This approach can be varied according to economic realities and desired management intensity merely by selecting "recognition variables" of suitable ranges and employing different degrees of lumping into aggregation types.

## Application

A description of how this approach was applied to a 40-acre compartment (230U) on Blodgett Forest should prove useful. Slopes range from 10 to 30 percent on a north to northeast aspect between 4,300 feet to 4,600 feet elevation. Current volumes average 25 thousand board feet (Scribner)/acre (385 $M^3$/hectare) at 240 $ft.^2$/acre (55 $M^2$/hectare) basal area of mixed conifers and oak. Growth averages 1.2 MBF/acre (14 $M^3$/hectare). The recognition variables used to identify plant aggregations included a plant descriptive element and a spacing element.

The descriptive element employed was tree diameter (DBH). Utilizing marginal physical growth analysis it was determined that 26 inches (66 cm) DBH trees were the largest (actual range was 22 to 30 inches, depending on species) that could remain after cyclical harvest and continue to grow above 6 percent value growth rate. Next, merchantability standards in the Blodgett Forest area and the economics of various cultural activities were examined. As a result six diameter classes were recognized: trees less than breast height, *seedlings; saplings,* 0 to 6 inches (0 to 15 cm); *poles,* 6 to 12 inches (15 to 30 cm); *small sawtimber,* 12 to 18 inches (30 to 46 cm); *medium sawtimber,* 18 to 26 inches (46 to 66 cm); and *large sawtimber,* more than 26 inches.

The spacing element was based on previously determined desirable basal area stocking levels. "Adequate" stocking for each aggregation type was defined as a basal area range that would al-

# Livestock grazing in national forests

Innovative research completed in annual forage production and begun in forest grazing practices during the past half-decade by U.C.'s Department of Forestry and Resource Management will benefit users of California's rangelands.

Research into site-specific management of annual range production, begun by Harold Heady and continued by James W. Bartolome, have significantly refined methods for defining variations in the productive capability of annual rangelands. Results have shown how management of plant residue can, within the limits of site potential, maximize forage productivity the following year.

The 6 million hectares of annual rangeland in California vary tremendously in site potential. Three major zones of annual rangeland require differing management for optimal productivity. Proper use by livestock leaves no less than 1100 kg/ha of plant residue at the end of the season in the zone of highest mean annual rainfall (more than 100cm), 800 kg/ha in the extensive zone with between 100 and 25 cm of mean annual rainfall, and about 500 kg/ha in the zone with less than 25 cm mean annual rainfall. These guidelines are the first site-specific, quantitative aids to proper use on annual rangelands.

Bartolome and researcher Barbara H. Kosco are changing the traditional views concerning grazing use of mixed conifer forests. Opportunities for the simultaneous use of forested ranges by timber and livestock producers to their mutual benefit have not been studied in California, but research at Blodgett Forest shows that carefully controlled cattle grazing has potential as a silvicultural tool, reducing the need for other forms of brush control in conifer plantations, not as a cost, but as an additional productive output. Logging practices and silvicultural treatments strongly influence the amount and quality of forage produced in openings created by harvest. Forage for wildlife or livestock can be enhanced through the use of improved techniques in prescribed burning, slash disposal, and seeding and planting.