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# A Photographic Utilization Guide for Key Riparian Graminoids

**John W. Kinney**
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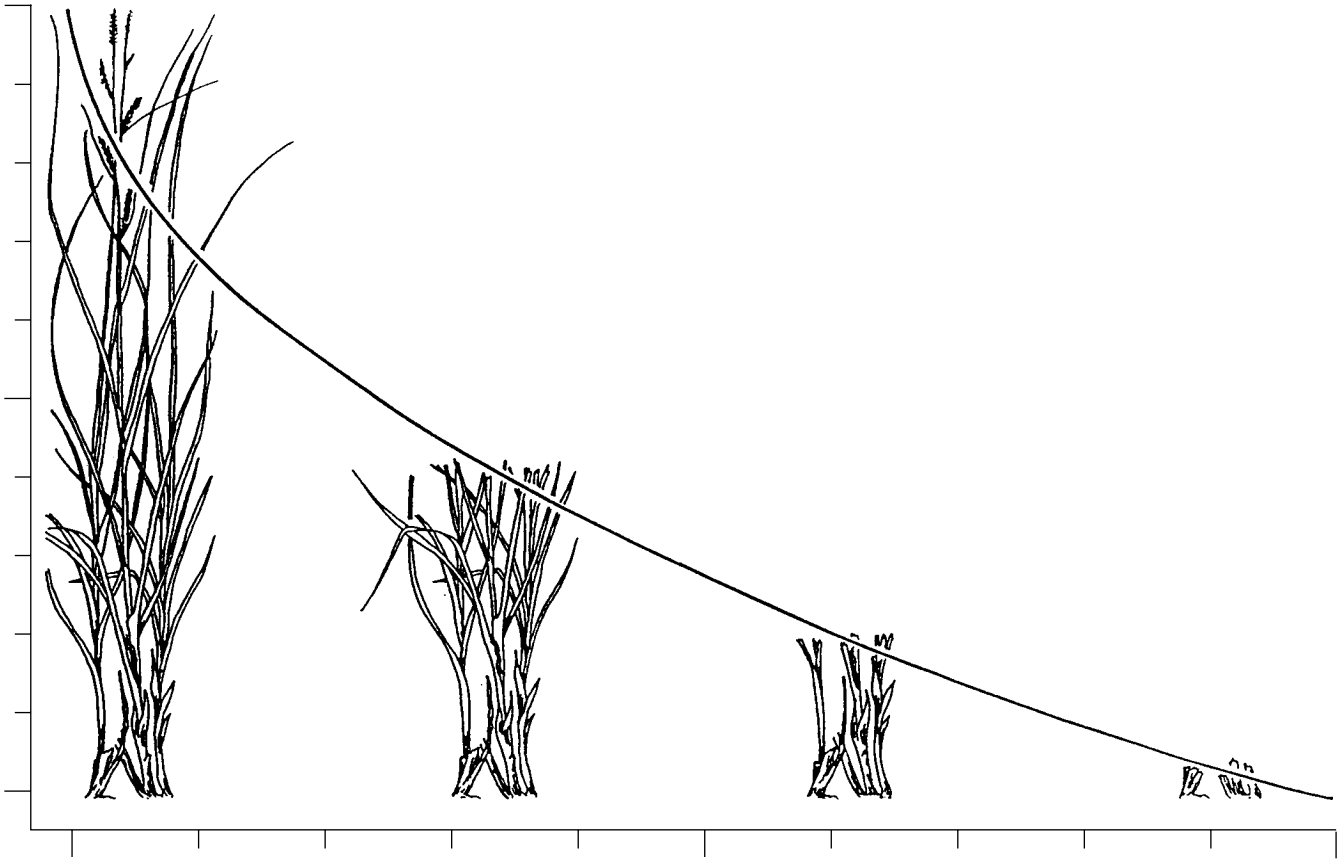

## The Authors

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## Acknowledgments

We gratefully acknowledge the assistance of Leroy Alonzo, Fred Galan, Mering Hurd, and Lynda Smithman. Suggestions by Warren Ririe and Alma Winward at the initiation of this effort are greatly appeciated. The cover illustration was drawn by Lenora Oosterhuis, an emigrant from Holland, who is a botanist and a freelance biological artist living in Boise, ID.

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# A Photographic Utilization Guide for Key Riparian Graminoids

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## Introduction

Determining proper utilization of forage is one of the most important activities in range management. Consequently, range technicians have spent a lot of time studying forage utilization and ways to measure utilization (Cook and Stubbendieck 1986; Schmutz and others 1963). Various methods have been developed. Some are quicker, while others take longer but are more detailed and accurate. A quick and easy method to estimate plant utilization is needed because many range managers must survey large areas. One such method, the grazed-class method, uses photographic guides (Schmutz and others 1963).

Cattle and most large grazing animals are attracted to riparian areas (Skovlin 1984) (fig. 1). It is, therefore, particularly important to monitor utilization in riparian areas. A search of the literature revealed no photographic guides available to estimate percent utilization for riparian plant species.

We have developed photographic guides for several key riparian grass and grasslike species to help determine forage utilization. Data and photographs for these guides were gathered on the Boise and Sawtooth National Forests, Boise and Vale Districts of the Bureau of Land Management, and on Idaho State land.

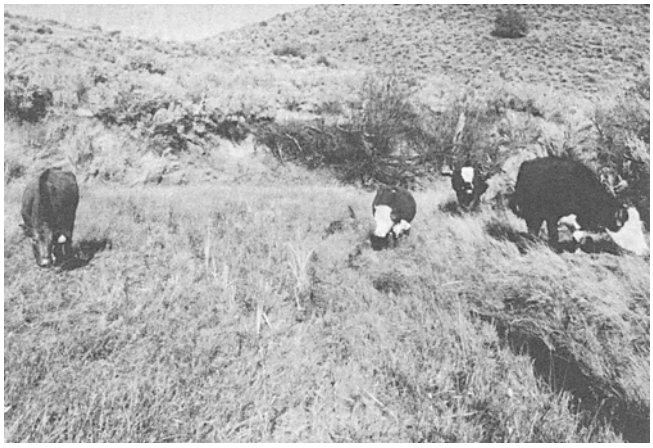

**Figure 1**—Cattle are attracted to riparian areas.

## Background

The grazed-class method provides a visual comparison standard, making utilization estimates more consistent and accurate. Estimates of utilization are based on the growth form of the plant rather than on its size. Variations in height growth due to site characteristics, seasonal precipitation, or other factors have minimal effect on utilization estimates (Schmutz 1971).

Lommasson and Jensen (1938, 1943) found each plant species had a more or less definite growth form, even though growing conditions may vary. Various growth forms have been illustrated by Campbell (1943), Caird (1945), and McDougald and Platt (1976). For a given growth form, the relationship between the percent of a plant's weight that has been consumed can be estimated based on the percent of its height left after grazing. Mitchell and others (1993) found height-weight relationships of western wheatgrass were affected somewhat by location, grazing history, and season. However, most differences were small. The authors concluded height-weight models allow managers to assess utilization efficiently.

## Development of Photographic Utilization Guides

Photographic guides should relate the appearance of a plant after a given portion of its weight has been removed to the height-weight curve (Schmutz and others 1963) (fig. 2). The first task is determining how the weight is vertically distributed for each species (Cook and Stubbendieck 1986). Initially, our approach followed that of Schmutz and others (1963). However, their procedure was developed primarily for use on bunchgrasses. In riparian areas the plants are typically sod formers. We soon found that selection of individual "plants" with flowering heads resulted in a biased sample, since many tillers (shoots) in dense meadows did not produce a flowering stem. The procedure was modified to use 10-cm-square sections of sod as the sample unit rather than individual plants.

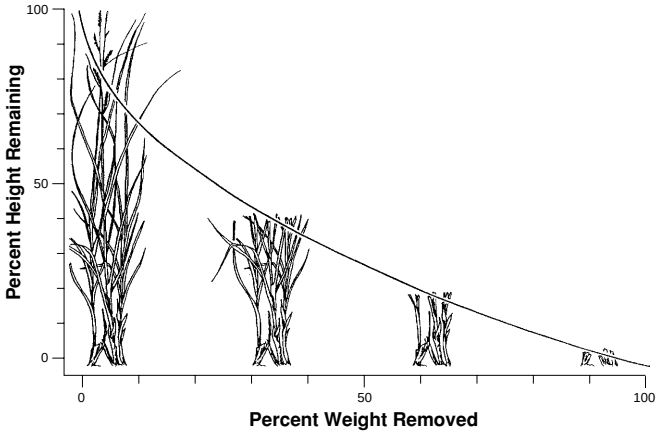


**Figure 2**—The relationship of percent height remaining and percent weight removed for grazed plants.

**Figure 3**—Photographic setup when taking pictures for the photographic utilization guide.

# Methods

After plants were fully headed, 25 representative 10- by 10-cm areas of sod (called plants in this discussion) were selected from a typical site or sites. Any tillers of nontarget species were removed. The plant's height was measured and divided into 10 to 20 equal linear sections. The plant was clipped starting from the top, removing the sections in sequence. Each section was placed into a paper bag, labeled, and ovendried at 100 °C for 24 hours. The sections were weighed to the nearest 0.1 g, and the percentages of total plant weight were calculated. The heights of the species studied are illustrated in table 1.

**Table 1**—Heights of plant species sampled

| Plant species | Height | | |
|---|---|---|---|
| | Mean | Minimum | Maximum |
| | ----------*cm*---------- | | |
| Redtop bentgrass (*Agrostis stolonifera*) | 73 | 58 | 84 |
| Bluejoint reedgrass (*Calamagrostis canadensis*) | 74 | 60 | 90 |
| Water sedge (*Carex aquatilis*) | 55 | 35 | 68 |
| Smallwing sedge (*Carex microptera*) | 35 | 30 | 40 |
| Nebraska sedge (*Carex nebrascensis*) | 54 | 47 | 62 |
| Beaked sedge (*Carex rostrata*) | 61 | 48 | 72 |
| Tufted hairgrass (*Deschampsia cespitosa*) | 35 | 28 | 44 |
| Baltic rush (*Juncus balticus*) | 74 | 51 | 92 |
| Kentucky bluegrass (*Poa pratensis*) | 44 | 23 | 78 |

Plant numbers 1, 5, 10, 15, 20, and 25 were photographed for potential use in illustrating the photographic guide. The sod was clipped to ground level at each side and in front of the target plant for a distance of 0.5 m. The plants were photographed using a tripod with the camera mounted at constant angle, distance from the plant, and height. A black backdrop was placed behind the plant (fig. 3). A sequence of photographs was taken beginning at the unclipped stage and continuing as each linear section was removed. The weight distribution was determined as described above.

The cumulative weight for each plant was determined for each clipped section removed, and cumulative weight percentages were calculated. The percent height remaining was plotted against the percentage of cumulative weight removed. All clipped plant data for a given species were plotted on the same chart; the relationship was described by an ocularly fitted curve.

From the chart curves, the average remaining height percentage was determined for each of the grazed classes—0, 10, 30, 50, 70, and 90 percent. Photographed plant sequences selected for use in the photographic guide had average deviations from the height-weight curve of less than 3 percent. If a close match was not obtained initially, additional typical plants were photographed until a close fit was secured.

## Field Application

The use of photographic guides is based on the appearance of the residual portion of the grazed plant. Therefore, to estimate the utilization of an individual plant, its residual stubble is visually compared to the photographic guide in the appendix. A number of individual utilization determinations are needed to reliably estimate average utilization in an area. "Substantial" statistical precision from a 50- to 100-plant sample within a homogeneous sample area has been reported (Kingery and others 1992; Schmutz 1971). Further suggestions on procedures for using a photographic guide can be found in Schmutz and others (1963), Schmutz (1971), and Kingery and others (1992).

Precise documentation of utilization requires additional effort. No absolute plant heights were included in the illustrations because height varies within plant species among sites and years. A plant height standard should be established for each species in a locality. The number of plant measurements necessary to develop a local standard will vary with the precision required and the variability of the plant population being measured. Based on our data, about 25 random plant height measurements should give mean plant height estimates within 5 percent of the mean at 95 percent confidence (table 2). After a local mean species height has been established, it can be used to calculate the proportion of height remaining on each grazed sample plant. The proportion of weight removed can be determined from the graphs in the appendix.

## Summary

The photographic utilization guides in the appendix are the first available for riparian herbaceous forage species in the Intermountain area. They include: redtop bentgrass (*Agrostis stolonifera*), water sedge (*Carex aquatilis*), smallwing sedge (*C. microptera*), Nebraska sedge (*C. nebrascensis*), beaked sedge (*C. rostrata*), bluejoint reedgrass (*Calamagrostis canadensis*), tufted hairgrass (*Deschampsia cespitosa*), Baltic rush (*Juncus balticus*), and Kentucky bluegrass (*Poa pratensis*). The scientific nomenclature follows Cronquist and others (1977).

Photographic utilization guides can be used effectively with little formal training. Instruction should include both theory and field practice. Otherwise, inexperienced users may tend to overestimate utilization when grazing is light (Boyd 1987) and underestimate utilization when grazing is heavy (Schmutz 1971). For more precise documentation of utilization, the height of local species before grazing can be determined, residual stubble heights can be measured, and the percent weight removed can be determined from the graphs in the appendix.

**Table 2**—Average number of plant height measurements needed to establish local standards[1]

| Sampling error (percent of maximum height) | Confidence level | | | | |
|---|---|---|---|---|---|
| | 0.80 | 0.85 | 0.90 | 0.95 | 0.99 |
| 10 | 2 | 3 | 4 | 6 | 10 |
| 5 | 10 | 13 | 16 | 23 | 40 |
| 1 | 247 | 312 | 407 | 578 | 998 |

[1]Based on the pooled variance of all species sampled.

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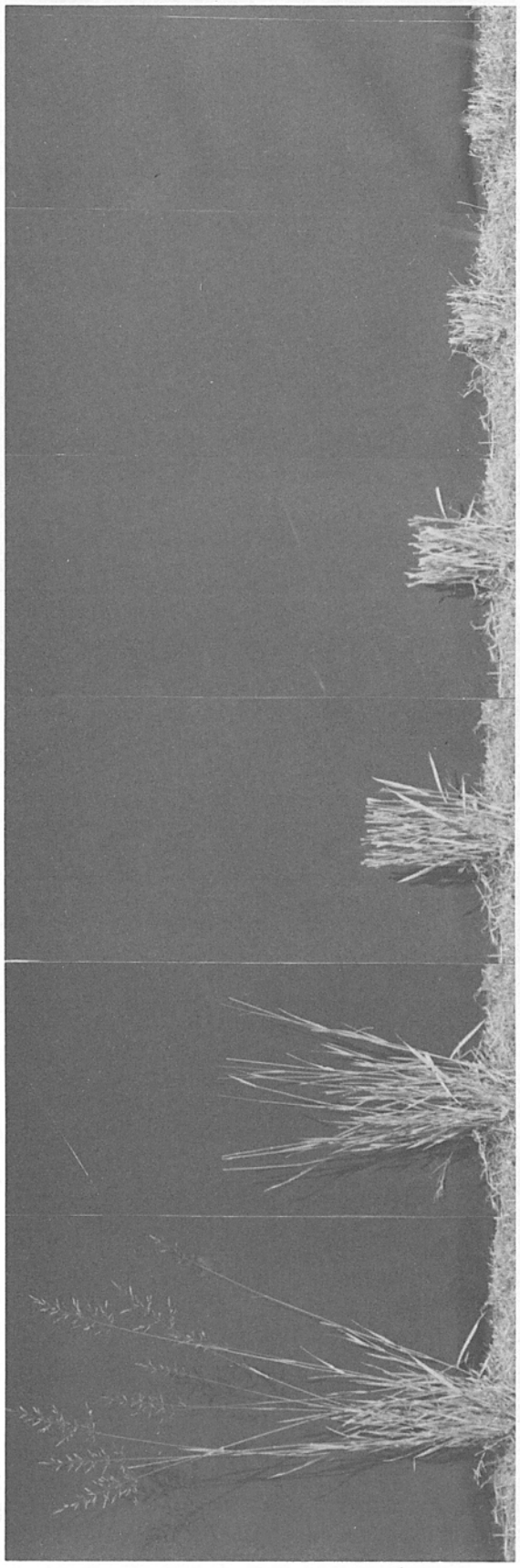
# Appendix: Photographic Guides and Height-Weight Curves for Nine Riparian Species

## Redtop bentgrass (*Agrostis stolonifera* L.)




Rhizomatous or stoloniferous perennials

4 to 10 dm tall

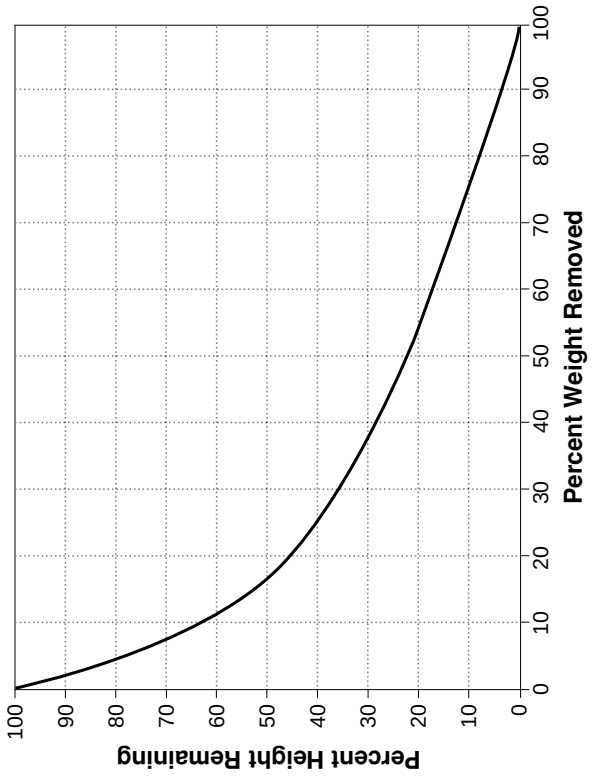
Flowering period mid-June to early August

Seed set August

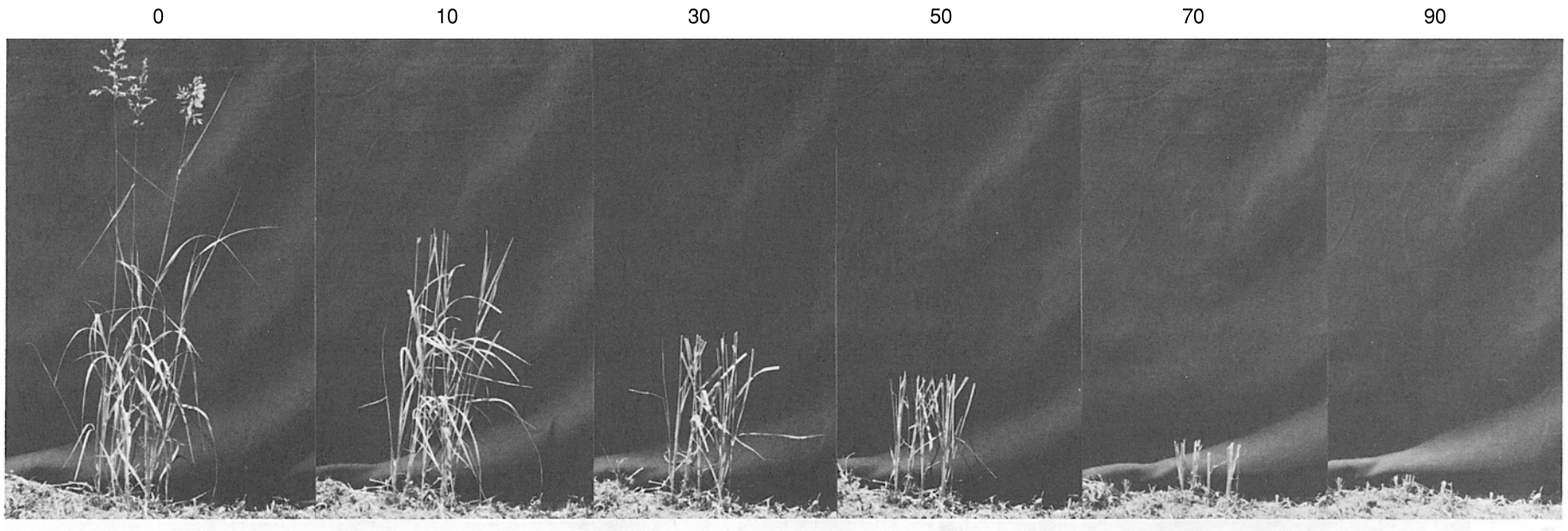
Palatability moderate

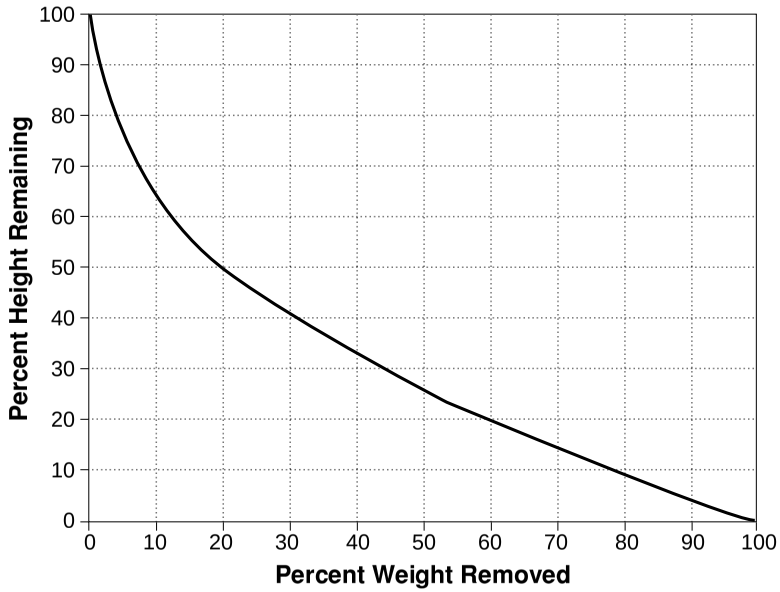
Streambanks, meadows, and moderately moist sagebrush slopes

Low to middle elevations



# Bluejoint reedgrass (*Calamagrostis canadensis* Michx.)




Strongly rhizomatous perennials, culms stout, panicle loosely branched and rather open

6 to 12 dm tall

Flowering period July to August

Seed set August

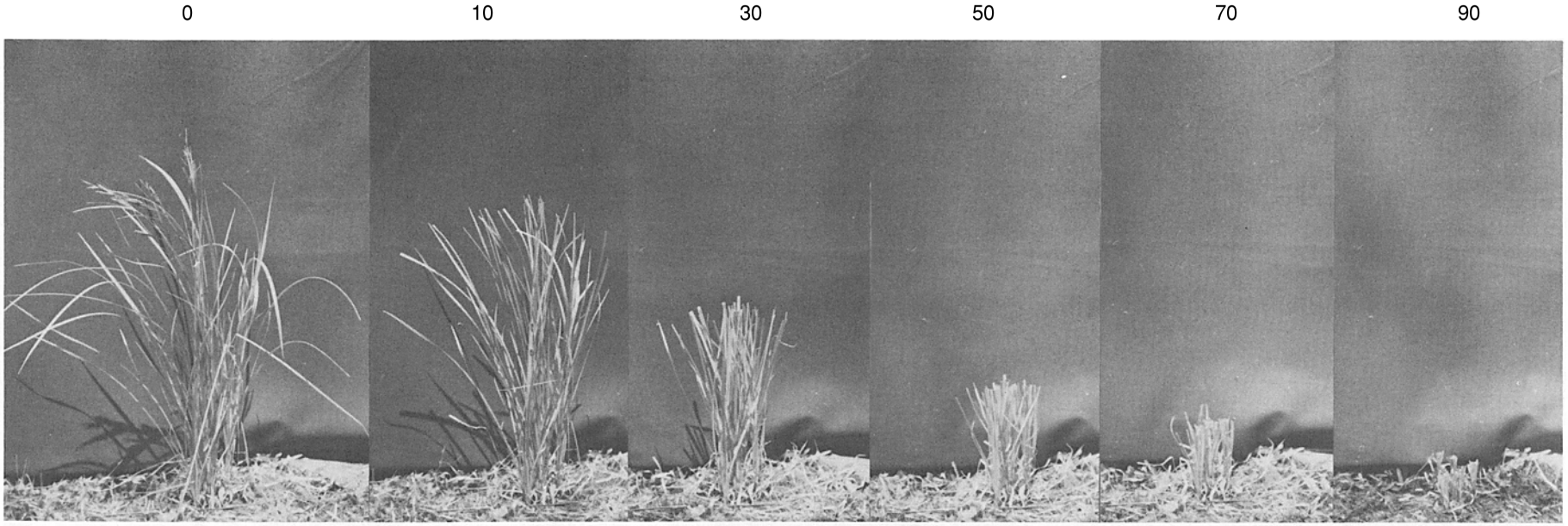
Palatability medium when young; tough and unpalatable when mature

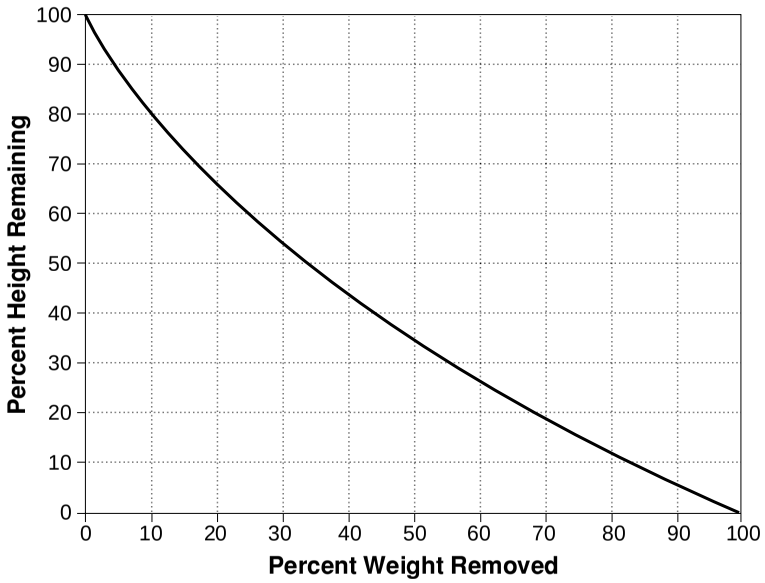
Wet meadows, forest openings, and streambanks

Low to high elevations

# Water sedge (*Carex aquatilis* Wahlenb.)

Percent Weight Removed




Stems borne singly or a few together on well-developed, stout, deep-seated, creeping rhizomes

3 to 10 dm tall

Flowering period July to September

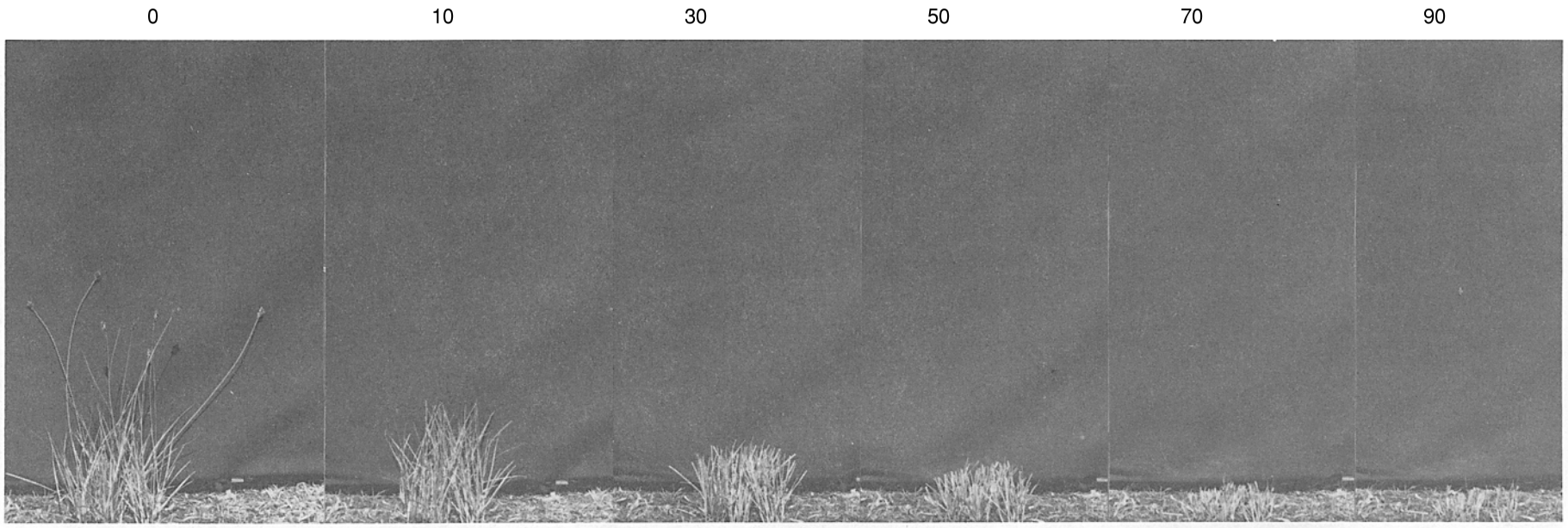
Seed set August

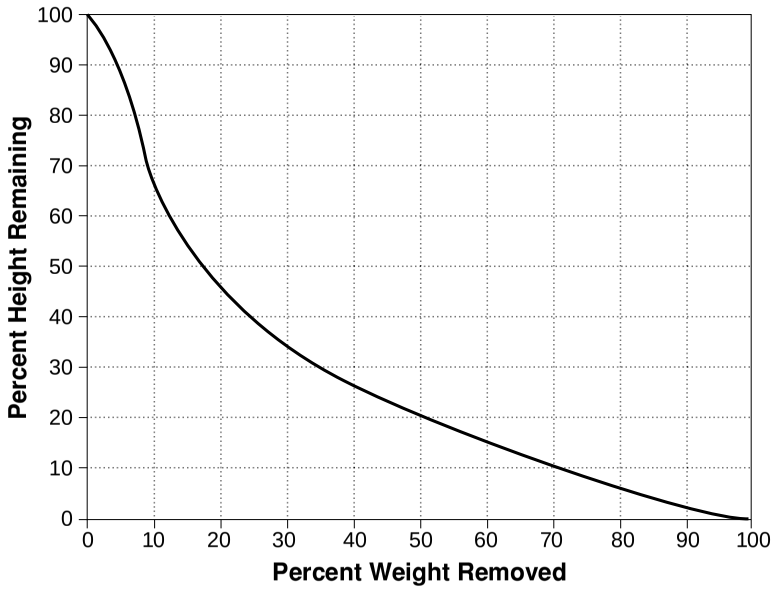
Palatability moderate

Common in shallow water or wet soil, and on streambanks

Middle elevations

# Smallwing sedge (*Carex microptera* Mack.)




Plants densely tufted, without creeping rhizomes, culms numerous

3 to 10 dm tall

Flowering period July to early September

Seed set August

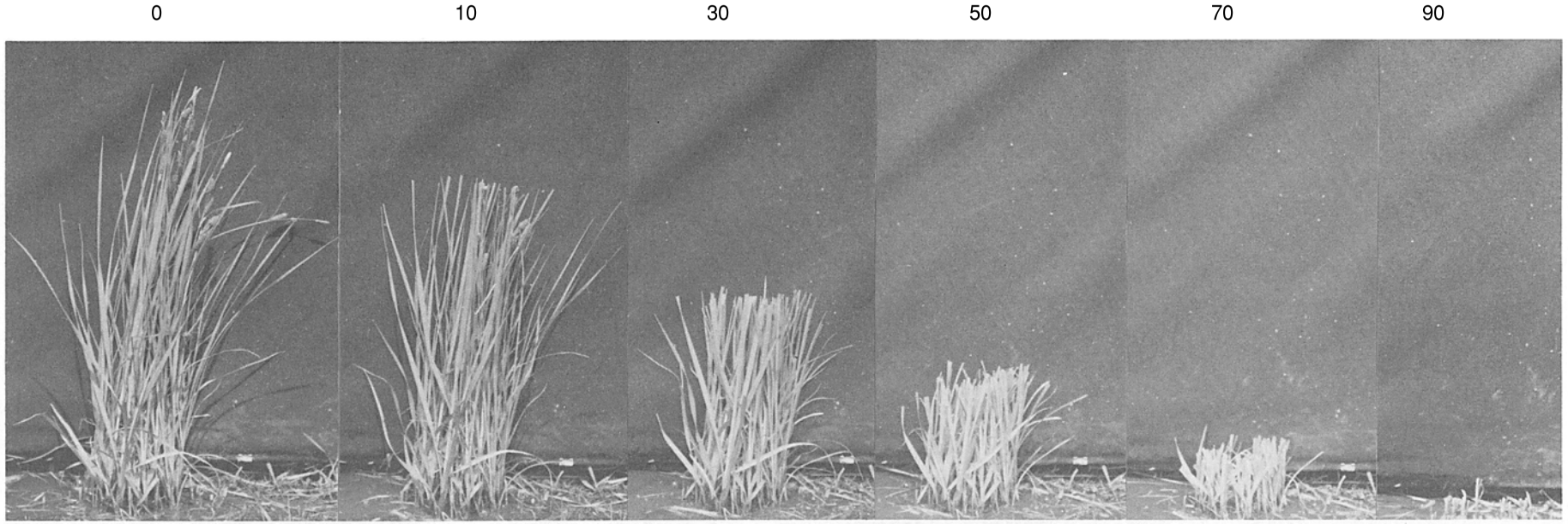
Palatability low to medium

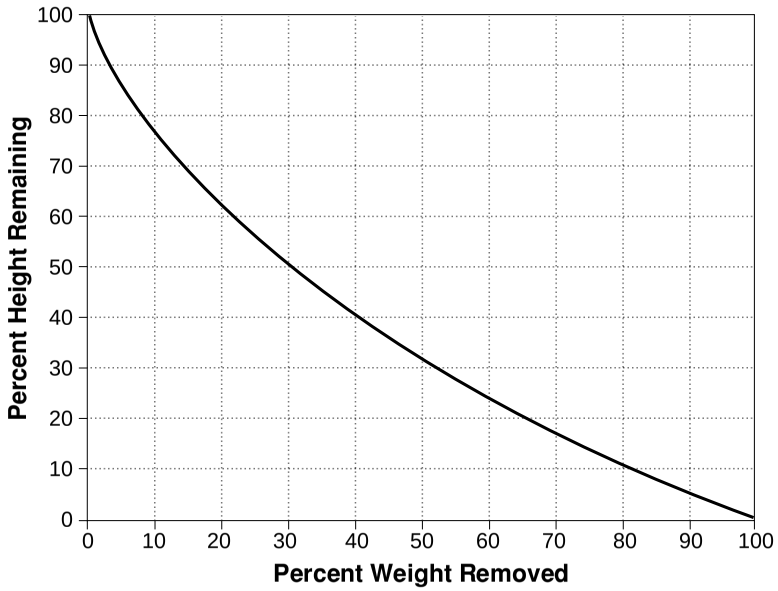
Moderately dry sites, in meadows and along streams

Foothills to moderately high elevations

# Nebraska sedge (*Carex nebrascensis* Dewey)

Percent Weight Removed




Plants coarse, stems stout and sharply triangular, vigorously rhizomatous, leaves firm, blue-glaucous

2 to 10 dm tall

Flowering period July to September

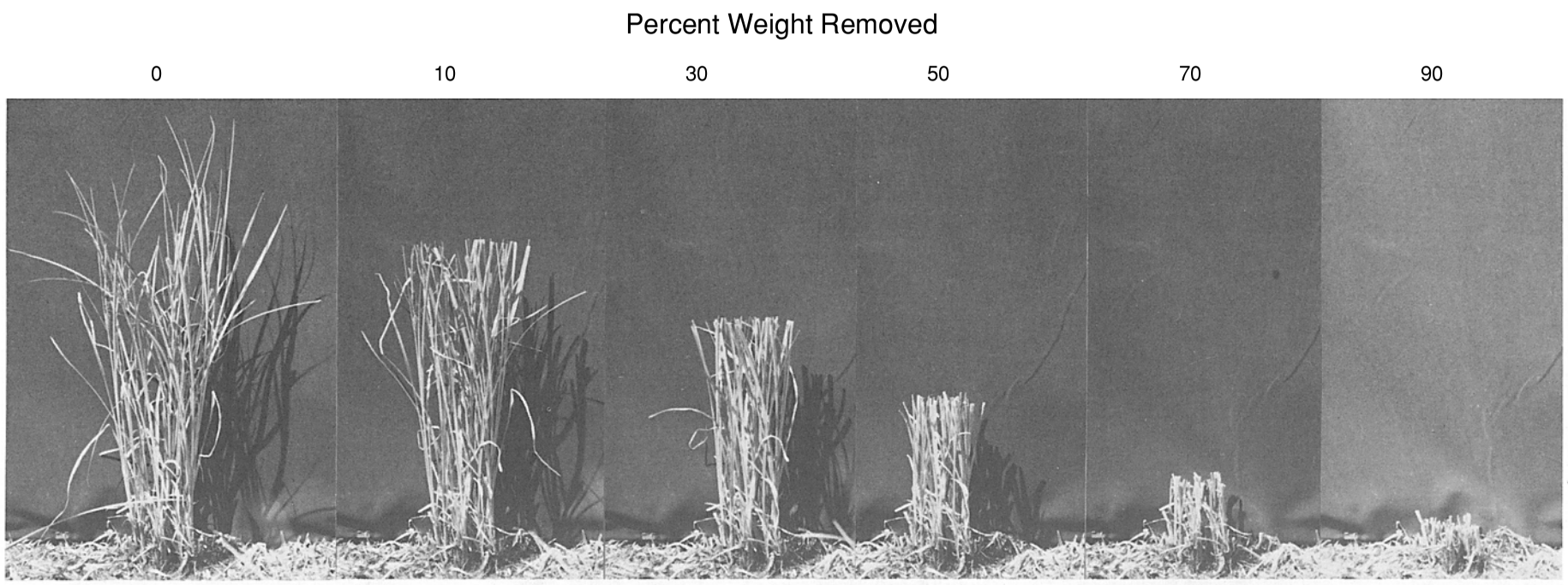
Seed set August

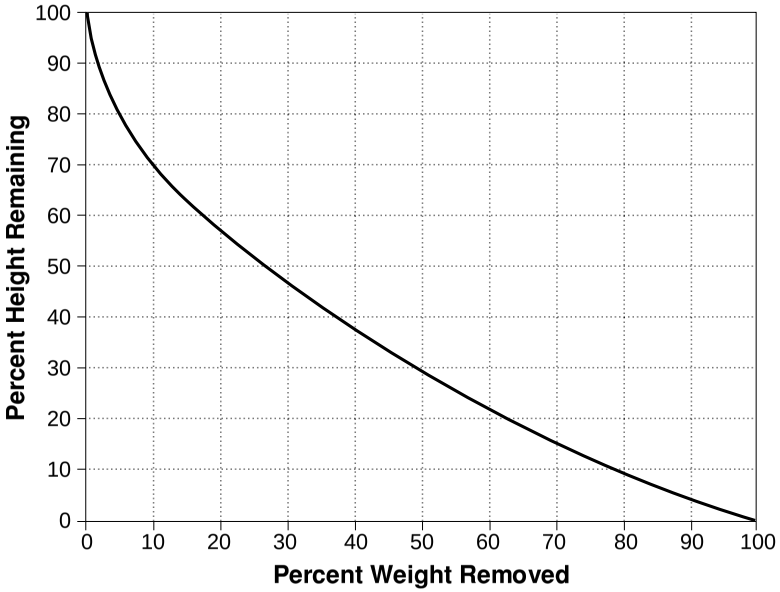
Palatability high

Wet meadows and other wet places, often in alkaline areas

Lower to middle elevations

# Beaked sedge (*Carex rostrata* Stokes)




Stems singly or a few together from stout rhizomes, sometimes forming a dense sod

6 to 12 dm tall

Flowering period July to September

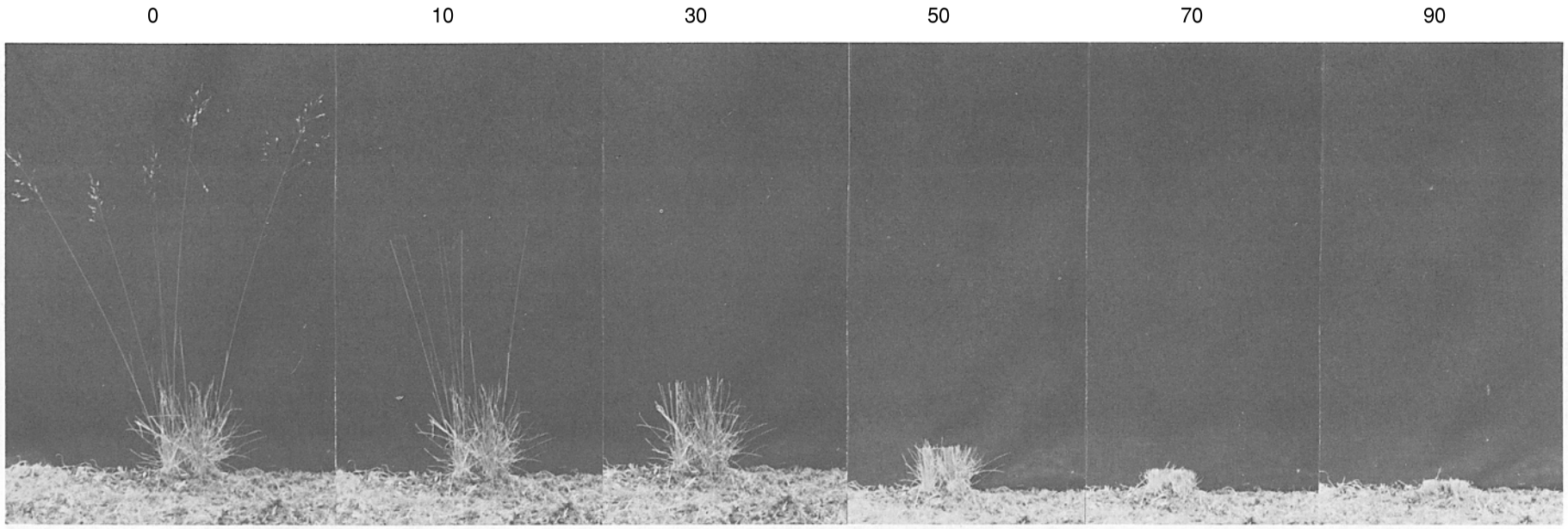
Seed set August

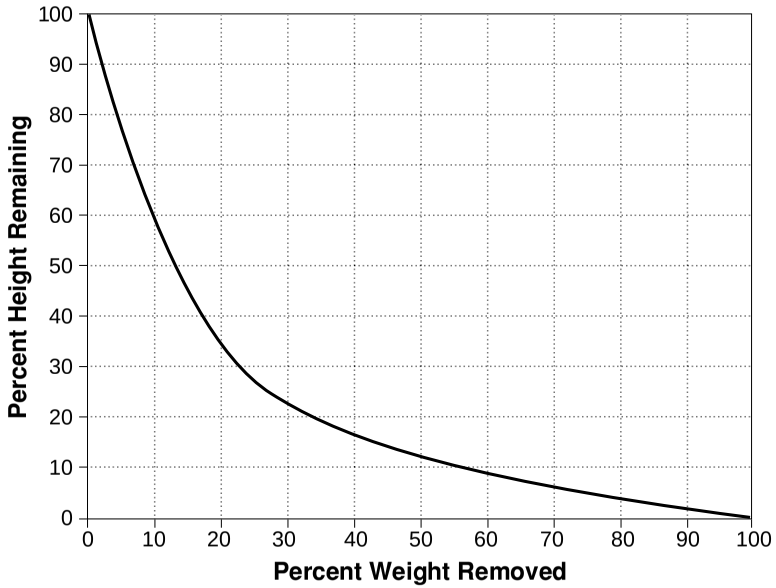
Palatability low late in the season

Common in wet meadows and marshes, or in standing or slow-moving water

Middle to high elevations

# Tufted hairgrass (*Deschampsia cespitosa* L.)




Strongly cespitose, tufted perennials with an open panicle

2 to 8 dm tall

Flowering period July to September

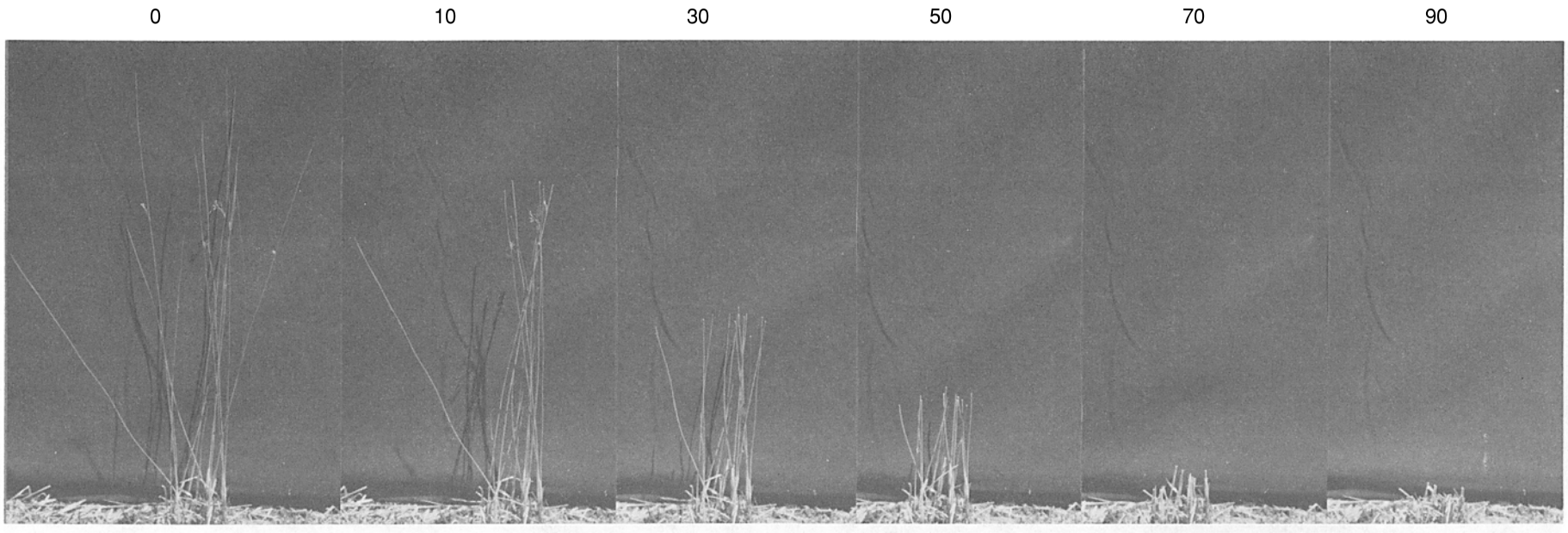
Seed set August to September

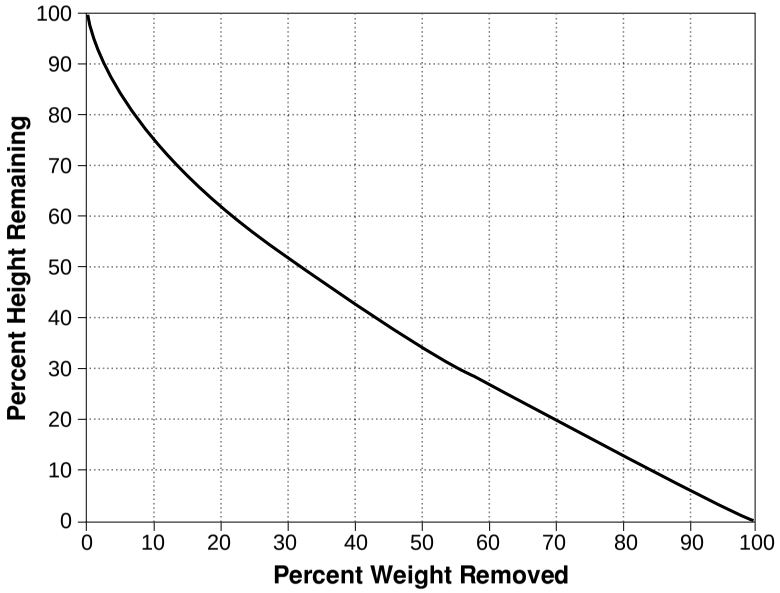
Palatability moderate

Streambanks and wet mountain meadows to dry uplands

Middle to high elevations

# Baltic rush (*Juncus balticus* Willd.)




Stems firm, wiry, and more or less terete (cylindrical); coarse, blackish, creeping rhizomes are often sod forming

3 to 9 dm tall

Flowering period May to July

Seed set July

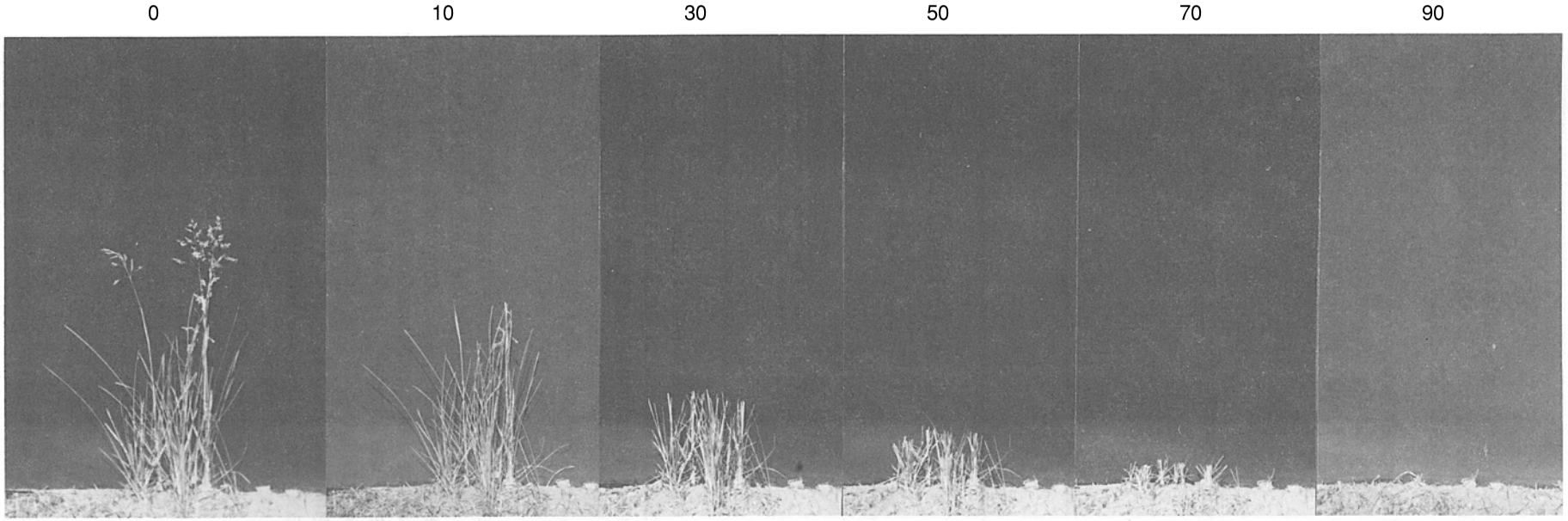
Palatability moderately low

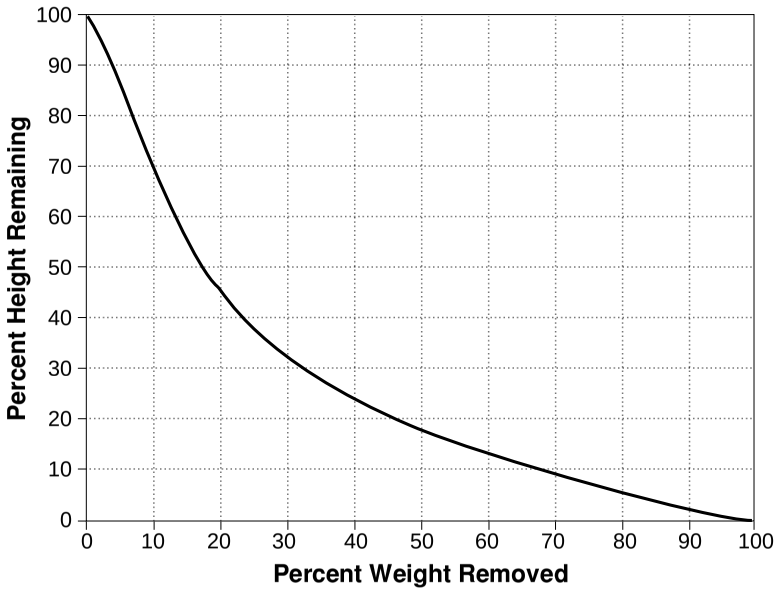
Low, wet, often alkaline areas with variable water tables

Valleys and plains to middle elevations

# Kentucky bluegrass (*Poa pratensis* L.)

Percent Weight Removed




Perennials forming dense sods

3 to 7 dm tall

Flowering period May to August, sometimes September

Seed set August

Palatability high

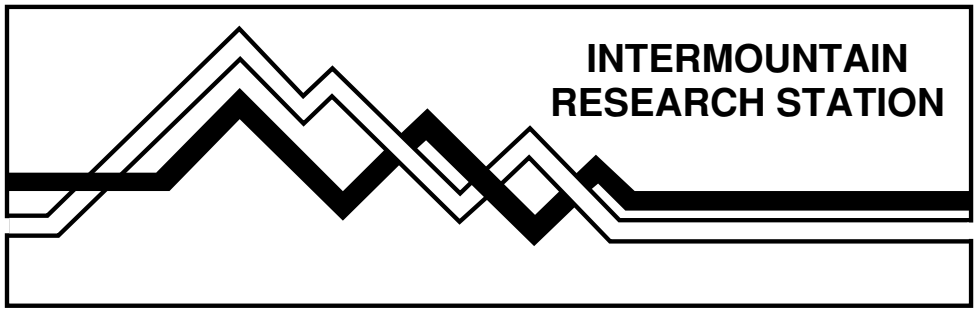
Moderately moist to dry meadows and open woods

Most elevations

Kinney, John W.; Clary, Warren P. 1994. A photographic utilization guide for key riparian graminoids. Gen. Tech. Rep. INT-GTR-308. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 13 p.

Photographic guides are presented to help estimate grazing utilization of important riparian grasses and grasslike plants. Graphs showing the percent of a plant's weight that has been consumed based on the percent of its height left after grazing allow utilization estimates to be refined further.

Keywords: grazing, grazing effects, grazing intensity, grasses, sedges, rushes

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