COMPUTER PLANNING TOOLS APPLIED TO A CABLE LOGGING RESEARCH STUDY

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ABSTRACT

Contemporary harvest planning software was used in planning the layout of cable logging units for a production study of the Clearwater Yarder in upstate New York. Planning software, including payload analysis and digital terrain models, allowed researchers to identify layout and yarding problems before the experiment. Analysis of proposed ground profiles pinpointed the need for constructed landings, and guidelines for rigging tail and lift trees, and helped define felling and bucking strategies to maximize payload. Considerations in unit layout and yarding strategy not considered by the planning software also are discussed. The harvest planning software proved a valuable tool for cable logging unit layout and design.

Keywords: Computer Software, Cable Logging Planning

INTRODUCTION

A logging manager faces the problem of selecting among cable logging machinery with different rates of production and operating costs. Generally, the manager has little, if any, production information available to him or her about new machinery entering the marketplace. Methods available for obtaining production and cost information include conducting production studies in-house or relying on information developed by other production studies or tests. It is imperative that this information be accurate and representative of a machine's capability.

Computer software is used in planning the layout of cable logging units for both practical operations and production tests (Nickerson 1980a, b). The use of planning software with specific input machine capabilities will provide the most useful results from production studies, and maximize production rates for everyday operations. In this paper, we show applications of computer planning software that were used in planning the layout of cable logging units for a production study of the Clearwater Yarder in upstate New York. The production study was a cooperative effort involving the Northeastern Forest Experiment Station; The New York State Department of Environmental Conservation; The State University of New York, College of Environmental Science and Forestry; International Paper Company; The New York State Energy Research and Development Authority; and the Missoula Equipment Development Center.

STUDY OBJECTIVE

The objectives of this study were to: (1) determine costs of production in time and dollars of the Clearwater Yarder operating in various stand conditions and silvicultural treatments; (2) determine the energy consumption for the conditions harvested; (3) identify undesirable environmental impacts in the use of this system; and (4) identify guidelines for efficient operation of the cable yarding system. The overall binding objective was that the study results generally should be applicable to other stand conditions and silvicultural treatments, and be representative of the Clearwater's potential in rates of production and cost for a wide range of harvesting conditions.

The objectives were met by cable logging a 20-acre stand of northern hardwoods. Predominate species included white birch, maple, aspen, northern red oak, ash, and beech. The terrain sideslopes averaged roughly 35 percent; huge rocks and boulders were scattered about the hillside. The research unit was divided into three types of cut: one lightly thinned section, one thinned heavily, and one clearcut. Directional felling was done with chain saws to facilitate the yarding process. Study results will follow in a companion paper; our intent here is to illustrate the extensive preharvest planning conducted at the Northeastern Forest Experiment Station at Morgantown, West Virginia, using a Hewlett-Packard 9845[1/] desktop computer. All planning, road and landing construction, and felling were completed before the Clearwater was moved to and set up on the site.

PREHARVEST PLANNING

Computer graphics of the Ticonderoga, New York, research site were derived from International Paper Company's topographic maps (Fig. 1). Computer software, PERSPECTIVE PLOT (Nickerson 1980a) and LOGGER (Nickerson 1980b), were used extensively to evaluate the logging unit layout and to pinpoint major visual impacts from the proposed clearcut block. Numerous PERSPECTIVE PLOT simulations showed that locating the clearcut block between the heavy and light thinning would produce the least visual impact (Fig. 2). Additional PERSPECTIVE PLOT simulations showed that the skyline corridor layout (Fig. 3) would result in the best layout to facilitate yarding and landing locations.

Preharvest payload analysis was conducted on candidate skyline profiles using the LOGGER payload analysis program (Fig. 4). Numerous LOGGER runs were conducted for each proposed skyline corridor until a feasible set was developed for each (Fig. 5). Preliminary profile analysis was most useful in defining landing requirements and payloads. The results pinpointed the need for lift trees and the desired rigging height for each skyline corridor. Generally, the preharvest payload analysis showed that we had a feasible logging layout plan, at least on paper.

The steps followed in the preharvest planning effort were:

(1) Pick a potential harvest site and consider the following questions: Can the Clearwater Yarder yard logs of the approximate size to be yarded? Are markets for the logs available? Is the terrain extremely difficult and untypical?

(2) Flag the access spur road into the unit.

(3) Obtain best available topographic map of general area (usually 15000:1). Layout preliminary logging plan on paper; show road, landings, corridors. Make PERSPECTIVE PLOT runs to assess visual impact of clearcut units.

(4) Pioneer the access spur road and construct landings.

(5) Flag the skyline corridors. Obtain ground profiles. Flag tail trees, tailholds, and lift trees. Identify guyline anchors.

(6) Analyze ground profiles using LOGGER to determine payload capability. Design for approximately 3,500 pounds (15,400 newtons) based on mainline pull (Peters and Biller 1984) of the Clearwater Yarder. Run PERSPECTIVE PLOT to verify spatial layout of skyline corridors.

1/ The use of trade, firm, or corporation names in this paper is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture or the Forest Service of any product or service to the exclusion of others that may be suitable.

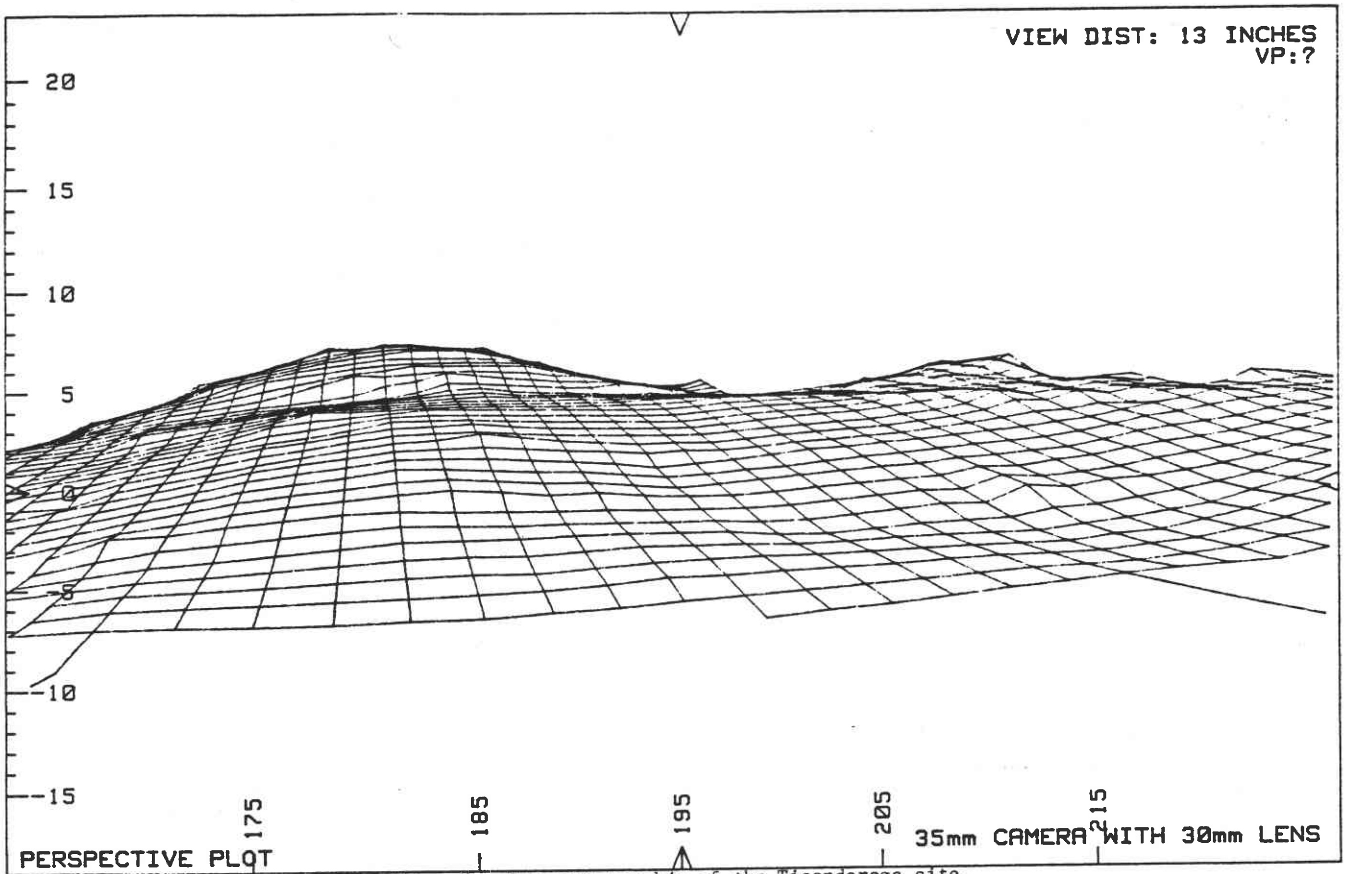


Figure 1. Computer graphic of the Ticonderoga site.

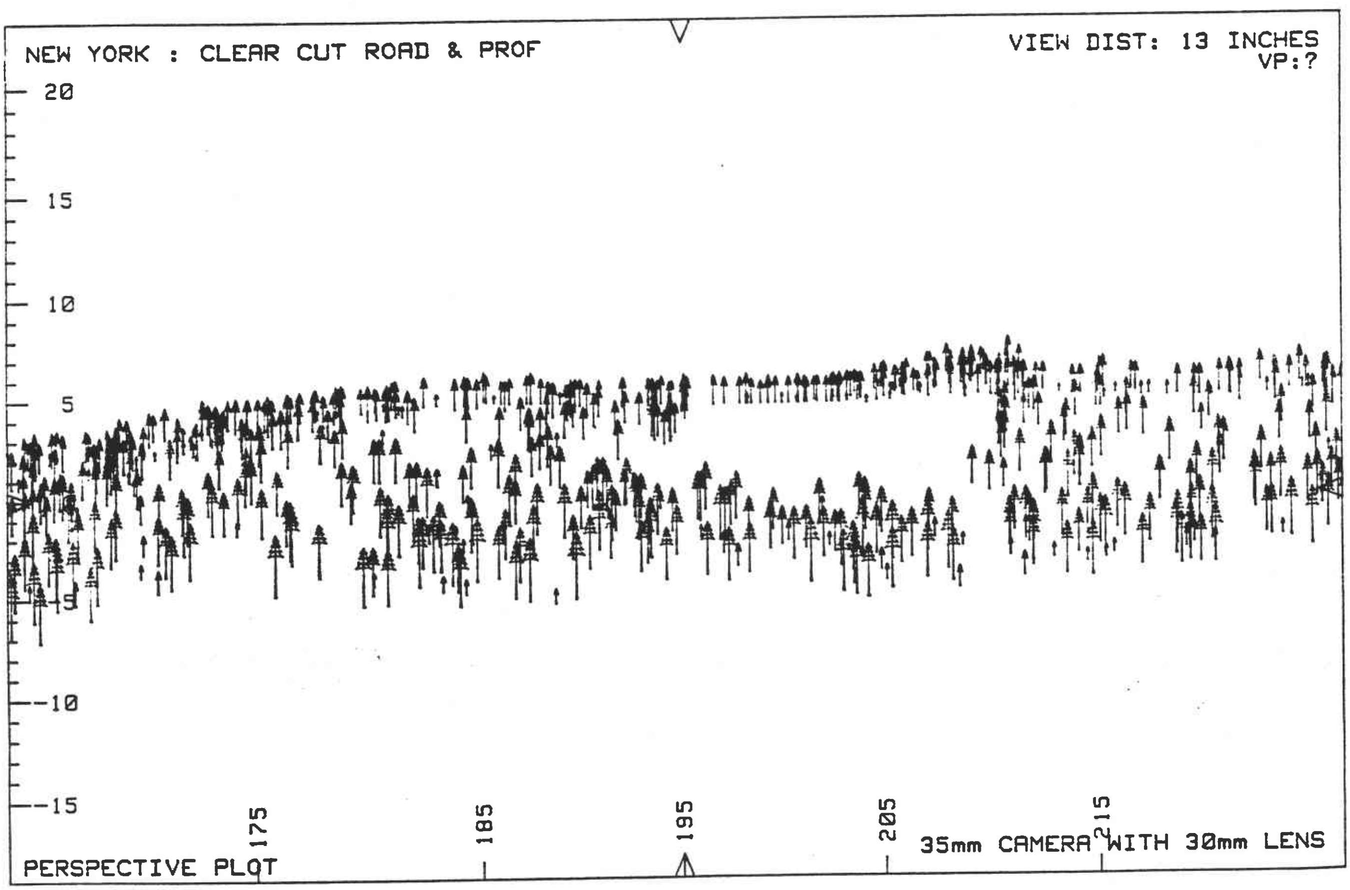


Figure 2. Simulated clearcut block location.

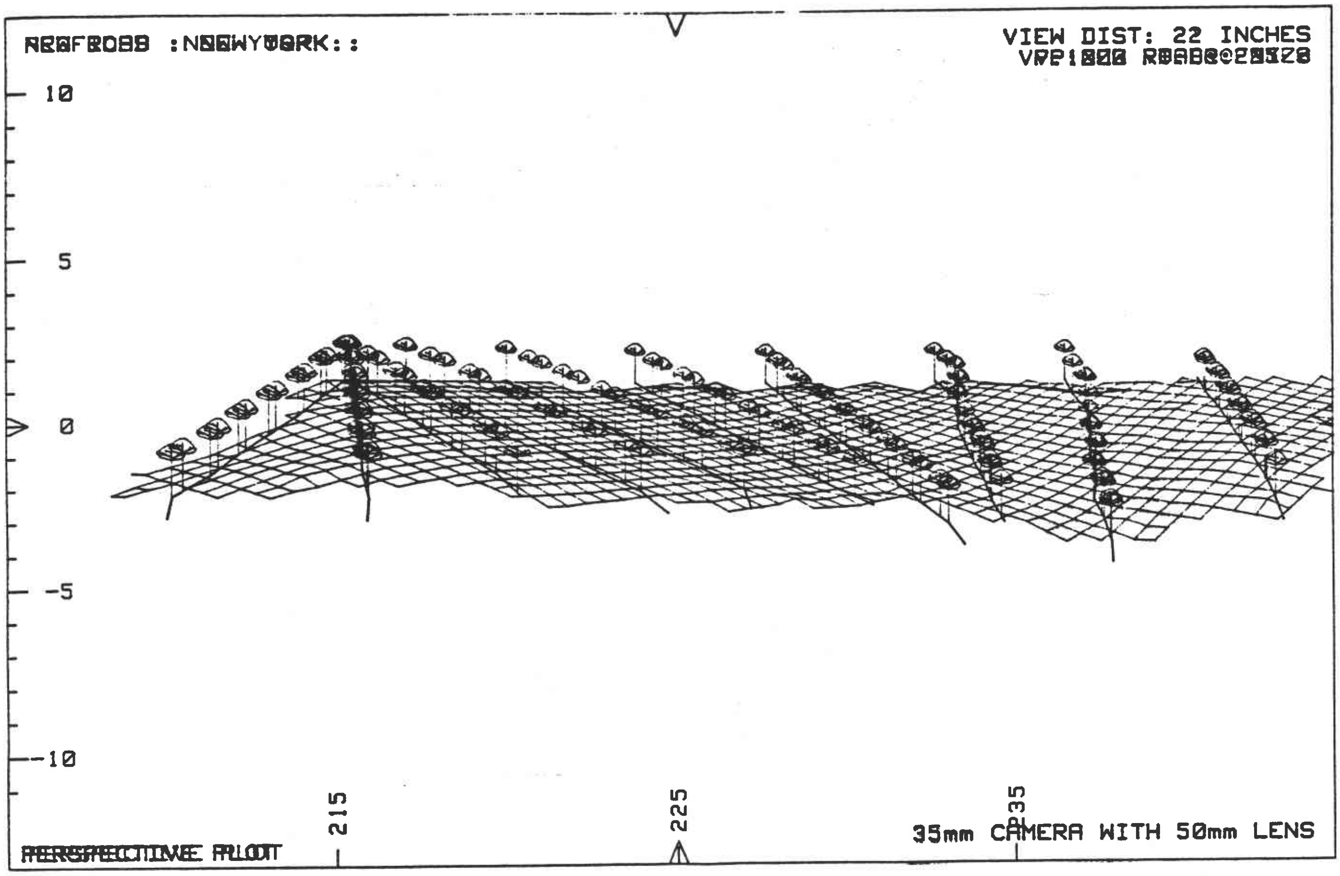
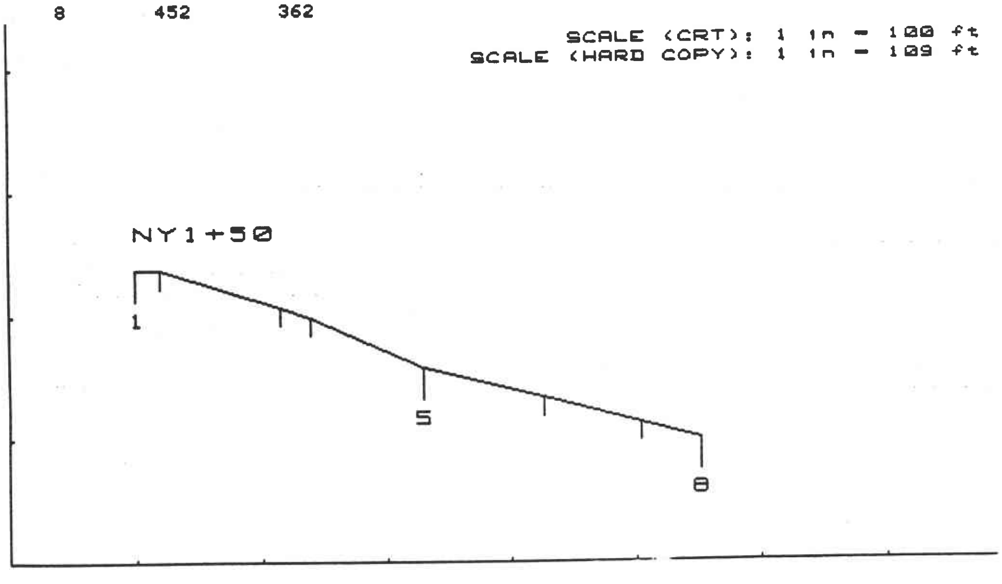


Figure 3. Simulated skyline corridor location layout.

Figure 4. Profile for Skyline Road Number 1.

PROFILE NY1+50 (FILE 5)

T.P.#	X COORD	Y COORD	SLOPE DIST	% SLOPE
1	0	500		
			20	0
2	20	500		
			100	-32
3	115	470		
			25	-35
4	139	461		
			100	-46
5	230	419		
			100	-24
6	327	396		
			80	-27
7	404	375		
			50	-27
8	452	362		



HEADSPAR HT= 35 TAILSPAR HT= 20
HEADSPAR TERRAIN POINT = 1 TAILSPAR TERRAIN POINT = 7
LANDING CUT(-) OR FILL(+) = 0
INNER YARDING LIMIT= 1 OUTER YARDING LIMIT= 7
LOADED CARRIAGE CLEARANCE= 8
FULL SUSPENSION REQUIRES 30 FEET OF CLEARANCE

TERR PT	FLYING PAYLOAD	DRAGGING PAYLOAD	MNLINE TENS	HLBACK TENS	CARRIAGE TO GROUND CLRC	SKYLINE LENGTH	MAX LOAD TO HDSPR	NO OF SKYLN LIFTS
2	0	11255	4660	N/REQ	8.0	434	11255	0
3	0	1951	548	N/REQ	8.0	429	1951	0
4	0	1734	480	N/REQ	8.0	429	1734	0
5	0	2760	639	N/REQ	8.0	431	1734	1
6	0	2794	523	N/REQ	8.0	430	1734	1

RIGGING LENGTH REQUIRED FOR SKYLINE = 535 FT
MAINLINE LENGTH REQUIRED TO REACH T.P. 7 IS 415 FT
YARDER AS DESCRIBED CARRIES ONLY 0 FT OF MAINLINE

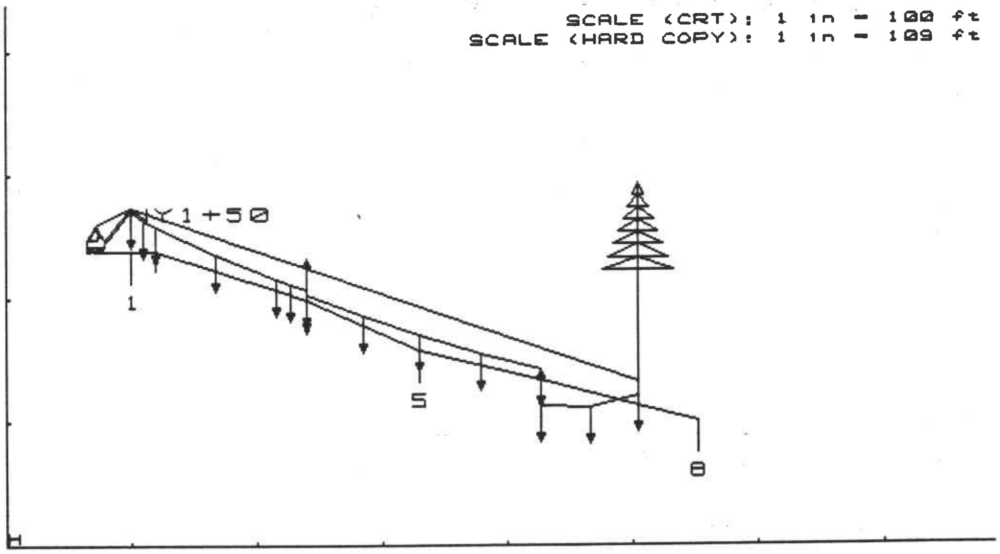


Figure 5. Payload analysis of skyline road Number 1. Conditions: Headspar height = 35 feet, tailspar height = 20 feet.

WHAT THE PLANNING SOFTWARE DOES NOT TELL US

Several trips were scheduled to the research site to field-verify the proposed logging plan. When the skyline corridors were flagged, the unit was covered with a deep snowpack that concealed gullies and numerous huge rocks and boulders throughout the unit. Minimal rearranging of the skyline corridors was required to avoid yarding problems. The size of some trees required bucking to log length to meet yarder payload capacity. Fellers were instructed to directional fell trees butt-to-lead in a herringbone pattern—45 degrees to the skyline corridor—and to avoid boulders. Fellers also were instructed to fell skyline corridors before felling to lead. Hardwood crowns required topping and additional bucking to facilitate lateral yarding.

The logging crew and equipment operators required training in safety, rigging, climbing, running the yarder, moving the stop, changing roads, whistle signals, and log hooking techniques. Hooking crews were encouraged to visually preselect the next turn and use roll(s) to minimize and free hangups. The trained crew worked well in positioning the carriage stop, picking the next turn ahead of time, and using roll methods to break logs away from hangups and to avoid stand damage. The preselection of landings, guyline anchors, lift trees, and payloads reduced the logging crew's responsibility.

Large log size, trained crews, and a well-laid out logging plan produced sufficient wood to require a swing machine to keep the landing chute free of jamming. High rates of production are imperative for economical cable logging.

STUDY RESULTS

The detailed study results are being summarized and will soon be available to potential users. We are confic that we met our objectives and that the production result will be valuable to logging managers and planners in evaluating whether to use cable systems, specifically the Clearwater Yarder.

Contemporary cable planning software saved much time and money in laying out this research study. The softwa not only helped us lay out the units but also provided a end product that will be useful and applicable. Cable logging is expensive and time-study results should reflect rates of production and cost for planned conditi We believe that substantial gains in production and over efficiency can be attained by using contemporary cable logging software in planning research studies.

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PREDICTING POST-LOGGING TERRAIN STABILITY - A STATISTICAL GEOGRAPHICAL APPROACH

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ABSTRACT

A simple empirical method for developing probabilities for post-logging landslide frequencies within varying terrain map units is presented and discussed. The probabilities developed are considered to be valid only within local climatic regions and only for the terrain types sampled. The method is presented as an alternative to classical engineering approaches for developing slope stability maps in forested watersheds where detailed data on precipitation, slope hydrology, and soil physical properties are limited, non-existent or if collected, are expected to be highly variable. The method is suitable for use by terrain mappers or soil surveyors who do not have a strong background in classical slope stability modeling. Terrain based stability maps can be produced which will provide forest managers with expected landslide frequencies and probabilities on a polygon by polygon basis. When combined with information on expected landslide magnitude and routing, this approach should facilitate more objective planning in mountain forests.

Paper not received by publication date and may appear in the "LATE PAPER" section.

PROCEEDINGS

IMPROVING MOUNTAIN LOGGING PLANNING, TECHNIQUES AND HARDWARE

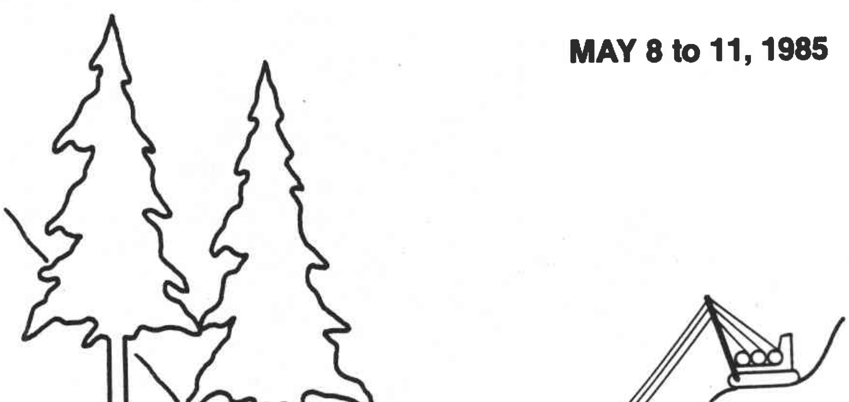
A JOINT SYMPOSIUM OF THE

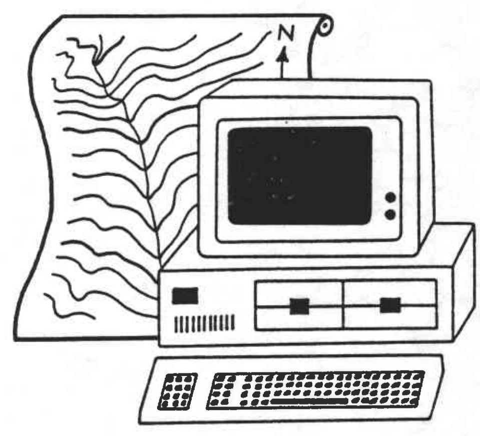
I.U.F.R.O. MOUNTAIN LOGGING SECTION

AND THE

SIXTH PACIFIC NORTHWEST SKYLINE LOGGING SYMPOSIUM

MAY 8 to 11, 1985





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