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LONG-TERM GRAZING INTENSITY DATA FROM THE GREAT PLAINS

Keith A. Redetzke and Leonard F. Paur

Natural Resource Ecology Laboratory

Colorado State University

Fort Collins, Colorado

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ABSTRACT

Data have been acquired from nine long-term grazing intensity studies on the Great Plains. Each study includes measurements of monthly animal weights and plant cover or biomass at the end of the growing season. For several studies soil type data were taken for the vegetation study plots. Climatic records also were obtained for each study. A description of the data sets and access procedure is presented for future users.

INTRODUCTION

The livestock industry on the Great Plains developed and prospered during the open range period. Following settlement and fencing of the range, problems of overgrazing could no longer be handled by free movement of stock. Declining economic returns and deteriorating pastures brought a demand for information regarding grazing practices.

Agricultural research agencies at various locations in the Great Plains have conducted grazing intensity experiments to provide the needed information. To accomplish this, pastures were grazed at varying intensities for extended periods of time. Data generally were taken on animal weights each month and plant cover or biomass at the end of the growing season. In addition, for several of the studies soil type data were taken for the vegetation study plots. These data, combined with climatic records from local weather stations, provide an account of livestock production and interseasonal change in prairie vegetation.

During the summer of 1970 a data synthesis and modeling project was undertaken, using these data to develop a model capable of predicting the response of plant cover and animal production to variations in weather and grazing pressure for several locations. Nine data sets were obtained from studies on the Great Plains. Three of these were incorporated into the model. The system was described by a set of matrix equations, with specific transition matrices for each combination of soil type, grazing intensity, and weather category. Model verification and validation tests were done with data from a study having replicated grazing treatments. In a management-application exercise the probability of weather categories occurring was used to solve the predictive equations of the model for the expected next

season values of revenue return and ground cover of major forage species for applications of light, moderate, and heavy grazing. A successional theory exercise was done to experiment with the model as a means of testing current hypotheses and developing new concepts of grassland succession. The details of this modeling effort are presented by Redetzke (1973).

This report is written to describe the long-term grazing intensity data sets that were obtained, providing future users with the background information needed for accurate interpretation.

DATA ACQUISITION

Letters of inquiry were sent in the spring of 1970 to agricultural research agencies that were known to have conducted long-term grazing intensity experiments. The general scope and objectives of the project were explained, and a request was made for needed data which included plant, animal, and soil information across grazing treatments. Assurance was given for proper recognition of data source in any resulting publications.

Of the 27 agencies that were contacted, 13 responded favorably to the requests, and these were visited during the summers of 1970 and 1971. Nine of these agencies were located in the Great Plains, two were in the desert grasslands of the Southwest, one was in the Rocky Mountains, and one was in the Snake River Plains of the northern extent of the Great Basin. The investigator in charge of the study at each agency was contacted, and the project and proposed use of the data were explained in greater detail. The field studies and data collection methods were discussed. Then, if the data still looked useful and the investigator was agreeable to the proposed use, arrangements were made for release of the data. Generally, a list of

the data being borrowed was made and signed as a checkout procedure. At some of the sites memorandums of agreement which specified the details of the use for which the data was authorized were written and signed. The nine cooperating agencies from the Great Plains, with the study locations and investigators contacted, is shown in Table 1.

Animal data from these studies were fairly uniform, generally being individual animal weights taken monthly during the grazing season. However, the type of livestock was variable with four studies using steers, two using cows with calves, one using both steers and cows with calves, one using heifers, and one using ewes with lambs. Generally, three intensities of summer grazing were used, although two of the studies used winter grazing treatments as well. A list of the studies with the type of animals, number of intensities, seasons of use, and years of data is shown in Table 2.

Plant data were more variable, both in the measurements taken and methods used. Most of the sites used some form of cover measurement. The two exceptions to this measured plant biomass by clipping. In addition, three of the studies collected biomass data by double sampling techniques plus percent cover, and three of the studies used plant cover only. Table 3 shows the type of vegetational data, plots per pasture, permanence of plots, years that data were collected, plants included, availability of soil type information, and plot distances from water.

Weather data were obtained for each of these studies. When data were not available from study sites, the information was obtained from the nearest U.S. and Canadian Weather Bureau stations. These data included precipitation, temperature, and wind for each study, evaporation for five of the studies, and humidity for two of the studies. Daily weather

Table 1. Cooperating research agencies conducting grazing intensity studies in the Great Plains.

Cooperating Agency	Study Location	Investigator
Eastern Colorado Range Station Range Science Department Colorado State University Fort Collins, Colorado	Akron, Colorado	Phillip L. Sims
Fort Hays Branch Kansas Agricultural Experiment Station Hays, Kansas	Hays, Kansas	John L. Launchbaugh
U.S. Department of Agriculture Agricultural Research Service Northern Great Plains Research Center Mandan, North Dakota	Mandan, North Dakota	George A. Rogler
Canada Agriculture Research Station Lethbridge, Alberta	Manyberries, Alberta	Sylvester Smoliak
U.S. Department of Agriculture Agricultural Research Service Crops Research Division U.S. Range Livestock Experiment Station Miles City, Montana	Miles City, Montana	Walter R. Houston
Central Plains Experimental Range (CPER) U.S. Department of Agriculture Forage and Range Research Branch Crops Research Division, A.R.S. Fort Collins, Colorado	Nunn, Colorado	Robert E. Bement
Nebraska Agricultural Experiment Station University of Nebraska Lincoln, Nebraska	Scottsbluff, Nebraska	Donald F. Burzlaff
Canada Agriculture Research Station Lethbridge, Alberta	Stavely, Alberta	Alex Johnson
U.S. Department of Agriculture Agricultural Research Service U.S. Southern Great Plains Field Station Woodward, Oklahoma	Woodward, Oklahoma	E. H. McIlvain

Table 2. Animal data obtained from nine grazing intensity studies on the Great Plains.

Station	Type of Animal Data*/	Intensities	Season	Years
Akron	Individual steer weights	3	May-Sept	55-66
Hays	Individual steer weights	3	May-Oct	56-66
Mandan	1. Grouped steer weights	4	May-Oct	17-18
	2. Individual steer weights	4	May-Oct	19-45
	3. Individual steer weights	2	May-Oct	46-65
Manyberries	1. Individual ewe weights		May-Oct	50-67
	2. Individual lamb weights	3	May-Oct	51-67
Miles City	1. Individual cow weights	6	Year-round	32-68
	2. Individual calf weights	6	Summer	32-68
	3. Individual calf birth weights	6		34-45
Nunn	1. Individual heifer weights	3	May-Sept	40-51
	2. Grouped or individual heifer weights	3	May-Sept	52-53
	3. Grouped or individual heifer weights, with animals rotated between pastures	3	May-Sept	56-70
Scottsbluff	Individual steer weights	3	May-Sept	58-67
Stavely	1. Individual cow weights	3	May-Oct	49-58
	2. Grouped calf weights	3	May-Oct	50-58
Woodward	1. Individual steer weights	3	Year-round	41-51
				61-66
	2. Individual cow and calf weights	3	Year-round	51-61

*/ See Appendix II (original data formats) for units of measurement.

Table 3. Vegetational data obtained from nine grazing intensity studies on the Great Plains.

Station	Type of Vegetational Data*/	Plots Per Pasture	Years	Plants Included
Akron	1. Percent cover by Parker loop	20†‡/	56-66	All perennials
	2. Biomass by double sampling		51-64	Major grasses
Hays	1. Biomass by clipping	20	56-66	Major grasses
Mandan	1. List quadrat technique	40†/	15-65	
	a. frequency			Indicator plants
	b. cover			Sod grasses
Manyberries	1. Biomass by clipping	2	50-67	Total forage
Miles City	1. Percent cover by pantiograph	6†‡/	32-57	All species
Nunn	1. Percent cover by square foot density	40†‡/	41-64	All species
	2. Biomass by double sampling	40	47-62	Two species
Scottsbluff	1. Percent cover by square foot density	60	59-67	All species
Stavely	1. Percent cover by vertical point	6000	49-53	All species
Woodward	1. Percent cover by line transect	120†/	42-58	Most species
	2. Biomass by double sampling	120	48-69	Most species

*/ See Appendix II (original data formats) for units of measurement.

†/ These plots were permanent.

‡/ Data are available on soil type and distance to water for each of these plots.

records were obtained for two of the studies, while only monthly records were available for the remainder. In addition, soil water data were available for two of the studies. A listing of the abiotic data for each study is presented in Table 4, showing the units of measure, frequency, and years available.

DATA PROCESSING

Data from these studies were, with few exceptions, obtained on field forms, either the original field sheets or thermofax copies. Each of the data sets was keypunched and verified according to a format compatible with the field form to facilitate the keypunching operation. Often several different field forms were used for a particular data set over the years of the study, necessitating the use of several formats. Every effort was made to assure that adequate formats would incorporate all the information present on the field forms; therefore no information would be lost in the keypunching process. This was done to maximize the utility of the punched data beyond the immediate needs of this particular modeling project. All the data sets listed in Tables 2, 3, and 4 were handled in this manner.

The cards were then loaded into the computer, a CDC 6400, and a magnetic tape file and output listing were made for each data set. The output listing was further checked against the field forms for errors, and corrections to the files were made using Program INSTAR (Robinson 1972), a data storage and retrieval routine with update capabilities.

A standard format was then developed for each of the data types: plant, animal, temperature, precipitation, etc. These standard composite formats were designed to use the full 132 character field that can be printed on

Table 4. Abiotic data obtained from nine grazing intensity studies on the Great Plains.

Station	Type of Abiotic Data	Units	Frequency	Years
Akron	1. Akron maximum and minimum temperatures	°F	Daily	55-66
	2. Akron precipitation	inches	Daily	55-66
	3. Akron wind, average velocity	mi/hr	Daily	55-66
	4. Akron available soil water	percent	Monthly	55-64
Hays	1. Hays mean temperature	°F	Monthly	55-67
	2. Hays total precipitation	inches	Monthly	55-67
	3. Hays wind	mi/month	Monthly	55-67
	4. Hays evaporation	inches	Monthly	55-67
Mandan	1. Mandan maximum and minimum temperatures	°F	Monthly	14-70
	2. Mandan total precipitation	inches	Monthly	14-70
	3. Mandan wind	mi/month	Monthly	19-69
	4. Mandan average humidity	percent	Monthly	19-38
	5. Mandan evaporation	inches	Monthly	39-69
	6. Mandan available soil water	percent		17-54
Manyberries	1. Manyberries maximum and minimum temperatures	°F	Monthly	49-70
	2. Manyberries total precipitation	inches	Monthly	49-70
	3. Lethbridge mean wind speed	mi/hr	Monthly	48-70
Miles City	1. Miles City maximum and minimum temperatures	°F	Monthly	30-71
	2. Miles City precipitation	inches	Daily	30-71
	3. Miles City wind	mi/month	Monthly	30-71
	4. Miles City average humidity	percent	Monthly	30-48, 60-71
Nunn	1. CPER average temperature	°F	Monthly	40-64
	2. CPER total precipitation	inches	Monthly	40-64
	3. Cheyenne evaporation	inches	Monthly	40-64
	4. Cheyenne wind	mi/month	Monthly	40-64
Scottsbluff	1. Mitchell maximum and minimum temperatures	°F	Monthly	55-70
	2. Mitchell total precipitation	inches	Monthly	55-70
	3. Mitchell average wind	mi/hr	Monthly	55-70
	4. Mitchell evaporation	inches	Monthly	55-70
Stavely	1. High River maximum and minimum temperatures	°F	Monthly	48-70
	2. Claresholm total precipitation	inches	Monthly	48-70
	3. Lethbridge mean wind speed	mi/hr	Monthly	48-70
Woodward	1. Woodward maximum and minimum temperatures	°F	Daily	39-71
	2. Woodward precipitation	inches	Daily	39-71
	3. Woodward wind total	miles	Daily	40-70
	4. Woodward evaporation	inches	Daily	41-70

computer paper. This permitted the inclusion of additional header information and eliminated most of the continuation cards needed to accommodate records punched on the 80-column keypunch cards. In the case of the standardized plant format, an individual record consisted of the header information identifying the station, pasture, soil, stratum, plot, and date for a given sampling period. This was followed by the data in the form of a species code and measurement for that species with up to 14 species per record. In the original plant formats two other basic combinations of the plot, species, and date information occurred. These were species and date in the header, followed by all of the observations by plots for a particular pasture, and species and plot in the header, followed by the observations by dates for the pasture.

To convert one of these data sets in original form to the standard format, several programs were required. First, a program was needed to develop the header information and to reduce the original data to a single observation per record. A second program was needed to sort these abbreviated records into the order needed for the standard format, and a third program was used to merge the individual observations into a composite record according to the standard format. In addition, a program was needed to check for errors and inconsistencies in the final format. Because of time limitations, only those plant and animal data sets used in this project were standardized. The standard composite data formats are shown in Appendix I, and the original data formats appear in Appendix II.

FUTURE DATA USE

The data reported in this paper represent many years of work by many people. The information herein represents a large investment on the part of the research agencies that conducted these studies. The full value of this investment can be obtained only through continued employment of the data in analysis and synthesis efforts.

Future data use depends on continued cooperation with the research agencies. Before any project is initiated using these data, the research agencies must be informed so they can withhold their data if they disagree with the project. In addition, the lending agency should have an opportunity to review any publications using their data. Proper recognition of the data source should be made in all publications, and joint authorship efforts involving people from the research agencies should be encouraged.

DATA SET DESCRIPTIONS

Akron

The Eastern Colorado Range Station is located 17 miles north of Akron, Colorado, at an elevation of 4,300 ft above sea level. Soils in this area are light, varying from loamy sand to sandy loam, and topography is level to slightly rolling dunes in typical sandhill form. Precipitation of this area is about 16 inches annually, with the greatest accumulations during the summer growing season. Vegetation on the more level areas is predominated by short- and midgrasses, such as blue grama and western wheatgrass, while the deep sandy dunes support a more mesic growth of tallgrasses, such as sandhill bluestem mixed with the mid- and shortgrasses (Sims and Denham 1969). Scientific names of plants are given in Appendix III.

Consumer. The grazing intensity experiment was initiated in 1954. Six native pastures were fenced for this purpose, and in 1955 grazing treatments were begun. Three intensities of steer grazing were used: light at 2.0 acres, moderate at 1.0 acres, and heavy at 0.7 acres per steer month. This was a replicated design with two pastures used for each of the treatments. The pastures ranged in size from 45 to 52 acres. Utilization of available forage by weight averaged near 30% for lightly grazed pastures, 50% for moderately grazed pastures, and 70% for heavily grazed pastures (Hervey and Dahl 1959). The steers involved were yearling herefords. The grazing season generally extended from 1 May to 1 October for 160 days of use. Animals were weighed at the beginning of each season and at 1-month intervals thereafter. These data were collected from 1955 through 1966.

Producer. Vegetative measurements included basal cover which was taken by the Parker loop method using 20-ft transects. In each pasture 15 to 25 of these permanent transects were located. Cover data were taken at the end of the growing season beginning in 1956 and in most of the following years through 1966. All species except annuals were included in the cover measurements. In addition, biomass estimated by double sampling on 4.8 sq. ft. plots was taken inside and outside cages for major grass species, and general plant categories.

Abiotic. Climatic data including precipitation, maximum and minimum temperatures, and average wind velocity have been taken daily at the station headquarters since 1956.

The Soil Conservation Service mapped the soils in this area. There were three types: a deep loamy sand with rapid substratum permeability, a deep sandy loam with moderate substratum permeability, and deep dune sand.

By overlaying this map on a map showing the location of each of the plots in the pastures, it was possible to determine the soil type for the plots.

Fort Hays

The Fort Hays Branch Station of the Kansas Agricultural Experiment Station is located south of Hays, Kansas, at an elevation of 2,000 ft above sea level. The topography is flat to gently rolling, and the soils are deep and dark brown chernozems developed from loess. A zone of calcium carbonate deposit occurs at a depth of 2 to 3 ft. Mean annual precipitation is 23 inches, occurring primarily in the spring and summer. The area's vegetation is predominantly buffalo grass which forms a dense sod. Smaller amounts of blue grama are present in this sod, and western wheatgrass forms scattered islands that occupy sites with more moisture. Other grasses such as big bluestem and side oats grama are represented by isolated plants producing little forage. (Launchbaugh 1957).

Consumer. The grazing intensity experiment was started in 1946. Light, moderate, and heavy grazing intensities were imposed on three native pastures, using yearling hereford heifers and steers. Stocking rates were 5.1, 3.4, and 2.0 acres per head for light, moderate, and heavy grazing treatments, respectively. Pastures ranged in size from 63 to 76 acres. Animals were weighed each month and at the beginning and end of the grazing season. Data obtained from this study were for 1956 through 1966.

Producer. Vegetation measurements taken in this study included end-of-season biomass measurements. There were 10 uncaged plots per pasture. Plots were clipped and weighed, and the composition of buffalo grass, blue grama, western wheatgrass, annual plants, and other grasses and weeds was

estimated at the time of clipping. The data were expressed in terms of pounds per acre of plant material, oven-dried to 55°C.

Abiotic. Climatic data available for Hays included monthly observations of mean temperature, total precipitation, total inches of pan evaporation, and total miles per month of wind. No soil information was available for the study plots.

Mandan

The Northern Great Plains Field Station is located 3 miles south of Mandan, North Dakota. Topography is mostly level prairie with rolling hills and ravines along the Missouri River. Elevation is approximately 2,000 ft. Soil is a heavy, silty clay loam, underlaid primarily by a clay subsoil. Annual precipitation averages 16.4 inches and the frost-free growing season averages 138 days. The dominant plant species are blue grama, western wheatgrass, and needle and thread grass. Scattered low shrubs such as fringed sagewort and false tarragon sagewort also contribute significant cover (Sarvis 1923).

Consumer. This grazing experiment was started in 1916. The four pastures ranged in size from 30 to 100 acres, with 10 steers in each pasture. Two-year-old steers of mixed breeds were used from 1916 to 1930 when a change was made to high-grade hereford steers. The average spring weight of these animals was 750 lb. Animal data available from this study were monthly steer weights, grouped by pastures for 1917 and 1918, and individual steer weights for 1919 through 1965. The grazing season extended from May through October. In 1946 the two intermediately stocked pastures were eliminated, leaving only the light and heavy grazing intensities (Sarvis 1941).

Producer. A list quadrat technique was the primary method used to investigate the plant responses in the Mandan study. For each 1 m^2 plot, ground cover of major sod-forming grasses was recorded in terms of tenths of the plot covered. Stem counts were recorded for other plants. All plants were not recorded; only the more abundant species or plants useful as indicators of over-grazing were included. The particular plants included were not constant throughout the study, making interpretation of successional patterns difficult. Forty of these plots were permanently located in each pasture. In addition, the 30-acre and 100-acre pastures had livestock exclosures in which 30 plots were located. These data were taken at the end of the growing season for most years from 1915 through 1965. Measurements of total forage in pounds per acre dry matter were available each year from 1957 through 1965. Cages were used to exclude grazing animals. Plots 2 ft^2 in size were clipped, and the samples were oven-dried and weighed. Ten plots were combined for each observation on the grazed vegetation, and six plots were combined per observation on the ungrazed. There were approximately six observations each of grazed and ungrazed vegetation per pasture per year.

Abiotic. Percent soil water data was available for 1-ft intervals to 6-ft depth for 1917 through 1954. There was one replicate for each pasture and exclosure. Weather data from the Weather Bureau at Mandan included precipitation for 1914 through 1970, total monthly miles per month of wind for 1919 through 1969, mean monthly relative humidity for 1919 through 1938, and pan evaporation in total inches per month for 1939 through 1969.

Manyberries

The Dominion Range Experiment Station, Manyberries, Alberta, is located 60 miles northwest of Havre, Alberta, Canada. Topography of the area is rolling with numerous coulees. Soils are loam to sandy loam in texture, and brown in color with a columnar B horizon. Elevation is approximately 3,000 ft. Climate is semiarid and precipitation averages 12.2 inches annually. This is a shortgrass prairie site dominated by blue grama, with needle and thread, western wheatgrass, June grass, and Sandberg bluegrass contributing significantly to forage production. Common associates include fringed sagewort, dwarf phlox, winter fat, salt sage, and prickly pear cactus.

Consumer. The grazing experiment was started in 1950. Twenty ewes with lambs were grazed in pastures of 100, 120, and 150 acres for the May through November grazing season. Ewes were weighed monthly, and lamb birth and weaning weights with dates were recorded. These data were available for 1950 through 1967.

Producer. Plant data available for this study were total forage in pounds per acre obtained by clipping one caged and one uncaged plot per pasture per year.

Abiotic. Climatic data available from the Manyberries Experiment Station included monthly maximum and minimum temperatures and total precipitation. Mean monthly wind speed in miles per hour was available from Lethbridge. A fairly detailed soil description was available for these pastures, but no mapping was done.

Miles City

The U.S. Range Livestock Experiment Station is located 5 miles southwest of Miles City, Montana. The topography of this area is variable, being

characterized by level bottomlands with gently sloping benches to rolling uplands with steep shale buttes and roughly eroded breaks between bottomlands and uplands. The elevation of the area is about 2,600 ft above sea level, and average annual precipitation is 13 inches, with 70% of this coming during the growing season. Soils vary from clays to sandy loams. The heavy clay soils are dominated by big sagebrush and Sandberg bluegrass with few other species, while the more sandy soils support a mixed cover of short- or mid-grasses dominated by blue grama, with good representations of western wheatgrass and low shrubs such as silver sagebrush and prickly pear cactus (Houston 1961).

Consumer. The grazing intensity experiment was designed to simulate typical cow-calf ranching operations over a range of stocking rates. Two sets of pastures were used to provide year-round grazing. The set used for winter grazing was located in rougher topography to provide shelter from winter storms, while the set grazed the remainder of the year was on the more level and open topography. Six pastures were in each set, and six intensities of cow-calf grazing were used, varying from light grazing at 4.2 acres per animal unit month to heavy grazing at 2.0 acres per animal unit month. A gradient in pasture sizes permitted the use of a fairly constant number of animals for each of the stocking rates. The size of the pasture on the summer use unit, for example, varied from 93 acres to 189 acres while the number of cows in each pasture was about 10. Utilization of blue grama in terms of percent of plants grazed averaged from 39% for the lightest grazed pasture to 68% for the heaviest grazing treatment (Houston and Woodward 1966, Reed and Peterson 1961).

Hereford livestock was used in this experiment. Animals were grazed on the winter-use pastures from the first of November through mid-May. Calves generally were born in April. The cattle then were moved to the summer-use pastures where they were held through October. In the transfers of livestock between winter and summer pastures each pasture in the winter-use unit was paired with a summer-use pasture of similar grazing intensity, thereby maintaining a constant treatment effect on the animals. Animals were weighed individually at approximate 1-month intervals, and birth weights of calves were recorded.

Producer. Plant cover measurements were noted by charting permanent plots with a pantiograph technique. These were 1 m^2 plots, and there were four to eight per pasture. All species were included in the measurements, and the plots were charted on most years between 1932 and 1956. These charts were later compiled, and the cover for each species expressed in terms of centimeters square per meter square (cm^2/m^2).

Abiotic. Climatic data taken by the U.S. Weather Bureau at Miles City during the period of this study included precipitation, wind, average humidity, and maximum and minimum temperatures.

The Soil Conservation Service did a detailed survey of soils at each of the vegetation study plots. The 12 soil types recognized were grouped into three categories--clays, loams, and sandy loams--for the purpose of this modeling.

Nunn

The Central Plains Experimental Range (CPER) is located 12 miles north of Nunn, Colorado, at an elevation of 5,400 ft above sea level. Topography of this area is rolling; and soils are primarily loams of the semiarid

brown soil group, varying in texture from clay loams to sandy loams, though areas of loamy clay and loamy sand also are present. Annual precipitation averages about 12 inches with 70% coming during the growing season. The vegetation is dominated by shortgrasses, mainly blue grama and buffalo grass with midgrasses, such as western wheatgrass and needle and thread, conspicuous on the moist sites and during wet years. Common browse species include fringed sagewort, broom snakeweed, and winter fat. Prickly pear cactus also is widely distributed.

Consumer. The grazing intensity experiment was started in 1939. Three intensities of grazing by yearling heifers were applied to three pastures, each of which was approximately 320 acres in size. The grazing season extended for 6 months from May through October. The stocking rates were heavy at 5.2 acres, moderate at 8.2 acres, and light at 14.5 acres per heifer for the 6-month grazing season. The utilization of current year's production of shortgrass forage by weight was 54%, 37%, and 21%, respectively, for heavy, moderate, and light use (Klipple and Costello 1960).

Yearling hereford heifers were used in the experiment. They were obtained from local ranchers and assigned at random to the pastures. The animals were weighed at the beginning of the season and at 1-month intervals. The animals were held in the same pastures throughout the grazing season for the period 1940 through 1953. No grazing was done during 1954 and 1955 because of drought; then starting 1956 the animals were rotated between pastures to permit a satisfactory weight gain on all animals, including those spending time on the heavily grazed units.

Producer. The percentage of ground surface cover for all species of plants was determined by the square-foot density method. In this technique

a visual estimate was made of the fractions of the plot covered by each species (Stewart and Hutchings 1936). Square plots 5 feet on each side were used. Forty plots were permanently located in each pasture. In addition, biomass by double sampling was done on 40 plots in each pasture with forage divided into two classes.

Abiotic. Monthly weather records available for this area included average temperature and total precipitation taken at the headquarters of the range. Total miles per month of wind and inches of pan evaporation were available from the U.S. Weather Bureau at Cheyenne, Wyoming.

A detailed soil map of the Central Plains Experimental Range was prepared by the Soil Conservation Service in 1969. Fourteen soil types were recognized. By overlaying the soil map on a map of the permanent vegetation study plot locations, the soils types of the study plots were determined. Ten soils types were represented on the study plots. These were lumped into three groups: Vona and Ascalon soils, Shingle and Renohill soils, and undifferentiated soils.

Scottsbluff

The experimental range is located 5 miles northwest of the Scottsbluff Station at an elevation of approximately 4,000 ft. Topography is gently rolling, and soils are fine sand. Precipitation averages 12.8 inches annually. This is sandhill range with vegetation dominated by blue grama and needle and thread grass and associated with sand dropseed, prairie sand reed, and sandhill bluestem. (Burzlaff and Harris 1969).

Consumer. Grazing treatments were begun in 1958. Three grazing intensities were imposed on six pastures in a replicated experimental design. There were 10 hereford steers each in pastures of 105, 65, and 50 acres for

the May through September grazing season. Animals were weighed monthly, and these data were available from 1958 through 1967.

Producer. A modified square-foot density technique was used to estimate plant cover and species composition on 60 nonpermanent plots in each pasture. These data were collected in mid-July.

Abiotic. Monthly climatic data from the U.S. Weather Bureau at Mitchell, Nebraska, was available for the period from 1955 through 1970 and included maximum and minimum temperatures, total precipitation, average wind speed, and inches of total pan evaporation.

Stavely

The Stavely Substation of the Canada Department of Agriculture is located in the foothills west of Stavely, Alberta, at an elevation of 4,300 ft. It is in the northern range of Porcupine Hills. Soils are dark-brown to black chernozems with clay-loam to loam texture. The climate is subhumid with an annual precipitation of 21.7 inches. Winter weather is moderated by frequent chinook winds from the Rocky Mountains to the west. Vegetation of this rolling and hilly area is dominated by rough fescue, with Parry oat grass and Idaho fescue as the chief associated grasses (Johnson 1961). Quaking aspen occurs commonly in draws and moist locations and is invading the grasslands.

Consumer. The grazing study was initiated in 1949. Thirteen cows with calves were grazed in three pastures of 156, 117, and 78 acres for stocking rates of 12, 9, and 6 acres per head, respectively. Cows were weighed individually each month, and calves were group-weighed by pasture monthly during the May through September grazing season for 1949 through 1958.

Producer. The vertical point method was used to measure basal cover of vegetation. Approximately 4,000 points in each pasture and 2,000 points in each exclosure were read. This gave one estimate of cover by species for each pasture and exclosure each year.

Abiotic. Climatic data available for the site from 1948 through 1970 include monthly total precipitation from Claresholm, Alberta and monthly maximum and minimum temperatures from High River, Alberta. Mean monthly wind speed is available from Lethbridge, Alberta.

Woodward

The U.S. Southern Great Plains Experimental Range is located 18 miles northwest of Woodward, Oklahoma, at an elevation of 2,000 feet. Soils are fine sandy loam with areas of loamy sand and dune sand. Topography is rolling. The growing season averages 177 days, and the annual precipitation averages 23 inches, with 70 percent coming in the summer. The native vegetation if sand sagebrush with an understory of mixed grasses. Primary grasses are blue grama and sand dropseed.

Consumer. When the grazing intensity study was initiated in 1941, hereford steers were grazed year-round at three intensities, and individual animal weights were taken monthly. In 1951 this was changed to cow-calf grazing, though the grazing intensity, grazing season, and frequency of weighing was maintained. Then in 1961 through 1966 steer grazing was again used. These data are available for 1941 through 1966.

Producer. Both cover and biomass measurements were taken on these pastures. Cover measurements were made by the line transect method, recording intercept by species for 10-m transects. There were 120 lines per pasture. Biomass measurements were made by double sampling, using a plot

1.92 sq. ft in size. There were 100 to 150 plots per pasture with part of these taken within exclosures. The cover measurements are available for 1942 through 1958, and the biomass measurements are available for 1948 through 1969.

Abiotic. For each of the plant cover transects the general soil type, aspect, and percent slope were recorded. Climatic data available for Woodward on a daily basis from 1940 through 1970 include maximum and minimum temperatures, inches of precipitation, total miles of wind, and inches of pan evaporation.

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APPENDIX I

COMPOSITE DATA FORMATS

Composite Animal Weights Format*/

Column	Information
1-2	Station abbreviation
3-4	Year
5-8	Pasture number
9-13	Pasture size (hundredths of hectares)
14	Season - W for winter; otherwise blank
15-16	Class of stock - CW, ST, CF, EW, LB, HF †/
17	Sex of calves and lambs - M (male), F (female), or U (unknown)
18	Type of weighing - I (individual) or G (group)
19-22	Animal number or number of animals for G type
23-26	Mother's number if animal is a calf or lamb
27-30	Month day
31-34	Weight 1
35-38	Month day
39-42	Weight 2
43-130	Continuation of the above through Weight 13

*/ All weights are in pounds and are right justified: for example, 0865.

†/ CW - cow; ST - steer; CF - calf; EW - ewe; LB - lamb; HF - heifer.

Composite Plant Format

Column	Information
1-2	Station abbreviation
3-4	Data type code
5-7	Pasture character
8-12	Pasture size
13-14	Grazing treatment (0 or 1)
15-17	Line or strata number
18-20	Plot number
21-24	Plot size
25-27	Soil code
28-29	Year
30-31	Month
32-33	Day
34	Card number of record
35-37	Numeric species code 1
38-41	Data 1
42-132	Continuation of the above through Data 14

Species Code Format

Column	Information
1-49	Scientific name
50-51	Classification - FO,GR,GL,SH*/
52-59	Numeric code, 3 digits in 53-55
60-61	Station abbreviation
62	Blank
63-68	Station code
69	Blank
70-72	Plant number at station; otherwise blank
73-75	Blank
76-80	Master code

*/ FO - forbs; GR - grasses; GL - grass-like; SH - shrubs

Composite Precipitation Format

Column	Information
1-2	Weather station abbreviation
3	M (monthly) or D (daily)
4	P (precipitation)
5-6	Year
7-8	Month
9-10	Day; blank if monthly
11-14	Precip 1
15-18	Month, day
19-22	Precip 2
23-126	Continuation of the above through Precip 15

Composite Temperature Format

Column	Information
1-2	Weather station abbreviation
3	M (monthly) or D (daily)
4	T (temperature)
5-6	MM (maximum-minimum) or AV (average)
7-8	Year
9-10	Month 1
11-12	Day; blank if monthly
13-15	Max temp or average
16-18	Min or blank
19-22	Month day 2
23-25	Max
26-28	Min
29-128	Continuation of the above through month day 12

Composite Wind Format

Column	Information
1-2	Station abbreviation
3	T (total mileage) or M (mean speed)
4-5	Year
6-7	Month
8-11	Wind (for example, 5540)
12-13	Month
14-17	Wind
18-47	Continuation of the above through 47
48-80	Blank

Composite Evaporation Format*/

Column	Information
1-2	Weather station abbreviation
3	M (monthly) or D (daily)
4	E (evaporation)
5-6	Year
7-8	Month 1
9-10	Day; blank if monthly
11-15	Evap 1
16-19	Month, day
20-24	Evap 2
25-132	Continuation of the above through Evap 14

*/ Evaporation in inches: for example 00.00.

Composite Humidity Format*/

Column	Information
1-2	Weather station abbreviation
3	M (monthly)
4	H (humidity)
5-6	Year
7-8	Month
9-16	Hum 1
17-18	Month
19-26	Hum 2
27-126	Continuation of the above through 126

*/ Relative humidity in percent taken at three or four times during each day: for example, 87816870.

APPENDIX II

ORIGINAL DATA FORMATS

A. Consumer Data

Akron Steer Weight Format

Column	Information
1-2	Year
3-4	Pasture number
5	Metal tag number preceding hyphen; otherwise blank
6-8	Metal tag number following hyphen
9-12	Month, day
13-16	Weight */
17-20	Month, day
21-24	Weight
25-80	Continuation of the above

*/ Weight in lb/animal.

Hays Animal Weights Format, 1956-1966

Column	Information
1	Intensity - L (low), M (medium), or H (high) - 1A=H, 2A=M, 3A=L
2-4	Animal number
5-10	Date - month, day, year
11-14	Weight*/
15-20	Date
21-24	Weight
25-74	Continuation of the above
75-80	Blank

*/Weight in lb/animal.

Mandan Group Animal Weights Format, 1917-1918

Column	Information
1-2	Year
3-5	Size of pasture
6-7	Number of animals
8-11	Date
12-16	Weight*/
17-20	Date
21-25	Weight
26-29	Date
30-34	Weight
35-38	Date
39-43	Weight
44-47	Date
48-52	Weight
53-56	Date
57-61	Weight
62-65	Date .
66-70	Weight
71-74	Date
75-79	Weight
80	Blank

*/Weight in lb/pasture.

NOTE: 1. If there are more than eight dates, they are continued on a second card.

2. Note substitution of seven cattle on 6/30/18 on 70-acre pasture.

Mandan Individual Animal Weights, Old Format, 1919-1955

Column	Information
1-2	Year
3-5	Size of pasture
6-7	Animal number
8-11	Date
12-15	Weight*/
16-19	Date
20-23	Weight
24-27	Date
28-31	Weight
32-35	Date
36-39	Weight
40-43	Date
44-47	Weight
48-51	Date
52-55	Weight
56-59	Date
60-63	Weight
64-67	Date
68-71	Weight
72-75	Date
76-79	Weight
80	Blank

*/Weight in lb/animal.

NOTE: 1. If there are more than nine dates, they are continued on a second card.

Mandan Individual Animal Weights, Old Format, 1919-1955 (cont.)

2. All empty columns are filled with zeros except those following final weight which are blank.

3. Only those dates are given that have corresponding weights except in 1933 when other cattle were substituted in July and August and in 1945 when other cattle were substituted in July.

Mandan Individual Animal Weights, New Format, 1956-1965

Column	Information
1-2	Year
3-5	Size of pasture
6-8	Animal number
9-12	Date
13-16	Weight */
17-20	Date
21-24	Weight
25-28	Date
29-32	Weight
33-36	Date
37-40	Weight
41-44	Date
45-48	Weight
49-52	Date
53-56	Weight
57-60	Date
61-64	Weight
65-68	Date
69-72	Weight
73-76	Date
77-80	Weight

*/Weight in lb/animal.

Manyberries Sheep Weights Format, 1950-1967

Column	Information
1-2	Year
3	Season - S (summer) or W (winter)
4	Lot number - 1 for 100-acre field, 2 for 120-acre field, or 3 for 150-acre field
5-8	Animal number - up to 3 numbers plus one letter
9-12	Month, day
13-15	Weight*/
16-19	Month, day
20-22	Weight
23-72	Continuation of the above
73-80	Blank

*/Weight in lb/animal.

Manyberries Lambing Record Format, 1951-1967

Column	Information
1	L (lambs)
2-3	Year
4	Lot number
5-8	Ewe number
9-11	Ewe weight */
12-15	Month, day of birth
16-19	Lamb number
20	Lamb sex
21-24	Birth weight
25-28	Weaning date
29-31	Weaning weight
32-80	Blank

*/Weight in lb/animal.

Miles City Cow and Calf Weights Format, 1932-1968

Column	Information
1	H (hogback) or L (Lonepine)
2	Pasture letter: H--A,B,C,D,E,F L--Q,R,S,T,U,V
3	Season - W (winter) or S (summer)
4-5	Year - if winter, use first year
6-9	Animal number
10-13	Corresponding cow if animal is a calf; otherwise blank
14	Sex - M, F, or U (unknown)
15-18	Month, day
19-22	Weight*/
23-26	Month, day
27-30	Weight
31-34	Month, day
35-38	Weight
39-42	Month, day
43-46	Weight
47-50	Month, day
51-54	Weight
55-58	Month, day
59-62	Weight
63-66	Month, day
67-70	Weight
71-80	Blank

*/Weight in lb/animal.

NOTE: If there are more than seven dates, a second card is used duplicating the first 14 columns.

Miles City Calving Record Format, 1934-1945

Column	Information
1-2	CR (calving record)
3	H (Hogback), L (Lonepine), or U (unknown)
4-7	Calf number
8	Sex - M, F, or U (unknown)
9-14	Year, month, day of birth
15-17	Birth weight*/
18-80	Blank

*/Weight in lb/animal.

Nunn Animal Weights Format, 1940-1970

Column	Information
1-2	Year
3	Pasture
4-6	Animal number
7-10	Month, day
11-14	Weight
15-18	Month, day
19-22	Weight
23-70	Continuation of the above
71-80	Blank

NOTE: 1. If no animal number is given, the weight in pounds is the average for the herd; otherwise the weights are given in lb/animal or lb/pasture.

2. 000 in animal number column means the tag was missing.

3. For 1965, 1967, 1968, and 1970 the number in the animal number column is the number of cattle in the herd; the weight is the average.

Scottsbluff Steer Weights Format

Column	Information
1-2	Year
3	Pasture number
4-6	Steer number
7-10	Month, day
11-14	Weight*/
15-18	Month, day
19-22	Weight
23-78	Continuation of the above
79-80	Blank

*/Weight in lb/animal.

Stavely Cow Weights Format, 1949-1958

Column	Information
1-2	Year
3	Field - A, B, or C
4-6	Cow number
7-8	Month
9-12	Weight*/
13-14	Month
15-18	Weight
19-54	Continuation of the above
55-80	Blank

*/Weight in lb/animal.

Stavely Calf Weights Format, 1951-1958

Column	Information
1-2	Year
3	Field
4-5	CF (calf)
6	Blank
7-8	Month
9-12	Weight*/
13-14	Month
15-18	Weight
19-78	Continuation of the above
79-80	Blank

*/Weights in pounds are average for pasture.

Woodward Animal Weights Format

Column	Information
1-2	Year
3	W (winter) or S (summer)
4-6	Pasture number
7	S (steer), C (cow), and for calves B (bulls) or H (heifers)
8-11	If calf, corresponding cow number; otherwise blank
12-15	Animal number
16-17	Month
18-19	Day
20-23	Weight*/
24-25	Month
26-27	Day
28-31	Weight
32-79	Continuation of the above
80	Blank

*/Weight in lb/animal.

B. Producer Data

Akron Cover Format

Column	Information
1-2	Pasture number
3-4	Year
5-7	Transect number
8-12	Species code
13-14	Data
15-19	Species code
20-21	Data
22-26	Species code
27-28	Data
29-77	Continuation of the above
78-80	Blank

NOTE: 1. Data for individual species are percent plant composition.

2. Data for annuals are numbers of plants.

3. Data for bare soil and litter are percent cover. The relationship 100 - (bare soil + litter) = vegetative cover can be used with the percent compositions to arrive at plant cover by species.

Akron Cage Clipping Format, 1957-1964

Column	Information
1	E (estimated); W (weighed)
2-7	Year, month, day
8-9	Pasture number
10-12	Plot number
13-15	Green inside, blue grama: 000 = trace
16-18	Green outside, blue grama
19-20	Air dry inside, blue grama (%); in % air dry columns 00 means data not given - 100% = 99
21-22	Air dry outside, blue grama (%)
23-25	Green inside, sand reed
26-28	Green outside, sand reed
29-30	Air dry inside, sand reed (%)
31-32	Air dry outside, sand reed (%)
33-35	Green inside, needle and thread
36-38	Green outside, needle and thread
39-40	Air dry inside, needle and thread (%)
41-42	Air dry outside, needle and thread (%)
43-45	Green inside, misc. grasses
46-48	Green outside, misc. grasses
49-50	Air dry inside, misc. grasses (%)
51-52	Air dry outside, misc. grasses (%)
53-55	Green inside, forbs
56-58	Green outside, forbs
59-60	Air dry inside, forbs (%)

Akron Cage Clipping Format, 1957-1964 (cont.)

Column	Information
61-62	Air dry outside, forbs (%)
63-65	Inside shrubs
66-68	Outside shrubs
69-71	Inside standing old
72-74	Outside standing old
75-80	Blank

NOTE: Data are grams per 4.8 sq. ft. plot green weight.

Akron Composition Format

Column	Information
1-2	Pasture number: 00 = north exclosures; 01 = south exclosures
3-4	Year
5-9	Species code
10-12	Composition (%)
13-17	Species code (%)
18-20	Composition (%)
21-76	Continuation of the above
77-80	Blank

Hays Plant Biomass Format, 1956-1966

Column	Information
1	Intensity - L (low), M (medium), or H (high)
2-3	Plot number
4-7	Species code
8-9	Year
10-13	Pounds per acre dry matter
14-15	Year
16-19	Pounds per acre dry matter
20-73	Continuation of the above
74-80	Blank

NOTE: Data are pounds per acre dry matter.

Manyberries Total Forage, 1950-1967

NOTE: 1. These data are in composite format only (see Appendix I, Composite Plant Format).

2. Data are in pounds/acre.

Mandan List Quadrats Format, 1915-1965

Column	Information
1-2	LQ (list quadrat)
3	Blank
4-5	Year
6-7	Month
8-9	Day
10	Blank
11-13	First 3 letters of genus
14-16	First 3 letters of species
17	Blank
18-20	Pasture size
21	Blank
22	Type of pasture: G (grazed) or I (isolation transect)
23	Blank
24	Transect direction (NESW) or number (1,2,3)
25	Blank
26-28	Quadrat 1*/
29	Blank
30-32	Quadrat 2
33	Blank
34-36	Quadrat 3
37	Blank
38-40	Quadrat 4
41	Blank
42-44	Quadrat 5

Mandan List Quadrats Format, 1915-1965 (cont.)

Column	Information
45	Blank
46-48	Quadrat 6
49	Blank
50-52	Quadrat 7
53	Blank
54-56	Quadrat 8
57	Blank
58-60	Quadrat 9
61	Blank
62-64	Quadrat 10
65-80	Blank

*/ Data are given in stem counts, 023, or as a decimal fraction of cover, -0.72.

NOTE: 1. When X is used to indicate less than 0.1 of ground cover, it is punched as 0.05.

2. T is punched as 0.05.

3. New rating system 1-10 starts in 1943 (for AGRSMI); 1-5 starts in 1952.

Mandan Dry Matter Weights Format, 1957-1965

Column	Information
1-2	Year
3	Blank
4-5	Pasture
6-7	Blank
8	C (caged)
9-10	Blank
11	Blank
12-15	Rep 1 of C
16	Blank
17-20	Rep 2 of C
21	Blank
22-25	Rep 3 of C
26	Blank
27-30	Rep 4 of C
31	Blank
32-35	Rep 5 of C
36	Blank
37-40	Rep 6 of C
41-42	Blank
43	G (grazed)
44-45	Blank
46	Blank
47-50	Rep 1 of G
51	Blank

Mandan Dry Matter Weights Format, 1957-1965 (cont.)

Column	Information
52-55	Rep 2 of G
56	Blank
57-60	Rep 3 of G
61	Blank
62-65	Rep 4 of G
66	Blank
67-70	Rep 5 of G
71	Blank
72-75	Rep 6 of G
76-80	Blank

NOTE: 1. Blank columns in reps of 3 digits are filled with zeros in left column.

2. When there are less than 6 reps, the columns are left blank.

3. Data are pounds per acre dry matter.

Miles City Quadrat Data Format, 1932-1957

Column	Information
1	H (Hogback) or L (Lonepine)
2	Pasture letter
3-4	Quadrat number
5-6	Soil number
7	1 (grazed) or 0 (ungrazed)
8-12	Species abbreviation (4 letters and a number when necessary; otherwise blank, e.g., AGSM, AGTR2. If no species name, use SS.)
13-14	Year
15-18	Cover (cm^2/m^2)
19-20	Year
21-24	Cover
25-26	Year
27-30	Cover
31-32	Year
33-36	Cover
37-38	Year
39-42	Cover
43-44	Year
45-48	Cover
49-50	Year
51-54	Cover
55-56	Year
57-60	Cover
61-62	Year

Miles City Quadrat Data Format, 1932-1957 (cont.)

Column	Information
63-66	Cover
67-68	Year
69-72	Cover
73-74	Year
75-78	Cover
79-80	Blank

NOTE: If there are more years of data, a second card is used duplicating columns 1-12.

Nunn Forage Production Format, 1947-1962

Column	Information
1-2	Year
3	Pasture
4-5	Plot number
6	Forage class - 1 or 3 if not divided into two classes
7	Blank
8-11	Weight
12	Blank
13-14	Utilization (%)
15	Blank
16-19	Weight
20	Blank
21-22	Utilization (%)
23	Blank
24	Forage class - 2
25	Blank
26-29	Weight
30	Blank
31-32	Utilization (%)
33	Blank
34-37	Weight
38	Blank
39-40	Utilization (%)
41-80	Blank

NOTE: 1. If zeros are given, they are punched; otherwise left blank.

2. Data are grams per 2 sq. ft dry weight.

Nunn Plant Density Format, 1941-1964

Column	Information
1	Pasture - H for 23E, M for 15E, or L for 23W
2-7	Date - month, day, year
8-10	Species code
11-12	Plot number
13-17	Density
18-19	Plot number
20-24	Density
25-80	Continuation of the above

NOTE: 1. Traces are punched as 0's; otherwise blank.

2. Density in % cover/sq. ft.

Scottsbluff Vegetation Format

Column	Information
1-2	Year
3	Pasture number
4-6	Plot number
7-8	Total ground cover (%)
9-10	Litter cover (%)
11-12	Vegetative cover (%)
13-17	Species code
18-20	Cover (%)
21-25	Species code
26-28	Cover (%)
29-76	Continuation of the above
77-80	Blank

Stavely Cover Format, 1949-1958

Column	Information
1	Field letter
2	F (field) or E (exclosure)
3-7	Plant abbreviation
8-9	Year
10-14	Cover
15-16	Year
17-21	Cover
22-77	Continuation of the above
78-80	Blank

NOTE: Data are % cover in an F5.2 format.

Woodward Forage Inventory Format, 1948-1969

Column	Information
1-2	Pasture number
3	Blank; if seasonal data, use S
4-5	Line number; if only quadrat size is given, use 12 or 4 with an X in column 6.
6	Blank
7	Type of data: 1 (clipped) or 2 (estimated). If both are marked, use 2; if neither are marked, use 2.
8	Blank
9	Grazing: 1 (grazed) or 2 (ungrazed)
10	Blank
11-16	Date - day, month, year
17	Blank
18-19	Plot number
20	Blank
21-22	BOGR weight
23	Blank
24-25	SPCR weight
26	Blank
27-28	ERTR weight
29	Blank
30-31	ANSC weight
32	Blank
33-34	ANHA weight
35	Blank

Woodward Forage Inventory Format (cont.)

Column	Information
36-37	PAVI weight
38	Blank
39-40	SONU weight
41	Blank
42-46	Species code and weight
47	Blank
48-52	Species code and weight
53	Blank
54-58	Species code and weight
59	Blank
60-64	Species code and weight
65	Blank
66-70	Species code and weight
71	Blank
72-76	Species code and weight
77	Blank
78-79	Total other plants
80	Blank

NOTE:
1. If can not read species code, use XXX.
2. T (trace) = 00.
3. If - in total other plants column, leave blank; if 0, use 00.
4. If there are 3 digit weights in columns 21-40 or 78-79, put hundreds in preceding blank column; if there are 3 digit weights in columns 42-76, the third digit falls in the following blank column.
5. For pastures 32A and 32C, use 32 for 32A and 30 for 32C.

Woodward Forage Inventory Format (cont.)

6. For pasture 23C, use 23.

7. Data are grams per 1.92 sq. ft green weight.

Woodward Air Dry Format (%)

Column	Information
1	S (seasonal) or blank (monthly)
2-3	Pasture number: 32a=32, 32c=30, 23c=23
4-9	Date - day, month, year
10-15	Date - day, month, year
16-18	Species code
19-20	Air dry (%): 99=100%
21-23	Species code
24-25	Air dry (%)
26-75	Continuation of the above
76-80	Blank

NOTE: 1. BLU = Bluestems.

2. OTG = Other grasses.

3. OTP = Other plants.

Woodward Plant Cover Format, 1948-1969 */

Column	Information
1	Stocking rate
2	Grazing system
3	Soil type
4-5	Year
6	Strata
7	Subsample
8-9	Transect
10	Slope direction
11-12	Slope percent
13-14	Soil texture
15-17	Cover SCR (%)
18-20	Cover BGR (%)
21-23	Cover AHA (%)
24-26	Cover ASC (%)
27-29	Cover ETR (%)
30-32	Cover PVI (%)
33-35	Cover BCU (%)
36-38	Cover PAR (%)
39-41	Cover PST (%)
42-44	Cover CSC (%)
45-47	Cover BHI (%)
48-50	Cover BDA (%)
51-53	Cover LCO (%)

Woodward Plant Cover Format (cont.)

Column	Information
54-56	Cover other herbs (%)
57-59	Cover perennial grass total (%)
60-62	Cover annual grass total (%)
63-65	Cover perennial forb total (%)
66-68	Cover annual forb total (%)
69-71	Cover AFI (%)
72-74	Cover RTR (%)
75-77	Cover other shrubs (%)
78-80	Cover shrubs total (%)

*/ The three-letter plant codes used in this format match the original data description, rather than the codes found in Appendix III.

C. Abiotic Data

Akron Weather Format

Column	Information
1-6	Year, month, day
7	Blank
8-10	Max temperature
11	Blank
12-14	Min temperature
15	Blank
16-20	Average wind velocity (for example, 09.30)
21	Blank
22-23	Relative humidity: 00 = 100
24	Blank
25-29	Headquarter rain (for example, 01.50)
30	Blank
31-35	South rain (for example, 00.70)
36	Blank
37-38	Form of precipitation
39	Blank
40-41	Form of precipitation
42-80	Blank

Akron Percent Available Soil Water Format*

Column	Information
1-6	Year, month, day
7-8	Pasture number
9	Blank
10-13	Available water (%) at 0-6 inches depth (for example, 02.7)
14	Blank
15-18	Available water (%) at 6-12 inches depth
19	Blank
20-23	Available water (%) at 12-18 inches depth
24	Blank
25-28	Available water (%) at 18-24 inches depth
29	Blank
30-33	Available water (%) at 24-36 inches depth
34	Blank
35-38	Available water (%) at 36-48 inches depth
39	Blank
40-43	Available water (%) at 54-66 inches depth
44-80	Blank

*The apparently missing increment from 48-54 inches is as the data appear on the original data forms.

Hays Temperature Format

Column	Information
1-2	HA (Hays)
3	T (temperature)
4-5	Year
6-7	Month
8-11	Temperature
12-13	Month
14-17	Temperature
18-77	Continuation of the above
78-80	Blank

Hays Precipitation Format

Column	Information
1-2	HA (Hays)
3	P (precipitation)
4-5	Year
6-7	Month
8-11	Precipitation
12-13	Month
14-17	Precipitation
18-77	Continuation of the above
78-80	Blank

Hays Evaporation Format

Column	Information
1-2	HA (Hays)
3	E (evaporation)
4-5	Year
6-7	Month
8-12	Evaporation
13-14	Month
15-19	Evaporation
20-54	Continuation of the above
55-80	Blank

Hays Wind Format

Column	Information
1-2	HA (Hays)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind
12-13	Month
14-17	Wind
18-47	Continuation of the above
48-80	Blank

Mandan Temperature Format, 1914-1970

Column	Information
1-2	MA (Mandan)
3	T (temperature)
4-5	Year
6-7	Month
8-12	Maximum temperature
13-17	Minimum temperature
18-19	Month
20-24	Max
25-29	Min
30-31	Month
32-36	Max
37-41	Min
42-43	Month
44-48	Max
49-53	Min
54-55	Month
56-60	Max
61-65	Min
66-67	Month
68-72	Max
73-77	Min
78-80	Blank

Mandan Temperature Format, 1914-1970 (cont.)

NOTE:
1. 2 cards per year - 6 months on each.
2. For the years 1920-1947 only one temperature is given; it is the mean.
3. For the first half of 1948 only one temperature is given; it is the average.
4. Minus temperatures are preceded by 9's (for example, -7.1 = 99.7.1; -9.3 = 909.3).

Mandan Precipitation Format, 1914-1970

Column	Information
1-2	MA (Mandan)
3	P (precipitation)
4-5	Year
6-7	Month
8-11	Precipitation (for example, 2.43)
12-13	Month
14-17	Precipitation
18-19	Month
20-23	Precipitation
24-25	Month
26-29	Precipitation
30-31	Month
32-35	Precipitation
36-37	Month
38-41	Precipitation
42-43	Month
44-47	Precipitation
48-49	Month
50-53	Precipitation
54-55	Month
56-59	Precipitation
60-61	Month
62-65	Precipitation

Mandan Precipitation Format (cont.)

Column	Information
66-67	Month
68-71	Precipitation
72-73	Month
74-77	Precipitation
78-80	Blank

NOTE: 1. Traces punched as 0.00; missing data left blank.

Mandan Humidity Format, 1919-1938

Column	Information
1-2	MA (Mandan)
3	H (humidity)
4-5	Year
6-7	Month
8-15	Humidity (for example, 78 66 50)
16-17	Month
18-25	Humidity
26-27	Month
28-35	Humidity
36-37	Month
38-45	Humidity
46-47	Month
48-55	Humidity
56-57	Month
58-65	Humidity
66-70	Blank

NOTE: 1. 2 cards per year - 6 months on each.

Mandan Evaporation Format, 1939-1969

Column	Information
1-2	MA (Mandan)
3	E (evaporation)
4-5	Year
6-7	Month (Apr)
8-11	Evaporation
12-13	Month (May)
14-17	Evaporation
18-19	Month (Jun)
20-23	Evaporation
24-25	Month (Jul)
26-29	Evaporation
30-31	Month (Aug)
32-35	Evaporation
36-37	Month (Sep)
38-41	Evaporation
42-80	Blank

Mandan Wind Format, 1919-1938

Column	Information
1-2	MA (Mandan)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind
12-13	Month
14-17	Wind
18-19	Month
20-23	Wind
24-25	Month
26-29	Wind
30-77	Continuation of the above
78-80	Blank

Mandan Wind Format, 1939-1969

Column	Information
1-2	MA (Mandan)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind
12-13	Month
14-17	Wind
18-19	Month
20-23	Wind
24-25	Month
26-29	Wind
30-31	Month
32-35	Wind
36-37	Month
38-41	Wind
42-43	Month
44-47	Wind
48-80	Blank

NOTE: 1. 9999 mean data are included in following total.

Mandan Percent Soil Water Format, 1917-1954

Column	Information
1-2	Year
3	Blank
4-6	Pasture size
7	Blank
8	Type of pasture: G (grazed) or I (isolation transect)
9	Blank
10-11	Day
12-13	Month
14	Blank
15-18	Depth 1
19	Blank
20-23	Depth 2
24	Blank
25-28	Depth 3
29	Blank
30-33	Depth 4
34	Blank
35-38	Depth 5
39	Blank
40-43	Depth 6
44-80	Blank

NOTE:
1. All empty columns programmed for digits are filled with zeros except for depths which were not recorded; these are left blank.
2. There are no data for 1923.
3. 1943 was not punched; there are only readings on the north and south of a snow fence - no dates or type or size of pasture.

Manyberries and High River Temperature Format

Column	Information
1-2	HR (High River) or MB (Manyberries)
3	T (temperature)
4-5	Year
6-7	Month
8-12	Maximum temperature
13-17	Minimum temperature
18-19	Month
20-24	Max
25-29	Min
30-77	Continuation of the above
78-80	Blank

NOTE: 1. 2 cards in one year.

Manyberries and Claresholm Total Precipitation Format

Column	Information
1-2	CL (Claresholm) or MB (Manyberries)
3	P (precipitation)
4-5	Year
6-7	Month
8-11	Precipitation
12-13	Month
14-17	Precipitation
18-77	Continuation of the above
78-80	Blank

Lethbridge Wind Mean Speed Format*/

Column	Information
1-2	LE (Lethbridge)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind
12-13	Month
14-17	Wind
18-77	Continuation of the above
78-80	Blank

*/ These data are used for Manyberries and Stavely.

Lethbridge Wind Greatest in 24 Hours Format*/

Column	Information
1-2	LE (Lethbridge)
3	W (wind)
4-5	Year
6-7	Month
8-9	Wind
10-11	Day
12-13	Month
14-15	Wind
16-17	Day
18-77	Continuation of the above
78-80	Blank

*/ These data are used for Manyberries and Stavely.

Lethbridge Total Hours of Wind Format*/

Column	Information
1-2	LE (Lethbridge)
3	W (wind)
4-5	Year
6-7	Month
8-10	Wind
11-12	Month
13-15	Wind
16-65	Continuation of the above
66-80	Blank

*/ These data are used for Manyberries and Stavely.

Miles City Precipitation Format, 1930-1971

Column	Information
1-2	MC (Miles City)
3	P (precipitation)
4-5	Year
6-7	Month
8-9	Day
10-13	Precipitation
14-15	Day
16-19	Precipitation
20-79	Continuation of the above
80	Blank

NOTE: 1. Traces were not punched.

Miles City Humidity Format, 1960-1971, 1930-1948

Column	Information
1-2	MC (Miles City)
3	H (humidity)
4-5	Year
6-7	Month
8-18	Humidity (for example, for 1960-1971, 87 81 68 69; for 1930-1948, 88 74 84)
19-20	Month
21-31	Humidity
32-70	Continuation of the above
71-80	Blank

NOTE: 1. 3 cards per year - Jan-May on first, June-Oct on second, and Nov-Dec on third.

Miles City Wind Format, 1930-1971

Column	Information
1-2	MC (Miles City)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind
12-13	Month
14-17	Wind
18-77	Continuation of the above
78-80	Blank

Miles City Temperature Format, 1930-1971

Column	Information
1-2	MC (Miles City)
3	T (temperature)
4-5	Year
6-7	Month
8-9	Day
10-12	Maximum temperature
13-15	Minimum temperature
16-17	Day
18-20	Max
21-23	Min
24-79	Continuation of the above
80	Blank

NOTE: 1. Minus temperatures are preceded by 9's.

Nunn Temperature Format

Column	Information
1-2	Station abbreviation; CP (CPER, Central Plains Experimental Range) or CH (Cheyenne)
3	T (temperature)
4-5	Year
6-7	Month 1
8-9	Maximum temperature average F2.0
10-11	Minimum temperature F2.0
12-13	Month 2
14-77	Continuation of the above
78-80	Blank

NOTE: 1. If only one temperature is given for a month, it is the mean.

Nunn Precipitation Format*/

Column	Information
1-2	CP (CPER)
3	P (precipitation)
4-5	Year
6-7	Month
8-11	Precipitation (for example, 1.02)
12-13	Month
14-17	Precipitation
18-77	Continuation of the above
78-80	Blank

*/ Data are from CPER.

Archer Evaporation Format, 1949-1965*/

Column	Information
1-2	AR (Archer)
3	E (evaporation)
4-5	Year
6-7	Month
8-12	Evaporation (for example, 03.90)
13-14	Month
15-19	Evaporation
20-54	Continuation of the above
55-80	Blank

*/ These data are used for Nunn.

Archer Humidity Format, 1938-1948*/

Column	Information
1-2	AR (Archer)
3	H (humidity)
4-5	Year
6-7	Month
8-18	Humidity (for example, 66 53 63 47)
19-20	Month
21-31	Humidity
32-70	Continuation of the above
71-80	Blank

*/ These data are used for Nunn.

NOTE: 1. 3 cards per year.

Archer Wind Format*/

Column	Information
1938-1948	
1-2	AR (Archer)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind (for example, 16.0 mph)
12-13	Month
14-17	Wind
18-77	Continuation of the above
78-80	Blank
1949-1965	
1-2	AR (Archer)
3	W (wind)
4-5	Year
6-7	Month
8-12	Wind (for example, 2601 miles per month)
13-14	Month
15-19	Wind
20-47	Continuation of the above
48-80	Blank

*/ These data are used for Nunn.

NOTE: 1. 2 cards per year.

Scottsbluff Temperature Format

Column	Information
1-2	MI (Mitchell)
3	T (temperature)
4-5	Year
6-7	Month
8-17	Max, min temperature (for example, 032.5007.3)
18-19	Month
20-29	Max, min temperature
30-77	Continuation of the above
78-80	Blank

NOTE: 1. 2 cards per year.

Scottsbluff Precipitation Format

Column	Information
1-2	MI (Mitchell)
3	P (precipitation)
4-5	Year
6-7	Month
8-11	Precipitation (for example, 1.02)
12-13	Month
14-17	Precipitation
18-77	Continuation of the above
78-80	Blank

Scottsbluff Evaporation Format

Column	Information
1-2	MI (Mitchell)
3	E (evaporation)
4-5	Year
6-7	Month
8-12	Evaporation (for example, 07.22)
13-14	Month
15-19	Evaporation
18-54	Continuation of the above
55-80	Blank

Scottsbluff Wind Format

Column	Information
1-2	MI (Mitchell)
3	W (wind)
4-5	Year
6-7	Month
8-11	Wind (for example, 5540)
12-13	Month
14-17	Wind
18-47	Continuation of the above
48-80	Blank

Stavely Weather Format

NOTE: Stavely used High River temperature, Claresholm precipitation, and Lethbridge wind.

Woodward Temperature Format, 1939-1971

Column	Information
1	WO (Woodward)
2	T (temperature)
3-4	Year
5-6	Month
7-8	Day
9-11	Maximum temperature
12-14	Minimum temperature
15-16	Day
17-19	Max
20-22	Min
23-78	Continuation of the above
79-80	Blank

NOTE: Minus temperatures are preceded by 9's.

Woodward Precipitation Format, 1939-1971

Column	Information
1-2	WO (Woodward)
3-4	Year
5-6	Month
7-8	Day
9-12	Precipitation
13-14	Day
15-18	Precipitation
19-78	Continuation of the above
79-80	Blank

Woodward Evaporation Format, 1941-1970

Column	Information
1	WO (Woodward)
2	E (evaporation)
3-4	Year
5-6	Month
7-8	Day
9-11	Evaporation
12-13	Day
14-16	Evaporation
17-76	Continuation of the above
77-80	Blank

NOTE: 1. If no data, leave blank.

2. If data on several days are summed up on one following data, use 0.99 for those days.

Woodward Wind Format, 1940-1970

Column	Information
1	WO (Woodward)
2	W (wind)
3-4	Year
5-6	Month
7-8	Day
9-11	Wind
12-13	Day
14-16	Wind
15-76	Continuation of the above
77-80	Blank

NOTE: 1. If no data given, leave blank.

2. If data from several days are summed up on one date, use 999 on those days.

APPENDIX III

MASTER SPECIES PLANT LIST

Field descriptor key

Column 1: Scientific name

Column 2: Plant number (this list only)

Column 3: Season type

P - perennial
B - biennial
A - annual

C - cool season
W - warm season

Column 4: Plant type

GR - grass

GL - grass-like

SH - shrub

FO - forb

HH - half-shrub

Column 5: Abbreviations used (alphabetized by abbreviation)

1	2	3	4	5
ACTAEA ARGUTA	001	FO	ACAR	
ACONITUM COLUMBIANUM	002	FO	ACCO	
ACHILLEA LANULOSA	003	PWFO	ACLA	
AGROSTIS ALBA	004	PCGR	AGAL	
AGROPYRON DASYSTACHYUM	005	PCGR	AGDA	
AGROPYRON CRISTATUM	006	PCGR	AGCR	
AGROPYRON ELONGATUM	007	PCGR	AGEL	
AGROSTIS EXARATA	008	GR	AGEX	
AGOSERIS GLAUCA	009	FO	AGGL	
AGROPYRON INTERMEDIUM	010	PCGR	AGIN	
AGROPYRON INERME	011	PCGR	AGIN2	
AGOSERIS LACINIATA	012	FO	AGLA	
AGOSERIS	013	FO	AGOS	
AGROPYRON PUNGENS	014	PCGR	AGPU	
AGROPYRON REPENS	015	PCGR	AGRE	
AGROPYRON RIPARIUM	016	PCGR	AGRI	
AGROPYRON	017	PCGR	AGROP	
AGROSTIS	018	GR	AGROS	
AGROPYRON SMITHII	019	PCGR	AGSM	
AGROPYRON SPICATUM	020	PCGR	AGSP	
AGROPYRON SUBSECUNDUM	021	PCGR	AGSU	
AGROPYRON TENERUM	022	PCGR	AGTR	
AGROPYRON TRACHYCAULUM	023	PCGR	AGTR2	
AGROPYRON TRICHOPHORUM	024	PCGR	AGTR3	
AGASTACHE URTICIFOLIA	025	FO	AGUR	
ALLIONIA DIFFUSIA	026	FO	ALDI	
ALLIONIA LINEARIS	027	FO	ALLI	
ALLIONIA	028	FO	ALLIO	
ALLIUM	029	FO	ALLIO	
ALLIUM NUTTALLI	030	PCFO	ALNU	
ALLIUM TEXTILE	031	PCFO	ALTE	
AMELANCHER ALNIFOLIA	032	SH	AMAL	
AMARANTHUS	033	FO	AMARA	
AMBROSIA	034	FO	AMBRO	
AMBROSIA MEDIA	035	FO	AMME	
AMBROSIA PSILOSTACHYA	036	PWFO	AMPS	
AMARANTHUS RETROFLEX	037	FO	AMRE	
ANTENNARIA APRICA	038	FO	ANAP	
ANTENNARIA DIMORPHA	039	P FO	ANDI	
ANDROSACE	040	FO	ANDRO	
ANGELICA	041	FO	ANGEL	
ANDROPOGON HALLII	042	PWGR	ANHA	
ANDROSACE OCCIDENTALIS	043	FO	ANOC	
ANTENNARIA ROSEA	044	FO	ANRO	
ANDROPOGON SCOPARIUS	045	PWGR	ANSC	
ANDROSACE SEPTENTRIONALIS	046	FO	ANSE	
ANTENNARIA SPI.	047	FO	ANSP	
ANTENNARIA	048	FO	ANTEN	
APLOPAPPUS	049	FO	APLOP	
APLOPAPPUS SPINULOSA	050	FO	APSP	
AQUILEGIA COERULEA	051	FO	AQCO	
ARABIS	052	FO	ARABI	
ARTEMISIA CANA	053	SH	ARCA	
ARENARIA CONGESTA	054	FO	ARCO	
ARABIS DIVARCARPA	055	FO	ARDI	
ARTEMISIA DRACUNCULOIDES	056	PWHH	ARDR	
ARABIS DRUMMONDI	057	FO	ARDR2	

1	2	3	4	5
ARENARIA	058	FO		ARENA
ARTEMISIA FILIFOLIA	059	PW	SH	ARFI
ARTEMISIA FRIGIDA	060	PW	HH	ARFR
ARGEMONE	061	FO		ARGEM
ARGEMONE INTERMEDIA	062	FO		ARIN
ARISTIDA	063	GR		ARIST
ARABIS LEMMONII	064	FO		ARLE
ARISTIDA LONGISETA	065	PW	GR	ARLO
ARTEMISIA LUDOVICIANA	066	PW	HH	ARLU
ARNICA	067	FO		ARNIC
ARTEMISIA NOVA	068	SH		ARNO
ARABIS NUTTALLII	069	FO		ARNU
ARISTIDA PURPUREA	070	GR		ARPU
ARTEMISIA	071	SH		ARTEM
ARTEMISIA TRIDENTATA	072	SH		ARTR
ARCTOSTAPHYLOS UVA-URSI	073	HH		ARUV
ASTRAGALUS BISULCATUS	074	PC	FO	ASBI
ASTER CANESCENS	075	B	FO	ASCA
ASTER CHILENSIS	076		FO	ASCH
ASTER CONCENS	077		FO	ASCO
ASTRAGALUS DASYGLOTTIS	078		FO	ASDA
ASTRAGALUS DIVERSIFOLIUS	079		FO	ASDI
ASTER ERICOIDES	080		FO	ASER
ASTER FOLIACEUS	081		FO	ASFO
ASTRAGALUS GILENSIS	082		FO	ASGI
ASTRAGALUS GRACILIS	083	PC	FO	ASGR
ASCLEPIAS HALLII	084		FO	ASHA
ASTRAGALUS JUNCEUS	085		FO	ASJU
ASTRAGALUS MICIOLOBUS	086		FO	ASMI
ASTRAGALUS MISSOURIENSIS	087	PC	FO	ASMI2
ASTRAGALUS MISER	088		FO	ASMI3
ASTRAGALUS MOLLISSIMUS	089	PC	FO	ASMO
ASTER MULTIFLORUS	090		FO	ASMU
ASTRAGALUS PECTINATUS	091	PC	FO	ASPE
ASTRAGALUS PURSHII	092		FO	ASPU
ASTRAGALUS SERICOLEUCUS	093	PC	FO	ASSE
ASTRAGALUS SPATULATUS	094		FO	ASSP
ASTRAGALUS STRIATUS	095	PC	FO	ASST
ASTER TANACTIFOLIA	096	PC	FO	ASTA
ASTER	097		FO	ASTER
ASTRAGALUS	098		FO	ASTRA
ASTRAGALUS UTAHENSIS	099		FO	ASUT
ASTER VISCOSA	100		FO	ASVI
ASTRAGALUS VISCUSA	101		FO	ASVI2
ATRIPLEX ARGENTEA	102	AW	FO	ATAR
ATRIPLEX CANESCENS	103	PW	SH	ATCA
ATRIPLEX CONFERTIFOLIA	104		SH	ATCO
ATRIPLEX NUTTALLII	105	PW	SH	ATNU
ATRIPLEX POWELLII	106		FO	ATPO
ATRIPLEX	107		SH	ATRIP
BALSAMORHIZA HISPIDULA	108		FO	BAHI
BAHIA	109		FO	BAHIA
BALSAMORHIZA	110		FO	BALSA
BALSAMORHIZA MACROPHYLLA	111		FO	BAMA
BAHIA OPPOSITIFOLIA	112		FO	BAOP
BALSAMORHIZA SAGITTATA	113		FO	BASA
BOUTELOUA CURTIPENDULA	114	PW	GR	BOCU

1	2	3	4	5
BOUTELOUA GRACILIS	115	P	WGR	BOGR
BOUTELOUA HIRSUTA	116	P	WGR	BOHI
BROMUS ANOMALUS	117		GR	BRAN
BROMUS CARINATUS	118		GR	BRCA
BROMUS CILATUS	119		GR	BRCI
BROMUS INERMIS	120	PC	GR	BRIN
BROMUS JAPONIUS	121	AC	GR	BRJA
BROMUS MARGINATUS	122		GR	BRMA
BRODIAEA	123		FO	BROD
BROMUS	124		GR	BROMU
BROMUS POLYANTHUS	125		GR	BRPO
BROMUS SECALINUS	126		GR	BRSE
BUCHLOE DACHTYLOIDES	128	P	WGR	BUDA
BROMUS TECTOREM	127	AC	GR	BRTE
CASTILLEJA CHROMOSA	129		FO	CACH
CAREX ELEOCHARIS	130	PC	GL	CAEL
CAREX FILIFOLIA	131	PC	GL	CAFI
CAREX GEYERI	132		GL	CAGE
CALAMOVILFA GIGANTEA	133		GR	CAGI
CAREX HELIOPHILA	134	PC	GL	CAHE
CAREX HOODII	135		GL	CAHO
CALAMAGROSTIS	136		GR	CALAM
CASTILLEJA LINARIAEFOLIA	137		FO	CALI
CALAMOVILFA LONGIFOLIA	138	P	WGR	CALO
CALOCHORTUS	139		FO	CALOC
CALTHA	140		FO	CALTH
CAMELINA	141		FO	CAMEL
CAMELINA MICROCARPA	142		FO	CAMI
CALOCHORTUS NUTTALLII	143		FO	CANU
CAMPANULA PETIOLATA	144		FO	CAPE
CAREX PENNSYLVANICA	145	PC	GL	CAPE2
CAREX	146		GL	CAREX
CAMPANULA ROTUNDIFOLIA	147		FO	CARO
CASTILLEJA SEPTENTRIONALIS	148		FO	CASE
CAREX STENOPHYLLA	149		GL	CAST
CASTILLEJA	150		FO	CAST1
CEANOTHUS FENDLERI	151		SH	CEFE
CERCOCARPUS MONTANUS	152		SH	CEMO
CENTUNCULUS	153		FO	CENTU
CENCHRUS PAUCIFLORUS	154		GR	CEPA
CERASTIUM	155		FO	CERAS
CHENOPODIUM ALBUM	156	AW	FO	CHAL
CHENOPODIUM	157		FO	CHENO
CHAENACTIS HUMILIS	158		FO	CHHU
CHRYSOTHAMNUS LANCEOLATUS	159		SH	CHLA
CHENOPODIUM LEPTOPHYLLUM	160	AW	FO	CHLE
CHRYSOTHAMNUS NAUSEOSUS	161	PW	SH	CHNA
CHENOPODIUM PRATERICOLA	162		FO	CHPR
CHRYSOTHAMNUS	163		SH	CHRYS
CHORISPORA TENELLA	164		FO	CHTE
CHLORIS VERTICILLATA	165		GR	CHVE
CHRYSOPSIS VILLOSA	166		FO	CHVI
CHRYSOTHAMNUS VISCIDIFLORUS	167		SH	CHVI2
CIRSIUM	168		FO	CIRSI
CIRSIUM UNDULATUM	169	PW	FO	CIUN
CLAYTONIA	170		FO	CLAYT

1	2	3	4	5
CLAYTONIA LANCEOLATA	171		FO	CLLA
CLEOME SERRULATA	172	PW	FO	CLSE
CONYZA CANADENSIS	173	AW	FO	COCA
COGSWELLIA FOENICULACEA	174		FO	COFO
COGSWELLIA	175		FO	COGSW
COLLOMIA LINEARIS	176		FO	COLI
COLLINSIA	177		FO	COLL1
COLLOMIA	178		FO	COLLO
COGSWELLIA ORIENTALE	179		FO	COOR
COLLINSIA PARVIFLORA	180		FO	COPA
CORDYLANTHUS	181		FO	CORDY
COLLOMIA TENELLA	182		FO	COTE
COMANDRA UMBELLATA	183	PC	FO	COUM
CREPIS ACUMINATA	184		FO	CRAC
CRYPTANTHA CIRCUMCISSA	185		FO	CRCI
CRYPTANTHA CRASSISEPALS	186	PW	FO	CRCR
CREPIS	187		FO	CREP1
CRYPTANTHA FENDLERI	188	PW	FO	CRFE
CRYPTANTHA JAMESII	189	PW	FO	CRJA
CRYPTANTHA MINIMA	190	AW	FO	CRMI
CREPIS MODOCENSIS	191		FO	CRMO
CROTON	192		FO	CROTO
CROTON TEXENSIS	193		FO	CRTE
CRYPTANTHA THRYSIFLORA	194		FO	CRTH
CRUCIFERAE	195		FO	CRUC1
CRYPTANTHA	196		FO	CRYPT
CUSCUTA	197		FO	CUSCU
CYMOPTERUS ACAULIS	198	PC	FO	CYAC
CYMOPTERUS DUCHENENSIS	199		FO	CYDU
CYMOPTERUS	200		FO	CYMOP
CYNOGLOSSIUM OFFICINALE	201		FO	CYOF
CYPERUS SCHWENITZII	202		GL	CYSC
DANTHONIA CALIFORNICA	203		GR	DACA
DACTYLIS GLOMERATA	204		GR	DAGL
DANTHONIA PARRYI	205		GR	DAPA
DELPHINIUM BARBEYI	206		FO	DEBA
DESCHAMPSIA CAESPITOSA	207	PW	GR	DECA
DELPHINIUM	208		FO	DELPH
DELPHINIUM NELSONI	209		FO	DENE
DESCURIANIA RICHARDSONII	210		FO	DERI
DICROPHYLLUM MARGINATUM	211		FO	DIMA
DISTICHLIS SPICATA	212		GR	DISP
DISTICHLIS STRICTA	213	PW	GR	DIST
DONDIA INTERMEDIA	214		HH	DOIN
DRABA	215		FO	DRABA
DRABA NEMOROSA	216		FO	DRNE
DRABA NUTTALLII	217		FO	DRNU
DYSSODIA PAPPOSA	218	AW	FO	DYPA
ECHINACEA ANGUSTIFOLIA	219		FO	ECAN
ECHINACEA	220		FO	ECHIN
ELYMUS CANADENSIS	221	PC	GR	ELCA
ELYMUS GLAUCUS	222		GR	ELGL
ELYMUS VIRGINICUS	223		GR	ELVI
EPILOBIUM ANGUSTIFOLIUM	224	PW	FO	EPAN
EPILOBIUM	225		FO	EPILO

1	2	3	4	5
EPILOBIUM PANICULATUM	226	FO	EPPA	
EQUISETUM	227	FO	EQUI	
ERIOGONUM ANNUUM	228	FO	ERAN	
ERYSIMUM ASPERUM	229BC	FO	ERAS	
ERIGERON BELLIDIASTRUM	230A	FO	ERBE	
ERIGERON CANADENSIS	231	FO	ERCA	
ERAGROSTIS CILIANENSIS	232	GR	ERCI	
ERAGROSTIS CURTIPEDICELLATA	233	GR	ERCU	
ERAGROSTIS CURVULA	234	GR	ERCUC	
ERIGERON EATONI	235	FO	EREA	
ERIOGONUM EFFUSION	236PW	HH	EREF	
ERIGERON FLAGELLARIS	237	FO	ERFL	
ERIOGONUM HERACLEOIDES	238	HH	ERHE	
ERIGERON	239	FO	ERIGE	
ERIOGONUM	240	HH	ERIO	
ERIOGONUM MICROTHECIUM	241PW	HH	ERMI	
ERIGERON PUMULUS	242P	FO	ERPU	
ERIOGONUM RACEMOSUM	243PW	FO	ERRA	
ERAGROSTIS SECUNDIFLORA	244	GR	ERSE	
ERAGROSTIS SESSILISPICA	245	GR	ERSEC	
ERAGROSTIS SPECTABILIS	246	GR	ERSP	
ERIGERON SPECIOSUS	247	FO	ERSPC	
ERIGERON SPATULATUS	248	FO	ERSPS	
ERIGERON SUBTRINERVIS	249	FO	ERSU	
ERAGROSTIS TRICHODES	250	GR	ERTR	
ERIOGONUM UMBELLATUM	251	HH	ERUM	
ERYSIMUM WHEELERI	252	FO	ERWH	
EUPHORBIA GEYERI	253	FO	EUGE	
EUPHORBIA GLYPTOSPERMA	254AW	FO	EUGL	
EUROTIA LANATA	255PW	SH	EULA	
EUPHORBIA MARGINATA	256	FO	EUMA	
EUPHORBIA MISSURICA	257AW	FO	EUMI	
EUPHORBIA PECTINATA	258	FO	EUPE	
EUPHORBIA	259	FO	EUPH	
EUPHORBIA SERPENS	260	FO	EUSE	
EUPHORBIA STRICTA	261A	FO	EUST	
EVOLVULUS NUTALLIANUS	262PW	FO	EVNU	
EVOLVULUS	263	FO	EVOLV	
EVOLVULUS PILOSUS	264	FO	EVPI	
EVAX PROLIFERA	265	FO	EVPR	
FESTUCA IDAHOENSIS	266	GR	FEID	
FESTUCA OCTOFLORA	267	GR	FEOC	
FESTUCA OVINA	268	GR	FEOV	
FESTUCA SCABRELLA	269	GR	FESC	
FESTUCA	270	GR	FEST	
FRAGARIA	271	FO	FRAG	
FRANSERIA	272	FO	FRAN	
FRAGARIA BACTEATA	273	FO	FRBA	
FRANSERIA DISCOLOR	274PW	FO	FRDI	
FRASERA SPECIOSA	275	FO	FRSP	
GAILLARDIA ARISTATA	276	FO	GAAR	
GALIUM BIFOLIUM	277	FO	GABI	
GALIUM BOREALE	278	FO	GABO	
GAURA COCCINEA	279PW	FO	GACO	
GAYOPHYTUM RAMOSISSIMUM	280	FO	GARA	
GENTIANA AFFINEA	281	FO	GEAF	

1	2	3	4	5
GENTIANA AMARELLA	282		FO	GEAM
GERANIUM FREMONTI	283		FO	GEFR
GERANIUM	284		FO	GERAN
GERANIUM RICHARDSONII	285		FO	GERI
GEUM TRIFLORUM	286		FO	GETR
GILIA LAXIFLORA	287		FO	GILA
GNAPHALIUM	288		FO	GNAPH
GRINDELIA SQUARROSA	289	BWF	O	GRSQ
GUTIERREZIA SARATHRAE	290	PWHH		GUSA
GUTIERREZIA	291		HH	GUTIE
HACKELIA FLORIBUNDA	292		FO	HAFL
HELIANTHUS ANNUUS	293	AWF	O	HEAN
HEDEOMA CAMPORUM	294		FO	HECA
HEDEOMA HISPIDA	295		FO	HEHI
HELENIUM HOOPSII	296		FO	HEHO
HERACLEUM LANATUM	297		FO	HELA
HELIANTHUS	298		FO	HELIA
HELIANTHUS PETIOLARIS	299	AWF	O	HEPE
HELIANTHELLA UNIFLORA	300		FO	HEUN
HIERACIUM CYNOGLOSSOIDES	301		FO	HICY
HORDEUM JUBATUM	302	PCG	R	HOJU
HOLODISCUS MICROPHYLLUS	303		SH	HOMI
HORDEUM PUSILLUM	304		GR	HOPU
HORDEUM	305		GR	HORDE
HYMENOXYS ACAULIS	306		FO	HYAC
HYDROPHYLLUM CAPITATUM	307		FO	HYCA
HYMENOPAPPUS FILIFOLIA	308	P FO		HYFI
HYMENOXYS FILIFOLIUS	309		FO	HYFIL
HYMENOXYS	310		FO	HYMEN
HYMENOPAPPUS TENUIFOLIUS	311	P FO		HYTE
ILIAMNA RIVULARIS	312		FO	ILRI
IPOMOPSIS AGGREGATA	313		FO	IPAG
IPOMOEA LEPTOPHYLLA	314		FO	IPLE
IPOMOPSIS LINEARIS	315		FO	IPLI
IPOMOEA	316		FO	IPOMO
IPOMOPSIS	317		FO	IPOMP
IRIS MISSOURIENSIS	318		FO	IRMI
IVA AXILLARIS	319	P FO		IVAX
JUNCUS BALTICUS	320		GL	JUBA
JUNIPERUS COMMUNIS	321		SH	JUCO
JUNCUS	322		GL	JUNCU
KOCHIA AMERICANA	323		FO	KOAM
KOELERIA CRISTATA	324		GR	KOCR
KOCHIA SCOPARIA	325	AWF	O	KOSC
LACTUCA	326		FO	LACTU
LAPPULA FLORIBUNDA	327		FO	LAFL
LATHYRUS ICANUS	328		FO	LAIC
LATHYRUS LANZWERTII	329		FO	LALA
LATHYRUS LEUCANTHUS	330		FO	LALE
LAPPULA OCCIDENTALIS	331		FO	LAOC
LATHYRUS PAUCIFLORUS	332		FO	LAPA
LATHYRUS POLYMORPHUS	333	P FO		LAPO
LAPPULA REDOWSKI	336	ACF	O	LARE
LEPIDIUM DENSIFLORUM	342	ACF	O	LEDE
LAPPULA	334		FO	LAPPU
LACINARIA PUNCTATA	335		FO	LAPU

1	2	3	4	5
LACTUCA SCARIOLA	337	A	W	FO LASC
LATHYRUS	338			FO LATHY
LEPIDIUM APELATUM	339			FO LEAP
LESQUERELLA ARGENTIA	340			FO LEAR
LEPTOLOMA COGNATUM	341			GR LECO
LESQUERELLA LUDOVICIANA	343	P	C	FO LELU
LEUCOCRINUM MONTANUM	344	P	C	FO LEMO
LEPIDIUM	345			FO LEPID
LEPTODACTYLON PUNGENS	346			SH LEPU
LEWISIA PYGMACAEA	347			FO LEPY
LESQUERELLA	348			FO LESQU
LESQUERELLA SUBUMBELLATA	349			FO LESU
LEONTODON TARAXACUM	350			FO LETA
LEUCOCRINUM	351			FO LEUCO
LEPIDIUM VIRGINICUM	352			FO LEVI
LINUM ARISTATUM	353	A	C	FO LIAR
LIATRUS	354			FO LIATR
LITHOPHRAGMA BULBIFERA	355			FO LIBU
LITHOCARPUS DENSIFLORUS	356			SH LIDE
LINUM FILIFOLIA	357			FO LIFI
LIGUSTICUM FILICINUM	358			FO LIFIC
LIGUSTICUM	359			FO LIGUS
LINANTHUS HARKNESSII	360			FO LIHA
LITHOSPERMUM INCISUM	361	P	C	FO LIIN
LINUM LEWISII	362			FO LILE
LITHOSPERMUM LINEARIFOLIUM	363			FO LILI
LINUM	364			FO LINUM
LITHOPHRAGMA PARVIFLORA	365			FO LIPA
LIGUSTICUM PORTERI	366			FO LIPO
LIATRUS PUNCTATUS	367			FO LIPU
LINUM RIGIDUM	368			FO LIRI
LITHOSPERMUM RUDERALE	369			FO LIRU
LINUM SULCATUM	370			FO LISU
LITHOSPERMUM	371			FO LITHO
LOMATIUM DISSECTUM	372			FO LODI
LOMATIUM ORIENTALE	373	P	C	FO LOOR
LOMATIUM	374			FO LOMA
LOMATIUM TRITERNATUM	375			FO LOTR
LUPINUS ARGENTEUS	376			FO LUAR
LUPINUS CAEPITOSUS	377			FO LUCA
LUPINUS CAUDATUS	378			FO LUCAC
LUPINUS PARVIFLORUS	379			FO LUPA
LUPINUS	380			FO LUPIN
LUPINUS PLATTENSIS	381			FO LUPL
LUPINUS PUSILLUS	382	A	C	FO LUPU
LUPINUS SERICEUS	383			FO LUSE
LYGODESMIA JUNCEA	384	P	W	FO LYJU
LYGODESMIA ROSTRATA	385			FO LYRO
MADIA GLOMERATA	386			FO MAGL
MAMILLARIA	387			CA MAMIL
MAHONIA REPENS	388			HH MARE
MARSILEA	389			FO MARSI
MACHAERANTHERA TAENCITIFOLIUS	390			FO MATE
MAMILLARIA VIVIPARA	391			CA MAVI
MELILOTUS ALBA	392			FO MEAL
MELICA BULBOSA	393			GR MEBU
MERTENSIA BREVISTYLA	394			FO MEBR
MENTZELIA DECAPETALA	395			FO MEDE

1	2	3	4	5
MEDICAGO	396		FO	MEDIC
MERTENSIA LEONARDI	397		FO	MELE
MIRABILIS LINEARIS	398		FO	MILI
MELICA	399		GR	MELIC
MELILOTUS	400		FO	MELIL
MEDICAGO LUPULINA	401		FO	MELU
MELILOTUS OFFICINALIS	402		FO	MEOF
MERTENSIA	403		FO	MERTE
MEDICAGO SATIVA	404		FO	MESA
MELICA SPECTABILIS	405		GR	MESP
MICROSTERIS	406		FO	MICRO
MICROSTERIS GRACILIS	407		FO	MIGR
MONOLEPSIS	408		FO	MONOL
MICROSTERIS NUTTALLII	409		FO	MINU
MONOLEPSIS NUTTALLIANA	410		FO	MONU
MONARDA PECTINATA	411		FO	MOPE
MUHLENBERGIA RICHARDSONIS	412		GR	MURI
MUNROA SQUARROSA	413	AW	GR	MUSQ
MUHLENBERGIA TORREYI	414	PW	GR	MUTO
MUSINEON TRACHYSPERMUM	415		FO	MUTR
MYOSURUS APETALUS	416		FO	MYAP
NEMOPHILLIA BREVIFLORA	417		FO	NEBR
NEOMAMILLIA MISSOURIENSIS	418		FO	NEMI
NEOMAMILLIA	419		FO	NEOMA
NYCTELEA AM.	420		FO	NYAM
OENOTHERA ALBICAULIS	421	AC	FO	OEAL
OENOTHERA ANDINA	422		FO	OEAN
OENOTHERA CORONUPIFOLIA	423	PW	FO	OECO
OENOTHERA	424		FO	OENOT
OENOTHERA NUTTALLII	425		FO	OENU
OENOTHERA PALLIDA	426		FO	OEPA
OENOTHERA SERRULATA	427		FO	OESE
OPUNTIA FRAGILIS	428		CA	OPFR
OPUNTIA HUMIFUSA	429	PC	CA	OPHU
OPUNTIA POLYACANTHA	430	PC	CA	OPPO
OPUNTIA	431		CA	OPUNT
ORYZOPSIS HENDERSONI	432		GR	ORHE
ORYZOPSIS HYMENOIDES	433	PC	GR	ORHY
OROGENIA LINEARIFOLIA	434		FO	ORLI
ORTHOCARPUS LUTEUS	435		FO	ORLU
ORTHOCARPUS TOLMIEI	436		FO	ORTO
OSMORHIZA	437		FO	OSMOR
OSMORHIZA OBTUSA	438		FO	OSOB
OSMORHIZA OCCIDENTALIS	439		FO	OSOC
OXYTROPIS LAMBERTII	440	PC	FO	OXLA
OXYTROPIS SAXIMONTANA	441		FO	OXSA
OXYTROPIS SERICEA	442	PC	FO	OXSE
OXYTROPIS	443		FO	OXYTR
PANICUM CAPILLARE	444	AW	GR	PACA
PACHISTIMA MYRSINITES	445		HH	PAMY
PANICUM SCRIBNERIANUM	446		GR	PASC
PASPALUM STRAMINEUM	447		GR	PAST
PANICUM VIRGATUM	448		GR	PAVI
PENSTEMON ALBIDUS	449	PC	FO	PEAL

1	2	3	4	5
PENSTEMON ANGUSTIFOLIUS	450	PC	FO	PEAN
PETALOSTEMON CANDIDUS	451	PW	FO	PECA
PENSTEMON CAEPITOSUS	452		FO	PECAC
PENSTEMON HUMILIS	453		FO	PEHU
PENSTEMON	454		FO	PENS
PETALOSTEMON PURPUREUS	455		FO	PEPU
PENSTEMON RYDBERGII	456		FO	PERY
PENSTEMON STRICTUS	457		FO	PEST
PETALOSTEMON	458		FO	PETAL
PENSTEMON WHIPPLEANUS	459		FO	PEWH
PHLOX ANDICOLA	460		FO	PHAN
PHYSARIA AUSTRALIS	461		FO	PHAU
PHACELIA HETEROPHYLLA	462		FO	PHHE
PHLOX HOODII	463	PC	FO	PHHO
PHLOX LONGIFOLIA	464		FO	PHLO
PHLOX	465		FO	PHLOX
PHILADELPHUS MICROPHYLLUS	466		SH	PHMI
PHLOX MULTIFLORA	467		FO	PHMU
PHLEUM PRATENSIS	468		GR	PHPR
PHACELIA SERICEA	469		FO	PHSE
PHYSALIS	470		FO	PHYSA
PLANTAGO ARISTATA	471		FO	PLAR
PLANTAGO ELONGATA	472		FO	PLEL
PLANTAGO GR.	473		FO	PLGR
PLANTAGO PURSHII	474	AC	FO	PLPU
POA	475		GR	POA
POLYGALA ALBA	476		FO	POAL
POA AMPLA	477		GR	POAM
POA ARACHNIFERA	478		GR	POAR
POLYGONUM AVICULARE	479A		FO	POAV
POLYGONUM BISTORTOIDES	480		FO	POBI
POLYGONUM BUXIFORME	481		FO	POBU
POA CANBYI	482		GR	POCA
POA COMPRESSA	483		GR	POCO
POA CURTA	484		GR	POCU
POLYGONUM DOUGLASII	485		FO	PODO
POLYGONUM ERECTUM	486		FO	POER
POA FENDLERIANA	487		GR	POFE
POLEMONIUM FOLIOSISSIUM	488		FO	POFO
POTENTILLA FRUTICOSA	489		SH	POFR
POTENTILLA GLANDULOSA	490		FO	POGL
POTENTILLA GRACILIS	491		FO	POGR
POA LONGILIGULA	492		GR	POLO
POLYGONUM	493		FO	POLYG
POA NEVADENSIS	494		GR	PONE
PORTULACA OLEROCEA	495A		FO	POOL
POA PRATENSIS	496		GR	POPR
PORTULACA	497		FO	PORTU
POA SECUNDA	498		GR	POSE
POTENTILLA	499		FO	POTEN
POPULUS TREMULOIDES	500		SH	POTR
PRUNUS ANGUSTIFOLIA	501		SH	PRAN
PRUNUS MELANOCARPA	502		SH	PRME
PSORALEA ARGOPHYLLA	503		FO	PSAR
PSORALEA ESCULENTA	504		FO	PSES
PSORALEA LANCEOLATA	505	PW	FO	PSLA

1	2	3	4	5
PSORALEA	506		FO	PSORA
PSORALEA TENUIFLORA	507	P	WFO	PSTE
PURSHIA TRIDENTATA	508		SH	PUTR
RATIBIDA COLUMNARIS	509	P	WFO	RACO
RANUNCULUS CYMBALARIA	510	P	CFO	RACY
RANUNCULUS JOVIS	511		FO	RAJO
RANUNCULUS	512		FO	RANUN
RANUNCULUS PEDATIFIDUS	513		FO	RAPE
RADICULA SINUATA	514		FO	RASI
REDFIELDIA FLEXUOSA	515		GR	REFL
RHUS TRILOBATA	516		SH	RHTR
RIBES	517		SH	RIBES
RORIPPA OBTUSA	518		FO	ROOB
ROSA	519		SH	ROSA
ROSA WOODSII	520	P	SH	ROWO
RUMEX CRISPUS	521		FO	RUCR
RUMEX	522		FO	RUMEX
RUDBECKIA OCCIDENTALIS	523		FO	RUOC
RUBUS PARVIFLORUS	524		SH	RUPA
RUMEX VENOSUS	525	P	CFO	RUVE
SALSOLA KALI	526	A	WFO	SAKA
SALIX	527		SH	SALIX
SALSOLA	528		FO	SALSO
SALSOLA PESTIFER	529		FO	SAPE
SAMBUCUS RACEMOSA MICROBOTRYS	530		SH	SARAM
SARCOBATUS VERMICULATUS	531		SH	SAVE
SCUTELLARIA BRITTONI	532	P	WFO	SCBR
SCHEDONNARDUS	533		GR	SCHED
SCIRPUS	534		GL	SCIRP
SCROPHULARIA LANCEOLATA	535		FO	SCLA
SCHEDONNARDUS PANICULATUS	536	P	WGR	SCPA
SENECIO AREMOPHILUS	537		FO	SEAR
SENECIO CROCATUS	538	P	FO	SECR
SEDUM	539		FO	SEDUM
SENECIO INTEGERRIMUS	540		FO	SEIN
SENECIO MUTABILIS	541	P	WFO	SEMU
SENECIO	542		FO	SENEC
SENECIO RIDDELLII	543		FO	SERI
SENECIO SERRA	544		FO	SESE
SEDUM STENOPETALUM	545		FO	SEST
SENECIO TRIDENTICULATUS	546	P	FO	SETR
SENECIO UINTAHENSIS	547		FO	SEUI
SISYMBRIUM ALTISSIMUM	548	A	CFO	SIAL
SITANION HYSTRIX	549	P	CGR	SIHY
SILENE	550		FO	SILEN
SILENE MONTANA	551		FO	SIMO
SIDALCEA NEOMEXICANA	552		FO	SINE
SISYMBRIUM	553		FO	SISYM
SMILACINA	554		FO	SMILA
SMILACINA RACEMOSA	555		FO	SMRA
SMILACINA STELLATA	556		FO	SMST
SOPHIA INCISA	557		FO	SOIN
SOLANUM	558		FO	SOLAN
SOLIDAGO	559		FO	SOLID
SOLIDAGO MISSOURIENSIS	560		FO	SOMI

1	2	3	4	5
SOLIDAGO NANA	561		FO	SONA
SORGHASTRUM NUTANS	562		GR	SONU
SOLIDAGO PETRADORIA	563		FO	SOPE
SOLIDAGO PULCHERRIMA	564		FO	SOPU
SOLIDAGO RIGIDA	565		FO	SORI
SOLANUM ROSTRATUM	566		FO	SORO
SORBUS SCOPULINA	567		SH	SOSC
SOPHORA SERICEA	568		FO	SOSE
SPOROBOLUS AIROIDES	569	PWGR		SPAI
SPOROBOLUS ASPER	570		GR	SPAS
SPHAERALCEA COCCINEA	571		FO	SPCO
SPOROBOLUS CRYPTANDRUS	572	PWGR		SPCR
SPHAERALCEA	573		FO	SPHAE
SPOROBOLUS NEGLECTUS	574	AWGR		SPNE
SPOROBOLUS	575		GR	SPORO
SPOROBOLUS SOBOLIFERA	576		GR	SPSO
STANLEYA ARCUATA	577		FO	STAR
STIPA COMATA	578	PCGR		STCO
STIPA COLUMBIANA	579	PCGR		STCO2
STIPA	580		GR	STIPA
STELLARIA JAMESIANA	581		FO	STJA
STIPA LETTERMANI	582		GR	STLE
STIPA SPARTEA	583		GR	STSP
STIPA VIRIDULA	584	PCGR		STVI
SYMPHORICARPOS	585		SH	SYMPH
SYMPHORICARPOS OCCIDENTALIS	586		SH	SYOC
SYMPHORICARPOS OREOPHILUS	587		SH	SYOR
TARAXICUM OFFICINALE	588	PCFO		TAOF
TALINUM PARVIFLORUM	589	PWFO		TAPA
TARAXICUM	590		FO	TARAX
TETRADYMIA CANESCENS	591		SH	TECA
THELESPERMA AMBIGUA	592		FO	THAM
THLASPI ARVENSE	593		FO	THAR
THELESPERMA	594		FO	THELE
THALICTRUM FENDLERI	595		FO	THFE
THELESPERMA GRACILE	596		FO	THGR
THELESPERMA INTERMEDIA	597		FO	THIN
THELESPERMA MEGAPOTAMICUM	598	PWFO		THME
THERMOPSIS MONTANA	599		FO	THMO
THELESPERMA TRIFIDUM	600		FO	THTR
TITHYMALUS ARKANSANUS	601		FO	TIAR
TITHYMALUS	602		FO	TITHY
TOWNSENDIA EXSCAPA	603		FO	TOEX
TOWNSENDIA GRANDIFLORA	604	PCFO		TOGR
TOWNSENDIA	605		FO	TOWNS
TRADESCANTIA	606		FO	TRADE
TRAGOPOGON	607		FO	TRAGO
TRADESCANTIA BRACTEATA	608		FO	TRBR
TRAGOPOGON DUBIUS	609	BCFO		TRDU
TRIFOLIUM GYMNOCARPON	610		FO	TRGY
TRIFOLIUM	611		FO	TRIFO
TRADESCANTIA OCCIDENTALIS	612	PCFO		TROC
TRAGOPOGON PRATENSIS	613	BCFO		TRPR
TRIPLASIS PURPUREA	614		GR	TRPU
TRISETUM SPICATUM	615		GR	TRSP

1	2	3	4	5
UMBELLIFERAE	616		FO	UMBEL
URTICA GRACILIS	617		FO	URGR
VALERIANA EDULIS	618		FO	VAED
VALERIANA OCCIDENTALIS	619		FO	VAOC
VERBENA BRACTEOSA	620	AW	FO	VEBR
VIOLA ADUNCA	621		FO	VIAD
VICIA AMERICANA	622	PC	FO	VIAM
VICIA AMERICANA OREGANA	623		FO	VIAMO
VICIA AMERICANA TRUNCATA	624		FO	VIAMT
VIOLA LINGUAEFOLIA	625		FO	VILI
VIGUIERA MULTIFLORA	626		FO	VIMU
VIOLA NUTTALLII	627	PC	FO	VINU
VIOLA	628		FO	VIOLA
YUCCA GLAUCA	629		HH	YUGL
ZYGADENUS	630		FO	ZYGAD
ZYGADENUS GRAMINEUS	631	PC	FO	ZYGR
ZYGADENUS PANICULATUS	632		FO	ZYPA
ANNUALS	633			ANNUA
ANNUAL GRASSES	634		GR	ANGR
BARE SOIL	635			BARES
LICHEN	636			LIC
LITTER	637			LITTE
MOSS	638			MOSS
MUSTARD	639		FO	MUS
OTHER FORBS AND GRASSES	640			OTFG
OTHER FORBS AND SHRUBS	641			FFFF
OTHER GRASSES	642		GR	GGGG
OTHER SHRUBS	643			OTSH
TOTAL ANNUAL FORBS	644			TANNF
TOTAL ANNUAL GRASS	645			TANNG
TOTAL PERENNIAL FORBS	646			TPERF
TOTAL PERENNIAL GRASS	647			TPERG
TOTAL SHRUBS	648			TOSH
UNKNOWN	649			XXXX
UNKNOWN ANNUAL FORB	650		FO	AFORB
UNKNOWN FORB	651			WEED
UNKNOWN GRASS	652		GR	GRASS
UNKNOWN PERINNIAL FORB	653		FO	PFORB