

Technical Report No. 40  
COMPREHENSIVE NETWORK SITE DESCRIPTION  
DICKINSON

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GRASSLANDS BIOME  
U. S. International Biological Program

I. *Site name:* Dickinson.

The Dickinson site is located on the Dickinson Experiment Station near the city of Dickinson in the southwestern part of North Dakota. The land on which the site is located is owned by the state of North Dakota and is formally constituted as part of the Dickinson Experiment Station. The Dickinson station is a branch station of the North Dakota Agricultural Experiment Station, which, in turn, is part of North Dakota State University at Fargo, North Dakota. The Director of the North Dakota Agricultural Experiment Station at Fargo is Dean Arlon G. Hazen. The Superintendent of the Dickinson Experiment Station is Mr. Thomas J. Conlon, who lives at the station headquarters about one and one-half miles from the site. The address of the Dickinson Experiment Station is Box 1117, Dickinson, North Dakota 58601. The phone number of the office at the station is 701-227-2338. During the summer season Warren C. Whitman can generally be located by calling this number. The office number for Whitman at North Dakota State University in Fargo is 701-237-7224.

II. *Location and elevation.*

The Dickinson station is in north-central Stark County on the northwestern edge of the city of Dickinson. The city of Dickinson is in southwestern North Dakota about 60 miles east of the Montana border and 65 miles north of the South Dakota border. The actual coordinates of the station are latitude  $46^{\circ}53'$  N, longitude  $102^{\circ}49'$  W. The cadastral description for the site itself is SE1/4, NW1/4, Section 32, Township 140 North, Range 96 West. The top of the

ridge on which the site is located rises to an elevation of approximately 2,800 ft, but the major portion of the site is considered to be at an elevation of 2,700 to 2,750 ft.

Interstate Highway 94 crosses land owned by the Dickinson Experiment Station for a distance of about one mile in a general northeast-southwest direction. Exit 12, on the extreme northwest corner of the city area, is the closest available point of departure from Interstate 94 to the site. The site is reached by driving north from this exit on a graded and gravelled road about one-half mile, then east on a graded section line road about one-half mile, then south on a trail about one-half mile. There are no problems of access to the area at the present time, but visitors are requested to park their vehicles in the indicated parking area at the northeast corner of the site.

### III. *Size of area.*

The specific study area consists of a four-acre enclosure within a 27-acre tract of native grass. The enclosure has been in place since 1961, and thus there has been no grazing in the enclosed area for nine years. The grassland outside the enclosure has been grazed heavily in late fall for the past 12 years. Its history prior to this time is not known in detail, but it is apparent that the area has received some grazing use for a good many years. It has not been grazed heavily enough at any time in the past to result in any appreciable erosion. The area is somewhat irregularly shaped with the long axis in a generally northwest-southeast direction. A

certain amount of disturbance takes place in the area outside the enclosure as the result of occasional movement of farm machinery across the area and some driving. In general this disturbance is minimal.

The area as a whole consists of an upland ridge with the southeast and northwest ends of the ridge marked by small eminences rising from 50 to 100 ft above the lower portions of the site. The major portions of the slopes have approximate angles varying from 5° to 15°. Below the grassland site are cultivated fields which are cropped each year to small grain or corn.

#### IV. *Type of grassland.*

The grassland vegetation on the site is fairly typical of the Northern Great Plains mixed grass prairie. The actual grassland type has been designated as the needle-and-thread/blue grama/sedge type. The principal species in this type are the grasses *Stipa comata*, *Bouteloua gracilis*, and *Agropyron smithii* and the sedges, *Carex filifolia* and *Carex eleocharis*. These species together make up about 80% of the total cover. The total cover itself has a basal area value of about 35%. Important secondary grasses are *Koeleria cristata*, *Stipa viridula*, *Calamagrostis montanensis*, *Calamovilfa longifolia*, and *Poa secunda*. These grasses make up about 15% of the total cover. Many species of broad-leaved plants are found in the area and make up about 5% of the total cover. The most important perennial forbs are *Sphaeralcea coccinea*, *Artemisia frigida*, *Artemisia ludoviciana*, *Phlox hoodii*, *Oxytropis lambertii*,

*Astragalus striatus*, *Chrysopsis villosus*, *Allium reticulatum*, *Liatris punctata*, and *Lygodesmia juncea*. *Erysimum asperum*, *Arabis hirsuta*, and *Arabis hoelboellii* are biennials which are fairly common. Among the annuals which occur frequently are *Androsace occidentalis*, *Hedeoma hispida*, *Lotus americana*, and *Lepidium densiflorum*. A list of the common and scientific names of the plant species occurring most commonly is appended to this report.

The general height of the vegetation in the enclosure at its peak of maximum seasonal development is about 12-16 inches. The general height of the grazed vegetation outside the enclosure at maximum development is about 8-10 inches. Such figures, of course, are dependent on the type of season with unusually dry seasons producing vegetation with appreciably less height growth. The vegetation is not uniform over the entire area, but the major difference occurs at the southeast end of the site, where a low hill has a scattering of small rocks on its upper portion and a small area of clayey material is exposed.

The following animals have been observed on the area: skunks, badger, red fox, ground squirrel (13-lines), jackrabbit, field mice, mole, and pocket gopher. A whitetailed deer was seen once on the area, but these animals do not frequent the site. In addition a stray horse, dog, or other domestic animal may cross the area occasionally. The most important insects on the area are grasshoppers, of which several different kinds are frequently seen. Butterflies, moths, and flies are common, and a number of beetles have been seen of which blister

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beetles and dung-rollers are perhaps the most common. Ants, bees, and wasps are present in fairly large numbers, as are mosquitoes at certain times. Crickets and stink bugs have been observed on the site. Neither the animals nor the insects have been studied in any detail.

Birds that are most frequently seen on the site are the western meadowlark, lark bunting, and horned lark. All three of these species nest on the site.

#### V. *Climate.*

The Dickinson Experiment Station maintains a weather station for the U. S. Weather Bureau near the station headquarters. This is a benchmark station, one of only 28 in the United States, having been established in February of 1893. The long-time records from this station are available in the "Climatological Summary, Dickinson, North Dakota, Climatology of the U. S. No. 20-32," copies of which can be obtained on request from the Dickinson Experiment Station. In addition to these long-time records, growing season records of air and soil temperatures, relative humidity, wind movement, evaporation, soil moisture, precipitation, and net radiation have been obtained on the site since 1962.

The climate of the area as a whole is semiarid with moderately cold winters and warm dry, sunny summer weather. The precipitation at the station has averaged 15.65 inches, with over 75% of this total occurring during the so-called growing season, April-September. The warm days of summer are followed by generally cool nights, and hot

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humid conditions are very rare. Most of the rainfall occurs in April, May, and June with the precipitation in June generally being the greatest of the year and averaging about 3.5 inches. Dry springs are not uncommon, and generally dry weather after mid-July is the usual expectation. Precipitation in amounts of one inch or more occurs only about twice each year. Snowfall is light with most of the snow blowing off the higher elevations and accumulating in ravines, tree plantings, and around buildings or other obstructions.

The prevailing winds are from the northwest, and during the summer months average about five to six miles per hour. The average annual temperature is 40.7°F, and the average January temperature is 11.0°F. Temperatures as low as -47°F have been recorded, while the maximum on record is 115°F. Minimum temperatures drop below zero an average of 46 times each year, while temperatures of 90°F or more occur only about 22 times during an average summer. Temperatures over 100°F occur only rarely. Growing-season evaporation from an open pan averages about 35.0 inches.

#### VI. *Soils and topography.*

The prevailing soil on the site is Flasher loamy fine sand, which in the enclosure averages about 84% sand to a depth of four feet. Associated with the Flasher are some small areas of Vebar sandy loam. On the east end of the area where one of the small hills is situated, Bainville silt loam is found with some rock outcrops. On the east and south exposures of this hill are some areas of Midway silty clay and clay loam. The soils of the area are described in

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the "Soil Survey of Stark County," issued in February 1968. The soils of the area have been mapped in more detail by the soil surveyors of the Soil Conservation Service District Office in Dickinson.

VII. *Physical facilities.*

A small instrument shelter, 8 ft x 10 ft is located on the site, and is available for immediate field shelter, although it does not provide much working space. Samples collected in the field and small instruments used in field studies can be stored temporarily in this shelter. Electric power (110v and 220v) is available in the shelter and also at several other points within the enclosure. Running water is not available on the site.

A laboratory building, 18 ft x 42 ft with full basement, is provided at the headquarters of the Dickinson Experiment Station, about two miles by road from the site. Facilities at this field laboratory include electric power, running water, gas-heated drying ovens of large capacity, two electric drying ovens for soil samples or other uses, rough and analytical balances, work tables and chairs, large deep-freeze, hand tools of various kinds, and storage space for field samples. A fairly large supply of distilled water is maintained at this laboratory, and limited amounts of chemicals can be made available, although there are no regular chemical laboratory fixture or benches installed.

A machine shop is maintained by the station in another building and a limited number of power tools are available including drills,



sharpeners, and grinders. Welding facilities are also available. Machine shops and blacksmith shops in Dickinson make possible the construction or repair of most field machines, or of nearly any required equipment except intricate electronic apparatus.

Telephone service is available in the main station office about 100 ft from the field laboratory. The office is open from about 7:00 AM to 5:30 PM in the summer months, although the regular office staff is on duty from 9:00 AM to 4:30 PM. The station number is 701-227-2338. The Superintendent of the Dickinson Experiment Station, Mr. Thomas J. Conlon, usually answers the telephone when none of the secretarial staff is present.

There is no lodging available at the Dickinson station itself, but there are a number of motels in the city of Dickinson; all of these motels are within two miles of the station headquarters. The Dickinson Motel is situated at the west end of Dickinson's main street, just adjacent to land belonging to the Dickinson Experiment Station. This motel is clean and reasonable. Other motels not far from the station include the Congress Inn, The New Oasis, West Plains, and the Rancher. The Ray Hotel in downtown Dickinson is an excellent hotel with a good restaurant.

The city of Dickinson maintains an excellent campground where trailers may be parked at Patterson Lake, a reservoir on the Heart River about four miles southwest of Dickinson. A very good KOA campground with trailer accommodations is available at reasonable rates about two miles south of the Dickinson station.

VIII. *Previous studies and continuing projects.*

Work was begun in this area in 1961 on a project on "Growth and Development of Native Grasses in Relation to Microclimate" under NSF Grant G17523. This project was terminated in 1965. The work on this project has resulted in three Ph.D. theses, available on Interlibrary Loan from North Dakota State University. These theses are:

1. Wolters, Gale L. 1968. Characterization of the growing-season microclimate of the mixed grass prairie of southwestern North Dakota. Ph.D. Thesis, North Dakota State Univ. 147 p.
2. Prasad, Naresh. 1967. Influence of microclimate on diurnal water relations in western wheatgrass leaves. Ph.D. Thesis, North Dakota State Univ. 149 p.
3. Scoby, Donald R. 1968. Utilization of radiant energy in mixed grass prairie. Ph.D. Thesis, North Dakota State Univ. 113 p.

Studies are continuing on the area under the program of the North Dakota Agricultural Experiment Station with the present project operating on the site being titled, "Range Forage Production in Relation to the Environment." The principal objective of this project is to determine the influence of physical factors of the grassland microclimate on the seasonal cycle of range forage production. This project is closely integrated with the IBP Grassland Biome Comprehensive Network project scheduled to be started on this site. The title of the Comprehensive Network project is,

"Seasonal Herbage Dynamics of Ungrazed and Grazed Mixed Grass Prairie in Western North Dakota."

It is anticipated that the Experiment Station project and the IBP project will be continued on the site over the next few years. The Experiment Station project envisions the addition of extra water and nitrogen fertilizer to certain portions of the area to determine how augmentation of precipitation and increased soil fertility will affect grassland production and influence microclimatic factors. Rather complete measurement of grassland microclimatic factors during the growing season is being made in relation to both the IBP and the Experiment Station projects.

At the present time no maps are available of the specific grassland area. However, the soil survey bulletin of Stark County does include a small-scale aerial photo of the area with the soil series boundaries outlined on it. Reproductions of this photo have been requested, and it is anticipated that they should soon be available. An outline map of the Dickinson Experiment Station has been prepared and will be sent to participants in the Comprehensive Network program, as well as to others who may request them.

#### IX. *Publications.*

Whitman, W. C. 1969. Microclimate and its importance in grassland ecosystems, p. 40-64. In R. L. Dix and R. G. Beidleman [ed.] The grassland ecosystem: A preliminary synthesis. Range Sci. Dep., Sci. Ser. No. 2, Colorado State Univ.

Whitman, W. C., H. C. Hanson, and R. Peterson. 1943. Relation of drought and grazing to North Dakota range lands. North Dakota Agr. Exp. Sta. Bull. 340. 43 p.

Whitman, W. C. and G. Wolters. 1967. Microclimatic gradients in mixed grass prairie, p. 165-185. *In* Ground level climatology. Amer. Ass. Advance. Sci. Pub. 86.

DICKINSON, NORTH DAKOTA

Dickinson Grassland Site

SE  $\frac{1}{4}$  SEC 32 TWP 140

← Exit 12

1-94

DATE \_\_\_\_\_

NE 1/4 SEC 5 TWP 139

US 10 HIGHWAY

REVISED 3-13-64

PARTIAL LIST OF PLANT SPECIES  
ON DICKINSON SITE

Grasses and sedges:

Thickspike wheatgrass . . . . .	<i>Agropyron dasytachyum</i>
Western wheatgrass . . . . .	<i>Agropyron smithii</i>
Slender wheatgrass . . . . .	<i>Agropyron trachycaulum</i>
Ticklegrass . . . . .	<i>Agrostis scabra</i>
Big bluestem . . . . .	<i>Andropogon gerardi</i>
Little bluestem . . . . .	<i>Andropogon scoparius</i>
Red three-awn . . . . .	<i>Aristida longiseta</i>
Side-oats grama . . . . .	<i>Bouteloua curtipendula</i>
Blue grama . . . . .	<i>Bouteloua gracilis</i>
Cheatgrass . . . . .	<i>Bromus tectorum</i>
Plains reedgrass . . . . .	<i>Calamagrostis montanensis</i>
Prairie sandreed . . . . .	<i>Calamovilfa longifolia</i>
Six-weeks fescue . . . . .	<i>Festuca octoflora</i>
Prairie junegrass . . . . .	<i>Koeleria cristata</i>
Plains muhly . . . . .	<i>Muhlenbergia cuspidata</i>
Wilcox panic grass . . . . .	<i>Panicum wilcoxianum</i>
Sandberg bluegrass . . . . .	<i>Poa secunda</i>
Tumblegrass . . . . .	<i>Schedonnardus paniculatus</i>
Needle-and-thread . . . . .	<i>Stipa comata</i>
Big needlegrass . . . . .	<i>Stipa spartea</i>
Green needlegrass . . . . .	<i>Stipa viridula</i>
Needleleaf sedge . . . . .	<i>Carex eleocharis</i>
Threadleaf sedge . . . . .	<i>Carex filifolia</i>
Penn sedge . . . . .	<i>Carex pennsylvanica</i>

Forbs:

Western yarrow . . . . .	<i>Achillea lanulosa</i>
Butte marigold . . . . .	<i>Actinella acaulis</i>
Wild onion . . . . .	<i>Allium reticulatum</i>
Fairy candelabra . . . . .	<i>Androsace occidentalis</i>
Pasque flower . . . . .	<i>Anemone patens</i>
Pussytoes . . . . .	<i>Antennaria parvifolia</i>

PARTIAL LIST OF PLANT SPECIES ON DICKINSON SITE (continued)

Forbs: (continued)

Spiny ironweed . . . . .	<i>Aplopappus spinulosus</i>
Rockcress . . . . .	<i>Arabis hirsuta</i>
Hanging-pod rockcress . . . . .	<i>Arabis hoelboellii</i>
Biennial green sage . . . . .	<i>Artemisia caudata</i>
Fringed sage . . . . .	<i>Artemisia frigida</i>
White sage . . . . .	<i>Artemisia ludoviciana</i>
White prairie aster . . . . .	<i>Aster ericoides</i>
Ground plum . . . . .	<i>Astragalus caryocarpus</i>
Missouri milkvetch . . . . .	<i>Astragalus missouriensis</i>
Upright milkvetch . . . . .	<i>Astragalus striatus</i>
Bluebells . . . . .	<i>Campanula rotundifolia</i>
Prairie thistle . . . . .	<i>Carduus undulatus</i>
Lamb's quarters . . . . .	<i>Chenopodium album</i>
Golden aster . . . . .	<i>Chrysopsis villosa</i>
Collomia . . . . .	<i>Collomia linearis</i>
Bastard toadflax . . . . .	<i>Comandra pollida</i>
Yellow whitlowwort . . . . .	<i>Draba nemorosa</i>
Purple coneflower . . . . .	<i>Echinacea angustifolia</i>
Wild buckwheat . . . . .	<i>Eriogonum multiceps</i>
Western wallflower . . . . .	<i>Erysimum asperum</i>
Ridge-seeded spurge . . . . .	<i>Euphorbia glyptosperma</i>
Gaillardia . . . . .	<i>Gaillardia aristata</i>
Butterfly weed . . . . .	<i>Gaura coccinea</i>
Gumweed . . . . .	<i>Grindelia squarrosa</i>
Rough pennyroyal . . . . .	<i>Hedeoma hispida</i>
Stiff sunflower . . . . .	<i>Helianthus rigidus</i>
Blue wild lettuce . . . . .	<i>Lactuca pulchella</i>
Prickly lettuce . . . . .	<i>Lactuca serriola</i>
Low stickseed . . . . .	<i>Lappula redowski</i>
Peppergrass . . . . .	<i>Lepidium densiflorum</i>
Bladderpod . . . . .	<i>Lesquerella alpina</i>
Bladderpod . . . . .	<i>Lesquerella arenosa</i>
Blazing star . . . . .	<i>Liatris punctata</i>

PARTIAL LIST OF PLANT SPECIES ON DICKINSON SITE (continued)

Forbs: (continued)

Wild flax . . . . .	<i>Linum lewisii</i>
Stiffstem flax . . . . .	<i>Linum rigidum</i>
Yellow wild parsley . . . . .	<i>Lomatium foeniculaceum</i>
Prairie birds'-foot trefoil . . . . .	<i>Lotus americana</i>
Sticky cockle . . . . .	<i>Lychnis drummondii</i>
Skeleton weed . . . . .	<i>Lygodesmia juncea</i>
Ball cactus . . . . .	<i>Mamillaria vivipara</i>
Wild parsley . . . . .	<i>Musineon divaricatum</i>
Brittle prickly pear . . . . .	<i>Opuntia fragilis</i>
Locoweed . . . . .	<i>Oxytropis lambertii</i>
White beardtongue . . . . .	<i>Penstemon albidus</i>
Narrow-leaved beardtongue . . . . .	<i>Penstemon angustifolius</i>
Slender beardtongue . . . . .	<i>Penstemon gracilis</i>
Purple prairie clover . . . . .	<i>Petalostemum purpureum</i>
Hood's phlox . . . . .	<i>Phlox hoodii</i>
Prairie plantain . . . . .	<i>Plantago purshii</i>
Silverleaf . . . . .	<i>Psoralea argophylla</i>
Indian breadroot . . . . .	<i>Psoralea esculenta</i>
Long-headed coneflower . . . . .	<i>Ratibida columnifera</i>
Prairie wildrose . . . . .	<i>Rosa arkansana</i>
Early goldenrod . . . . .	<i>Solidago missouriensis</i>
Soft goldenrod . . . . .	<i>Solidago mollis</i>
Gray goldenrod . . . . .	<i>Solidago nemoralis</i>
Scarlet globemallow . . . . .	<i>Sphaeralcea coccinea</i>
Dandelion . . . . .	<i>Taraxacum officinale</i>
Golden pea . . . . .	<i>Thermopsis rhombifolia</i>
Goatsbeard . . . . .	<i>Tragopogon dubius</i>
Prairie vetch . . . . .	<i>Vicia americana</i>
Nuttall's violet . . . . .	<i>Viola nuttallii</i>