

ANALYSIS OF THE PRODUCTIVITY, COST, AND SITE IMPACTS  
OF A SECOND GENERATION SMALL-LOG SKIDDER

A thesis

Presented in Partial Fulfillment of the Requirements for the

DEGREE OF MASTER OF SCIENCE

With a

Major in Forest Products

In the

GRADUATE SCHOOL  
UNIVERSITY OF IDAHO

By

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## Abstract

A low-horsepower, rubber-tired skidder designed for the efficient removal of thinning residues has been developed at the University of Idaho. This thesis draws on the results of two previous small-log skidder projects: a computer simulation model and testing of the original mini-skidder design. The project continues with the testing and analysis of an improved design.

A 43-hp backhoe power unit was obtained and converted for skidding use. Modifications included the addition of skidpans, a safety canopy, and a small hydraulic grapple mounted on the backhoe boom. Time/motion studies of this machine in three different stands were conducted. Evaluations of soil-compaction, soil disturbance, and residual damage were also performed. Production ranged from 47.6 cubic feet per hour to 201.6 cubic feet per hour. An improvement in the grapple design led to a significant increase in hourly piece production. Delay time was reduced during the project and machine availability in the last stand was 72.2% with a static ground pressure of 9 psi, the mini-skidder caused small, but statistically significant, increases in bulk density of the upper 6 inches of the skid trails. Areal soil disturbance of the stands was limited. An average of 80% of total stand area was classified as slightly disturbed. Damage to the residual stand from skidding operations occurred on 16.5% of the residual trees. Data from the field testing were used to develop regression equations for predicting turn-time.

This project shows the feasibility of using a small machine to skid thinning residues. Skidding costs were approximately \$200.00 per acre. A gross profit of 110% was realized in one stand by utilizing the recovered material for post and rail products.

The general simulation model developed in an earlier small-log skidder project was revised to specifically model the improved skidder design. Results of the revised model accurately predict hourly piece production, but weight and volume production statistics are inconsistent. Even in its current form, however, the revised simulation model can be a

valuable tool for evaluating the influence of stand and machine attributes on skidding production.

### Study Site

This study took place on the Flat Creek Unit of the University of Idaho Experimental Forest; two stands were used.

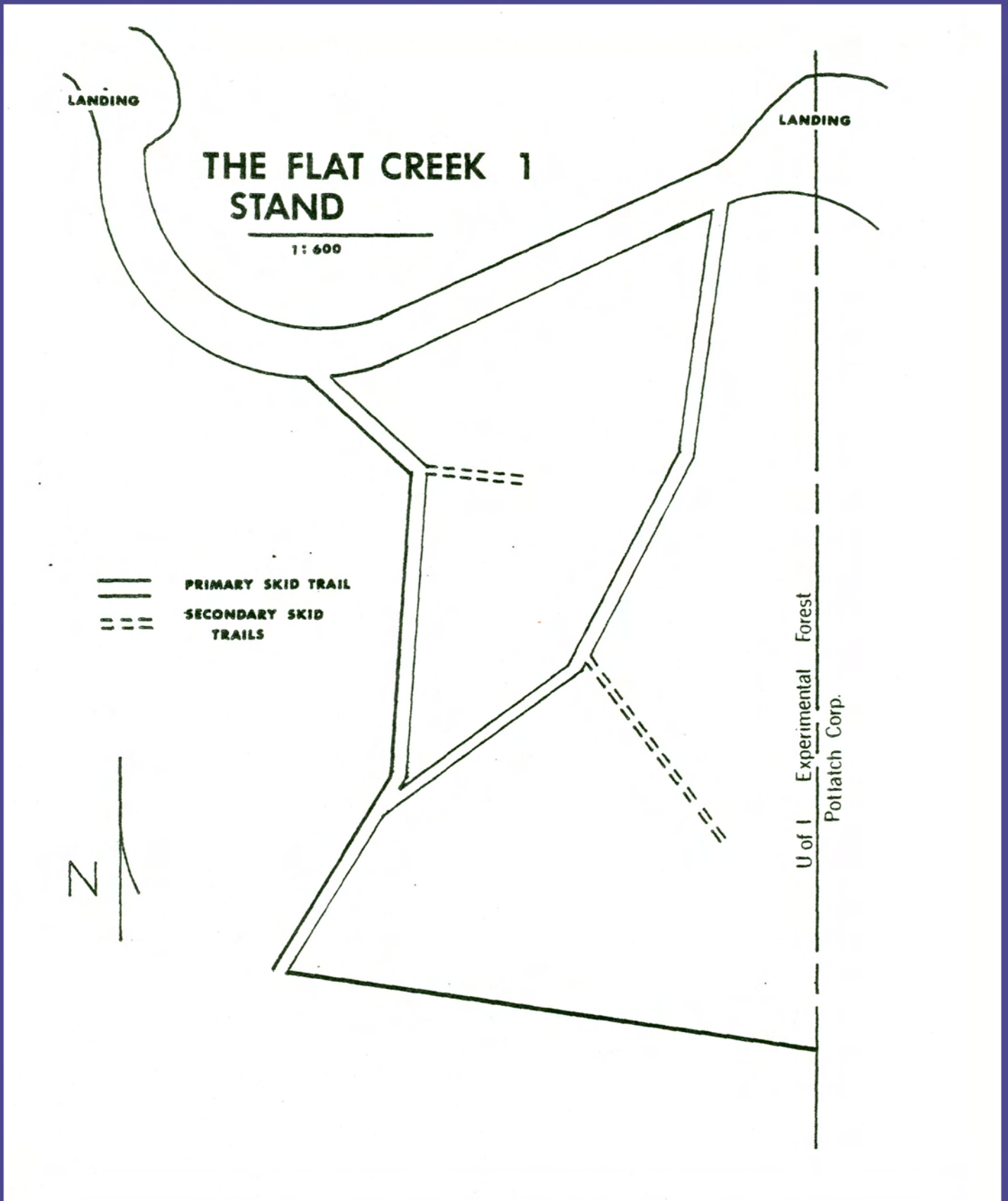


Figure 8. Map of the Flat Creek #1 Stand

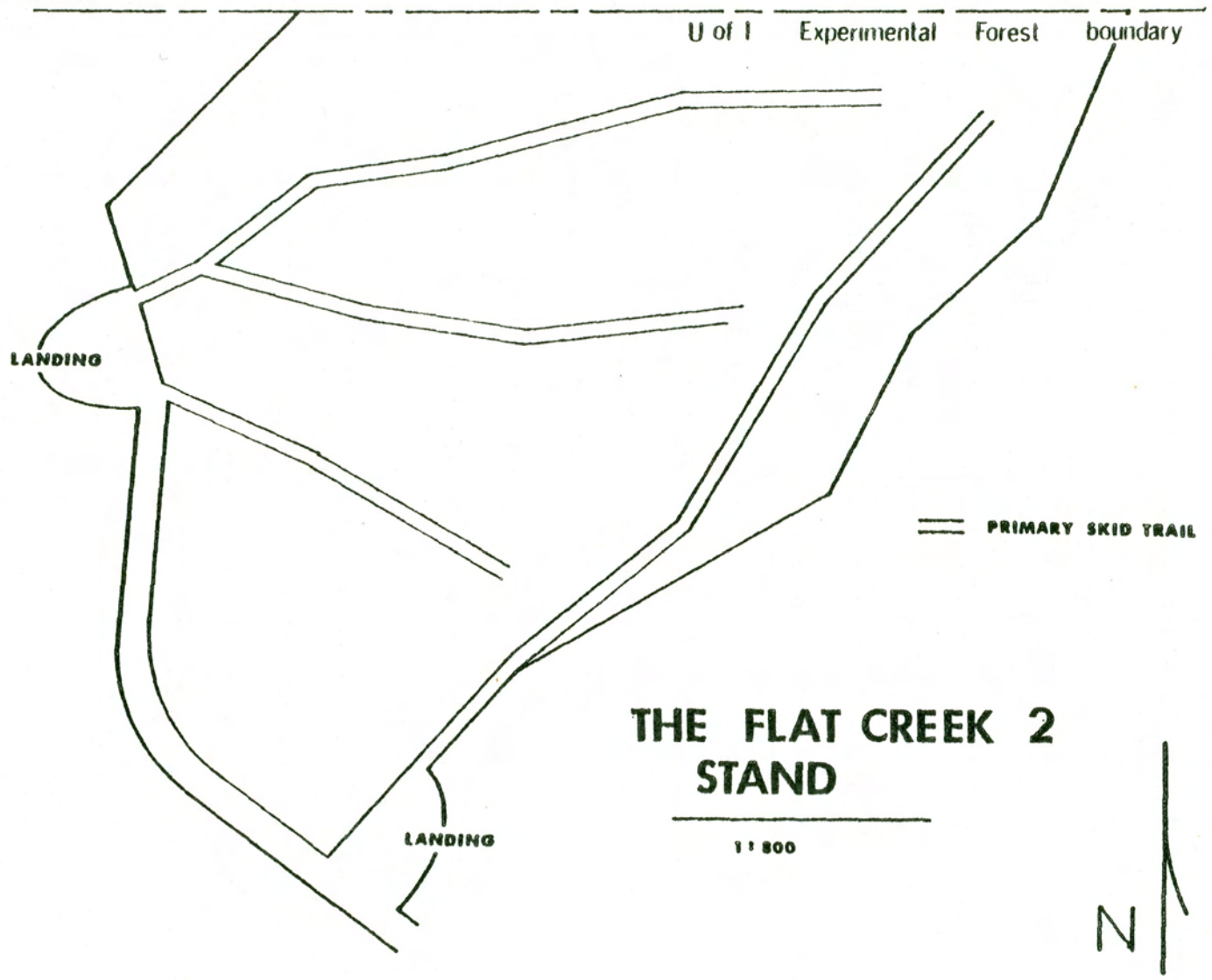


Figure 10. Map of the Flat Creek #2 stand

Date: 15 APRIL 1985

Researcher/s: Leonard Johnson, Robert B. Rimmer

Project Title: Analysis of the productivity, costs and site impacts of a second generation small log skidder.

Subject: \_\_\_\_\_

Keywords: miniskidder, thinning, logging costs

Abstract: A small, modified utility machine equipped with a grapple was used in a thinning operation. Time/motion studies, soil disturbance, soil compaction and residual damage were measured. A model, previously developed, was revised to predict hourly piece, production, weight and volume production.

Location: \_\_\_\_\_

Unit of the Forest Fict Creek, West Hatter Creek

T \_\_\_\_\_ R \_\_\_\_\_ S \_\_\_\_\_

Stand \_\_\_\_\_ Size of Area \_\_\_\_\_

General Description of Area \_\_\_\_\_

Plot or Area Designation: \_\_\_\_\_

Date Begun: Summer 1981 Completion date (expected) Summer 1981

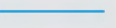

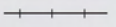











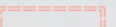
Papers or Thesis Resulting: \_\_\_\_\_

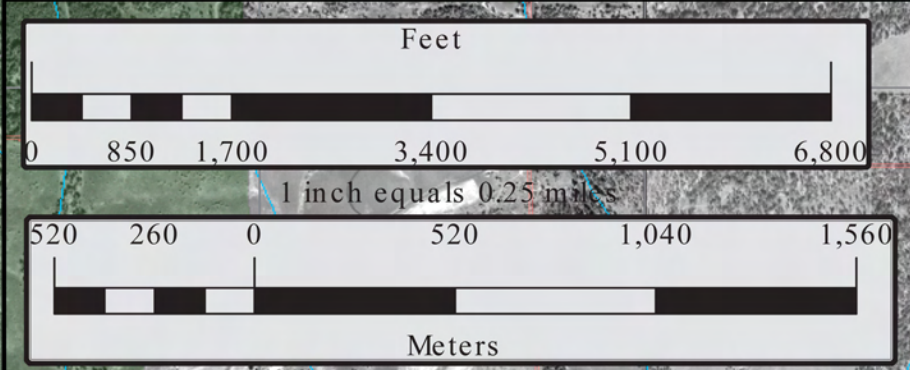
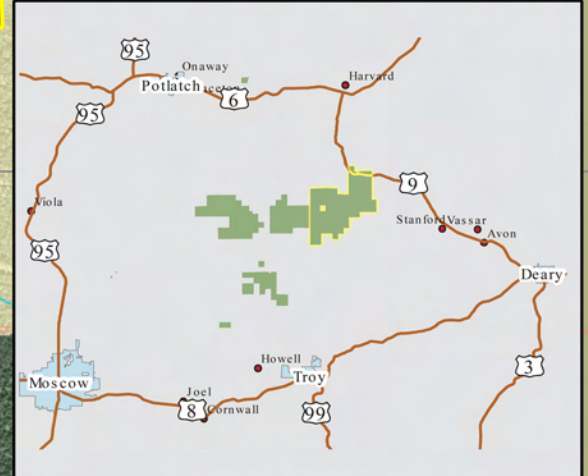
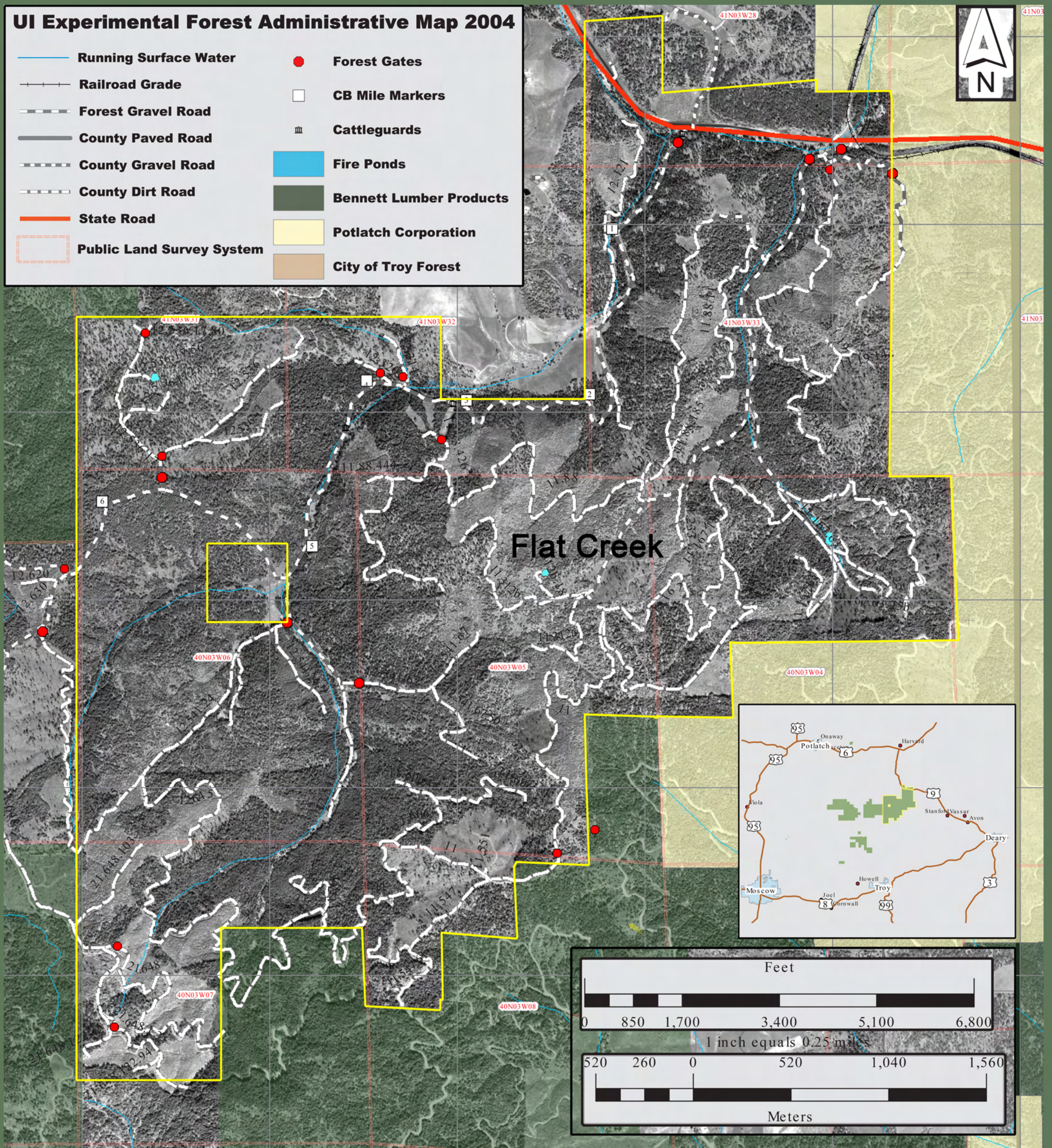
M.S. thesis, same project title, second researcher, Uof I, April 1982

Funding Source: Experimental Forest, Forest Utilization Research, (project profits - Packard Post & Pole)

Future Plans: \_\_\_\_\_

# UI Experimental Forest Administrative Map 2004

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



Flat Creek



## Location of Complete Research:

Author & Title: **Rummer, Robert Bruce**  
**Analysis of the Productivity, Costs, and Site Impacts  
of a Second Generation Small-Log Skidder**

University of Idaho Library:

Call Number- **SD388.R8**

College of Natural Resources:

Department- **Forest Products**

Other Sources: