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NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., 260 MADISON AVENUE, NEW YORK, N.Y. 10016

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ASSESSING FOREST PRACTICE RULES AND MANAGING TO  
AVOID LANDSLIDES AND CUMULATIVE EFFECTS

TECHNICAL BULLETIN NO. 496

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For the past seven years, the Southern and West Coast Regional Meetings have featured one or more sessions covering research, field investigations, and regulatory programs related to the impact of forest management practices on water quality and utility. This technical bulletin is an assembly of five presentations at the 1986 West Coast Regional Meeting. The session in which these papers were presented was arranged by Dr. George G. Ice, Research Forester at the West Coast Regional Center.

In the first paper, Kenneth Delfino, California Department of Forestry, described the California Forest Practice Act and an assessment of the effectiveness of the rules for water quality protection. A four-person multi-disciplinary team is evaluating selected timber harvest sites in order to develop a qualitative evaluation of water quality protection, rule implementation, and rule effectiveness. In the second paper, Dr. George G. Ice, NCASI, discussed the development of cumulative effects planning and modeling in forest operations. Cumulative effects models now being used have not been subjected to traditional model building and testing procedures. Patrick A. Teti, Teti and Associates, reviewed the question of whether stream impacts occur as a result of site-specific impacts or as a result of rate-of-cut. More important than the rate-of-cut is the identification of sensitive sites which cause the most impacts.

Terry P. Rollerson, MacMillan Bloedel, Don E. Howes, B.C. Ministry of Environment, and Mark W. Sondheim, B.C. Ministry of Environment, discussed mapping of forest sites for slope stability in coastal British Columbia. Empirical map-based stability classification techniques were discussed and factors found important were presented. In the last paper, Frederick J. Swanson and Christopher J. Roach, USDA, Forest Service, summa-

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#### RESULTS OF THE MAPLETON LEAVE AREA STUDY

Frederick J. Swanson and Christopher J. Roach  
USDA, Forest Service

#### I INTRODUCTION

The Mapleton leave area study is designed to evaluate "the implementation effectiveness of headwall and streamside leave areas" in the Mapleton Ranger District of the Siuslaw National Forest. Last year at this meeting we reported on the implementation of headwall leave areas (1). Over the past year, we have examined:

- (1) Frequency of slides from headwalls in clearcuts, leave areas, and forested areas.
- (2) Occurrence of slides in areas outside of headwalls,

such as roads and planar and convex slope elements.

(3) Implementation success of streamside leave areas.

(4) Frequency of slides in streamside leave areas.

(5) Effects of roads on the drainage area above headwalls in forest, clearcut, and headwall leave areas and the apparent effects of this modification of drainage area on slide frequency in headwalls.

(6) Frequency of slides in clearcut units without headwall leave areas.

Several of these and additional phases of the study are still underway. Here we report on the frequency of sliding from headwalls in clearcuts, forest, and headwall leave areas (Table 1).

## II RESULTS

Areas were visited in the field in mid-1985, headwalls were identified, and their risk rating was evaluated using the headwall stability rating system of the Mapleton Ranger District. Any landslides occurring since 1975 in the forest or since cutting in clearcut and associated leave areas were noted and described in terms of volume and fate of soil moved as well as other site characteristics. Year of slide occurrence was estimated based on air photos, dendrochronology, and other field observations.

Table 1 shows numbers of headwalls sampled, numbers of those headwalls containing slides in the appropriate time period, and percent of headwalls containing slides for the 1975-1985 decade. The samples consist of all headwall leave areas on the district, all headwalls in clearcuts containing headwall leave areas, and a set of forested areas with similar terrain characteristics (Soil Resource Inventory units) to the nearby clearcut units containing headwall leave areas. Not included in this analysis are headwalls with substantial influence of road fill or road-induced alteration of drainage basin area (greater than 100 percent increase in drainage area). An annual frequency of sliding is also computed, because the time periods of forest, clearcut, and leave area conditions differ. The forested areas sampled were in the forested condition throughout the 10-year period of the sample, so we divide the decade slide frequency by 10 years to get annual frequency of sliding. The clearcutting activity which resulted in clearcut headwalls and establishment of leave areas began in 1975 and has progressed to 1985. The average age of these clearcuts and their associated headwall leave areas is 3.4 years, so we divided the decade slide frequencies by 3.4 years to arrive at an estimate of annual frequency of sliding in headwalls in clearcuts and leave areas.

TABLE 1 FREQUENCY OF SLIDING FROM HEADWALLS IN CLEARCUTS AND LEAVE AREAS IMPLEMENTED BETWEEN 1975 AND 1985 AND SLIDES FOR THE SAME PERIOD IN FORESTED AREAS WITH NO SIGNIFICANT ROAD INFLUENCE. RISK RATINGS OF HIGH, MODERATE, OR LOW POTENTIAL OF SLIDES FROM HEADWALLS IS BASED ON THE HEADWALL RATING SYSTEM USED ON THE MAPLETON RANGER DISTRICT.

	HEADWALLS/RISK RATING								
	Clearcut			Leave Area			Forest		
	High	Mod.	Low	High	Mod.	Low	High	Mod.	Low
Slides greater than 10 yd <sup>3</sup>									
No. headwalls sampled	15	81	116	7	16	9	15	51	38
No. with slide(s)	4	13	2	2	2	1	1	8	2
Percent with slide(s)	27%	16%	2%	29%	12%	11%	7%	16%	5%
Annual frequency of slides	7.9%	4.7%	0.6%	8.5%	3.5%	3.2%	0.7%	1.6%	0.5%
Slides greater than 100 yd <sup>3</sup>									
No. headwalls sampled	15	81	116	7	16	9	15	51	38
No. with slide(s)	1	3	0	0	0	0	0	0	1
Percent with slide(s)	7%	6%	0%	0%	0%	0%	0%	0%	3%
Annual frequency of slides	0.3%	1.8%	0%	0%	0%	0%	0%	0%	0.3%

Considering slides greater than 10 yd<sup>3</sup>, the annual frequencies of sliding of headwalls in clearcuts and leave areas are quite similar and substantially higher than the annual frequency of sliding in forested headwalls. Slides larger than 100 yd<sup>3</sup> occurred in only four of the 212 clearcut headwalls sampled and one of the 104 forested headwalls. None of these larger slides were found in the 32 headwalls in leave areas.

### III INTERPRETATION OF RESULTS

These results can be interpreted in several ways. A first impression is that headwall leave areas have not mitigated in-unit landslides, because the frequencies of slides in headwalls in clearcuts and leave areas are similar. However, one could also argue that there has been insufficient hydrologic testing of the landscape--no big storms--during the past few years when most clearcuts and leave areas sampled in the study were implemented. Furthermore, direct damage to fish habitat as a result of slides in clearcut units containing headwall leave areas has been minor. Most of these slides were very small and did not leave the headwall area. Slides in two of the 25 clearcut units with headwall leave areas entered Class I or II (anadromous fish bearing) streams. These slides occurred in the two earliest (1975 and 1978) clearcut units containing headwall leave areas. We are now sampling the occurrence of slides in clearcut units without headwall leave areas so we can compare damage to fish habitat by slides originating in units with and without headwall leave areas.

At the present time we consider the effectiveness of headwall leave areas in mitigating in-unit sliding and damage to fish habitat to remain an open question. We are continuing evaluation of these and other data.

### IV LITERATURE REFERENCES

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