

PRODUCTION, COSTS, AND SITE IMPACTS FOR A MINI-SKIDDER

WHEN SKIDDING SMALL DIAMETER TREES

A Thesis

Presented in Partial Fulfillment of the Requirement for the

DEGREE OF MASTER OF SCIENCE

Major in Forest Products

In the

UNIVERSITY OF IDAHO GRADUATE SCHOOL

By

MICHAEL WAYNE LEVERICK

March 1980

ACKNOWLEDGEMENTS

I wish to thank Leonard Johnson, Walt Moden, and Dr. James Moore for their advice, support, and guidance throughout the course of this study.

I would also like to thank the following organizations for their financial support: the U.S. Forest Service Intermountain Forest and Range Experiment Station in Missoula, Montana; the U.S. Forest Service Equipment Development Center in San Dimas, California; the University of Idaho's Forest, Wildlife, and Range Experiment Station and Experimental Forest; and the equipment manufacturer, Case-Davis.

I would also like to thank Harold Osborne for his logistical support throughout the course of the study. Special thanks go to Terry Bartlett, Greg Bassler, Joe Boucher, Bill Hill, Mike McDonnell, and Chris Reynolds for fall the timber within the test area. Finally, I would like to thank Al Strong, my skidder operator for a job well done.

ABSTRACT

Production, Costs, and Site Impacts for a Mini-Skidder When Thinning Small Diameter Trees

By

Michael Wayne Leverick

An existing small utility machine was modified to work as a small tree and log skidder. Several modifications were necessary to adapt the machine to a timber harvesting situation. The major modifications included design and fabrication of skid plates, grapple boom assembly brackets, grapple, operator and machine safety canopies, and rerouting hydraulic hoses.

Cost analyses were made for two cases: (1) skidding thinned material directly to the landing with the small skidder and (2) prebunching thinned material to a main skid trail with the small skidder and moving the material to the landing with either a grapple or choker skidder. These cases were defined in terms of length of skidding distance to the landing. For shorter skidding distances, skidding costs were \$177.27 per acre for direct skidding, \$144.82 per acre for prebunching and subsequent transport with a grapple skidder, and \$214.96 per acre for prebunching and subsequent transport with a choker skidder. For longer skidding distance, skidding costs were \$216.66 per acre for direct skidding, \$151.64 per acre for prebunching and subsequent transport with a grapple skidder, and \$229.47 per acre for prebunching and subsequent transport with a choker skidder.

The most important variables affecting turn time in the regression equations included skidding distance on primary and secondary skid trails, and trees and logs skidded per turn.

Soil disturbance caused by the small skidder was evaluated in terms of soil compaction and aerial soil surface disturbance. Soil bulk density samples taken during a controlled experiment with soil moisture contents varying from 20.38 to 25.32 percent (%) indicated that soil compaction was limited to within six inches of the soil surface.

Soil bulk density samples taken from the most heavily traveled skid trail on the test plot indicated that soil compaction was limited to within the top two inches of the soil surface. The results of the aerial soil surface disturbance study indicated that only 13% of the area was disturbed to a point where erosion could occur as a result of exposed mineral soil.

Residual stand damage was evaluated in terms of percent damager by diameter class to the trees of the residual stand. Sapling-sized trees (31.98%) were damaged more heavily than pole-sized trees (17.545%). Use of a herringbone falling pattern helped keep stand damage within acceptable limits.

The results of the study showed that a more durable machine is needed in these types of timber harvesting operations.

Study Site

This study took place in a field on the University of Idaho Experimental Forest. Three test plots were laid out. In the Flat Creek and West Hatter Creek Units.

Date: 15 APRIL 1985

Researcher/s: LEONARD JOHNSON, MICHAEL W. LEVERICK

Project Title: Production Costs, and Site Impacts For a Mini-Skidder when Skidding Small Diameter Trees

Subject: Evaluation of a miniskidder in recovering thinned trees - Harvest

Keywords: miniskidder, thinning (precommercial), logging costs

Abstract: A small utility machine was modified for skidding using a grapple. ~~Thinning~~ Cost analyses were made for skidding thinned material directly to the landing and prethinning thinned material on a main skid trail using a larger machine to move the logs to the landing. Time/motion studies were made and soil compaction and disturbance and residual stand damage were measured. A model was constructed to predict turn times as influenced by site and stand conditions.

Location:

Unit of the Forest Flat Creek

T _____ R _____ S _____

Stand _____ Size of Area _____

General Description of Area _____

Plot or Area Designation: _____

Date Begun: Summer 1979 Completion date (expected) 1980 no

Papers or Thesis Resulting: same as project title - M.S. by Mike Leverick May 1980 UI

Funding Source: Forest Utilization Research, USFS INT Experiment Station

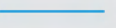

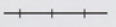



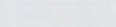

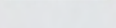

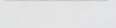

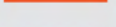

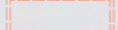
USFS Sandinas Equipment Development Center

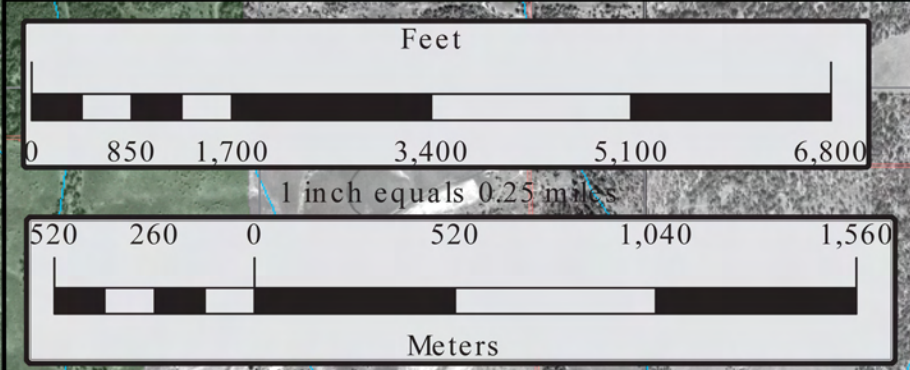
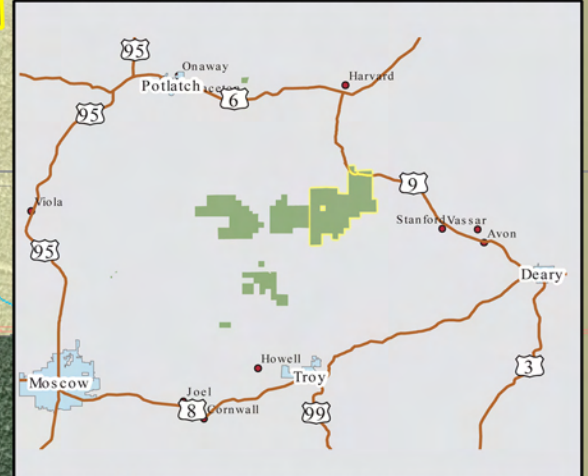
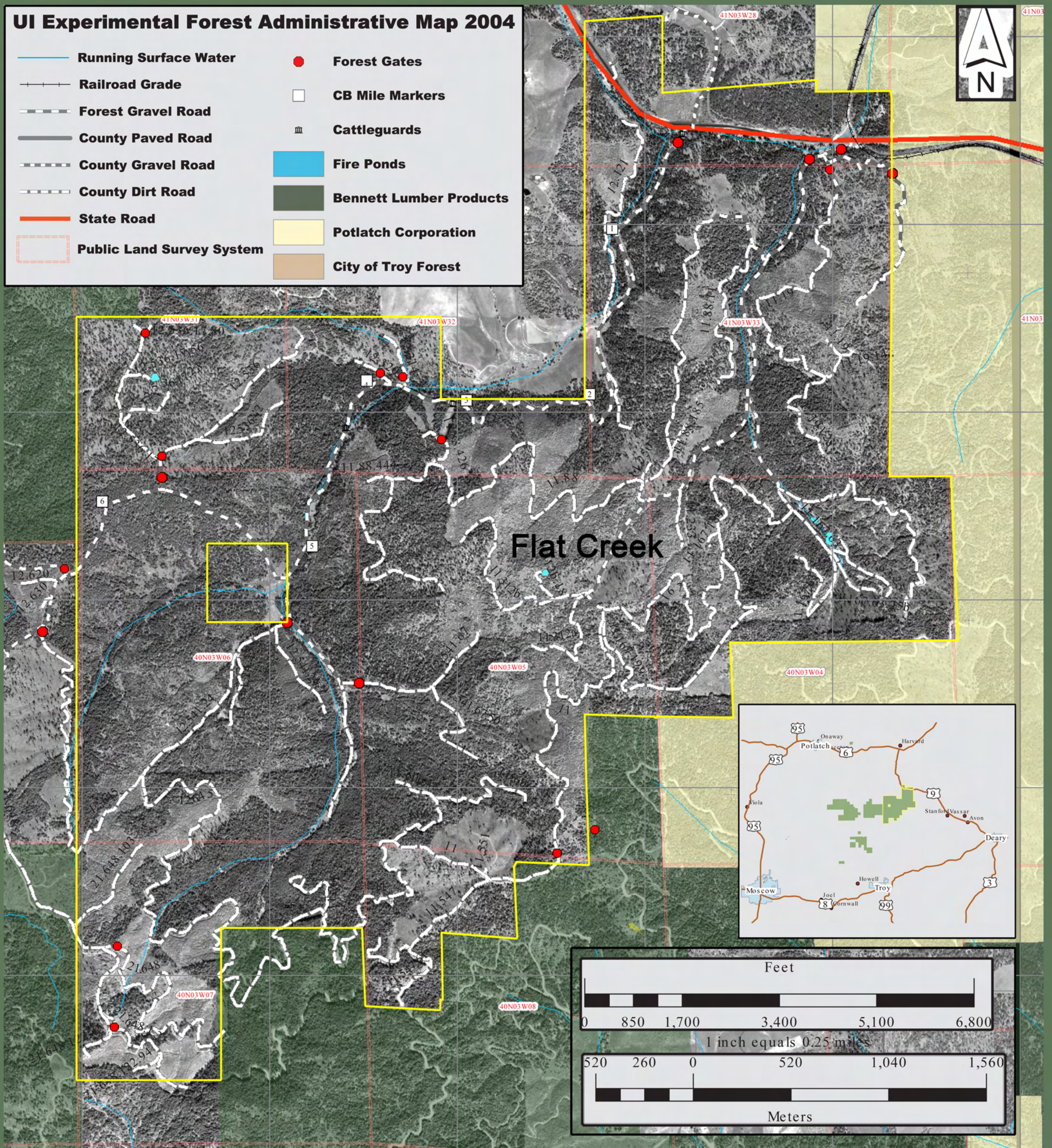
Future Plans: none

do growth plots exist

Access from Flat creek by trail

UI Experimental Forest Administrative Map 2004

- | | | | |
|---|----------------------------------|---|--------------------------------|
|  | Running Surface Water |  | Forest Gates |
|  | Railroad Grade |  | CB Mile Markers |
|  | Forest Gravel Road |  | Cattleguards |
|  | County Paved Road |  | Fire Ponds |
|  | County Gravel Road |  | Bennett Lumber Products |
|  | County Dirt Road |  | Potlatch Corporation |
|  | State Road |  | City of Troy Forest |
|  | Public Land Survey System | | |



Flat Creek



Location of Complete Research:

Author & Title: **Leverick, Michael W.**
**Production, Costs, and Site Impacts for a Mini-Skidder
when Skidding Small Diameter Trees**

University of Idaho Library:

Call Number- **SD388.L4**

College of Natural Resources:

Department- **Forest Products**

Other Sources: