June 1992

Bulletin Number 54

University of Idaho College of Forestry, Wildlife and Range Sciences

The Grazed-Class Method to Estimate Forage Utilization on Transitory Forest Rangelands

by James L. Kingery
Carol Boyd
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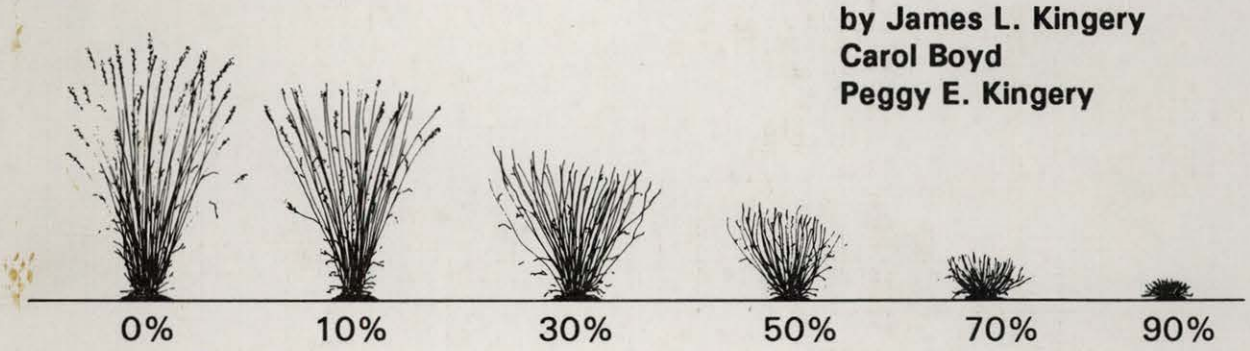

FOREST, WILDLIFE AND RANGE EXPERIMENT STATION

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Contents

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James L. Kingery, Carol Boyd
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Introduction

Grazing of forested lands in the Pacific Northwest has been included in forest resource management strategies since the turn of the century (Tisdale 1961). Many of the areas grazed are transitory in nature, that is, sites where the natural forest community has been removed due to harvesting, fire or some other disturbance. Seral shrubs and herbaceous vegetation now flourish. While successional processes are restoring the site to forestland, such areas can provide considerable support of animal use for up to 40 years (Kingery 1987). This fact may have considerable appeal to private land owners, especially during times when the timber market is poor (Adams 1975).

As on traditional rangelands, it is necessary to monitor vegetation on transitory rangeland to ensure proper use of the resource and attainment of management objectives. Proper use is defined by the Society for Range Management as "the degree and time of use of current year's growth which, if continued, will either maintain or improve the range condition consistent with conservation of other natural resources." (Range Term Glossary Committee 1989). Proper use, when applied to an individual species, refers to the season and amount of use that can occur without interfering with that species' ability to provide for its own needs. When applied to a plant community, proper use refers to the season and level of use that can occur without jeopardizing the long-term health of the plant community (Stoddart et al. 1975). When land is not managed for proper use, plant vigor and forage production can decrease and the trend in range condition can decline. In contrast, an increase in the food manufacturing leaf surface, an improvement in litter cover, and an increase in forage quality and quantity result when proper use guidelines are followed.

On transitory rangelands, especially in northern Idaho, the primary use is generally for timber production. As such, tree seedling establishment and maintenance of range condition are the chief concerns. On these sites, therefore, proper use is the degree and time of use of forage plants that will not only maintain or improve the condition of the forage resource, but also be consistent with goals for forest regeneration.

For proper use to be achieved, animal use must be monitored. While there are many methods of estimating forage utilization, most have been developed for use on traditional rangelands and may not be completely applicable to transitory rangelands. In addition, they can be time-consuming and require extensive training to produce acceptable results. For these reasons, there is a need for a reliable procedure to estimate utilization that is accurate, rapid and easily learned. The grazed-class method developed by Schmutz, Holt and Michaels (1963) meets this need.

Background for the Grazed-Class Method

The grazed-class method of estimating forage utilization was developed for and tested on arid rangelands in the Southwest, but appears to have considerable potential in forested settings of the Pacific Northwest as well (Boyd 1987). It was designed to provide range resource managers with an accurate and easy-to-use tool to monitor livestock utilization of selected forage species. The procedure is based on the concept that when one or more key species of an area representative of a larger range type have been properly utilized, optimum use of that rangeland has been made (Stoddart et al. 1975). The method classifies grazed plants into utilization classes, based on the percent of total plant weight removed. The classes are 0, 10, 30, 50, 70 and 90-percent use (Fig. 1). Photographic guides, developed from height-weight relations of the chosen species (Fig. 2), are used to guide the examiner in placing grazed plants into their respective utilization classes.

The photo guides for use on transitory rangelands were developed according to the procedure of Schmutz (1978) with some modifications. These modifications were necessary because of the variability of growth characteristics encountered within the plant species tested. This variability was primarily due to the heterogeneous growing conditions typical of forest environments as compared to the more homogeneous conditions found in the Southwest desert grasslands for which the photo guides were originally developed.

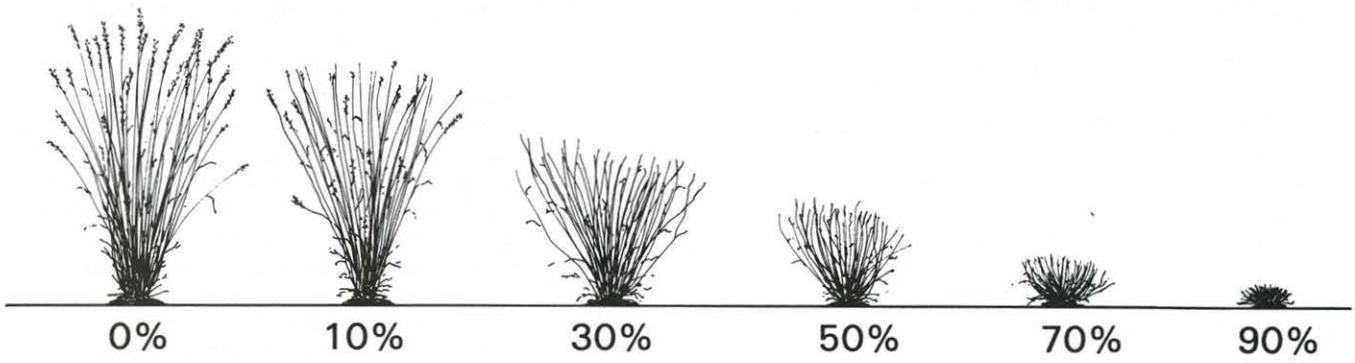

Figure 1. Utilization classes based on the percent of total plant weight removed.

Development of Photo Guides for Transitory Rangelands

The factors involved in choosing the key management area and for selecting the key species to monitor are critical for the development of the photo guides. According to Schmutz (1978), key management areas for livestock production are located at intermediate distances from water but not where livestock naturally congregate. Key species are defined as those that are both abundant in the plant community and important components of the livestock diet.

Determination of Key Management Areas

For purposes of developing and testing the photo guides for transitory rangelands, key areas were located in the Douglas-fir/ninebark (*Pseudotsuga menziesii/Physocarpus malvaceus*), Douglas-fir/snowberry (*Pseudotsuga menziesii/Symphoricarpos albus*), grand fir/queenscup beadlily (*Abies grandis/Clintonia uniflora*), and western redcedar/queenscup beadlily (*Thuja plicata/Clintonia uniflora*) habitat types (Boyd 1987). The four habitat types selected represent a wide range of environmental conditions common to transitory rangelands in the Pacific Northwest, and possess a high potential for both timber and forage production. The specific sites for observation were selected primarily for the variability in the vegetation; however, differences in slope, soil type and aspect were also considered.

Determination of Key Management Species

Forage species meeting the criteria of abundance and dietary importance for key species designation in the Douglas-fir, grand fir and western redcedar habitat types are: Idaho fescue (*Festuca idahoensis*), meadow foxtail (*Alopecurus pratensis*), timothy (*Phleum pratense*), bluebunch wheatgrass (*Agropyron spicatum*), pinegrass (*Calamagrostis rubescens*), slender hairgrass (*Deschampsia elongata*), and orchardgrass (*Dactylis glomerata*). The selections were guided by personal experiences and the suggestions of range users and management agency personnel.

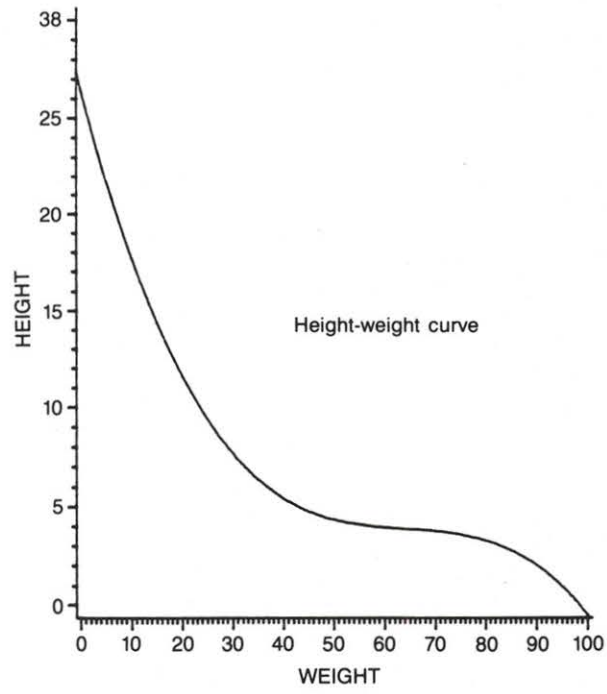

Figure 2. Height of typical grass plant with corresponding percent weights representing the grazed classes.

Photo Guide Development

The most important consideration in developing accurate photo guides is a close correlation between grazed-class percentages and the height-weight relations of the plant photographed.

To begin, an "average plant" for each species was determined. Eight to 12 plants representative of the species and within a normal range of growth (eliminating height and production extremes) were collected. The weight of each plant was determined at specified heights by clipping and weighing; the averages of these measurements were used as the basis for height-weight curves for each plant. To determine the height of a specific grazed class (0, 10, 30, 50, 70 and 90-percent weight removed), the height of the "average plant" corresponding to that grazed class was used.

Once an "average plant" for a given species was determined, a representative of that species was located in the management area. The plant was clipped to the heights corresponding to the various grazed classes. Photographs were taken of the plant at each height. All plant clippings were individually bagged and weighed to determine the weight distribution for the different grazed classes. For the plants photographed, height was plotted against weight percent. This graph was compared with the graph of the "average plant."

Due to a large variation in growing conditions at the sites, the photographed plants often did not exactly fit the height-weight curve of the "average plant." To account for this variation, 99-percent confidence limits were used with the regression line of the graph to produce a range of values for the "average plant" (Fig. 3). If the values of the photographed plant were within the confidence limits of the height-weight curve for a given species, it was accepted as a representation of the "average." The photo guide was then created from the photograph series to represent different grazing intensities.

Applications for the Grazed-Class Photo Guides

Utilization

The grazed-class photo guides provide a standard for plant height comparison. Because the photo guides estimate utilization based on the amount of forage removed, variations in height (and weight) due to irregular plant use are automatically adjusted for by the eye, while variations in height growth due to site characteristics or seasonal precipitation can be disregarded (Schmutz 1978). In turn, the accuracy of the estimate is increased and the required calculations are reduced.

Assessing proper use

The upper limit of livestock utilization on transitory sites will vary, depending upon the stage of reforestation and forage availability. In the Intermountain West and Pacific Northwest, the first four years for naturally regenerated tree seedlings and the first two years for transplanted tree seedlings are generally considered the most critical periods (Roath and Krueger 1982). Livestock utilization during these critical periods should be well distributed and not exceed 25% to 30% of the standing crop (Kingery et al. 1987). As the tree seedlings mature, livestock utilization can be increased in accordance with forage availability. Studies in central and northern Idaho and in Oregon have indicated that utilization not exceeding 60% will maintain desirable forage conditions in most transitory range settings during the forest rotation period (Kingery 1987; Young et al. 1967; Doescher et al. 1987).

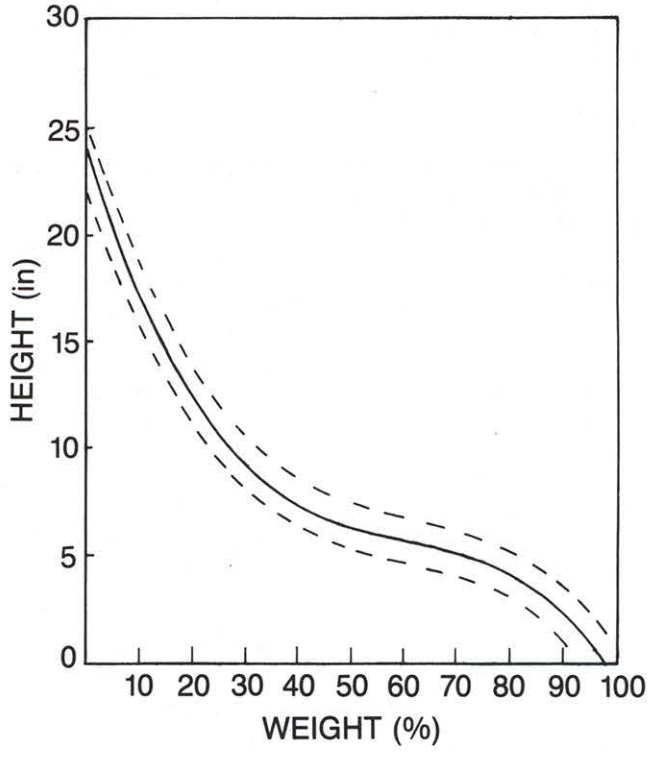

Figure 3. Height-weight curve with 99% confidence limits.

Other Estimates Which May Be Obtained

As discussed by Schmutz (1978), the grazed class method can also be used to estimate stocking rates, grazing capacity, distribution of grazing and economics of range improvements. These parameters have not as yet been evaluated in transitory rangeland settings, however. Possible applications of this method on forested sites would be to make interim seasonal adjustments in stocking rates; to determine grazing distribution problems due to water source locations, soil, slope, etc.; and to aid in the assessment of economic benefits of improvements made to increase grazing capacity.

Range of Application

While the photo guides were developed for seven important forage species in the four habitat types studied (Boyd 1987), they can also provide a reliable index for livestock utilization in other transitory rangeland types. Our observations support those of Schmutz (1978) in that the photo guides are not restricted to only the community types in which they were developed. There is generally as much variation in plant form on a given site as between sites, and these variations are averaged out with large samples.

The grazed-class method is an accurate and rapid means of estimating forage utilization, and its application for monitoring utilization is shown to be well suited to transitory rangelands in the Intermountain West.

Instructions for Use

The sampling procedure for this method is fast (a 100-plant sample requires from 30 to 60 minutes); therefore, it is possible to sample multiple sites in a short time. The calculations to determine utilization are simple and can be done on location or later. If the area to be sampled is large, it may be necessary to stratify it into smaller, more homogeneous sampling units based primarily on differences in vegetation and soils. Each unit would then be sampled independently. One species should be sampled at a time using a toe-pace transect set diagonally across the sampling unit. This technique reduces the probability of sampling the same plant twice and includes most of the variability within the unit.

To estimate current utilization, either 50 or 100 samples of individual plants of each key species may be used. By referring to the photo guides the appendix, **determine** which grazed-class the plant falls into and record that in the dot count block on the data sheet (Fig. 4). After the desired number of plants are recorded, **convert** the tallies to percentage of grazed plants by classes. If 50 samples were taken, **double** the dot tallies for the recorded number. Then **record** the number of plants occurring in each grazed class in the column labelled "No. By Class" (C). Next, **multiply** the grazed-class percent (P) by (C) to obtain the number by class percent and record this figure in the column labelled "No. By Class %" (CP). Finally, **divide** the total amount in column (CP) by the total amount in column (C) to obtain the average utilization of the plant species.

Very little formal training is required to use the grazed-class method effectively. Instruction should include an explanation of the theory behind the method as well as practice sessions in the field. According to Schmutz (1978), consistent results can be obtained with only two hours experience, although personnel inexperienced with the procedure or personnel who have not used the method for some time often underestimated use of the heavier grazed plants. Studies in northern Idaho have shown that inexperienced samplers overestimated utilization when livestock use of the site was minimal (Boyd 1987).■

UTILIZATION STUDY DATA
GRAZED CLASS METHOD

Study Number	Date	Examiner
Allotment Name & Number		
Kind/Class of Livestock	Period of Use	
Legal Description		

Grazed Class Percents (P)	Key Species			Key Species			Key Species		
	Dot Count	No by Class (C)	No X Class % (C)(P)	Dot Count	No by Class (C)	No X Class % (C)(P)	Dot Count	No by Class (C)	No X Class % (C)(P)
0									
10									
30									
50									
70									
90									
Totals				Totals			Totals		
Ave. Util. $= \frac{\sum (C)(P)}{\sum (C)} =$ ——— =				Ave. Util. = ——— =			Ave. Util. = ——— =		

Notes:

Figure 4. Record form for estimating utilization with grazed class photo guide.

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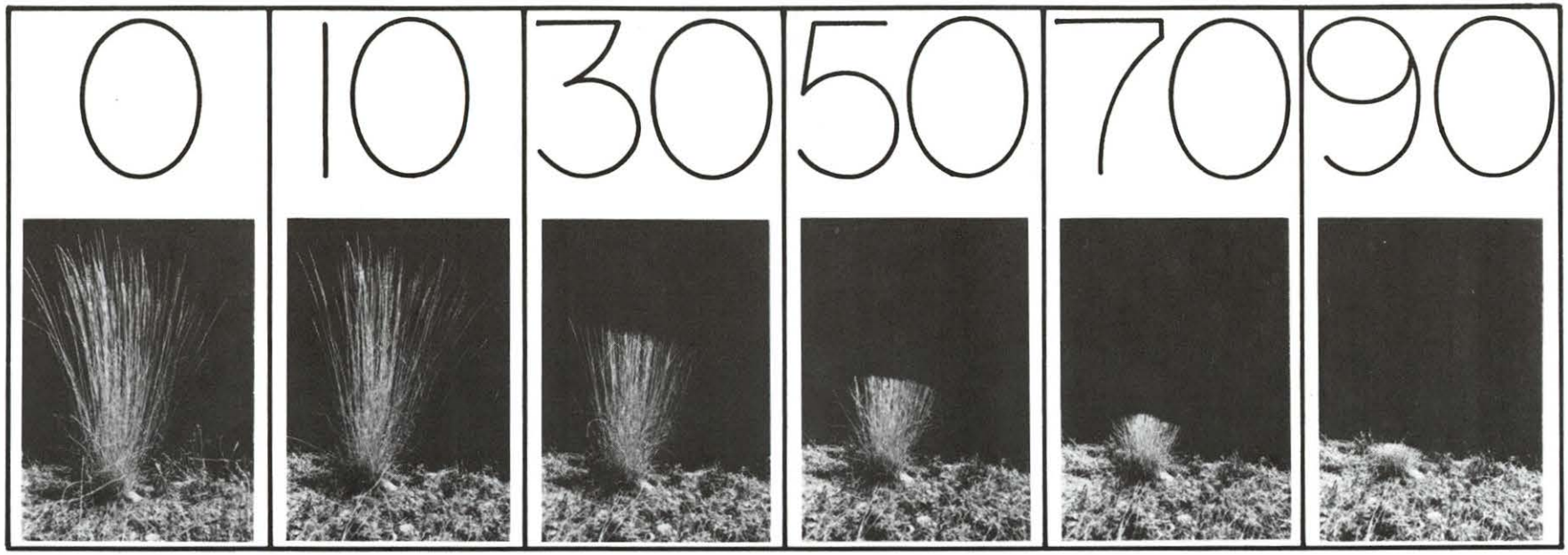
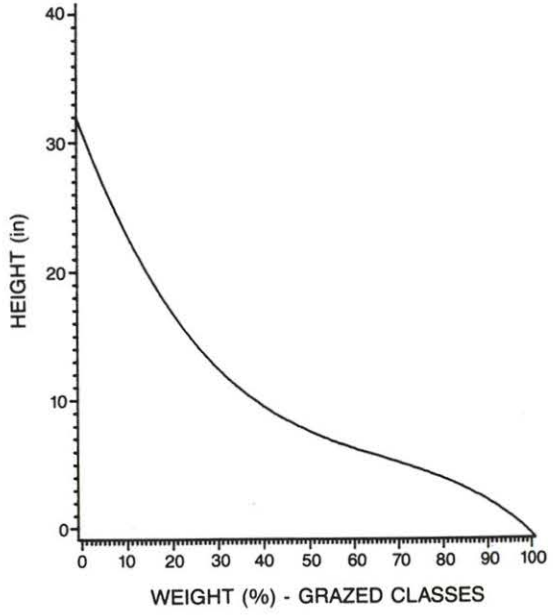
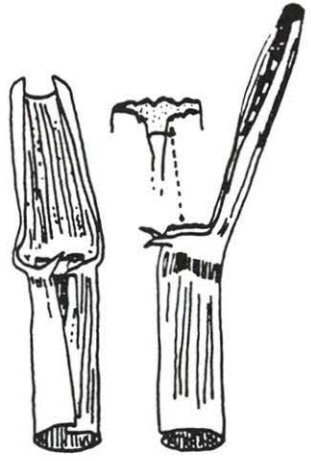
Appendix

Photo Guides with Corresponding Height-Weight Curves for Seven Key Forage Species Found on Transitory Rangelands in the Pacific Northwest

Bluebunch Wheatgrass



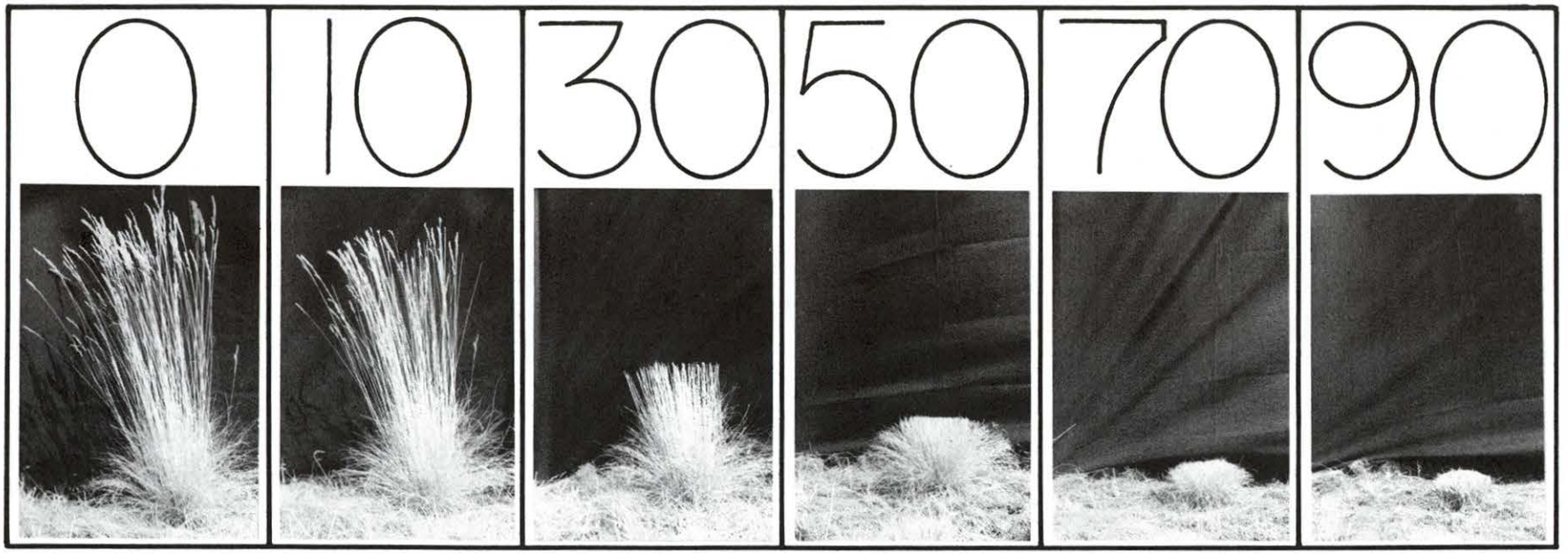


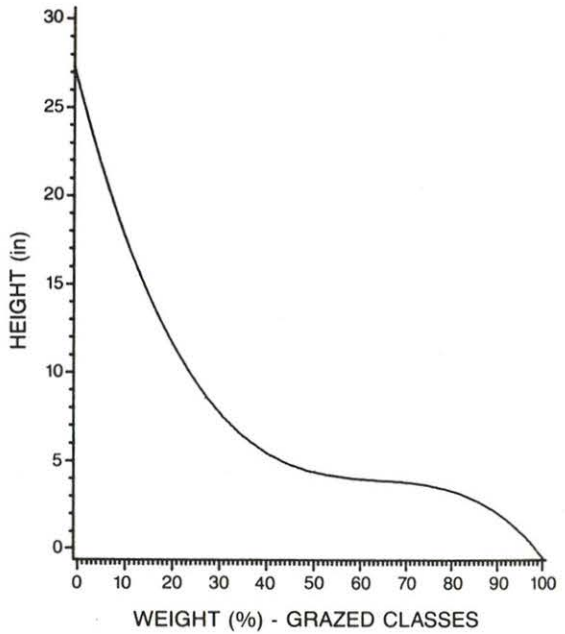


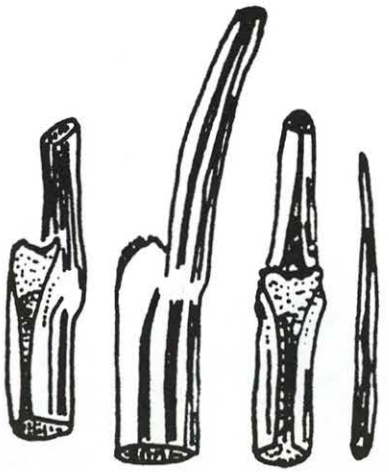
Elytrigia (Agropyron) spicata

- Caespitose
- Sheaths glabrous to lightly pubescent
- Blades flat to involute, 1.5-3 mm broad, auricles well developed
- Ligules scarcely 1 mm long, minutely erose-ciliate

Idaho Fescue



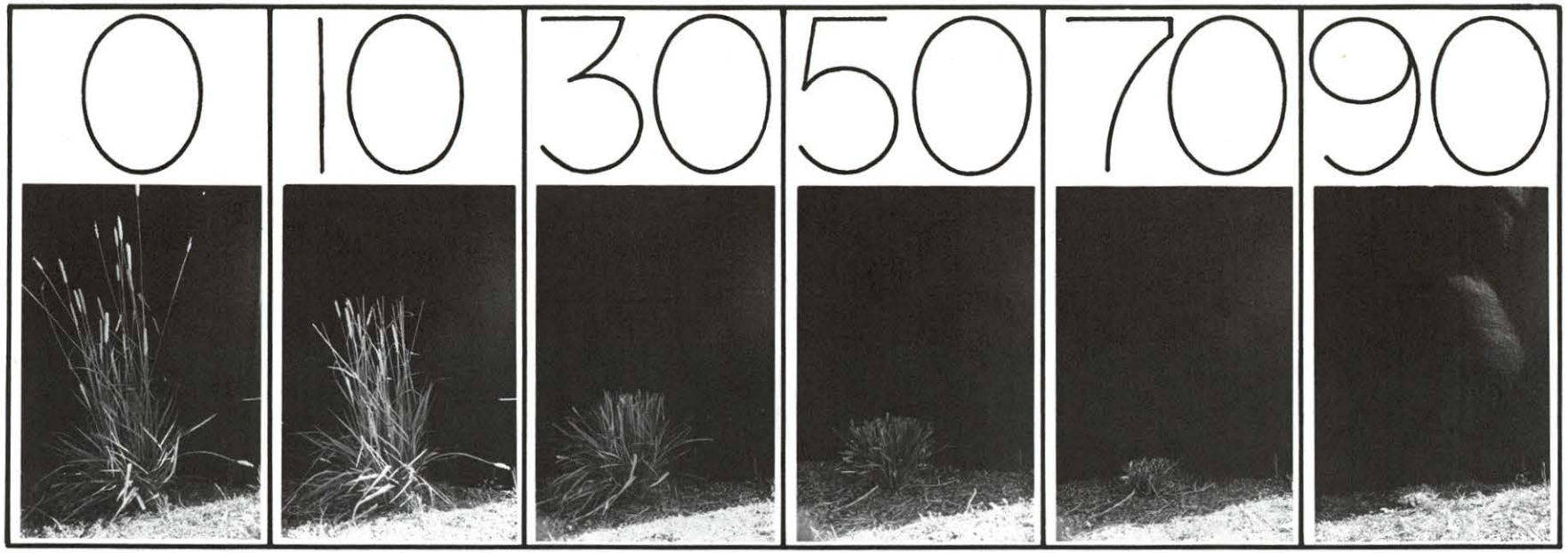


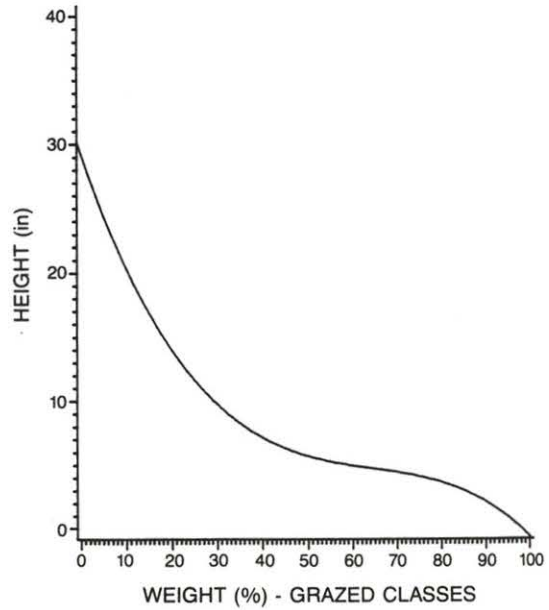


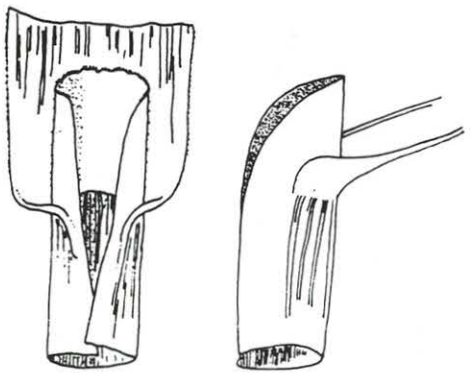
Festuca idahoensis

- Caespitose
- Sheaths glabrous to scaberulous
- Blades mostly basal, filiform, folded involute, less than 1.5 mm broad
- Auricles lacking
- Ligule 0.3-0.6 mm long, ciliolate, highest on the sides

Meadow Foxtail



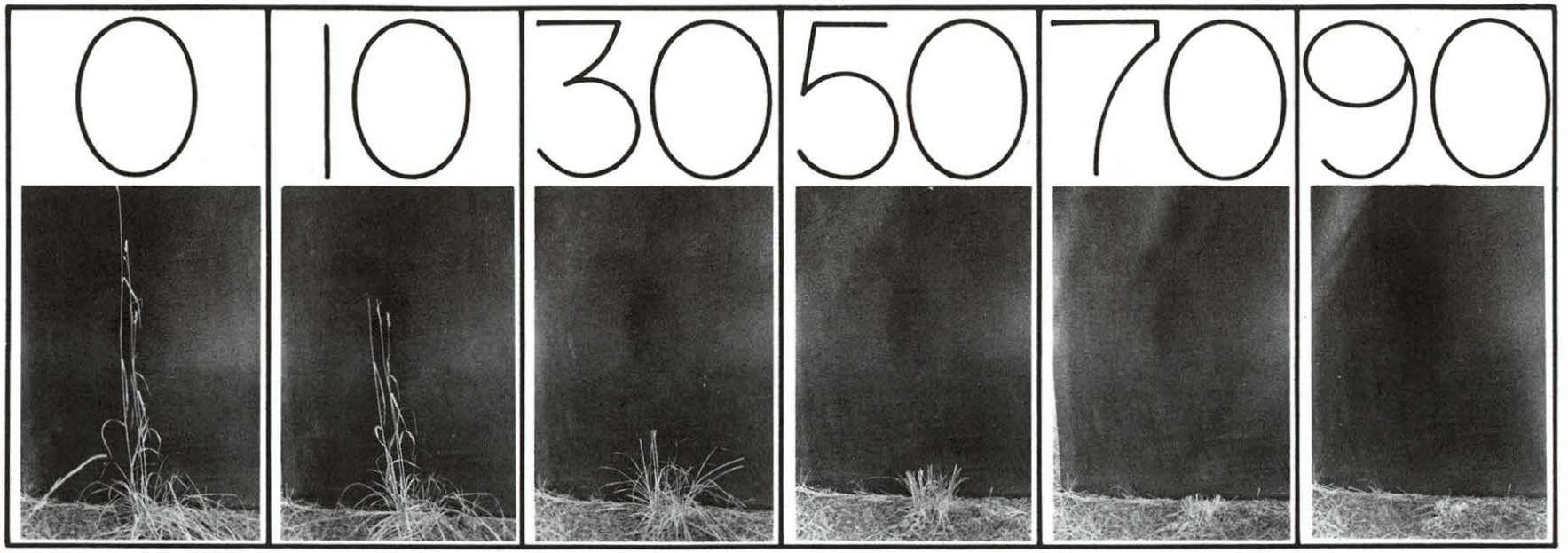


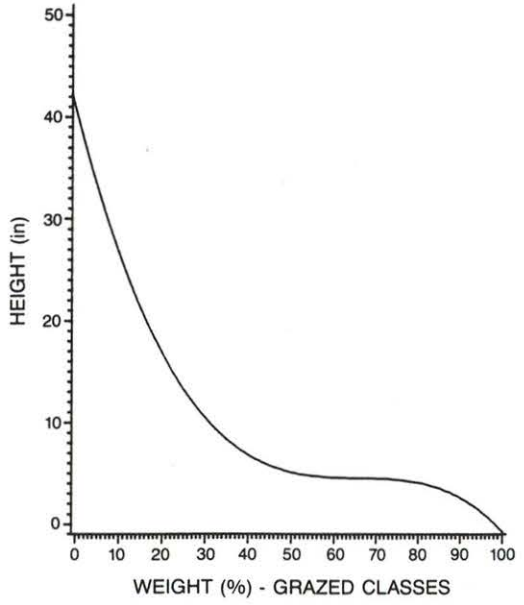


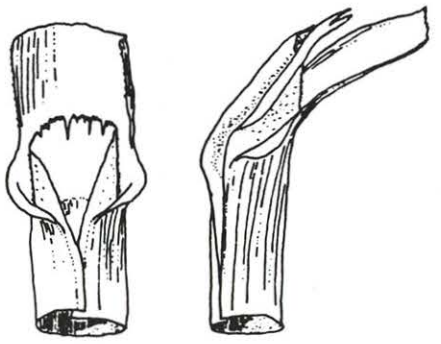
Alopecurus pratensis

- Caespitose but rooting at lower nodes
- Blades, scabrous, 3-10 mm broad
- Ligules of lower leaves 1.2-2 mm long, truncate and subentire
- Ligules of upper culm leaves up to 6 mm long, truncate to obtuse, finely erose

Orchardgrass



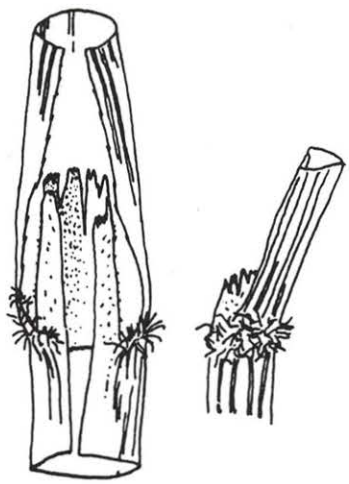




Dactylis glomerata

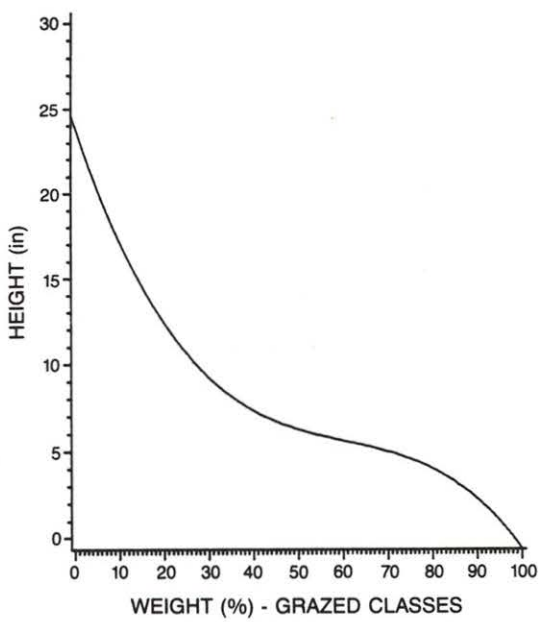
- Caespitose
- Sheaths glabrous to slightly scabrous
- Blades flat 3-11 mm broad, mostly somewhat scabrous
- Stems somewhat flattened at base
- Ligules 3-9 mm long, sparsely pubescent, obtuse to acure, margin finely erose-ciliate, but upper half usually turned back and split in several places

Pinegrass

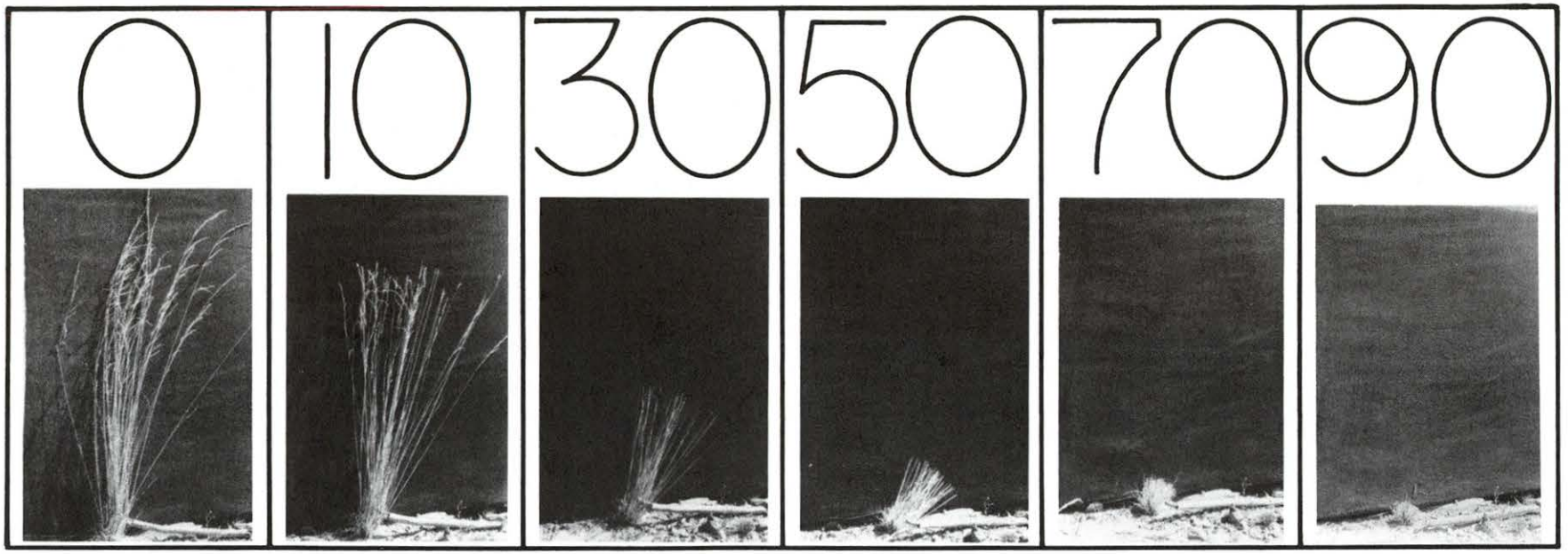


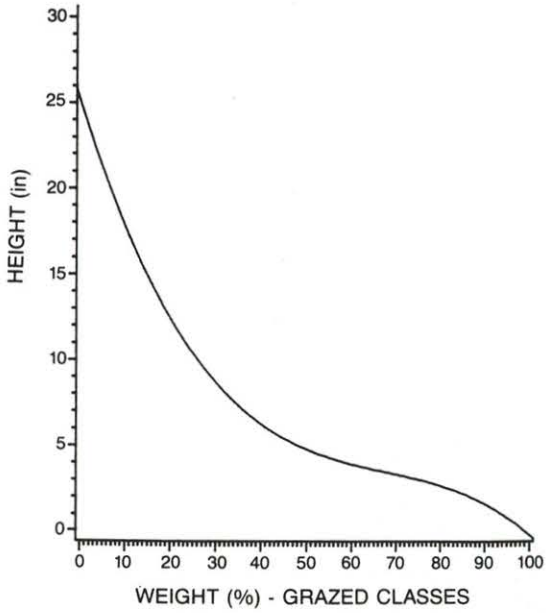
Calamagrostis rubescens

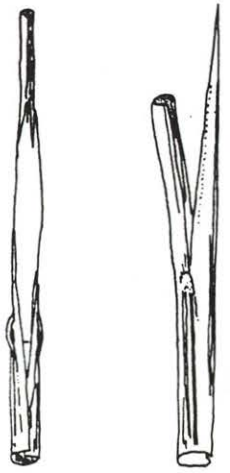
- Strongly rhizomatous
- Culms and sheaths smooth
- Blades mostly flat (involute), 2-4 mm broad, usually scabrous
- Ligules 1-5 mm long, obtuse or truncate, usually lacerate and irregularly erose-ciliate



Slender Hairgrass



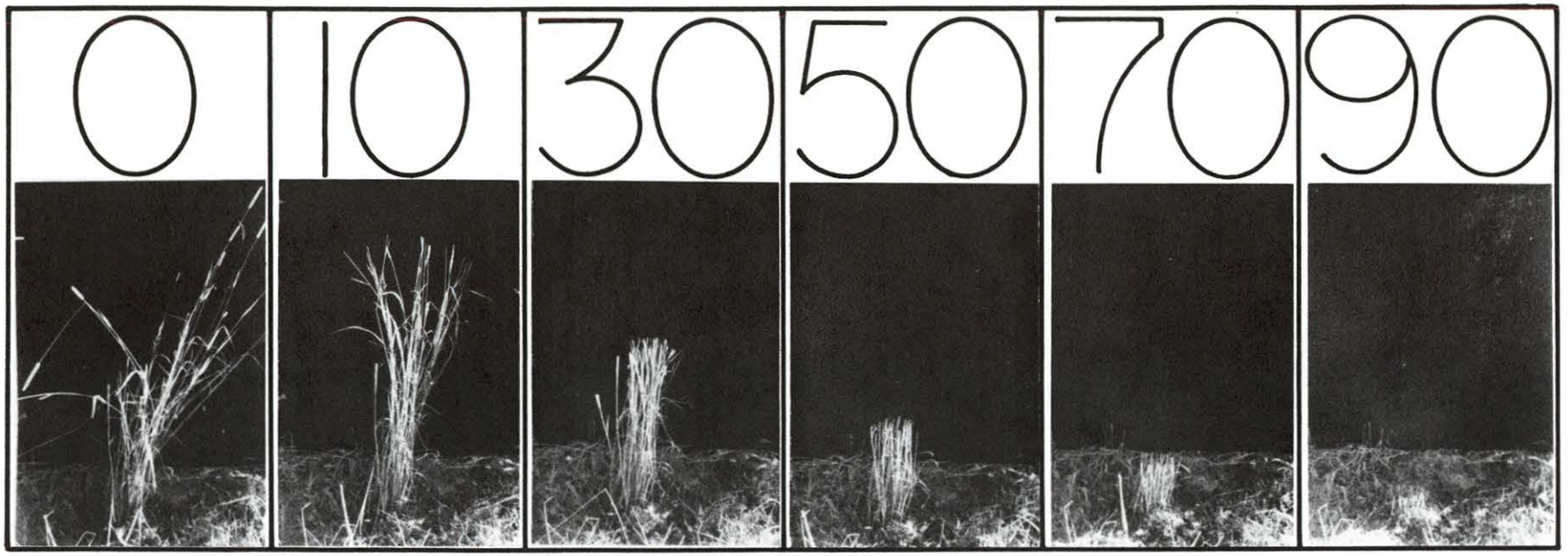


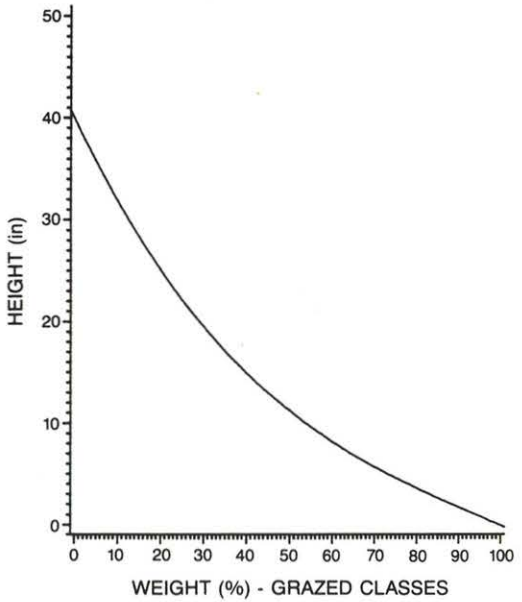


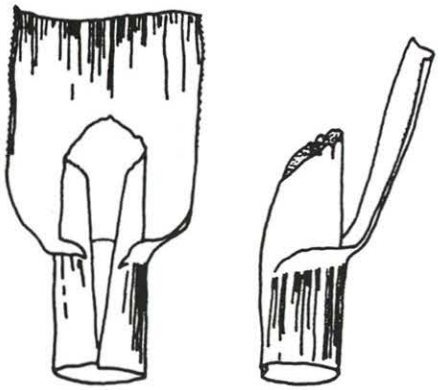
Deschampsia elongata

- Caespitose with tufted basal leaves
- Sheaths glabrous
- Blades glabrous to scabridulous; basal filiform, flat or folded to involute, up to 1.5 mm broad
- Ligule acute to acuminate, 3-9 mm long, puberulent

Timothy







Phleum Pratense

- Culms enlarged or bulbous at base
- Sheaths glabrous
- Ligules 2-3 mm long, subentire, obtuse, sometimes lacerate
- Blades flat, 4-8 mm broad, scabrous margined, sometimes with small auricles