CONCLUSIONS

Mean sediment potentials produced on ecological land units ranged from 169 pounds per acre in the mixed forest to 2,052 pounds per acre on the mixed steppe. Potential for soil loss in relation to intense rainfall was highly variable among habitat types, with means ranging from 42 to 3,679 pounds per acre. Our results indicate that with increasing ecological interpretation, including habitat type and range condition, a more reliable index of soil erodability can be developed.

REMOTE SENSING INVENTORY OF ELK HABITAT IN THE BLUE MOUNTAINS

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An inventory of forest and grassland vegetation types that provide elk cover and forage was developed with remotely sensed data from the Blue Mountains. Elk habitat was measured by mapping cover and forage extent in two locations: 1) a northern area of 125,000 acres along the south fork of the Walla Walla River and around Jubilee Lake; 2) a southern area of 264,000 acres around Bridge Creek Flats and along the north fork of the John Day River. Fall herds occupying the management units containing the north and south study areas are estimated at 3,650 and 6,220 adult elk, respectively.

Forest and grasslands within both study areas are representative of elk-habitat classes found throughout the Blue Mountains. Mixed conifer is the most abundant tree-dominated resource class throughout these areas. Spruce-fir is of secondary extent in the north, lodgepole pine in the south. Bluebunch wheatgrass is the prevalent grass-forb resource class of elk winter ranges, but created grass-forb classes are prominent in logged areas of summer ranges. Elk use these and other resource classes primarily for either cover or forage depending on their extent, intermixture, and structure (tree height and canopy closures are structural qualities).

METHODS

The inventory first involved documenting actual use by elk of various habitats. Elk were tagged with radios, followed, and their activity was observed to record specific use of all habitats throughout the year. Temperature, wind, and other specific environmental conditions within the habitats were noted during use. Elk behavior was analyzed with habitat structure, plant composition, and weather conditions. Observed patterns of habitat use were compared with relationship published by Thomas *et al.* (1979)[1].

[1]Thomas, J. E., ed. 1979. Wildlife Habitats in Managed Forests - The Blue Mountains of Oregon and Washington. USDA Forest Agriculture Handbook No. 553.

The inventory of cover and forage areas was performed using remote sensing information from a LANDSAT satellite and from aerial photography. First, the satellite data were anlayzed to identify different spectral classes of reflected solar energy over the whole of both study areas. Each data element, approximately 1.1 acres in size, was sorted and assigned to one of 60 classes to construct an areawide spectral class map. Second, resource classes were identified on large-scale, 1:6000, color-infrared aerial photographs which covered 5000 ± acre sample of each area. Third, spectral classes were compared with resource classes over the same ground areas to determine association of spectral classes with resource classes. Fourth, several spectral classes were combined into elk-habitat classes on the basis of similarity of stand height, canopy closure, and number of vegetation layers. General habitat maps were then constructed from the processed satellite data.

In summary, spectral classes determined from LANDSAT data were associated with resource classes recognized from aerial photographs and then were condensed into habitat classes that elk were observed to use, for either forage or cover (Table 1). Maps and acreage tables of spectral, resource, and habitat classes for both study areas were saved on computer files. Data from small areas can now be retrieved for detailed study and data from larger portions could be regrouped and manipulated for further evaluation.

VERIFICATION OF RESULTS

Ground identification of resource and habitat classes which occur in the Blue Mountains has been compared with the computer-determined spectral classes. Overall, the habitat map is realistic and the detail in specific, well-known areas is more than adequate. Based on experience with other land cover inventories, 75 percent of the area on computer-derived maps accurately represent actual land cover.

Further evaluations are designed to estimate accuracy levels. About 500 descriptions of habitat structure and composition obtained from stands where elk were observed are to be compared with spectral classes in each area. These comparisons of areas occupied by elk with the same areas on the satellite maps provide quantitative assessment of accuracy and error so the land manager can evaluate the impacts of various degrees of error in the context of specific resource-management decisions.

HABITAT MANAGEMENT APPLICATIONS

The elk-habitat, resource, and spectral maps based on LANDSAT data can be displayed and manipulated for input into the land-management decision-making process. This habitat information can be used for monitoring habitat status and change because it is a numerical record tied to geographic coordinates and it is stored on and accessible from a computer. The research data have been extended to mapping of elk habitats in the Heppner wildlife management unit. Oregon Department of Fish and Wildlife and U.S. Forest Service managers are using the research information in land-use planning

dialogues. The habitat maps and acreage tables can become a monitoring basis for maintenance of elk herds through planned manipulations of cover-forage areas and ratios. The measurement of elk habitat distribution and cover-forage area ratios over time provides managers and planners with heretofore unavailable data. Such data are necessary for informed management decisions that will allow Oregonians to have productive elk habitat as well as time and forage resources.

Table 1. Spectral and cover classes for Walla Walla elk range

Original spectral classes	Habitat type	Cover map symbol	Example map*
A B C E F K L P R U V W Ø 5 6 7 ¡ □ ▼ √ 3 /	Forage	.	Original Spectral Map
D G H N T Z 2 4 8 9 * # @ + =	Forage-Hiding	/	
I O Q S X Y $ ≠ ¢ ★ ¥ 1	Thermal	$	Habitat Map
J M	Thermal-Hiding	=	
%	Water, misc.	%	

*outlined area is Langdon Lake in northeastern Umatilla County