

# Autecology of Prairie chickweed on the Northern Mixed Grass Prairie

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The autecology of Prairie chickweed, *Cerastium arvense*, is one of the prairie plant species included in a long ecological study conducted at the NDSU Dickinson Research Extension Center during 67 growing seasons from 1946 to 2012 that quantitatively describes the changes in growth and development during the annual growing season life history and the changes in abundance through time as affected by management treatments for the intended purpose of the development and establishment of scientific standards for proper management of native rangelands of the Northern Plains. The introduction to this study can be found in report DREC 16-1093 (Manske 2016).

Prairie chickweed, *Cerastium arvense* L., is a member of the pink family, Caryophyllaceae, and is a native, perennial, dicot, herb. The first North Dakota record is Stevens 1961. Annual aerial growth has numerous trailing, prostrate, base stems and spreading lateral branches; the flower stems are erect, arising from long creeping rhizomes, forming dense mats that can be 1-2 m (3-7 ft) wide. Stem leaves are opposite, simple, 1 nerved, linear to lanceolate or narrowly oblong, 1-2 cm (0.4-0.8 in) long, 1-5 mm wide; the lateral decumbent branches have smaller leaves. Stems and leaves are softly pubescent. The root system has a main taproot with numerous fibrous lateral roots. Above the taproot is a swollen persistent base caudex from which numerous horizontal rhizomes develop. Tufts of fibrous roots develop at rhizome nodes where a single stem has developed. Regeneration is by vegetative and sexual reproduction. Vegetative growth is by annual sprouts from the crown and rhizome nodes and by sprouts from the extending rhizome system. Inflorescence is a complex of few to several flowers forming a compact cyme at the top of erect leafy stems 5-30 cm (2-12 in) tall. Flowers are perfect, showy, have 5 deeply lobed white petals, 1.3 cm (0.5 in) wide, appearing during late May to late June. Fruit is a cylindrical dehiscent capsule that splits open when mature and has many small brown seeds. Aerial parts are not usually eaten by livestock and are top killed by fire. Damage to aerial parts activates regrowth shoots from the main crown and from nodes of the extensive rhizome system. This summary information on growth development and regeneration of prairie

chickweed was based on works of Stevens 1963, Zaczkowski 1972, Great Plains Flora Association 1986, and Larson and Johnson 2007.

## Procedures

### The 1955-1962 Study

Prairie chickweed plant growth in height was determined by measuring ungrazed stems from ground level to top of leaf or to the tip of the inflorescence of an average of 10 plants of each species at approximately 7 to 10 day intervals during the growing seasons of 1955 to 1962 from early May until early September. Dates of first flower (anthesis) were recorded as observed. These growth in height and flower data were reported in Goetz 1963.

### The 1969-1971 Study

The range of flowering time of Prairie chickweed was determined by recording daily observations of plants at anthesis on several prairie habitat type collection locations distributed throughout 4,569 square miles of southwestern North Dakota. The daily observed flowering plant data collected during the growing seasons of 1969 to 1971 from April to August were reported as flower sample periods with 7 to 8 day duration in Zaczkowski 1972.

### The 1983-2012 Study

A long-term study on change in abundance of Prairie chickweed was conducted during active plant growth of July and August each growing season of 1983 to 2012 (30 years) on native rangeland pastures at the Dickinson Research Extension Center ranch located near Manning, North Dakota. Effects from three management treatments were evaluated: 1) long-term nongrazing, 2) traditional seasonlong grazing, and 3) twice-over rotation grazing. Each treatment had two replications, each with data collection sites on sandy, shallow, and silty ecological sites. Each ecological site of the two grazed treatments had matching paired plots, one grazed and the other with an ungrazed enclosure. The sandy, shallow, and silty ecological sites were each replicated two times on the nongrazed treatment,

three times on the seasonlong treatment, and six times on the twice-over treatment.

During the initial phase of this study, 1983 to 1986, the long-term nongrazed and seasonlong treatments were at different locations and moved to the permanent study locations in 1987. The data collected on those two treatments during 1983 to 1986 were not included in this report.

Abundance of Prairie chickweed was determined with plant species stem density by 0.1 m<sup>2</sup> frame density method and with plant species basal cover by the ten-pin point frame method (Cook and Stubbendieck 1986).

The stem density method was used to count individual stems of each plant species rooted inside twenty five 0.1 m<sup>2</sup> quadrats placed along permanent transect lines at each sample site both inside (ungrazed) and outside (grazed) each enclosure. Stem density per 0.1 m<sup>2</sup> quadrat, relative stem density, percent frequency, relative percent frequency, and importance value were determined from the stem density data. Plant species stem density data collection was 1984, 1986 to 2012 on the twice-over treatment and was 1987 to 2012 on the long-term nongrazed and seasonlong treatments. However, stem density data was not collected during 1991, 1993 to 1997 on the sandy, shallow, and silty ecological sites of all three management treatments, stem density data was not collected during 1992 on the sandy ecological site of all three management treatments, and stem density data was not collected during 1999 on the sandy and silty ecological sites of the long-term nongrazed treatment.

The point frame method was used to collect data at 2000 points along permanent transect lines at each sample site both inside (ungrazed) and outside (grazed) each enclosure. Basal cover, relative basal cover, percent frequency, relative percent frequency, and importance value were determined from the ten-pin point frame data. Point frame data collection period was 1983 to 2012 on the twice-over treatment and was 1987 to 2012 on the long-term nongrazed and seasonlong treatments. However, point frame data was not collected during 1992 on the sandy ecological sites of all three treatments.

During some growing seasons, the point frame method or the stem density method did not document the presence of a particular plant species which will be reflected in the data summary tables as an 0.00 or as a blank spot.

The 1983-2012 study attempted to quantify the increasing or decreasing changes in individual plant species abundance during 30 growing seasons by comparing differences in the importance values of individual species during multiple year periods. Importance value is an old technique that combines relative density or relative basal cover with relative frequency producing a scale of 0 to 200 that ranks individual species abundance within a plant community relative to the individual abundance of the other species in the community during a growing season. Density importance value ranks the forbs and shrubs and basal cover importance value ranks the grasses, upland sedges, forbs, and shrubs in a community. The quantity of change in the importance value of an individual species across time indicates the magnitude of the increases or decreases in abundance of that species relative to the changes in abundance of the other species.

## Results

Prairie chickweed resumes annual aerial growth with numerous prostrate, trailing base stems with spreading lateral branches arising from several persistent base caudexes. Long subterranean creeping rhizome systems extend from each caudex. The complex of above and below ground stems, branches, and rhizomes forms a dense mat that can be 1 to 2 m (3-7 ft) wide. Erect flower stems arise from rhizome nodes. A main taproot with numerous fibrous lateral roots descend below each caudex and tufts of fibrous roots develop from each rhizome node. Flowers are perfect, showy, with 5 deeply lobed white petals. Several flowers form a compact cyme at the top of an erect leafy stem. On the fall grazed pastures of the 1955-1962 study, the earliest first flowers appeared 12 June, the mean first flowers occurred on 27 June, with a 5 week flower period from the last week of May to late June (table 1) (Goetz 1963, Zaczkowski 1972). The mean flower stalk height of 11.1 cm (4.4 in) with an annual variance in height from 8.0 cm (3.1 in) to 12.0 cm (4.7 in) was reached during July (table 2) (Goetz 1963). The reported normal flower stalk height in the Northern Plains ranged from 5 cm (2.0 in) to 30 cm (11.8 in) tall. The mean flower stalk heights measured during the 1955-1962 study were within the normal height range for the Northern Plains.

Plant species composition in rangeland ecosystems is variable during a growing season and dynamic among growing seasons. Patterns in the changes in individual plant species abundance was followed for 30 growing seasons during the 1983-2012 study on the sandy, shallow, and silty ecological

sites of the long-term nongrazed, traditional seasonlong, and twice-over rotation management treatments (tables 3, 4, and 5).

On the sandy site of the nongrazed treatment, Prairie chickweed was present during 11.1% and 8.0% of the years that density and basal cover data were collected with a mean 0.11 stems/m<sup>2</sup> density and a mean 0.015% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present on the sandy site of the nongrazed treatment. During the later period (1998-2012), Prairie chickweed was present during 14.3% and 13.3% of the years with a mean 0.14 stems/m<sup>2</sup> density and a mean 0.025% basal cover, respectively. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance.

On the sandy site of the ungrazed seasonlong treatment, Prairie chickweed was not present where basal cover data were collected and was present during 15.8% of the years that density data were collected with a mean 0.08 stems/m<sup>2</sup> density during the total 30 year period. During the early period (1983-1992), Prairie chickweed was not present on the sandy site of the ungrazed seasonlong treatment. During the later period (1998-2012), Prairie chickweed was present during 20.0% of the years with a mean 0.10 stems/m<sup>2</sup> density. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance.

On the sandy site of the grazed seasonlong treatment, Prairie chickweed was not present where basal cover data were collected and was present during 5.3% of the years that density data were collected with a mean 0.02 stems/m<sup>2</sup> density during the total 30 year period. During the early period (1983-1992), Prairie chickweed was not present on the sandy site of the grazed seasonlong treatment. During the later period (1998-2012), Prairie chickweed was present during 6.7% of the years with a mean 0.03 stems/m<sup>2</sup> density. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance. The percent present and stem density were greater on the sandy site of the ungrazed seasonlong treatment than those on the sandy site of the grazed seasonlong treatment.

On the sandy site of the ungrazed twice-over treatment, Prairie chickweed was not present where basal cover data were collected and was present

during 23.8% of the years that density data were collected with a mean 0.04 stems/m<sup>2</sup> density during the total 30 year period. During the early period (1983-1992), Prairie chickweed was present during 16.7% of the years with a mean 0.02 stems/m<sup>2</sup> density. During the later period (1998-2012), Prairie chickweed was present during 26.7% of the years with a mean 0.05 stems/m<sup>2</sup> density. The percent present and stem density increased on the sandy site of the ungrazed twice-over treatment over time (tables 3, 4, and 5).

On the sandy site of the grazed twice-over treatment, Prairie chickweed was present during 19.1% and 10.3% of the years that density and basal cover data were collected with a mean 0.09 stems/m<sup>2</sup> density and a mean 0.002% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was present during 33.3% and 22.2% of the years with a mean 0.05 stems/m<sup>2</sup> density and a mean 0.005% basal cover, respectively. During the later period (1998-2012), Prairie chickweed was present during 13.3% and 6.7% of the years with a mean 0.11 stems/m<sup>2</sup> density and a mean 0.001% basal cover, respectively. The percent present for the density data and the percent present for basal cover data and basal cover decreased and stem density increased on the sandy site of the grazed twice-over treatment over time (tables 3, 4, and 5). The percent present for the density data were lower, and the percent present for the basal cover data, stem density, and basal cover were greater on the sandy site of the grazed twice-over treatment than those on the sandy site of the ungrazed twice-over treatment.

On the shallow site of the nongrazed treatment, Prairie chickweed was present during 10.5% and 3.9% of the years that density and basal cover data were collected with a mean 0.06 stems/m<sup>2</sup> density and a mean 0.001% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present on the shallow site of the nongrazed treatment. During the later period (1998-2012), Prairie chickweed was present during 14.3% and 6.7% of the years with a mean 0.09 stems/m<sup>2</sup> density and a mean 0.002% basal cover, respectively. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance.

On the shallow site of the ungrazed seasonlong treatment, Prairie chickweed was not present during the total 30 year period.

On the shallow site of the grazed seasonlong treatment, Prairie chickweed was not present where basal cover data were collected and was present during 10.0% of the years that density data were collected with a mean 0.04 stems/m<sup>2</sup> density during the total 30 year period. During the early period (1983-1992), Prairie chickweed was not present on the shallow site of the grazed seasonlong treatment. During the later period (1998-2012), Prairie chickweed was present during 13.3% of the years with a mean 0.05 stems/m<sup>2</sup> density. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance.

On the shallow site of the ungrazed twice-over treatment, Prairie chickweed was present during 18.2% and 3.5% of the years that density and basal cover data were collected with a mean 0.02 stems/m<sup>2</sup> density and a mean 0.001% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present where basal cover data were collected and was present during 14.3% of the years with a mean 0.01 stems/m<sup>2</sup> density. During the later period (1998-2012), Prairie chickweed was present during 20.0% and 6.7% of the years with a mean 0.02 stems/m<sup>2</sup> density and a mean 0.001% basal cover, respectively. The percent present, stem density, and basal cover increased slightly on the shallow site of the ungrazed twice-over treatment over time (tables 3, 4, and 5).

On the shallow site of the grazed twice-over treatment, Prairie chickweed was present during 13.6% and 6.7% of the years that density and basal cover data were collected with a mean 0.02 stems/m<sup>2</sup> density and a mean 0.001% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present where density data were collected and was present during 10.0% of the years with a mean 0.002% basal cover. During the later period (1998-2012), Prairie chickweed was present during 20.0% and 6.7% of the years with a mean 0.03 stems/m<sup>2</sup> density and a mean 0.001% basal cover, respectively. The percent present, stem density, and basal cover were similar on the shallow site of the ungrazed and grazed twice-over treatment.

On the silty site of the nongrazed treatment, Prairie chickweed was present during 21.1% and 19.2% of the years that density and basal cover data were collected with a mean 0.37 stems/m<sup>2</sup> density and a mean 0.01% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present on the silty

site of the nongrazed treatment. During the later period (1998-2012), Prairie chickweed was present during 28.6% and 33.3% of the years with a mean 0.50 stems/m<sup>2</sup> density and a mean 0.02% basal cover, respectively. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance.

On the silty site of the ungrazed seasonlong treatment, Prairie chickweed was present during 25.0% and 3.9% of the years that density and basal cover data were collected with a mean 0.37 stems/m<sup>2</sup> density and a mean 0.01% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present on the silty site of the ungrazed seasonlong treatment. During the later period (1998-2012), Prairie chickweed was present during 33.3% and 6.7% of the years with a mean 0.12 stems/m<sup>2</sup> density and a mean 0.001% basal cover, respectively. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance.

On the silty site of the grazed seasonlong treatment, Prairie chickweed was not present where basal cover data were collected and was present during 25.0% of the years that density data were collected with a mean 0.05 stems/m<sup>2</sup> density during the total 30 year period. During the early period (1983-1992), Prairie chickweed was not present on the silty site of the grazed seasonlong treatment. During the later period (1998-2012), Prairie chickweed was present during 33.3% of the years with a mean 0.06 stems/m<sup>2</sup> density. Prairie chickweed was not present during the early period and all observations were made during the later period that indicated low abundance. The percent present for the density data were similar on the silty site of the ungrazed and grazed seasonlong treatment and the stem density was greater on the silty site of the ungrazed seasonlong treatment than that on the silty site of the grazed seasonlong treatment.

On the silty site of the ungrazed twice-over treatment, Prairie chickweed was present during 40.9% and 10.3% of the years that density and basal cover data were collected with a mean 0.97 stems/m<sup>2</sup> density and a mean 0.005% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present where basal cover data were collected and was present during 14.3% of the years with a mean 0.01 stems/m<sup>2</sup> density. During the later period (1998-2012), Prairie chickweed was present during 53.3%

and 20.0% of the years with a mean 1.41 stems/m<sup>2</sup> density and a mean 0.009% basal cover, respectively. The percent present, stem density, and basal cover all increased on the silty site of the ungrazed twice-over treatment over time (tables 3, 4, and 5).

On the silty site of the grazed twice-over treatment, Prairie chickweed was present during 63.6% and 40.0% of the years that density and basal cover data were collected with a mean 1.11 stems/m<sup>2</sup> density and a mean 0.04% basal cover during the total 30 year period, respectively. During the early period (1983-1992), Prairie chickweed was not present where basal cover data were collected and was present during 28.6% of the years with a mean 0.30 stems/m<sup>2</sup> density. During the later period (1998-2012), Prairie chickweed was present during 80.0% and 80.0% of the years with a mean 1.49 stems/m<sup>2</sup> density and a mean 0.08% basal cover, respectively. The percent present, stem density, and basal cover all increased on the silty site of the grazed twice-over treatment over time. The percent present, stem density, and basal cover were greater on the silty site of the grazed twice-over treatment than those on the silty site of the ungrazed twice-over treatment.

Prairie chickweed on the sandy site was present during 15.0% and 3.7% of the years with a mean 0.07 stems/m<sup>2</sup> density and a mean 0.003% basal cover. Prairie chickweed on the shallow site was present during 10.5% and 2.8% of the years with a mean 0.03 stems/m<sup>2</sup> density and a mean 0.001% basal cover. Prairie chickweed on the silty site was present during 35.1% and 14.7% of the years with a mean 0.52 stems/m<sup>2</sup> density and a mean 0.012% basal cover. The percent present, stem density, and basal cover were all greater on the silty sites and lower on the shallow sites. Prairie chickweed was rarely present on the early period.

Prairie chickweed was present on the sandy site of the nongrazed treatment during 11.0% and 8.0% of the years with a mean 0.11 stems/m<sup>2</sup> density and a mean 0.015% basal cover. Prairie chickweed was present on the sandy site of the seasonlong treatment during 10.5% and 0.0% of the years with a mean 0.05 stems/m<sup>2</sup> density and a mean 0.0% basal cover. Prairie chickweed was present on the sandy site of the twice-over treatment during 21.4% and 5.2% of the years with a mean 0.07 stems/m<sup>2</sup> density and a mean 0.001% basal cover. On the sandy sites, the twice-over treatment has the greatest percent present for density data, and the nongrazed treatment has the greatest percent present for basal cover data, stem density, and basal cover.

Prairie chickweed was present on the shallow site of the nongrazed treatment during 10.5% and 3.9% of the years with a mean 0.06 stems/m<sup>2</sup> density and a mean 0.001% basal cover. Prairie chickweed was present on the shallow site of the seasonlong treatment during 5.0% and 0.0% of the years with a mean 0.02 stems/m<sup>2</sup> density and a mean 0.0% basal cover. Prairie chickweed was present on the shallow site of the twice-over treatment during 15.9% and 5.1% of the years with a mean 0.02 stems/m<sup>2</sup> density and a mean 0.001% basal cover. On the shallow sites, the twice-over treatment has the greatest percent present for density data and percent present for basal cover data, and the nongrazed treatment has the greatest stem density. Basal cover was the same on the nongrazed and twice-over treatments.

Prairie chickweed was present on the silty site of the nongrazed treatment during 21.1% and 19.2% of the years with a mean 0.37 stems/m<sup>2</sup> density and a mean 0.014% basal cover. Prairie chickweed was present on the silty site of the seasonlong treatment during 25.0% and 1.9% of the years with a mean 0.07 stems/m<sup>2</sup> density and a mean 0.001% basal cover. Prairie chickweed was present on the silty site of the twice-over treatment during 52.3% and 25.2% of the years with a mean 1.04 stems/m<sup>2</sup> density and a mean 0.023% basal cover. On the silty sites, the twice-over treatment had the greatest percent present for density data, percent present for basal cover data, stem density, and basal cover.

Prairie chickweed had low abundance on the sandy and shallow sites of the three management treatments. Prairie chickweed had moderate abundance on the silty sites of the three management treatments and had the greatest abundance on the silty site of the twice-over treatment.

## Discussion

Prairie chickweed, *Cerastium arvense*, is a native, late succession, perennial, dicot, forb of the pink family that is commonly present on healthy mixed grass prairie plant communities. Prairie chickweed can grow on sandy, shallow, and silty ecological sites. It grows better on the silty sites and grows best on silty sites managed with the twice-over rotation treatment. Annual aerial growth resumes with numerous aboveground prostrate, branched stems and belowground creeping rhizomes all arising from several persistent caudexes, each with a main taproot with numerous fibrous lateral roots. Several white showy flowers form a compact cyme on top of an erect leafy stem that arises from rhizome nodes.

The mean first flower date is 27 June (1955-1962 study) with a 5 week flower period from late May to late June (1969-1971 study). The mean flower stalk height of 11.1 cm (4.4 in) was reached during July (1955-1962 study). The multiple swollen caudexes each with a taproot and lateral root system, a creeping rhizome system, and numerous branching prostrate spreading stems help Prairie chickweed to persist through the harsh conditions of the Northern Mixed Grass Prairie.

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Table 1. First flower and flower period of *Cereatrium arvense*, Prairie chickweed.

	Apr	May	Jun	Jul	Aug	Sep
First Flower						
1955-1962						
Earliest			12			
Mean				27		
Flower Period						
1969-1971		X	XX	XX		

First Flower data from Goetz 1963.

Flower Period Data from Zaczkowski 1972.

Table 2. Autecology of *Cereatrium arvense*, Prairie chickweed, with growing season changes in mature height.

Data Period	Minimum Annual Mature Height cm	Maximum Annual Mature Height cm	Mean Mature Height cm	Percent of Mature Height Attained					
				Apr %	May %	Jun %	Jul %	Aug %	Sep %
1955-1962	8.0	12.0	11.1	28.3	71.0	96.7	100.0		

Data from Goetz 1963.

Table 3. Autecology of <i>Cerastium arvense</i> , Prairie chickweed, with growing season changes in density importance value, 1983-2012.					
Ecological Site Year Period	Nongrazed	Seasonlong		Twice-over	
		Ungrazed	Grazed	Ungrazed	Grazed
Sandy					
1983-1987	0.00	0.00	0.00	0.19	0.68
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.11	0.00
2004-2009	1.26	0.95	0.30	0.52	1.17
2010-2012	0.00	0.00	0.00	0.00	0.00
Shallow					
1983-1987	0.00	0.00	0.00	0.10	0.00
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.04	0.19
2004-2009	0.18	0.00	0.70	0.20	0.16
2010-2012	2.18	0.00	0.00	0.00	0.00
Silty					
1983-1987	0.00	0.00	0.00	0.10	1.53
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.24	1.76	3.35
2004-2009	1.61	0.58	0.61	11.06	4.07
2010-2012	4.69	2.82	0.00	5.00	7.35



Table 4. Autecology of <i>Cerastium arvense</i> , Prairie chickweed, with growing season changes in basal cover importance value, 1983-2012.					
Ecological Site Year Period	Nongrazed	Seasonlong		Twice-over	
		Ungrazed	Grazed	Ungrazed	Grazed
Sandy					
1983-1987	0.00	0.00	0.00	0.00	0.02
1988-1992	0.00	0.00	0.00	0.00	0.09
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.00	0.00
2004-2009	0.42	0.00	0.00	0.00	0.01
2010-2012	0.00	0.00	0.00	0.00	0.00
Shallow					
1983-1987	0.00	0.00	0.00	0.00	0.00
1988-1992	0.00	0.00	0.00	0.00	0.02
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.00	0.00
2004-2009	0.04	0.00	0.00	0.02	0.01
2010-2012	0.00	0.00	0.00	0.00	0.00
Silty					
1983-1987	0.00	0.00	0.00	0.00	0.00
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.00	0.47
2004-2009	0.41	0.03	0.00	0.24	0.75
2010-2012	0.28	0.00	0.00	0.00	0.25

Table 5. Autecology of <i>Cerastium arvense</i> , Prairie chickweed, with growing season changes in density, 1983-2012.					
Ecological Site Year Period	Nongrazed	Seasonlong		Twice-over	
		Ungrazed	Grazed	Ungrazed	Grazed
Sandy					
1983-1987	0.00	0.00	0.00	0.00	0.01
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.00	0.00
2004-2009	0.03	0.02	0.01	0.01	0.03
2010-2012	0.00	0.00	0.00	0.00	0.00
Shallow					
1983-1987	0.00	0.00	0.00	0.00	0.00
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.00	0.00	0.00
2004-2009	0.00	0.00	0.01	0.00	0.01
2010-2012	0.03	0.00	0.00	0.00	0.00
Silty					
1983-1987	0.00	0.00	0.00	0.00	0.07
1988-1992	0.00	0.00	0.00	0.00	0.00
1993-1998	0.00	0.00	0.00	0.00	0.00
1999-2003	0.00	0.00	0.01	0.02	0.12
2004-2009	0.07	0.07	0.01	0.31	0.21
2010-2012	0.09	0.04	0.00	0.04	0.13

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