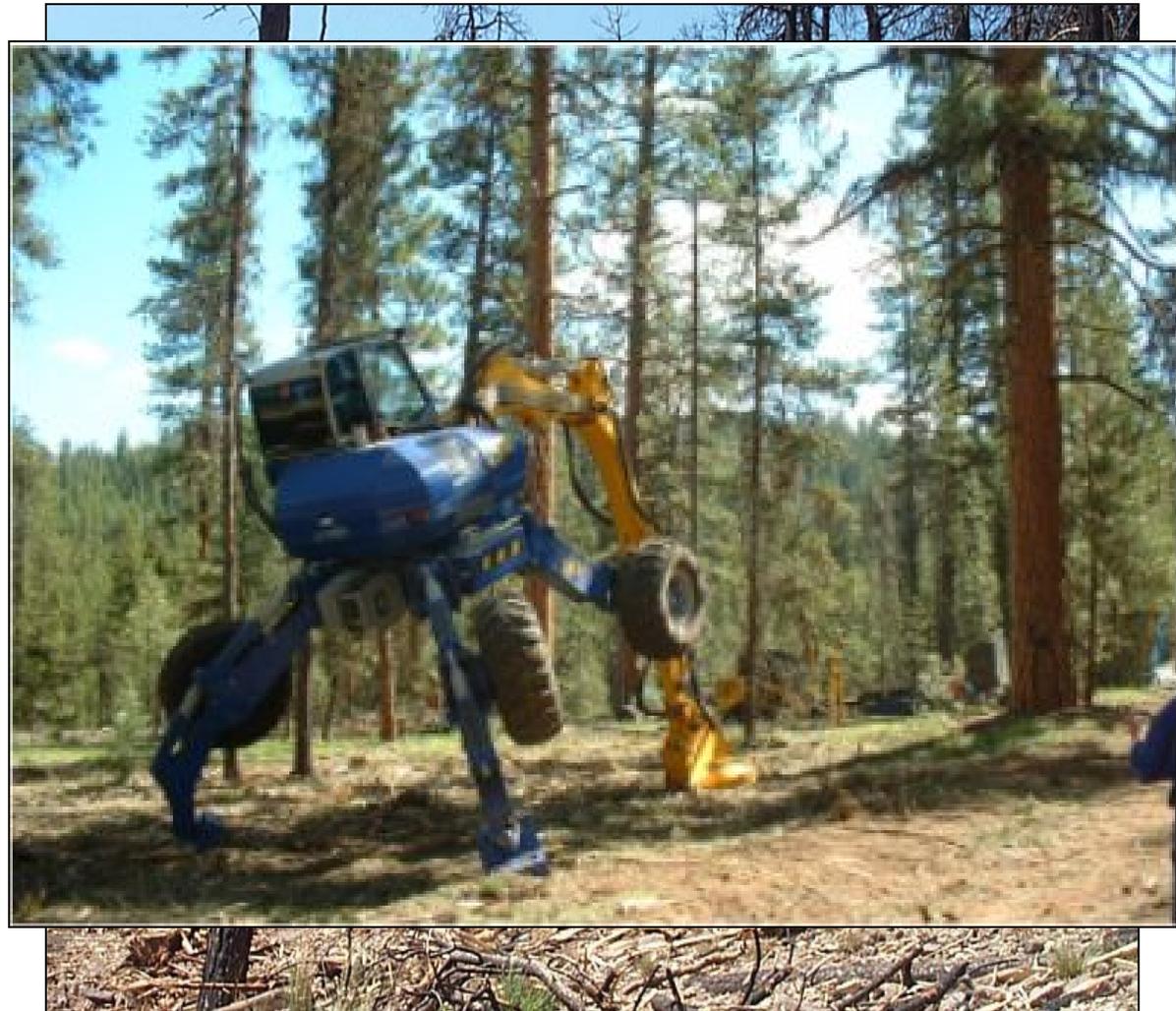


Thrown Objects



Features

- ☀ Prime mover
 - Rubber-tired
 - Steel tracked
 - Rubber tracked
 - Skidsteer



Prime mover



Features

☀ Cutter head



Pro's and Cons (p. 13)

Vertical Shaft

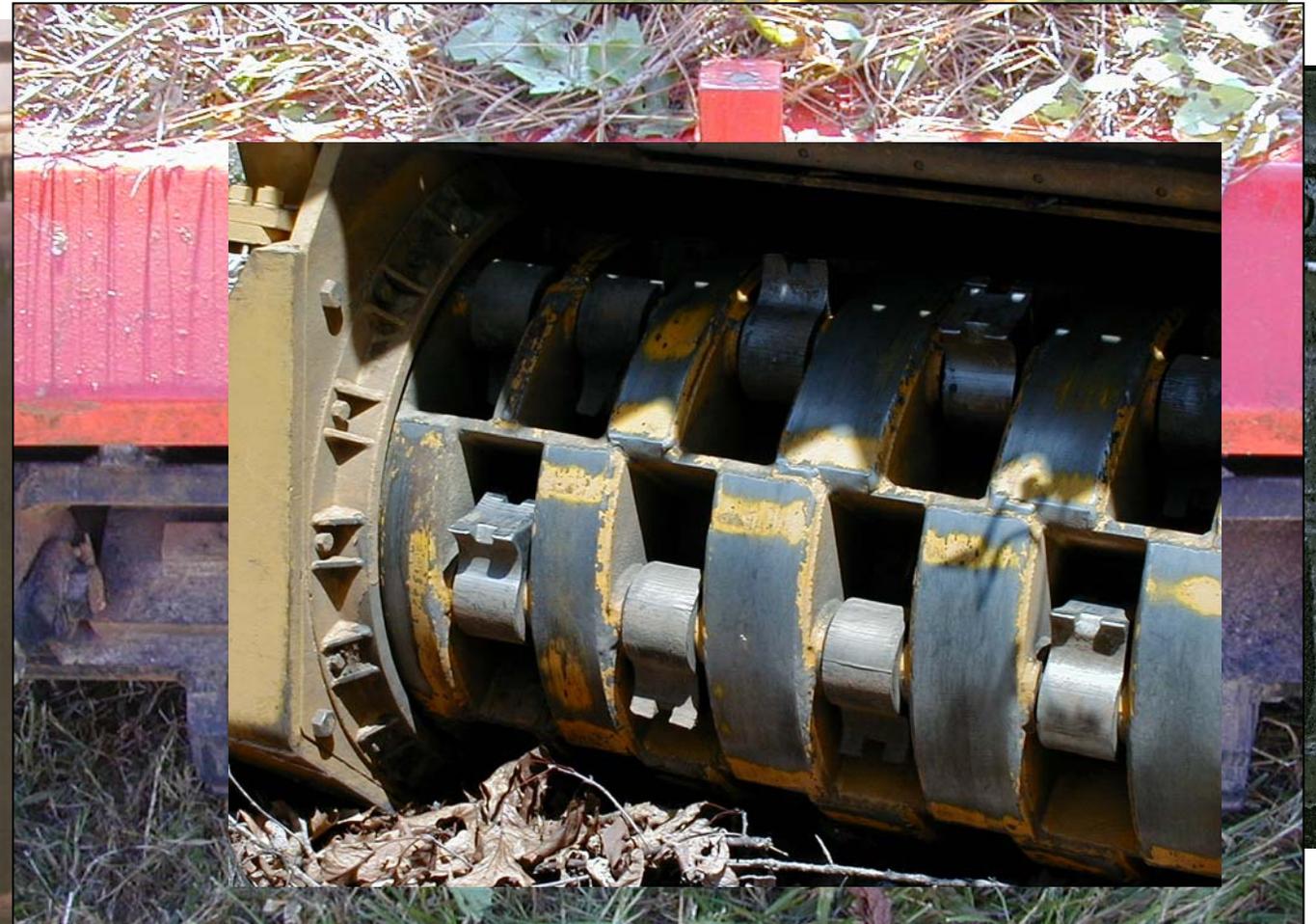
- ✖ Less hp
- ✖ High stubs
- ✖ Flying objects
- ✖ Longer machine
- ✖ Lighter machine
- ✖ Less maintenance
- ✖ Cheaper
- ✖ Diameters < 10"

Horizontal Shaft

- ✖ Higher hp
- ✖ Cut into ground
- ✖ Throws into ground
- ✖ Shorter
- ✖ Heavier
- ✖ More maintenance
- ✖ Expensive
- ✖ Diameters to 30"

Features

☼ Teeth



Vertical-Fixed blade



Chips are not all chips



Features

✿ Mounting: 3-pt hitch, loader, boom



Features

🔧 Operating method





Also ...



Operator experience

- Forestry knowledge
- Seat of the pants



Contractor Overhead/Support

- Fuel/maintenance truck
- Fittings

Leased Equipment



Carbon Sequestration



Not Ready for Prime Time



Functioning Ecosystem



Francis-Marion NF

