

Technical Report No. 39
COMPREHENSIVE NETWORK SITE DESCRIPTION
COTTONWOOD

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GRASSLANDS BIOME
U. S. International Biological Program

I. *Site Name:* *Cottonwood* - owned and controlled by South Dakota
Agricultural Experiment Station

II. *Location and Elevation*

The Cottonwood Range Field Station is located in west central South Dakota on Highway 14 75 miles east of Rapid City, two miles east of Cottonwood and 11 miles west of Philip. The headquarters is located one-half mile south of Highway 14. The access road is marked by a sign. A sod air strip with a wind sock suitable for use by light planes is located adjacent to the headquarters. An outline map of the location of the station in the state is attached (Fig. 1).

III. *Size*

The area of the Cottonwood Range Field Station is 2,640 acres. The legal description is Sections 16, 20, 21, West Half (W 1/2), 22, Northwest Quarter (NW 1/4) 28, Southeast Quarter and South Half of Southwest Quarter Section 17 in Township 1 South, Range 19 East, Black Hills Meridian, Jackson County, South Dakota. A map of the station showing the various pastures is attached (Fig. 2). A summer intensity of grazing study has been conducted since 1942. The location of the six summer pastures are indicated in Fig. 2. Pastures 1 and 4 on the photo have been grazed heavily, pastures 2 and 5 moderately and pastures 3 and 6 lightly since the beginning of the study. The seasons of use and stocking rates are shown in Table 1. Since the intensity of grazing has been a summer treatment, there are six pastures indicated in Fig. 2 which have been grazed in the winter only. The pasture south

of the beef sheds west of the road, the section on which the farmstead is located and the reserve pasture on the east have received varying use for the management of a breeding herd and for animals which were not on experiment. Four small (two acre) watersheds were installed on north facing slopes on pastures 4, 5, and 6 in 1962 and runoff data have been collected on these by personnel of the Agricultural Research Service from 1963 to the present. Various range improvement plots are located in the north portion of the winter pastures.

IV. Type

The station lies in the central portion of the mixed prairie. In high range condition the vegetation is dominated by midgrasses (especially *Agropyron smithii* and *Stipa viridula*) with an understory of shortgrasses (especially *Bouteloua gracilis* and *Euchloe dactyloides*). Several forbs are conspicuous during the early part of the year. Shrubs are of minor importance except in the wetter drainage ways where *Symphoricarpos occidentalis* and *Rosa* spp. may be important. Patchiness of the vegetation is primarily related to soil heterogeneity and microrelief. Gilgai microrelief occurs commonly on the gentle slopes. Under prolonged overgrazing the midgrasses are reduced and the shortgrasses increased in abundance forming a shortgrass sod. A list of the major plant species which have been observed is attached (Table 2). There has been no official record kept of the species of birds, mammals, reptiles, amphibians and invertebrates on the station. However, a list of the Herpetofauna expected in this area is shown in Table 3. The Badlands National Monument is located southwest of

the station about 20 miles. A list of the mammals of the Badlands National Monument is shown in Table 4. The birds that have been observed in the Badlands National Monument are shown in Table 5 and those that are expected to occur in this area of the state are shown in Table 6. The important insects expected to occur in the area of the station are shown in Table 7.

V. *Climate*

A part of Climatological Summary No. 14, Cottonwood, South Dakota, which summarizes the climatology from 1910 through 1967 is attached in the appendix. Precipitation data for 1968 and 1969 have been added in pen. The weather station from which these data were obtained is located at the headquarters of the station at an elevation of 2,414 ft. The topography is gently rolling and there are no orographic features or bodies of water nearby that would affect the local climate.

VI. *Soils, Topography, Exposure*

The geomorphology of the station and surrounding area is complex. The landscape features have developed over a long period of time, probably beginning to develop during the late Tertiary. Erosion has shaped the landscape into rather gentle, long sloping hills with a total relief of about 200 ft. The higher hills appear to be flat-topped and have probably been protected from erosion by capping of more resistant strata of sandier limestone or sandstone. The bedrock appears to be the Pierre, Foxhills and Chadron formations. The latter two have been removed from all but the higher ridge tops. Soil textures are predominantly silty clay but range from heavy clays to fine aeolian sands. An unpublished

soil survey made by Dr. E. M. White, Soil Survey Division, Plant Science Department, in 1956 is available through the Site Coordinator. The first line of the soil legend is the mapping unit which is described in the descriptive material in the appendix following the photos. The second line of the legend is the average percent slope of the mapping unit. The third line refers to the geological erosion as indicated by relative amounts of organic matter. The soils on the Cottonwood Range Field Station have not been correlated and the survey has not been published.

VII. *Physical facilities*

- a. Work space. The superintendent, Joe Herndon, and his family live at the station. Temporary office facilities are available in a single room of the Community Building. A field laboratory is being prepared this winter from an old building and will have facilities for washing soil cores, drying and weighing of biomass samples. There are no chemical laboratory facilities at the present time. The telephone number is Area Code 605, 386-2205.
- b. Equipment. A large Dispatch forced air drying oven, a 31 ft³ deep freeze, balances and a low power binocular microscope are available.
- c. Lodging. A four-room bunkhouse is available with kitchen and bathroom facilities and six bunk beds. There is no provision for trailer hook-up although there is camping space. Water can usually be made available by a hose and electricity would be available with an extension cord for short periods of time. The bunkhouse could be used for showers.

VIII. *Previous Studies and Continuing Long-term Projects*

The principal ecological study at the Cottonwood Range Field Station has been the long-term intensity of grazing study. This study is being continued with certain modifications. The grazing season will be continued from early May to about November 1. Yearling steers will be used for the foreseeable future. However, mature cows may be used in the future. The criterion of grazing management will be to secure maximum livestock production while maintaining minimum amounts of change in the existing vegetation. A Xerox copy of the project outline is placed in the appendix. Aerial photographic coverage is available from the Eastern Laboratory, Aerial Photographic Division, ASCS-USDA, 45 South French Broad Avenue, Asheville, North Carolina, 28801.

IX. *Publications*

Pertinent publications relating to the long-term intensity of grazing study are listed below.

Johnson, L. E., L. R. Albee, R. O. Smith, and A. L. Moxon. 1951.

Cows, calves and grass: Effects of grazing intensities on beef cow and calf production and on mixed prairie vegetation on western South Dakota ranges. South Dakota Agr. Exp. Sta. Bull. 412.

Lewis, J. K., G. M. Van Dyne, L. R. Albee, and F. W. Whetzal. 1956.

Intensity of grazing--its effect on livestock and forage production. South Dakota Agr. Exp. Sta. Bull. 459.

Kamstra, L. D., J. K. Lewis, D. Schentzel, and L. B. Embry. 1963.

The *in vitro* digestibility and carbohydrate composition of western wheatgrass. J. Anim. Sci. 22:851.

Lewis, J. K., F. R. Gartner, and J. Nesvold. 1964. The effect of winter supplementation and intensity of grazing on steer gains on native range. Amer. Soc. Anim. Sci., Western Sect., Proc., 15:49.

Lewis, J. K., F. R. Gartner, L. B. Embry, and J. Nesvold. 1964. The effect of level of winter supplementation and intensity of summer grazing on steer gains on native range. South Dakota Agr. Exp. Sta., A. S. Series 64-10.

Lewis, J. K., J. Nesvold, and B. Beer. 1966. The effect of level of winter supplementation and intensity of summer grazing on steer gains on native range. South Dakota Agr. Exp. Sta., A. S. Series 66-9.

Enevoldsen, M. E., J. K. Lewis, and L. D. Kamstra. 1966. Studies in the growth and development of western wheatgrass. South Dakota Agr. Exp. Sta., A. S. Series 66-10.

Kamstra, L. D., J. K. Lewis, D. Schentzel, and R. Elderkin. 1966. Neutral sugars and other components of western wheatgrass. South Dakota Agr. Exp. Sta., A. S. Series 66-3.

Enevoldsen, M. E. 1967. The effect of range site and range condition on the growth and development of western wheatgrass. M.S. Thesis, South Dakota State University.

Enevoldsen, M. E. and J. K. Lewis. 1967. Effect of range site and range condition on the height and location of the growing point in vegetative shoots of western wheatgrass. South Dakota Agr. Exp. Sta., A. S. Series 67-11.

- Lewis, J. K. and B. Beer. 1968. Effect of level of winter supplementation of steer calves grazing winter range. South Dakota Agr. Exp. Sta., A. S. Series 68-18.
- Kamstra, L. D., J. K. Lewis, and M. Wurster. 1968. Characterization of range grasses at Cottonwood Range Field Station. South Dakota Agr. Exp. Sta., A. S. Series 68-2.
- Lewis, J. K., J. Nesvold, and B. Beer. 1968. The effect of intensity of summer grazing on steer gains on native ranges. South Dakota Agr. Exp. Sta., A. S. Series 68-26.
- Spuhler, W., W. F. Lytle, and D. Moe. 1968. Climatological Summary of Cottonwood, South Dakota. South Dakota Agr. Exp. Sta. Climatological Summary No. 14. Climatology of the U.S. 20-39. 5 p.
- Kamstra, L. D., D. L. Schentzel, J. K. Lewis, and R. Elderkin. 1968. The carbohydrate composition of western wheatgrass hemicellulose at various growth stages as determined by leaf number and cutting date. Accepted for publication by J. Range Manage.
- Wurster, M. J., J. K. Lewis, L. D. Kamstra, and W. K. Bjorklund. 1968. Studies on the chemical composition and *in vitro* digestibility of western wheatgrass. South Dakota Agr. Exp. Sta., A. S. Series 68-15.

Table C. Intensity of grazing study: Stocking rate study 1942 through 1969.

Grazing Rate Rep	Year	Kind of Stock	A.U. Equiv.	On	Grazing Season		Kind of Stocking	Heavy			Moderate			Light		Cover- all Mean	ppt. veg. yr.
					Off	Days		1	2	$\bar{x}$	1	2	$\bar{x}$	1	2	$\bar{x}$	
	1942	Cows	1.0	May 12	Dec. 4	207	Set	.70	.70	.70	.42	.42	.42	.31	.31	.43	21.74
	1943	"	"	May 1	Dec. 1	215	"	.73	.73	.73	.44	.44	.44	.32	.32	.50	11.98
	1944	"	"	May 3	Nov. 30	212	"	.72	.72	.72	.43	.43	.43	.31	.31	.49	11.95
	1945	"	"	May 2	Dec. 3	216	"	.73	.73	.73	.44	.44	.44	.32	.32	.50	12.07
	1946	"	"	May 2	Dec. 5	218	"	.74	.74	.74	.44	.44	.44	.32	.32	.50	13.83
	5 yr. av.	"	"			213.6	"	.72	.72	.72	.44	.44	.44	.32	.32	.49	
	1947	"	"	May 2	Dec. 3	216	"	.91	.91	.91	.55	.55	.55	.40	.40	.62	16.14
	1948	"	"	April 30	Nov. 30	215	"	.91	.91	.91	.55	.55	.55	.40	.40	.62	16.70
	1949	"	"	May 2	Variable	Variable	"	.70	.64	.67	.46	.51	.48	.40	.40	.52	13.71
	1950	"	"	Variable	Sept. 16	Variable	"	.47	.47	.47	.27	.31	.29	.25	.25	.34	12.36
	4 yr. av.	"	"				"	.75	.73	.74	.46	.48	.47	.36	.36	.52	
	2 yr. av.	"	"				"	.73	.73	.73	.44	.45	.45	.34	.34	.50	
	1951	"	"	May 17	Dec. 1	198	P & T	.69	.62	.66	.41	.42	.42	.30	.30	.46	18.26
	1952	"	"	May 6	Dec. 4	201	"	.62	.57	.60	.37	.37	.37	.27	.27	.41	21.01
	1953	2 yr. olds	.85				"	.65	.62	.64	.39	.39	.39	.28	.28	.44	17.43
	1954	Cows	1.0	May 14	Nov. 30	200	"	.59	.56	.58	.36	.36	.36	.26	.26	.40	11.73
	1955	"	"	May 14	Nov. 26	196	"	.67	.57	.62	.37	.40	.38	.29	.29	.43	12.19
	1956	"	"	May 9	Nov. 26	201	"	.72	.65	.68	.41	.43	.42	.32	.32	.47	17.62
	1957	"	"	May 10	Nov. 30	204	"	.76	.63	.70	.38	.47	.42	.34	.34	.49	22.02
	1958	"	"	May 16	Nov. 22	190	"	.64	.64	.64	.39	.44	.42	.32	.32	.46	18.72
	1959	"	"	May 13	Sept. 17	127	"	.42	.42	.42	.25	.28	.26	.19	.20	.29	11.83
	6 yr. av.	"	"				"	.63	.58	.61	.36	.40	.38	.29	.29	.43	
	1960	Yrlg. Steers	.70	May 13	Nov. 9	180	"	.68	.62	.65	.37	.39	.38	.32	.32	.45	18.27
	1961	"	"	May 16	Nov. 14	182	"	.63	.56	.60	.34	.35	.34	.25	.27	.40	12.47
	1962	"	"	May 23	Nov. 6	167	"	.56	.49	.52	.31	.34	.32	.25	.25	.36	15.80
	1963	"	"	May 21	Nov. 5	168	"	.59	.36	.48	.28	.30	.29	.22	.22	.33	17.07
	1964	"	"	May 22	Nov. 5	167	"	.52	.47	.50	.29	.33	.31	.22	.22	.34	16.66
	1965	"	"	May 24	Nov. 7	167	"	.52	.46	.49	.28	.30	.29	.21	.21	.33	14.90
	1966	"	"	May 24	Nov. 5	165	"	.43	.43	.43	.26	.26	.26	.19	.19	.29	13.82
	7 yr. av.	"	"				"	.56	.48	.52	.30	.32	.31	.24	.24	.36	
	25 yr. av.							.65	.61	.63	.38	.40	.39	.29	.29	.44	
								1.54	1.64	1.59	2.63	2.50	2.56	3.45	3.45	2.27	
								9.24	9.84	9.54	15.78	15.00	15.36	20.70	20.70	13.62	
	1967	"	"	5/18	Nov. 1	167		.57	.47	.50	.28	.30	.29	.27	.27	.27	22.20
	1968		Complete Rest														17.08
	1969	Yrlg. heifers	.70	5/13	Nov. 1	172		.64	.50	.57	.30	.31	.30	.27	.27	.27	17.66

Table 2. Plants identified in the experimental pastures at the Range Field Station, Cottonwood, tentatively classified by their observed response on clayey range site to grazing by cattle (from Lewis et al., 1956).

Common Name; Scientific Name	Grazing Reaction
GRASSES AND GRASSLIKE PLANTS	
Perennials	
Barley, foxtail; <i>Hordeum jubatum</i> L.	Invader
Bluegrass, sandberg; <i>Poa secunda</i> Presl.	Increaser
Bluegrass, waxy; <i>Poa glaucifolia</i> Scribn. and Williams	Decreaser
Bluestem, big; <i>Andropogon gerardi</i> Vitman	Decreaser
Bluestem, little; <i>Andropogon scoparius</i> Michx.	Decreaser
Buffalograss; <i>Buchloe dactyloides</i> (Nutt.) Engelm.	Increaser
Dropseed, tall; <i>Sporobolus asper</i> (Michx.) Kunth	Decreaser
Dropseed, sand; <i>Sporobolus cryptandrus</i> (Torr.) A. Gray	Decreaser
Grama, blue; <i>Bouteloua gracilis</i> (H. B. K.) Lag. ex Steud	Increaser
Grama, hairy; <i>Bouteloua hirsuta</i> Lag.	Increaser
Grama, sideoats; <i>Bouteloua curtipendula</i> (Michx.) Torr	Decreaser
Junegrass, prairie; <i>Koeleria cristata</i> (L.) Pers.	Decreaser
Muhly, sandhill; <i>Muhlenbergia pungens</i> Thurb.	Decreaser
Muhly, stonyhills; <i>Muhlenbergia cuspidata</i> (Torr.) Rydb.	Decreaser
Needleandthread; <i>Stipa comata</i> Trin. and Rupr.	Decreaser
Needlegrass, green; <i>Stipa viridula</i> Trin.	Decreaser
Saltgrass, inland; <i>Distichlis stricta</i> (Torr.) Rydb.	Increaser
Sandreed, prairie; <i>Calamovilfa longifolia</i> (Hook.) Scribn.	Decreaser
Sedge, fescue; <i>Carex brevior</i> (Dewey) Mack.	Decreaser
Sedge, needleleaf; <i>Carex eleocharis</i> Bailey	Increaser
Sedge, plump-seed; <i>Carex gravida</i> Bailey	Decreaser
Sedge, threadleaf; <i>Carex filifolia</i> Nutt.	Decreaser
Switchgrass; <i>Panicum virgatum</i> L.	Decreaser
Threeawn, red; <i>Aristida longiseta</i> Steud.	Increaser
Wheatgrass, slender; <i>Agropyron trachycatulum</i> (Link) Malte	Decreaser
Wheatgrass, western; <i>Agropyron smithi</i> Rydb.	Increaser
Wildrye, Canada; <i>Elymus canadensis</i> L.	Decreaser
Annuals	
Barley, little; <i>Hordeum pusillum</i> Nutt.	Invader
Barnyardgrass; <i>Echinochloa crusgalli</i> (L.) Beauv.	Invader
Brome, cheatgrass; <i>Bromus tectorum</i> L.	Invader
Brome, Japanese; <i>Bromus japonicus</i> Thunb.	Invader
Dropseed, puffsheath; <i>Sporobolus neglectus</i> Nash.	Invader
Fescue, sixweeks; <i>Festuca octoflora</i> Walt.	Invader
Foxtail, water; <i>Alopecurus geniculatus</i> L.	Invader
Stinkgrass; <i>Eragrostis cilianensis</i> (All.) Lutati	Invader
Tumblegrass; <i>Schedonnardus paniculatus</i> (Nutt.) Trel.	Invader
Witchgrass, common; <i>Panicum capillare</i> L.	Invader

Table 2. (Continued)

Common Name; Scientific Name	Grazing Reaction
FORBS	
Perennials	
Agoseris, pale; <i>Agoseris glauca</i> (Nutt.) Greene	Decreaser
Aster, heath; <i>Aster ericoides</i> L.	Increaser
Bahia, plains; <i>Bahia oppositifolia</i> (Nutt.) A. Gray	Uncertain
Bindweed, field; <i>Convolvulus arvensis</i> L.	Invader
Bladder-pod; <i>Lesquerella versicolor</i> Greene	Increaser
Boneset, false; <i>Kuhnia eupatorioides</i> L.	Decreaser
Cinquefoil; <i>Potentilla</i> spp.	Increaser
Comandra, common; <i>Comandra umbrellata</i> (L.) Nutt.	Uncertain
Dalea, bigtop; <i>Dalea emicandra</i> Nutt.	Decreaser
Dalea, silktop; <i>Dalea aurea</i> Nutt.	Decreaser
Dandelion, common; <i>Taraxacum officinale</i> Weber	Invader
Deathcamas, meadow; <i>Zigadenus venenosus</i> S. Wats.	Increaser
Deathcamas, Nuttall; <i>Zigadenus nuttalli</i> (Gray) S. Wats.	Increaser
Dock, curly; <i>Rumex crispus</i> L.	Invader
Dock, Mexican; <i>Rumex mexicanus</i> Meissn.	Invader
Dock, tall; <i>Rumex altissimus</i> Wood	Invader
Dogbane, hemp; <i>Apocynum cannabinum</i> L.	Increaser
Echinacea, blacksapson; <i>Echinacea angustifolia</i> DC.	Decreaser
Fleabane, hoary; <i>Erigeron canus</i> A. Gray	Increaser
Four-o'clock, narrow leaved; <i>Mirabilis linearis</i> (Pursh.) Heimerl	Decreaser
Gaura, scarlet; <i>Gaura coccinea</i> Nutt.	Increaser
Gayfeather, dotted; <i>Liatris punctata</i> Hook.	Decreaser
Geranium, Carolina; <i>Geranium carolinianum</i> L.	Decreaser
Globemallow, scarlet; <i>Sphaeralcea coccinea</i> (Pursh.) Rydb.	Increaser
Goldaster, hairy; <i>Chrysopsis villosa</i> (Pursh.) Nutt., ex DC.	Decreaser
Goldenrod, threenerve; <i>Solidago sparsiflora</i> A. Gray	Increaser
Goldenweed, ironplant; <i>Haplopappus spinulosus</i> (Pursh.) DC.	Decreaser
Gromwell, yellow; <i>Lithospermum incisum</i> Lehm.	Decreaser
Hymenopappus, fineleaf; <i>Hymenopappus filifolius</i> Hook	Decreaser
Larkspur, plains; <i>Delphinium virescens</i> Nutt.	Decreaser
Licorice, American; <i>Glycyrrhiza lepidota</i> (Nutt.) Pursh.	Increaser
Lettuce, chicory; <i>Lactuca pulchella</i> (Pursh.) DC.	Decreaser
Lomatium, yellowflowered; <i>Lomatium foeniculaceum</i> (Nutt.) Coult. and Rose	Increaser
Lomatium, whiteflowered; <i>Lomatium orientale</i> Coult. and Rose	Increaser
Mariposa, segolily; <i>Calochortus nuttalli</i> Torr.	Decreaser
Milkweed, green; <i>Asclepias viridiflora</i> Raf.	Decreaser
Milkweed, plains; <i>Asclepias pumila</i> (A. Gray) Vail	Decreaser
Milkvetch, groundplum; <i>Astragalus crassicaarpus</i> Nutt.	Decreaser
Milkvetch, Missouri; <i>Astragalus missouriensis</i> Nutt.	Increaser
Milkvetch, threeleaf; <i>Astragalus triphyllus</i> Pursh.	Decreaser
Onion, textile; <i>Allium textile</i>	Decreaser
Parsley, wild; <i>Musineon divaricatum</i> (Pursh.) Coult. and Rose	Increaser
Penstemon, pale; <i>Penstemon pallidus</i> Small.	Decreaser
Penstemon, slender; <i>Penstemon gracilis</i> Nutt.	Decreaser

Table 2. (Continued)

Common Name; Scientific Name	Grazing Reaction
FORBS (Continued)	
Perennials (Continued)	
Penstemon, white; <i>Penstemon albidus</i> Nutt.	Decreaser
Phlox, plains; <i>Phlox andicola</i> (Britton) E. Nelson	Increaser
Polygala, white; <i>Polygala alba</i> Nutt.	Decreaser
Prairieclover, purple; <i>Petalostemon purpureum</i> (Vent.) Rydb.	Decreaser
Prairieclover, slender white; <i>Petalostemon occidentale</i> (Gray) Fernald	Decreaser
Prairieconeflower, upright; <i>Ratibida columnifera</i> (Nutt.) Wootton and Standley	Increaser
Pussytoes, rockymountain; <i>Antennaria aprica</i> Greene	Increaser
Sagewort, cudweed; <i>Artemisia ludoviciana</i> Nutt. var. <i>gnaphalodes</i> (Nutt.) T & G.	Increaser
Sagewort, fringed; <i>Artemisia frigida</i> Willd.	Increaser
Scurfpea, common breadroot; <i>Psoralea esculenta</i> Pursh.	Decreaser
Scurfpea, silverleaf; <i>Psoralea argophylla</i> Pursh.	Increaser
Scurfpea, slimflower; <i>Psoralea tenuiflora</i> Pursh.	Increaser
Scurfpea, tallbread; <i>Psoralea cuspidata</i> Pursh.	Decreaser
Sensitivebriar, catclaw; <i>Schrankia nuttalli</i> DC.	Decreaser
Skeletonplant, rush; <i>Lygodesmia juncea</i> (Pursh.) D. Don.	Increaser
Snakeweed, broom; <i>Gutierrezia sarothrae</i> (Pursh.) Britton and Rusby	Invader
Soapweed, small; <i>Yucca glauca</i> Nutt.	Decreaser
Spiderwort, bracted; <i>Tradescantia bracteata</i> Small	Decreaser
Starlily, common; <i>Leucocrinum montanum</i> Nutt.	Decreaser
Violet, Nuttall; <i>Viola nuttalli</i> Pursh.	Increaser
Vetch, American; <i>Vicia americana</i> Muhl.	Decreaser
Verbena, bigbract; <i>Verbena bracteata</i> Lag. and Rodr.	Invader
Yarrow, common; <i>Achillea millefolium</i> L.	Increaser
Yellowcress, spreading; <i>Rorippa sinuata</i> (Nutt.) Hitchc.	Increaser
Biennials	
Cryptantha, Bradbury's; <i>Cryptantha bradburiana</i> Payson	Invader
Erysimum, plains; <i>Erysimum asperum</i> (Nutt.) DC.	Invader
Gumweed, curlycup; <i>Grindelia squarrosa</i> (Pursh.) Dunal	Invader
Salsify, meadow; <i>Tragopogon pratensis</i> L.	Invader
Salsify, vegetable-oyster; <i>Tragopogon porrifolius</i> L.	Invader
Stickseed, American; <i>Hackelia americana</i> (L.) I. M. Johnston	Invader
Thistle, bull; <i>Cirsium vulgare</i> (Savi) Tenore	Invader
Annuals	
Amaranth, redroot; <i>Amaranthus retroflexus</i> L.	Invader
Cocklebur, oriental; <i>Xanthium orientale</i> L.	Invader
Collomia, slenderleaf; <i>Collomia linearis</i> Nutt.	Invader
Deervetch, spanishclover; <i>Lotus americanus</i> (Nutt.) Bisch.	Invader
Draba, creeping; <i>Draba reptans</i> (Lam.) Fern.	Invader
Ellisia, waterleaf; <i>Ellisia nyctelea</i> L.	Invader
Euphorbia, netted-seed; <i>Euphorbia dicyosperma</i> Fisch. and Mey.	Invader

Table 2. (Continued)

Common Name; Scientific Name	Grazing Reaction
FORBS (Continued)	
Annuals (Continued)	
Euphorbia, ridgeseed; <i>Euphorbia glyptosperma</i> Engelm.	Invader
Euphorbia, snow-on-the-mountain; <i>Euphorbia martinata</i> Pursh.	Invader
Falseflax, bigseed; <i>Camelina sativa</i> (L.) Crantz	Invader
Falsepennyroyal, American; <i>Hedeoma pulegioides</i> (L.) Pers.	Invader
Falsepennyroyal, rough; <i>Hedeoma hispida</i> Pursh.	Invader
Flax, grooved; <i>Linum sulcatum</i> Riddell	Invader
Fleabane, annual; <i>Erigeron annuus</i> (L.) Pers.	Invader
Fleabane, horseweed; <i>Erigeron canadensis</i> L.	Invader
Fleabane, daisy; <i>Erigeron strigosus</i> Muhl. ex Wild.	Invader
Goosefoot, lambsquarters; <i>Chenopodium album</i> L.	Invader
Goosefoot, slimleaf; <i>Chenopodium leptophyllum</i> Nutt.	Invader
Indianwheat, spiny; <i>Plantago spinulosa</i> Decne. ex DC.	Invader
Indianwheat, wooly; <i>Plantago purshi</i> Roem. and Schult.	Invader
Knotweed, prostrate; <i>Polygonum aviculare</i> L.	Invader
Knotweed, erect; <i>Polygonum erectum</i> L.	Invader
Kochia; <i>Kochia scoparia</i> (L.) Schrad.	Invader
Lettuce, prickly; <i>Lactuca scariola</i> L.	Invader
Monolepis, Nuttall; <i>Monolepis nuttalliana</i> (Schultes) Greene	Invader
Nightshade, buffalobur; <i>Solanum rostratum</i> Dunal	Invader
Pennycress, field; <i>Thlaspi arvense</i> L.	Invader
Pepperweed, prairie; <i>Lepidium densiflorum</i> Schrad.	Invader
Polygala, whorled; <i>Polygala verticillata</i> L.	Invader
Purslane, common; <i>Portulaca oleracea</i> L.	Invader
Ragweed, common; <i>Ambrosia artemisiifolia</i> L.	Invader
Rockjasmine, western; <i>Androsace occidentalis</i> Pursh.	Invader
Russianthistle, tumbling; <i>Salsola kali</i> L., var. <i>tenuifolia</i> Tausch.	Invader
Stickseed, European; <i>Lappula echinata</i> Gilib.	Invader
Stickseed, western; <i>Lappula redowski</i> (Hornem.) Greene	Invader
Sunflower, common; <i>Helianthus annuus</i> L.	Invader
Transymustard, richardson; <i>Descurainia richardsoni</i> (Sweet) O. E. Schulz	Invader
Venuslookingglass, clasping; <i>Specularia perfoliata</i> (L.) A. DC.	Invader
Venuslookingglass, slender; <i>Specularian leptocarpa</i> (Nutt.) Gray	Invader

WOODY PLANTS

Perennials

Amorpha, dwarfindigo; <i>Amorpha nana</i> Nutt.	Decreaser
Amorpha, leadplant; <i>Amorpha canescens</i> Pursh.	Decreaser
Cactus, pincushions; <i>Mammillaria missouriensis</i> Sweet	Decreaser
Chokecherry, black; <i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nels.)	Decreaser

Table 2. (Continued)

Common Name; Scientific Name	Grazing Reaction
WOODY PLANTS (Continued)	
Perennials (Continued)	
Currant, buffalo; <i>Ribes odoratum</i> Wendl.	Decreaser
Plum, American; <i>Prunus americana</i> Marsh.	Decreaser
Pricklypear, brittle; <i>Opuntia fragilis</i> (Nutt.) Haw.	Increaser
Pricklypear, common; <i>Opuntia humifusa</i> Raf.	Increaser
Pricklypear, plains; <i>Opuntia polyacantha</i> Haw.	Increaser
Rose, woods; <i>Rosa woodsii</i> Lindl.	Decreaser
Sagebrush, silver; <i>Artemisia cana</i> Pursh.	Increaser
Snowberry, western; <i>Symphoricarpos occidentalis</i> Hook.	Increaser
Sumac, skunkbush; <i>Rhus trilobata</i> Nutt.	Decreaser

Table 3. List of herpetofauna of the region (from G. Callison, 1969. Report on the basic natural resources of Badlands National Monument (i.e. aquatic ecosystems, herpetofauna, and invertebrates). In: Larson [ed.] Natural resources basic data for Badlands National Monument. National Forest Service, Processed, 178 p. (For administrative use only.)

HERPETOFAUNA

AMPHIBIANS

Salamanders

Tiger Salamander (*Ambystoma tigrinum melanostictum*)

Frogs and Toads

Central Plains Spadefoot (*Scaphiopus bombifrons*)

Great Plains Toad (*Bufo cognatus*)

Woodhouse's Toad (*Bufo woodhousei*)

Western Chorus Frog (*Pseudacris triseriata triseriata*)

Boreal Chorus Frog (*Pseudacris triseriata maculata*)

Bullfrog (*Rana catesbeiana*)

Leopard Frog (*Rana pipiens*)

REPTILES

Turtles

Ornate Box Turtle (*Terrapene ornata ornata*)

Painted Turtle (*Chrysemys picta belli*)

Common Snapping Turtle (*Chelydra serpentina serpentina*)

Spiny Soft-shelled Turtle (*Trionyx spinifer hartwegi*)

Lizards

Lesser Earless Lizard (*Holbrokia maculata maculata*)

Short-horned Lizard (*Phrynosoma douglassi brevirostre*)

Eastern Fence Lizard (*Sceloporus undulatus garmani*)

Many-lined Racerunner (*Cnemidophorus sexlineatus*)

Snakes

Plains Hog-nosed Snake (*Heterodon nasicus nasicus*)

Northern Water Snake (*Matrix sipedon sipedon*)

Milk Snake (*Lampropeltis dolia multistrata*)

Smooth Green Snake (*Opheodrys vernalis vernalis*)

Bull Snake (*Pituophis melanoleucus melanoleucus*)

Common Garter Snake (*Thamnophis sirtalis parietalis*)

Plains Garter Snake (*Thamnophis radix haydeni*)

Western Garter Snake (*Thamnophis elegans vagrans*)

Yellow-bellied Racer (*Coluber constrictor flaviventris*)

Prairie Rattlesnake (*Crotalus viridis viridis*)

Table 4. Mammals of the Badlands National Monument, South Dakota (compiled by F. Robert Henderson).

NATIVE MAMMALS	
1. Masked shrew	3-F
2. Little brown myotis	2-E
3. Small footed myotis	1-E
4. Silver-haired bat	3-B
5. Big brown bat	1-E
6. Hoary bat	2-B
7. Long-eared myotis	3-E
8. Townsend's big-eared bat	1-E
9. Desert cottontail	1-E
10. Eastern cottontail	2-B
11. Black-tailed jackrabbit	3-C
12. White-tailed jackrabbit	1-A
13. Least chipmunk	1-E
14. Thirteen-lined ground squirrel	1-A
15. Black-tail prairie dog	1-A
16. Fox squirrel	1-B
17. Northern pocket gopher	1-C
18. Plains pocket gopher	1-C
19. Olive-backed pocket mouse	2-D
20. Hispid pocket mouse	1-D
21. Ord's kangaroo rat	1-C
22. Beaver	1-F
23. Western harvest mouse	1-B
24. Plains harvest mouse	2-A
25. White-footed mouse	2-B
26. Deer mouse	1-A
27. Northern grasshopper mouse	1-C
28. Bushy-tailed woodrat	1-G
29. Prairie vole	1-F
30. Meadow vole	1-F
31. Muskrat	1-F
32. Meadow jumping mouse	2-D
33. Porcupine	1-B
34. Coyote	1-A
35. Red fox	2-E
36. Gray fox	2-B
37. Raccoon	1-B
38. Long-tailed weasel	1-D
39. Black-footed ferret	3-A
40. Least weasel	3-F
41. Mink	1-F
42. Badger	1-A
43. Striped skunk	1-A
44. Mountain lion	3-E
45. Bobcat	1-D
46. Wapiti (elk)	3-B
47. Mule deer	1-B
48. White-tailed deer	1-B
49. Pronghorn	1-A
50. Bison	1-A
51. Mountain sheep	2-E

NON-NATIVE MAMMALS	
52. House mouse	1-B
53. Norway rat	1-E

Abundance

- 1 - Common
- 2 - Uncommon
- 3 - Rare
- 4 - Very Rare

Communities

- A - Grassland-Bison Community
- B - Buffaloberry-Mule Deer Community
- C - Sand-Kangaroo Rat Community
- D - Cedar-Bobcat Community
- E - Barren Badlands-Least Chipmunk Community
- F - Marsh-Prairie Vole Community

Table 5. Birds of Badlands National Monument, South Dakota (compiled by B. J. Rose).

1. Eared grebe	M-4	41. Long-billed curlew	S-4
2. Pied-billed grebe	S-3	42. Upland plover	S-3
3. Trumpeter swan	S-4	43. Spotted sandpiper	M-3
4. Canada goose	M-4	44. Greater yellowlegs	M-4
5. Snow goose	M-5	45. Lesser yellowlegs	M-3
6. Mallard	S-3	46. Wilson's phalarope	M-3
7. Black duck	M-5	47. Northern phalarope	M-4
8. Pintail	S-4	48. Franklin's gull	M-3
9. Gadwall	M-3	49. Black tern	M-3
10. American widgeon	M-4	50. Rock dove (Feral pigeon)	P-3
11. Shoveler	M-3	51. Mourning dove	S-2
12. Blue-winged teal	M-2	52. Yellow-billed cuckoo	S-4
13. Green-winged teal	M-3	53. Black-billed cuckoo	S-3
14. Redhead	M-4	54. Great-horned owl	P-3
15. Canvasback	M-4	55. Short-eared owl	M-3
16. Lesser scaup	M-3	56. Burrowing owl	S-3
17. Bufflehead	M-4	57. Common nighthawk	S-3
18. Common goldeneye	M-4	58. White-throated swift	S-3
19. Ruddy duck	M-4	59. Yellow-shafted flicker	S-2
20. Turkey vulture	S-2	60. Red-shafted flicker	S-3
21. Cooper's hawk	M-4	61. Red-headed woodpecker	S-4
22. Sharp-shinned hawk	M-3	62. Hairy woodpecker	P-3
23. Marsh hawk	P-2	63. Downy woodpecker	P-3
24. Rough-legged hawk	W-2	64. Eastern kingbird	S-3
25. Ferruginous hawk	S-4	65. Western kingbird	S-3
26. Red-tailed hawk	P-3	66. Say's phoebe	S-3
27. Swainson's hawk	S-3	67. Eastern phoebe	S-4
28. Golden eagle	P-3	68. Horned lark	P-2
29. Bald eagle	M-5	69. Barn swallow	S-2
30. Prairie falcon	P-3	70. Cliff swallow	S-2
31. Sparrow hawk	S-3	71. Violet-green swallow	S-4
32. Sharp-tailed grouse	P-3	72. Bank swallow	S-3
33. Ring-necked pheasant	P-3	73. Rough-winged swallow	S-3
34. Whooping crane	M-5	74. Blue jay	M-3
35. Sandhill crane	M-4	75. Black-billed magpie	P-2
36. Great blue heron	S-3	76. Common crow	P-3
37. American bittern	M-3	77. Black-capped chickadee	W-3
38. American coot	M-3	78. Red-breasted nuthatch	M-4
39. Killdeer	S-3	79. House wren	M-3
40. Common snipe	M-4	80. Canyon wren	W-4

Seasonal Status

P - Permanent Resident
 S - Summer Resident
 W - Winter Resident
 M - Migrant, Spring and Fall

Abundance

1 - Abundant
 2 - Common
 3 - Uncommon
 4 - Occasional
 5 - Rare or Accidental

Table 5. (Continued)

81. Rock wren	S-2	107. Orchard oriole	S-3
82. Mockingbird	S-4	108. Baltimore oriole	S-3
83. Catbird	S-3	109. Western tanager	S-3
84. Brown thrasher	S-2	110. Black-headed grosbeak	S-2
85. Robin	P-3	111. Blue grosbeak	S-3
86. Townsend's solitaire	W-3	112. Evening grosbeak	W-4
87. Mountain bluebird	S-2	113. Gray-crowned rosy finch	W-4
88. Bohemian waxwing	W-4	114. Pine siskin	W-3
89. Northern shrike	W-3	115. American goldfinch	M-3
90. Loggerhead shrike	S-3	116. Dickcissel	S-4
91. Starling	P-3	117. Rufous-sided towhee	S-2
92. Black and white warbler	P-3	118. Grasshopper sparrow	S-2
93. Orange-crowned warbler	M-3	119. Lark bunting	S-1
94. Yellow warbler	S-3	120. Vesper sparrow	S-3
95. Myrtle warbler	M-3	121. Lark sparrow	S-3
96. Blackpoll warbler	M-3	122. Slate-colored junco	W-2
97. Yellowthroat	S-3	123. Oregon junco	W-3
98. Yellow-breasted chat	S-3	124. Tree sparrow	W-2
99. American redstart	M-3	125. Chipping sparrow	S-3
100. House sparrow	P-3	126. Clay-colored sparrow	M-2
101. Western meadowlark	S-1	127. Harris sparrow	M-3
102. Yellow-headed blackbird	S-3	128. White-crowned sparrow	M-2
103. Red-winged blackbird	S-2	129. Song sparrow	M-3
104. Brewer's blackbird	S-3	130. Lapland longspur	W-3
105. Common grackle	S-2	131. Snow bunting	W-4
106. Brown-headed cowbird	S-3		

Table 6. Birds that should occur in Badlands National Monument, South Dakota
(compiled by B. J. Rose).

1. Common loon	50. Belted kingfisher
2. Western grebe	51. Yellow-bellied sapsucker
3. Horned grebe	52. Lewis' woodpecker
4. White pelican	53. Great-crested flycatcher
5. Double-crested cormorant	54. Traill's flycatcher
6. Whistling swan	55. Least flycatcher
7. Blue goose	56. Western wood pewee
8. White-fronted goose	57. Olive-sided flycatcher
9. Cinnamon teal	58. Tree swallow
10. Ring-necked duck	59. Purple martin
11. Common merganser	60. White-breasted nuthatch
12. Red-breasted merganser	61. Swainson's thrush
13. Hooded merganser	62. Gray-cheeked thrush
14. Goshawk	63. Hermit thrush
15. Broad-winged hawk	64. Eastern bluebird
16. Harlan's hawk	65. Ruby-crowned kinglet
17. Osprey	66. Sprague's pipit
18. Peregrine falcon	67. Water pipit
19. Pigeon hawk	68. Cedar waxwing
20. Greater prairie chicken	69. Solitary vireo
21. Chukar	70. Bell's vireo
22. Gray partridge	71. Red-eyed vireo
23. Black-crowned night heron	72. Philadelphia vireo
24. Virginia rail	73. Warbling vireo
25. Sora	74. Audubon's warbler
26. American avocet	75. Tennessee warbler
27. Black-bellied plover	76. Palm warbler
28. Golden plover	77. Ovenbird
29. Semipalmated plover	78. Northern water thrush
30. Marbled godwit	79. Wilson's warbler
31. Solitary sandpiper	80. Bobolink
32. Willet	81. Bullock's oriole
33. Stilt sandpiper	82. Cardinal
34. Long-billed dowitcher	83. Rose-breasted grosbeak
35. Pectoral sandpiper	84. Indigo bunting
36. Sanderling	85. Lazuli bunting
37. White-rumped sandpiper	86. Purple finch
38. Baird's sandpiper	87. Cassin's finch
39. Least sandpiper	88. Common redpoll
40. Semipalmated sandpiper	89. Savannah sparrow
41. Western sandpiper	90. White-winged junco
42. Ring-billed gull	91. Field sparrow
43. Forster's tern	92. White-throated sparrow
44. Common tern	93. Fox sparrow
45. Snowy owl	94. Lincoln's sparrow
46. Long-eared owl	95. Chestnut-collared longspur
47. Screech owl	96. Lapland longspur
48. Saw-whet owl	97. Smith's longspur
49. Barn owl	98. Snow bunting

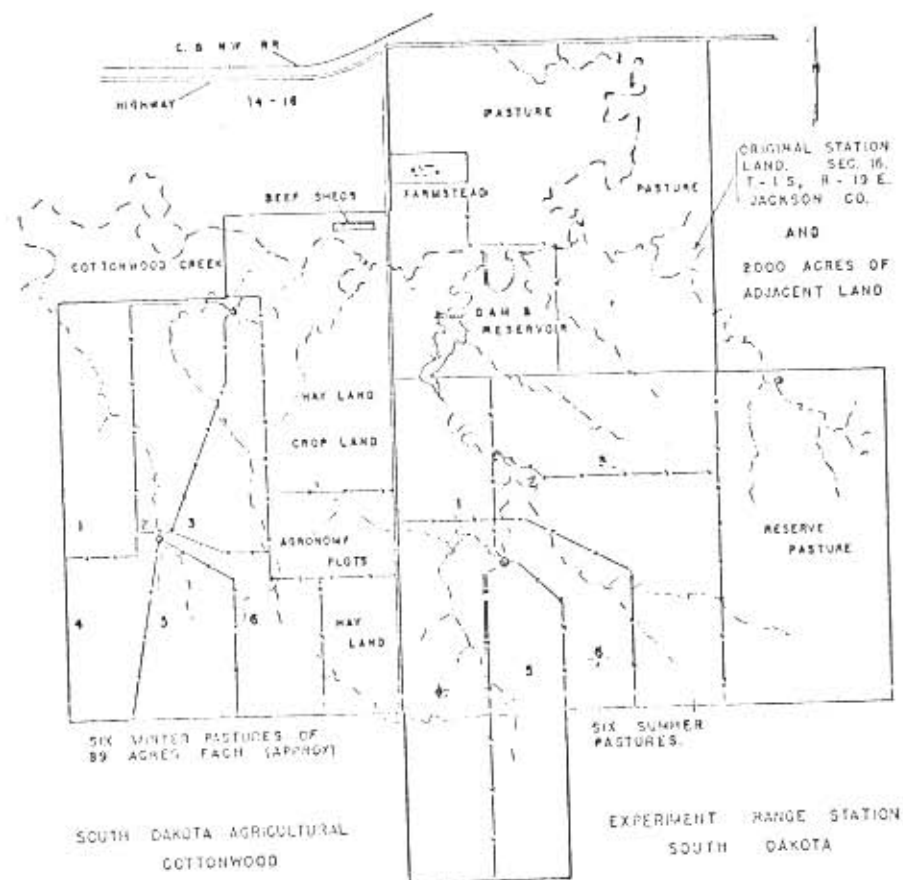
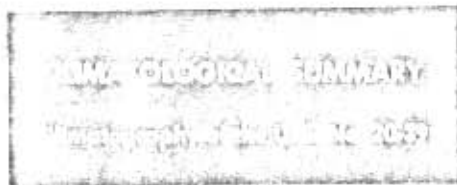


Fig. 2. Diagram of the farm and the experimental plots at the Range Field Station.

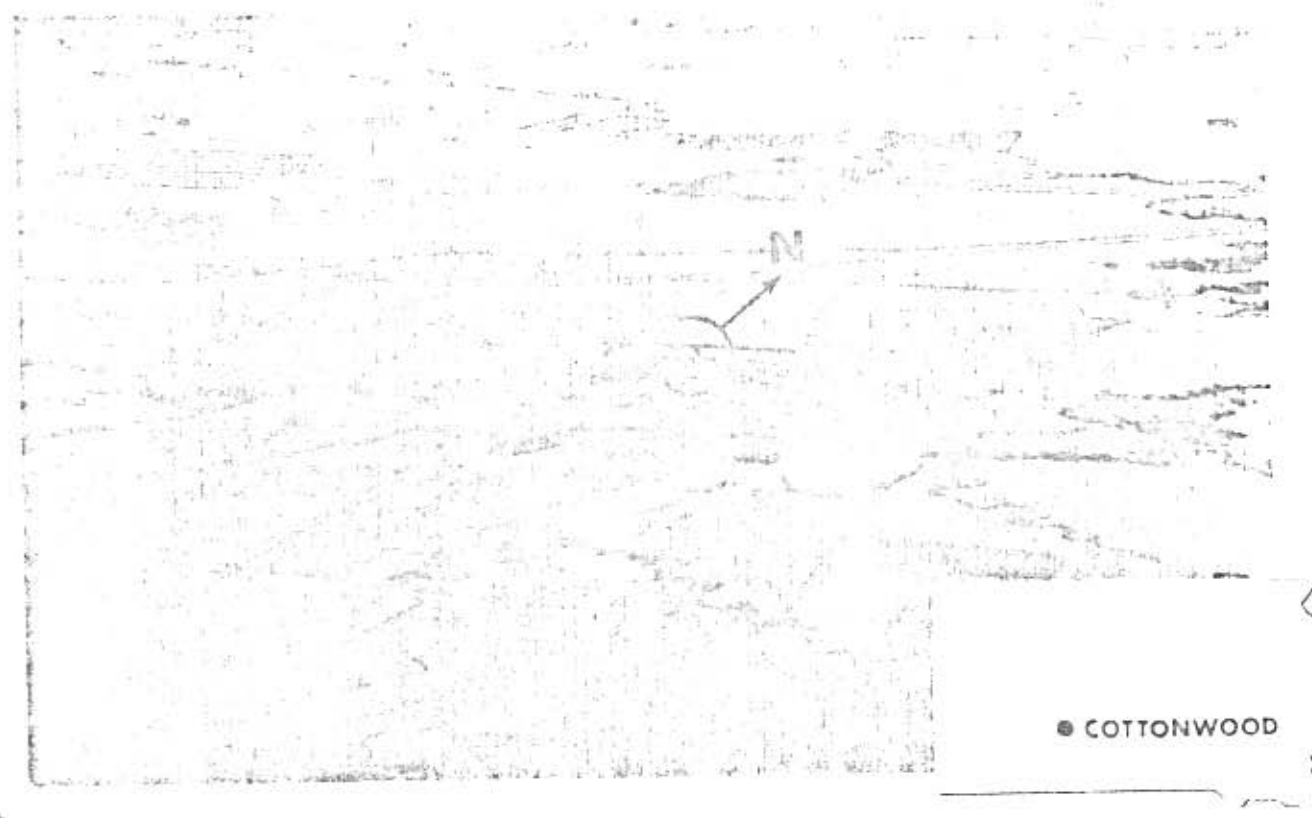


NO. 14

COTTONWOOD

South Dakota

LATITUDE 43° 58' LONGITUDE 101° 52' ELEVATION 2,414 FT.



STATION HISTORY

Official weather observations were first made at the South Dakota State University Experiment Station located about 2 miles east of Cottonwood in June 1909 and have continued in approximately the same location to date. Weather observations were taken by Experiment Station personnel but changes in the personnel responsible for the observations were not well documented.

Instruments used throughout period included maximum and minimum thermometers and a stand

and rain gage. An evaporation pan was installed in August 1952 and a Sox's thermometer was added in July 1962.

This station is one of the national Climatological Benchmark Stations. In line with the planned expansion of the instrumentation of these stations, wind recording equipment was installed in June 1968. Future plans include installation of soil temperature and solar radiation as well as other recording weather related instruments.

STATION SUMMARY

Cottonwood is located in northwestern Jackson County in the southwestern part of the state. The topography is gently rolling. There are no nearby bodies of water that affect the climate. The eastern edge of the badlands lies about 12 miles to the south.

The climate is a continental type with a large contrast in temperature from winter to summer and occasionally from day to day. Precipitation is marginal for adapted crops.

Livestock grazing along with hay production and wheat farming are the main sources of income although some oats and other small grain are grown.

TEMPERATURE

Temperatures have an annual average of about 47 degrees but usually rise to above 100 degrees in summer and drop to 20 degrees below zero or lower in winter. A temperature of 100 degrees or higher may occur on the average about 11 days per year. A reading of 20 degrees below zero or lower may occur on the average about 4 days per year. Thirty degrees below zero or lower may be expected about once in 2 years. The temperature may drop below zero on the average about 26 days per year and fail to climb above zero about 2 days per year.

The average date for last frost in spring is May 19 and first frost in fall is September 22, with an average length growing season of 126 days.

PRECIPITATION

The average annual precipitation is 15.13 inches of which 11.94 inches (79%) fall during the growing season (April-September). The main source of rainfall during the growing season is thundershowers which produce a wide range of amounts and intensities of rain. A rainfall of 1 inch or more in 1 hour may be expected on the average about once a year. Two inches or more of rain in 1 hour may be expected on the average about once in 12 years and 2.5 inches in 1 hour about once in 50 years. A 24-hour rain of 2 inches or more may be expected on the average about once in 3 years and 3 inches or more about once in 8 years.

Hail may be expected about 2 to 3 times per year in any one place in the Cottonwood area. June is the month of the most frequent occurrence but hail may occur as early as March and as late as October.

Snow cover is important for protecting pastures and fall seeded crops, although a heavy snow cover may be a hindrance to ranch and farm activity. The seasonal snowfall averages about 24 inches but has varied from 7 inches during the 1940-41 season to 58 inches during the 1949-50 season. Snow cover of 1 inch or more averages about 36 days per year. Strong winds often accompany the snowfall causing drifts to form in and near sheltered areas while open fields remain nearly bare.

AVERAGE TEMPERATURE, 1910-1967 (°F.)

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909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PROBABILITY DATE OF LAST TEMPERATURE OCCURRENCE IN SPRING, 1910-1967 (°F.)

PERCENT CHANCE OF LATER DATE	TEMPERATURE LEVELS					
	16	20	24	28	32	36
90	MAR. 13	MAR. 23	APR. 1	APR. 14	MAY 1	MAY 10
70	MAR. 21	APR. 1	APR. 9	APR. 21	MAY 7	MAY 16
50	APR. 7	APR. 16	APR. 25	MAY 6	MAY 19	MAY 29
30	APR. 22	MAY 1	MAY 10	MAY 19	MAY 30	JUNE 9
10	APR. 30	MAY 9	MAY 18	MAY 27	JUNE 5	JUNE 15

PROBABILITY DATE OF FIRST TEMPERATURE OCCURRENCE IN FALL, 1910-1967 (°F.)

PERCENT CHANCE OF EARLIER DATE	TEMPERATURE LEVELS					
	16	20	24	28	32	36
10	OCT. 5	SEP. 27	SEP. 19	SEP. 9	SEP. 4	AUG. 11
30	OCT. 12	OCT. 5	SEP. 27	SEP. 17	SEP. 10	AUG. 21
50	OCT. 28	OCT. 21	OCT. 12	OCT. 2	SEP. 22	SEP. 9
70	NOV. 11	NOV. 4	OCT. 26	OCT. 16	OCT. 2	SEP. 27
90	NOV. 18	NOV. 12	NOV. 3	OCT. 24	OCT. 9	OCT. 7

MEANS AND EXTREMES, 1910-1967

TEMPERATURE (°F.)

	Avg. daily max	Avg. daily min.	Avg. monthly mean	Highest daily max	Year	Day	Lowest daily min.	Year	Day	Avg. heating degree days	Avg. no. days			
											90° & above	82° & below	68° & below	50° & below
Jan.	32.5	5.7	19.1	75	63	14	-42	16	12	1379	0	13	30	10
Feb.	36.4	9.3	22.8	74	54	08	-41	36	06	1172	0	10	27	7
Mar.	46.0	19.2	32.6	88	46	31	-28	60	04	999	0	6	27	2
Apr.	60.8	31.6	46.2	92	39	23	-12	36	02	562	0	0	16	0
May	70.9	42.3	56.6	105	34	28	13	44	05	285	1	0	4	0
June	81.2	52.6	66.9	114	36	18	31	66	06	70	6	0	0	0
July	90.8	58.7	74.7	116	10	14	36	50	13	7	17	0	0	0
Aug.	89.2	56.1	72.6	113	35	07	27	10	25	16	16	0	0	0
Sept.	78.5	45.5	62.0	108	31	09	10	26	25	161	5	0	2	0
Oct.	66.0	33.4	49.7	98	10	16	-07	25	28	475	0	0	14	0
Nov.	48.5	20.2	34.3	81	31	07	-29	59	14	916	0	3	27	1
Dec.	36.4	10.2	23.3	77	39	11	-41	16	20	1269	0	10	30	6
Annual	61.4	32.1	46.7	JULY		116 10 14	JAN.		-42 16 12	7311	45	42	177	26

PRECIPITATION (In.)

	Avg. monthly	Greatest monthly	Year	Greatest daily	Year	Day	Avg. monthly snowfall	Greatest monthly snowfall	Year	Greatest daily snowfall	Year	Day	0.1 & over	Avg. no. days	1.0 & over	5.0 & over	10.0 & over
Jan.	.42	3.08	49	2.31	49	04	4.4	19.0	49	8.5	17	20	3	1	0	0	0
Feb.	.38	1.82	53	1.01	51	28	4.3	15.7	48	8.0	14	22	3	1	0	0	0
Mar.	.75	2.68	29	1.70	37	24	5.8	24.4	29	11.0	33	05	4	2	0	0	0
Apr.	1.76	5.54	27	2.00	67	30	3.1	28.0	27	18.0	27	13	7	4	1	0	0
May	2.78	6.91	15	4.00	15	26	0.3	8.0	50	6.0	50	07	9	6	2	0	0
June	2.99	9.47	67	3.04	48	17	0.0	0.0		0.0			10	6	2	1	1
July	1.81	6.48	22	2.46	23	16	0.0	0.0		0.0			7	4	1	0	0
Aug.	1.56	7.82	30	5.18	30	16	0.0	0.0		0.0			6	3	1	0	0
Sept.	1.13	3.89	55	3.30	55	20	0.0	0.5	34	0.5	34	25	5	3	1	0	0
Oct.	.89	3.98	30	2.39	30	02	0.9	12.3	19	8.7	19	19	4	2	0	0	0
Nov.	.40	2.72	22	1.40	22	04	2.9	20.6	47	8.0	52	17	2	1	0	0	0
Dec.	.35	1.83	51	.80	31	30	3.9	17.0	51	8.0	31	30	3	1	0	0	0
Annual	15.22	JUNE		AUG.		5.18 30 16	25.6	APR.		28.0 27	APR.		18.0 27 13	63	34	8	1

*Dates of extremes are latest occurrence—extremes may have been equaled earlier.

[Snowfall includes hail and sleet.

INSECTS OF JACKSON COUNTY, SOUTH DAKOTA

(Compiled by P. A. Jones)

The following records are those from the South Dakota Insect Survey from the period 1948 - 1969 inclusive.

Orthoptera

Acrididae

- Aulocara ellioti* (Thomas)
- Melanoplus bivittatus* (Say)
- " *differentialis* (Thomas)
- " *femurrubrum* (DeGeer)
- " *packardii* (Scudder)
- " *sanguinipes* (Fabricius)
- Drepanopterna femoratum* (Scudder)
- Phostaliotes nebrascensis* (Thomas)

Blattidae

- Supella supellectilium*

Gryllidae

- Acheta assimilis* Fab.

Phasmidae

Tettigoniidae

- Orchelimum vulgare* Harr.

Odonata

Lestidae

- Lestes* sp.

Hemiptera

Anthocoridae

- Orius insidiosus* (Say)

Lygaeidae

- Lygius kalmii* (Stål)

Miridae

- Adelphocoris lineolatus* (Goeze)
- " *rapidus* (Say)
- Lygus* sp.
- " *lineolaris* (P. de B.)

Nabidae

- Nabis* sp.

Pentatomidae

Homoptera

Aphidae

- Rhopalosiphum padi* (L.)
- Schizaphis praminum* (Rondani)
- Therioaphis maculata* (Buckton)

Homoptera (Continued)

Cicadellidae

Aceratagallia sanguinolenta (Prov.)

Cypinana sp.

Macrosteles fascifrons (Stål)

Platymetopius sp.

Fulgoridae

Aphelonema rugosa

Delphacodes campestris Van D.

Scolops sp.

Neuroptera

Chrysopidae

Chrysops sp.

Colcoptera

Cantharidae

Cantharis sp.

Chrysomelidae

Diabrotica atripennis atripennis Say

" *longicornis* (Say)

" *undecimpunctata howardi* Mann.

" *virgifera* LeConte

Galerucella sp.

Pachybrachis sp.

Phyllotreta striolata (Fab.)

Coccinellidae

Hippodamia sp.

Curculionidae

Hypera postica Gyllenhal

Sitona scissifrons Say

Elateridae

Moloidae

Epicauta fabricii (LeConte)

" *maculata* (Say)

Tenebrionidae

Eleodes sp.

Mecoptera

Meropeidae

Merope sp.

Lepidoptera

Olethreutidae

Grapholitha interstinctana (Clemens)

Phalaenidae

Agrotis orthogonia Morrison

Chorizagrotis auxiliaris (Grote)

Pieridae

Colias philodice eurythema Boisduval

Pyralidae

Ostrinia nubilalis (Hübner)

Diptera

Anthomyiidae

Hylemia sp.

Bombyliidae

Villa sp.

Culicidae

Aedes dorsalis (Meigen)

" *vexans* (Meigen)

Dolichopodidae

Oestridae

Hypoderma bovis (L.)

" *lineatum* (deVillers)

Oestrus ovis L.

Muscidae

Haematobia irritans (L.)

Musca autumnalis DeGeer

" *domestica* L.

Stomoxys calcitrans (L.)

Syrphidae

Mesogramma marginata

" sp.

Sphaerophoria cylindrica

Hymenoptera

Apidae

Apis mellifera L.

Formicidae

Pogonomyrmex occidentalis (Cresson)

Tapinoma sessile (Say)

Ichneumonidae

Sagaritis sp.

Acarida

Tetranychidae

Eotetranychus populi (Koch)

Eriophyidae

Aceria tulipae (K.)

Note: Many common insects are absent from this list since they have not been recorded in the South Dakota Insect Survey Records. This list does not include all the species from Jackson County which are represented in the S.D.S.U. Insect Collection.