

Autecology of Green Sage on the Northern Mixed Grass Prairie

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The autecology of Green Sage, *Artemisia dracunculus*, 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).

Green sage, tarragon, *Artemisia dracunculus* L., is a member of the aster (sunflower) family, Asteraceae, and is a native, perennial, deciduous, warm season subshrub-shrub that is drought tolerant and intolerant of shading. Aerial growth has unbranched reddish stems arising from thick horizontal rhizomes; stems are single until tip is removed by browsing, after which stem clusters form that are 1.5-3 feet (4.5-9.1 dm) tall. The root system has large quantities of adventitious roots that contain cork formed within the xylem tissue that can descend to 7 feet (2.1 m) in depth; thick rhizomes develop horizontally below the soil surface. Symbiotic associations with mycorrhiza fungi develop on the roots. Regeneration is by vegetative and sexual reproduction. Vegetative growth is sprouts from rhizomes. Sexual reproduction is from numerous inconspicuous flowers clustered on small heads that emerge during August-September. Pollination is by wind. Seed is a small achene. Fire top kills aerial stems; the rhizomes are protected by the soil, sprouts from rhizomes develop following fire. This summary information on growth development and regeneration of green sage was based on the works of Stevens 1963, Great Plains Flora Association 1986, Stubbendieck et al. 2003, Groen 2005a, Hurteau 2006a, and Johnson and Larson 2007.

Procedures

The 1955-1962 Study

Green sage 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 Green sage 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 1984-1985 Study

Green Sage plant growth in height was determined by measuring stems from ground level to top of stem or leaf or to the tip of the inflorescence of 12 ungrazed specimens randomly selected on each of the three replications of grazed sandy, shallow, silty, and clayey ecological sites biweekly during June, July, and August of the growing seasons of 1984 and 1985. Phenological growth stage of each specimen was recorded as vegetative, budding, anthesis, seed developing, seed shedding, or mature. Percentage of stem dryness of each specimen was recorded as 0, 0-2, 2-25, 25-50, 50-75, 75-98, or 100 percent dry. Mean stem weight was determined by clipping at ground level 12 specimens at typical phenological growth stages at biweekly sample dates on separate grazed areas of the sandy, shallow, silty, and clayey ecological sites. Clipped stems at each sample site were placed in separate labeled paper bags of known weight, oven dried at 62° C (144° F), and weighed in grams.

The 1983-2012 Study

A long-term study on change in abundance of Green sage 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 Green sage was determined with plant species stem density by 0.1 m² 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 m² quadrats placed along permanent transect lines at each sample site both inside (ungrazed) and outside (grazed) each enclosure. Stem density per 0.1 m² 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 that 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 values 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

Green sage resumed growth during early spring and continued active growth until the end of the growing season. Aerial stems arise from thick rhizomes. The unbranched reddish stems are single until browsed, then clusters of stems can form and grow in height to 91.4 cm (36 in). On the fall grazed pasture of the 1955-1962 study, the earliest first flowers appeared on 7 May, and the mean first flowers occurred on 16 May (table 1) (Goetz 1963). On the summer grazed (early June to mid October) pastures of the 1984-1985 study, green sage stems at anthesis were sampled during late June and during early July (table 4). The flower period identified during the 1969-1971 study extended from mid July to mid August (table 1) (Zaczkowski 1972). Green sage stems at the flower phenological growth stage have been documented during this long 67 growing season study to occur during May, June, July, and August, which is an extremely long flower period. On the 1955-1962 study a mean mature stem height of 42.5 cm (16.7 in) with an annual variance in height of 32.0 cm to 47.0 cm (12.6 in to 18.5 in) was reached during August (table 2) (Goetz 1963).

Changes in phenological growth stages from 1984-1985 study are summarized on tables 3, 4, 5, and 6. A total of 3,722 green sage stems were sampled during this study, with 1000 stems (26.9%) from the sandy sites, 1019 stems (27.4%) from the shallow sites, 1011 stems (27.2%) from the silty sites, and 692 stems (18.6%) from the clayey sites. Green sage grows on the sandy, shallow, silty, and clayey

ecological sites. The maximum mature stem height reached during August and percent of normal plant height of 91.4 cm (36 in) on the sandy site was 27.7 cm (10.9 in) 30.3%, on the shallow site was 24.6 cm (9.7 in) 26.9%, on the silty site was 25.7 cm (10.1 in) 28.1%, and on the clayey site was 27.3 cm (10.7 in) 29.9%. The mean mature stem height from 1955-1962 study was 42.5 cm (16.7 in) 46.5% of normal height. The reduced stem height of green sage on the 1955-1962 study and 1984-1985 study was caused by low quantities of available mineral nitrogen well below the threshold levels of 100 lbs/ac that resulted from the traditional management practices detrimental effects on the biogeochemical processes of the prairie plant community.

Mean green sage stem weights were not significantly different on the four ecological sites. Stem weights were heaviest on the sandy site at 2.90 g, were lightest on the shallow site at 2.10 g, were second heaviest on the silty site at 2.66 g, and were second lightest on the clayey site at 2.51 g (tables 3, 4, 5, and 6).

As a result of the long active growth period of Green sage occurring during the full length of the growing season, 99.95% of the total stem population were still at the vegetative and budding growth stages through August and only 0.05% of the stem population had reached the mature phenological growth stages of anthesis or beyond. All of the seed development stages occurred during September to mid October or the seeds did not develop. Senescence rate of green sage stems was low at 22.2% during late August. The aerial stems of green sage die back completely to ground level during winter.

Plant species composition in rangeland ecosystems is variable during a growing season and dynamic among growing seasons. Green sage stems were present at the beginning of the study on the sandy, shallow, and silty ecological sites of the nongrazed treatment, on the grazed sandy and shallow ecological sites and on the ungrazed and grazed silty ecological sites of the seasonlong treatment, and on the ungrazed and grazed sandy, shallow, and silty ecological sites of the twice-over treatment (tables 7 and 8).

Relative stem abundance of green sage as measured by the density and basal cover importance values (tables 7 and 8) was dynamic during the 30 year study of 1983-2012. The density importance value for green sage greatly increased during the low precipitation period of 1988 to 1992 then greatly decreased to low levels after the growing season precipitation returned to normal levels. The wide changes in the density importance values resulted

because of the wide swings in the abundance of the forbs as a group that generally respond rapidly with increases and decreases in stem density in concordance with the dynamic changes in growing season precipitation. The basal cover importance values for green sage increased during the low precipitation period of 1988 to 1992 then decreased to low levels after the growing season precipitation returned to normal levels. The basal cover importance value, however, did not increase and decrease to the great extent that the density importance values changed because the basal cover of grasses and upland sedges oscillate as much lower magnitude than the fluctuation in growing season precipitation.

On the sandy site of the nongrazed treatment, green sage was present during 66.7% and 76.0% of the years that density and basal cover data were collected, with a mean 1.1 stems/m² density and a mean 0.10 % basal cover, respectively. Green sage stems had low abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1991 as a result of a great reduction of most forbs and some grasses and also because green sage stem density greatly increased. The greatest increases in green sage relative stem abundance occurred during 1988 and 1989. The relative stem abundance greatly decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the sandy sites of the seasonlong treatment, green sage was present on the ungrazed sandy site during 94.7% and 96.0% of the years, with a mean 1.0 stems/m² density and a mean 0.25 % basal cover, and on the grazed sandy site during 100.0% and 96.0% of the years that density and basal cover data were collected, with a mean 1.6 stems/m² density and a mean 0.28 % basal cover, respectively. Green sage stems had moderate abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1991 as a result of a great reduction of most forbs and some grasses and also because green sage stem density greatly increased. The greatest increases in green sage stem relative stem abundance occurred during 1988 and 1990. The relative stem abundance greatly decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the sandy sites of the twice-over treatment, green sage was present on the ungrazed sandy site during 95.2% and 89.7% of the years, with a mean 0.9 stems/m² density and a mean 0.19 % basal cover, and on the grazed sandy site during 100.0%

and 96.6% of the years that density and basal cover data were collected, with a mean 1.8 stems/m² density and a mean 0.29 % basal cover, respectively. Green sage stems had high abundance at the start of the study, and relative stem abundance based on density data decreased because green sage stem density decreased, however, relative stem abundance based on basal cover data increased because green sage stem basal cover increased during the low precipitation period of 1988 to 1991. The relative stem abundance based on both density and basal cover data greatly decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the shallow site of the nongrazed treatment, green sage was present during 95.0% and 84.6% of the years that density and basal cover data were collected, with a mean 1.6 stems/m² density and a mean 0.39 % basal cover, respectively. Green sage stems had moderate abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1992 as a result of a great reduction of most forbs and some grasses and also because green sage stem density greatly increased. The greatest increases in green sage relative stem abundance occurred during 1988 and 1989. Green sage relative stem abundance decreased to moderate levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the shallow sites of the seasonlong treatment, green sage was present on the ungrazed shallow site during 95.0% and 84.6% of the years, with a mean 1.0 stems/m² density and a mean 0.25 % basal cover, and on the grazed shallow site during 100.0% and 96.2% of the years that density and basal cover data were collected, with a mean 1.1 stems/m² density and a mean 0.26 % basal cover, respectively. Green sage stems had moderate abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1992 as a result of a great reduction of most forbs and some grasses and also because green sage stem density greatly increased. The greatest increases in green sage relative stem abundance occurred during 1988 and 1989. Green sage relative stem abundance decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the shallow sites of the twice-over treatment, green sage was present on the ungrazed shallow site during 95.5% and 96.7% of the years, with a mean 1.3 stems/m² density and a mean 0.21 % basal cover, and on the grazed shallow site during

100.0% and 100.0% of the years that density and basal cover data were collected, with a mean 1.6 stems/m² density and a mean 0.26 % basal cover, respectively. Green sage stems had great abundance at the start of the study, and relative stem abundance increased moderately during the low precipitation period of 1988 to 1992 as a result of a great reduction of most forbs and some grasses and also because green sage stem density increased slightly. The greatest increases in green sage relative stem abundance occurred during 1988 and 1990. Green sage relative stem abundance decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the silty site of the nongrazed treatment, green sage was present during 94.7% and 92.3% of the years that density and basal cover data were collected, with a mean 1.3 stems/m² density and a mean 0.24 % basal cover, respectively. Green sage stems had moderate abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1990 as a result of a great reduction of most forbs and some grasses and also because green sage stem density greatly increased. The greatest increase in green sage relative stem abundance occurred during 1988. Green sage relative stem abundance decreased to moderate levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the silty sites of the seasonlong treatment, green sage was present on the ungrazed silty site during 95.0% and 96.2% of the years, with a mean 1.0 stems/m² density and a mean 0.26 % basal cover, and on the grazed silty site during 100.0% and 100.0% of the years that density and basal cover data were collected, with a mean 1.6 stems/m² density and a mean 0.48 % basal cover, respectively. Green sage stems had moderate abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1990 as a result of a great reduction of most forbs and some grasses and also because green sage stem density increased. The greatest increase in green sage relative stem abundance occurred during 1988. Green sage relative stem abundance decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

On the silty sites of the twice-over treatment, green sage was present on the ungrazed silty site during 63.6% and 73.3% of the years, with a mean 0.6 stems/m² density and a mean 0.16 % basal cover, and on the grazed silty site during 95.5% and 96.7% of the years that density and basal cover data

were collected, with a mean 1.1 stems/m² density and a mean 0.20 % basal cover, respectively. Green sage stems had moderate abundance at the start of the study, and relative stem abundance greatly increased during the low precipitation period of 1988 to 1990 as a result of a great reduction of most forbs and some grasses and also because of a modest increase in green sage stem density. The greatest increase in green sage relative stem abundance occurred during 1988. Green sage relative stem abundance decreased to low levels during 1998 to 2012 as the forbs and grasses increased and also because green sage stem density greatly decreased (tables 7 and 8).

Stem density of green sage (table 9) was generally low, at a mean of 1.2 stems/m². The mean green sage stem densities were not significantly different on the three ecological sites, with a mean density on the shallow sites at 1.3 stems/m², with a mean density on the sandy sites at 1.3 stems/m², and with a mean density on the silty sites at 1.1 stems/m². There is no significant difference among the mean green sage densities on the nongrazed, ungrazed, and grazed treatments. The initial green sage stem densities on the sandy and shallow sites of the twice-over treatment were significantly greater than those on the sandy and shallow sites of the nongrazed and seasonlong treatments. Stem densities were 2.8 stems/m² and 2.7 stems/m² on the ungrazed and grazed sandy and shallow sites of the twice-over treatment and were 1.3 stems/m², 1.4 stems/m², and 1.4 stems/m² on the sandy and shallow sites of the nongrazed and the ungrazed and grazed sites of the seasonlong treatments, respectively. The initial green sage stem density on the silty sites of the nongrazed, seasonlong, and twice-over treatments were not significantly different. The changes in stem density of green sage during the 25 year period of 1988 to 2012 followed a similar basic pattern on the sandy, shallow, and silty ecological sites of the nongrazed, seasonlong, and twice-over treatments. During the low precipitation period of 1988 to 1992, the green sage stem density was not significantly different on the sandy, shallow, and silty ecological sites of the nongrazed, ungrazed and grazed seasonlong, and ungrazed and grazed twice-over treatment at a mean 2.2 stems/m². Green sage stem densities increased during the low precipitation period of 1988 to 1992 from their initial densities of the sandy, shallow, and silty sites of the nongrazed and seasonlong treatments and green sage stem densities decreased during the low precipitation period from their initial densities on the sandy, shallow, and silty ecological sites of the twice-over treatment. During the 15 year period of 1998 to 2012, green sage stem densities greatly decreased and were not significantly different on the sandy, shallow, and silty ecological sites of the nongrazed, ungrazed and grazed seasonlong, and ungrazed and grazed twice-over treatments at a mean

0.9 stems/m². Differences in ecological sites and management treatments did not cause differences in green sage mean stem density at 2.2 stems/m² during low precipitation and did not cause differences in green sage mean stem density at 0.9 stems/m² during normal growing season precipitation.

Discussion

Green sage, *Artemisia dracunculus*, is a subshrub that is commonly present but a minor component of healthy mixed grass prairie plant communities. Green sage can grow at similar densities in sandy, shallow, silty, and clayey ecological sites and is not directly effected by differences in management treatments. Each year green sage resumes aerial stem growth from thick rhizomes during early spring as a single stem until the tip is damaged or removed by browsing, then multiple clusters of stems develop. Vegetative growth in height continues during May, June, July, and August. Flower buds were documented to appear during late June. Green sage stems at flower (anthesis) were documented to occur during May, June, July, and August. The common flower period occurs from mid July through to mid August. Erect aerial stems reach maximum mature height during August. Normal height is reported to be 91.4 cm (36 in). Stems growing in fall grazed pastures reached mean mature height at 42.5 cm (16.7 in) (46.5% of the normal height) and stems growing in summer grazed (early June to mid October) pastures reached mean mature height at 27.7 cm (10.9 in) (30.3% of the normal height) on silty sites, at 27.3 cm (10.7 in) (29.9% of the normal height) on clayey sites, at 25.7 cm (10.1 in) (28.1% of the normal height) on silty sites, and at 24.6 cm (9.7 in) (26.9% of the normal height) on shallow sites. The stem heights collected during the 1955-1962 study and during the 1984-1985 study were shorter than the normal height of 91.4 cm (36 in) because the soils of both studies had quantities of mineral nitrogen available at much less than the threshold quantity of 100 lbs/ac which resulted from the detrimental effects caused by the traditional management practices on the biogeochemical processes of the prairie plant communities. Mean stem weights were at 2.90 g on the sandy sites, at 2.66 g on the silty sites, at 2.51 g on the clayey sites, and at 2.10 g on the shallow sites. The sandy sites had the tallest stems that were the heaviest in weight and spaced at similar densities. The clayey sites had the second tallest stems that were the second lightest in weight and spaced at similar densities. The silty sites had the second shortest stems that were the second heaviest in weight and spaced at similar densities. The shallow sites had the shortest stems that were the lightest in weight and spaced at similar densities. As a result of the long active growth period, 99.95% of the total

population of green sage stems were still at the vegetative and budding growth stages through August and only 0.05% of the stem population had reached the anthesis growth stage. During August, senescence had caused a mean of 22.2% dryness on the green sage stems. The herbaceous aerial stems of green sage die back completely to ground level during winter.

Green sage stem density was elevated under one set of conditions. During the 5 year period of 1988 to 1992, the growing season precipitation ranged from 5.3 inches (37.5% of LTM) to 12.5 inches (88.8% of the LTM) with a mean of only 9.65 inches (68.3% of LTM) and the green sage stem densities on the sandy, shallow, and silty ecological sites of the nongrazed, seasonlong, and twice-over treatments reached the mean of 2.2 stems/m² that was not significantly different on any sites or treatments. During this low precipitation period, most forbs and some grasses decreased, reducing competition for soil water and nutrients. Green sage has numerous adventitious roots that can descent to 7 feet (2.1 m) in depths to search for water and these roots have the added benefit of an association with symbiotic mycorrhizal fungi that help support an elevated stem density during dry conditions.

Green sage stem density decreased under one set of conditions. During the 15 year period of 1998 to 2012, the growing season precipitation had returned to normal with a mean of 15.25 inches (107.9% of LTM). The prairie forbs and grasses had returned to normal conditions. The recovered grasses resumed their effective belowground resource uptake competitiveness and were able to acquire water and nutrients away from the green sage plants causing a reduction of mean stem density to 0.9 stems/m² that was not significantly different on the sandy, shallow, and silty ecological sites of the nongrazed, ungrazed and grazed seasonlong, and ungrazed and grazed twice-over treatments. Green sage is a native subshrub that has active growth during the entire growing season and is well adapted to drought and low precipitation conditions. When drought or low precipitation growing seasons decrease the quantity of forbs and grasses in a community and reduce the competition for soil water and nutrients, green sage has deep roots with symbiotic mycorrhizal fungi that can support an elevated stem density, however, when grasses recover their effective belowground resource uptake competitiveness, green sage roots can only support a much reduced stem density.

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Table 1. First flower and flower period of *Artemisia dracunculus*, Green sage.

	Apr	May	Jun	Jul	Aug	Sep
First Flower 1955-1962						
Earliest		7				
Mean		16				
Flower Period 1969-1971				XX	XX	

First Flower data from Goetz 1963.

Flower Period Data from Zaczkowski 1972.

Table 2. Autecology of *Artemisia dracunculus*, Green sage, 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	32.0	47.0	42.5			79.0	93.7	100.0	

Data from Goetz 1963.

Table 3. Phenological growth stage changes during the growing season for, *Artemisia dracunculas*, Green sage, 1984-1985.

Site	8 Jun	23 Jun	8 Jul	23 Jul	8 Aug	23 Aug
Sandy						
% Population						
Veg	100.0	91.4	72.8	50.7	28.6	42.8
Bud		8.6	27.2	49.3	71.4	57.2
Anth						
Seed Dev						
Seed Shed						
Mat						
Mean Height (cm)						
Veg	22.9	21.9	24.4	20.2	20.7	20.2
Bud		23.9	28.0	26.6	25.9	29.5
Anth						
Seed Dev						
Seed Shed						
Mat						
% Dryness						
Veg	2.4	5.9	8.2	8.8	10.6	21.2
Bud		3.1	14.1	13.4	17.1	28.7
Anth						
Seed Dev						
Seed Shed						
Mat						
Mean Weight (g)	1.44	3.12	2.30	3.77	3.77	3.01

Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).

Table 4. Phenological growth stage changes during the growing season for, *Artemisia dracunculas*, Green sage, 1984-1985.

Site	8 Jun	23 Jun	8 Jul	23 Jul	8 Aug	23 Aug
Shallow						
% Population						
Veg	100.0	93.9	91.3	58.6	33.3	38.0
Bud		5.5	18.2	41.4	66.7	62.0
Anth		0.6	0.5			
Seed Dev						
Seed Shed						
Mat						
Mean Height (cm)						
Veg	18.0	18.2	18.1	19.4	16.6	16.9
Bud		18.3	18.1	24.9	24.9	24.2
Anth		12.2	24.2			
Seed Dev						
Seed Shed						
Mat						
% Dryness						
Veg	1.6	6.3	9.5	8.9	13.3	22.2
Bud		6.5	15.4	13.9	16.6	26.0
Anth		2.0	25.0			
Seed Dev						
Seed Shed						
Mat						
Mean Weight (g)	1.71	2.23	2.26	1.92	2.51	1.98

Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).

Table 5. Phenological growth stage changes during the growing season for, *Artemisia dracunculas*, Green sage, 1984-1985.

Site	8 Jun	23 Jun	8 Jul	23 Jul	8 Aug	23 Aug
Silty						
% Population						
Veg	100.0	90.6	72.9	54.7	36.0	39.1
Bud		9.4	27.1	45.3	64.0	60.9
Anth						
Seed Dev						
Seed Shed						
Mat						
Mean Height (cm)						
Veg	19.1	19.1	21.7	19.2	18.3	19.5
Bud		17.3	20.0	26.3	25.1	26.3
Anth						
Seed Dev						
Seed Shed						
Mat						
% Dryness						
Veg	2.0	9.1	11.0	9.6	20.4	17.9
Bud		2.9	2.5	13.7	23.8	24.2
Anth						
Seed Dev						
Seed Shed						
Mat						
Mean Weight (g)	1.37	2.12	2.79	4.18	2.25	3.25

Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).

Table 6. Phenological growth stage changes during the growing season for, *Artemisia dracunculas*, Green sage, 1984-1985.

Site	8 Jun	23 Jun	8 Jul	23 Jul	8 Aug	23 Aug
Clayey						
% Population						
Veg	100.0	87.9	68.2	54.5	41.1	27.7
Bud		12.1	31.8	45.5	58.6	72.3
Anth						
Seed Dev						
Seed Shed						
Mat						
Mean Height (cm)						
Veg	19.1	21.0	21.6	19.9	18.5	17.4
Bud		21.5	19.4	24.4	28.7	25.9
Anth						
Seed Dev						
Seed Shed						
Mat						
% Dryness						
Veg	4.5	6.0	6.6	9.0	17.2	12.0
Bud		7.6	4.4	14.6	20.9	25.4
Anth						
Seed Dev						
Seed Shed						
Mat						
Mean Weight (g)	1.71	1.93	2.70	2.71	3.63	2.38

Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).

Table 7. Autecology of *Artemisia dracunculus*, Green sage, 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	3.63	0.00	10.60	19.62	21.27
1988-1992	24.23	0.00	19.30	15.89	20.52
1993-1998	0.00	0.00	2.91	4.10	6.58
1999-2003	0.00	1.69	5.61	1.44	8.90
2004-2009	4.79	2.12	6.12	3.27	7.41
2010-2012	14.40	3.01	7.12	2.98	6.91
Shallow					
1983-1987	10.52	0.00	11.04	15.49	12.60
1988-1992	15.49	0.00	27.37	28.92	30.34
1993-1998	0.93	0.00	4.51	3.11	3.20
1999-2003	2.65	2.55	4.36	4.05	3.07
2004-2009	13.73	2.84	4.75	4.25	6.92
2010-2012	10.31	3.44	4.92	2.93	10.39
Silty					
1983-1987	6.97	3.70	7.15	8.95	7.74
1988-1992	14.14	16.27	32.53	21.18	18.07
1993-1998	2.45	5.77	3.98	1.90	5.84
1999-2003	2.98	3.14	7.38	0.38	4.27
2004-2009	6.41	4.49	3.69	1.11	9.08
2010-2012	14.13	4.85	8.69	0.15	4.98

Table 8. Autecology of *Artemisia dracunculus*, Green sage, 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	1.44	0.00	3.24	2.36	2.55
1988-1992	2.30	0.00	4.90	5.74	6.14
1993-1998	0.24	0.00	0.62	0.95	1.76
1999-2003	0.30	0.50	2.40	0.68	1.51
2004-2009	1.28	0.82	1.30	0.76	1.23
2010-2012	0.96	0.57	0.93	0.37	0.50
Shallow					
1983-1987	7.65	0.00	5.39	1.51	2.18
1988-1992	10.07	0.00	6.63	5.14	5.75
1993-1998	0.87	0.00	0.71	1.06	1.61
1999-2003	1.28	0.14	1.46	1.26	0.98
2004-2009	1.47	0.37	0.42	0.76	0.72
2010-2012	0.34	0.11	0.20	0.54	0.99
Silty					
1983-1987	2.44	0.92	3.13	2.31	1.77
1988-1992	5.77	4.28	8.06	4.51	4.71
1993-1998	0.74	1.78	2.95	0.12	0.25
1999-2003	0.85	2.27	3.90	0.73	1.13
2004-2009	1.43	1.01	1.51	0.20	0.61
2010-2012	1.02	0.54	1.11	0.03	0.24

Table 9. Autecology of *Artemisia dracunculus*, Green sage, with growing season changes in density, 1983-2012.

Ecological Site Year Period	Nongrazed	Seasonlong		Twice-over	
		Ungrazed	Grazed	Ungrazed	Grazed
Sandy					
1983-1987	0.08	0.00	0.13	0.26	0.29
1988-1992	0.26	0.00	0.22	0.15	0.20
1993-1998	0.00	0.00	0.04	0.06	0.08
1999-2003	0.00	0.21	0.14	0.02	0.19
2004-2009	0.06	0.05	0.21	0.07	0.14
2010-2012	0.22	0.06	0.08	0.05	0.11
Shallow					
1983-1987	0.18	0.00	0.15	0.30	0.24
1988-1992	0.28	0.00	0.26	0.23	0.27
1993-1998	0.02	0.00	0.05	0.05	0.03
1999-2003	0.05	0.09	0.07	0.10	0.06
2004-2009	0.21	0.05	0.09	0.08	0.15
2010-2012	0.15	0.04	0.07	0.04	0.17
Silty					
1983-1987	0.12	0.08	0.21	0.19	0.14
1988-1992	0.17	0.18	0.28	0.18	0.14
1993-1998	0.06	0.09	0.11	0.02	0.05
1999-2003	0.08	0.07	0.18	0.00	0.06
2004-2009	0.11	0.09	0.10	0.02	0.16
2010-2012	0.19	0.05	0.11	0.00	0.05

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Appendix
Autecology Data
of Green Sage

Table 1.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1984.													
		8 Jun						23 Jun							
Site: Sandy		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat		
% Population								85.4	14.6						
Mean Height (cm)								19.0	23.9						
% Dryness								3.1	3.1						
Mean Weight (g)	0.92														
		8 Jul						23 Jul							
Site: Sandy		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat		
% Population		38.3	61.7					40.3	59.7						
Mean Height (cm)		18.5	20.8					16.7	24.6						
% Dryness		1.3	3.1					7.3	13.9						
Mean Weight (g)	2.46							3.44							
		8 Aug						23 Aug							
Site: Sandy		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat		
% Population		20.8	79.2					30.6	69.4						
Mean Height (cm)		18.4	24.1					19.1	29.5						
% Dryness		6.2	10.7					13.5	21.1						
Mean Weight (g)	4.44							2.24							
Table 2.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1985.													
		8 Jun						23 Jun							
Site: Sandy		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat		
% Population		100.0						100.0							
Mean Height (cm)		22.9						25.4							
% Dryness		2.4						8.6							
Mean Weight (g)	1.95							3.12							
		8 Jul						23 Jul							
Site: Sandy		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat		
% Population		96.7	3.3					60.3	39.7						
Mean Height (cm)		26.9	26.5					22.4	29.3						
% Dryness		15.0	25.0					10.2	12.9						
Mean Weight (g)	2.13							4.09							
		8 Aug						23 Aug							
Site: Sandy		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat		
% Population		36.0	64.0					56.1	43.9						
Mean Height (cm)		22.0	27.9					20.8	29.6						
% Dryness		15.0	23.4					28.9	36.3						
Mean Weight (g)	3.09							3.77							
Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).															

Table 3.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1984.												
		8 Jun						23 Jun						
Site: Shallow		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population								89.1	9.8	1.1				
Mean Height (cm)								14.5	18.3	12.2				
% Dryness								5.3	6.5	2.0				
Mean Weight (g)	1.06													
		8 Jul						23 Jul						
Site: Shallow		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population		67.0	33.0					50.0	50.0					
Mean Height (cm)		14.2	17.1					15.4	22.5					
% Dryness		2.1	5.7					3.6	13.7					
Mean Weight (g)	2.23							2.03						
		8 Aug						23 Aug						
Site: Shallow		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population		30.6	69.4					38.9	61.1					
Mean Height (cm)		16.3	24.0					16.0	22.6					
% Dryness		9.1	9.3					18.7	21.3					
Mean Weight (g)	2.92							3.08						
Table 4.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1985.												
		8 Jun						23 Jun						
Site: Shallow		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population		100.0						100.0						
Mean Height (cm)		18.0						22.4						
% Dryness		1.6						7.2						
Mean Weight (g)	2.37							2.23						
		8 Jul						23 Jul						
Site: Shallow		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population		96.5	2.4	1.2				65.9	34.1					
Mean Height (cm)		21.0	33.1	24.2				22.0	27.8					
% Dryness		16.8	25.0	25.0				14.2	14.0					
Mean Weight (g)	2.28							1.81						
		8 Aug						23 Aug						
Site: Shallow		Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population		35.9	64.1					36.9	63.1					
Mean Height (cm)		16.8	25.9					17.9	25.8					
% Dryness		17.5	23.9					25.7	30.6					
Mean Weight (g)	2.10							0.88						
Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).														

Table 5.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1984.											
8 Jun							23 Jun						
Site: Silty	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population							83.5	16.5					
Mean Height (cm)							17.9	17.3					
% Dryness							3.2	2.9					
Mean Weight (g)	0.80												
8 Jul							23 Jul						
Site: Silty	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	44.8	55.2					38.9						
Mean Height (cm)	16.4	20.0					17.3						
% Dryness	3.0	2.5					7.5						
Mean Weight (g)	2.57						4.60						
8 Aug							23 Aug						
Site: Silty	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	22.2	77.8					44.9	55.1					
Mean Height (cm)	16.9	24.0					20.0	25.4					
% Dryness	17.7	11.7					19.2	22.3					
Mean Weight (g)	2.54						4.18						
Table 6.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1985.											
8 Jun							23 Jun						
Site: Silty	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	100.0						100.0						
Mean Height (cm)	19.1						20.4						
% Dryness	2.0						15.0						
Mean Weight (g)	1.93						2.12						
8 Jul							23 Jul						
Site: Silty	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	100.0						69.2	30.8					
Mean Height (cm)	23.9						20.1	29.6					
% Dryness	18.9						11.7	17.3					
Mean Weight (g)	3.00						3.75						
8 Aug							23 Aug						
Site: Silty	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	48.7	51.3					32.8	67.2					
Mean Height (cm)	19.0	26.7					18.8	27.1					
% Dryness	23.1	23.5					16.5	26.0					
Mean Weight (g)	1.96						2.32						
Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).													

Table 7.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1984.											
8 Jun							23 Jun						
Site: Clayey	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population							73.3	26.7					
Mean Height (cm)							19.2	21.5					
% Dryness							3.5	7.6					
Mean Weight (g)	1.67												
8 Jul							23 Jul						
Site: Clayey	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	40.6	59.4					31.3	68.8					
Mean Height (cm)	16.8	19.4					17.4	23.8					
% Dryness	1.1	4.4					6.6	6.1					
Mean Weight (g)	3.84						3.53						
8 Aug							23 Aug						
Site: Clayey	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	18.8	81.3					18.8	81.3					
Mean Height (cm)	19.6	28.1					19.0	25.1					
% Dryness	14.3	17.5					6.9	18.6					
Mean Weight (g)	5.39						3.34						
Table 8.		Autecology study of <i>Artemisia dracunculus</i> with growing season changes in phenological growth stage, mean height, and mean weight, 1985.											
8 Jun							23 Jun						
Site: Clayey	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	100.0						100.0						
Mean Height (cm)	19.1						22.1						
% Dryness	4.5						8.5						
Mean Weight (g)	1.74						1.93						
8 Jul							23 Jul						
Site: Clayey	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	100.0						76.5	23.5					
Mean Height (cm)	23.9						20.8	25.9					
% Dryness	12.1						11.4	23.1					
Mean Weight (g)	1.56						1.88						
8 Aug							23 Aug						
Site: Clayey	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	Veg	Bud	Anth	Seed Dev	Seed Shed	Mat	
% Population	62.7	37.3					37.0	63.0					
Mean Height (cm)	18.2	29.9					16.6	27.0					
% Dryness	20.1	24.2					17.0	32.1					
Mean Weight (g)	1.86						1.42						
Phenological Growth Stages: Vegetative (Veg), Budding (Bud), Anthesis (Anth), Seed Developing (Seed Dev), Seed Shedding (Seed Shed), Mature (Mat).													

Table 9. Density analysis for native range on the nongrazed grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NG-W & E				Relative	
Site:	Sandy, ungrazed		Relative	Percent	Percent	Importance
Species:	Artemisia dracunculus	Density	Density	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.08	2.38	0.60	1.25	3.63
1988		0.22	16.43	16.43	18.38	34.81
1989		0.48	12.12	10.10	18.87	30.99
1990		0.08	1.48	1.48	5.41	6.89
1991				No Densities Collected		
1992				No Densities Collected		
1993				No Densities Collected		
1994				No Densities Collected		
1995				No Densities Collected		
1996				No Densities Collected		
1997				No Densities Collected		
1998						
1999				No Densities Collected		
2000						
2001						
2002						
2003						
2004						
2005		0.02	0.19	2.00	1.16	1.35
2006		0.10	2.45	10.00	4.50	6.95
2007		0.12	3.65	12.00	5.45	9.10
2008		0.04	1.95	4.00	2.71	4.67
2009		0.10	2.35	10.00	4.31	6.66
2010		0.22	11.48	10.00	8.33	19.81
2011		0.12	1.52	8.00	2.30	3.82
2012		0.32	8.08	28.00	11.49	19.57

Table 10. Density analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.

System:	West/East/North					
Pasture:	NR-9-12				Relative	
Site:	Sandy, ungrazed		Relative	Percent	Percent	Importance
Species:	Artemisia dracunculus	Density	Density	Frequency	Frequency	Value
1983					No Data	
1984					No Data	
1985					No Data	
1986					No Data	
1987						
1988						
1989						
1990						
1991					No Densities Collected	
1992					No Densities Collected	
1993					No Densities Collected	
1994					No Densities Collected	
1995					No Densities Collected	
1996					No Densities Collected	
1997					No Densities Collected	
1998						
1999						
2000						
2001						
2002						
2003		0.21	2.68	14.67	5.74	8.43
2004		0.07	0.76	5.33	2.28	3.05
2005		0.05	0.60	4.00	1.52	2.12
2006		0.08	0.81	6.67	2.62	3.42
2007		0.01	0.32	1.33	0.53	0.85
2008		0.07	1.02	5.33	2.24	3.27
2009						
2010		0.11	2.29	5.33	3.26	5.55
2011		0.01	0.30	1.33	0.62	0.91
2012		0.05	0.70	4.00	1.87	2.56

Table 11. Density analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12				Relative	
Site:	Sandy, grazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983						No Data
1984						No Data
1985						No Data
1986						No Data
1987		0.13	3.91	10.67	6.68	10.60
1988		0.25	12.47	22.67	17.12	29.59
1989		0.21	3.80	14.67	6.23	10.03
1990		0.20	3.42	18.67	14.86	18.27
1991						No Densities Collected
1992						No Densities Collected
1993						No Densities Collected
1994						No Densities Collected
1995						No Densities Collected
1996						No Densities Collected
1997						No Densities Collected
1998		0.04	1.08	2.67	1.84	2.91
1999		0.13	2.17	1.85	5.26	7.43
2000		0.12	1.08	10.67	4.44	5.52
2001		0.08	0.82	6.67	1.84	2.67
2002		0.11	1.07	4.00	1.33	2.40
2003		0.24	3.69	13.33	6.34	10.03
2004		0.01	0.33	1.33	0.98	1.31
2005		0.19	1.99	14.67	4.27	6.26
2006		0.12	3.00	9.33	4.44	7.44
2007		0.23	2.13	16.00	4.25	6.39
2008		0.44	6.71	10.67	4.44	11.15
2009		0.25	2.08	6.67	2.11	4.19
2010		0.09	3.05	6.67	5.12	8.18
2011		0.05	1.22	4.00	2.08	3.31
2012		0.11	3.95	9.33	5.91	9.87

Table 12. Density analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6				Relative	
Site:	Sandy, ungrazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983	No Densities Collected					
1984	0.29	12.46	20.00	13.27	25.74	
1985	No Densities Collected					
1986	0.23	6.72	21.33	11.21	17.93	
1987	0.25	5.21	16.67	9.97	15.18	
1988	0.14	7.66	12.00	8.85	16.51	
1989	0.21	6.45	19.33	12.23	18.68	
1990	0.11	3.16	10.67	9.33	12.49	
1991	No Densities Collected					
1992	No Densities Collected					
1993	No Densities Collected					
1994	No Densities Collected					
1995	No Densities Collected					
1996	No Densities Collected					
1997	No Densities Collected					
1998	0.06	1.58	4.67	2.51	4.10	
1999	0.03	1.08	1.33	1.19	2.27	
2000	0.03	0.85	2.00	1.24	2.10	
2001	0.03	0.68	2.00	1.06	1.74	
2002	0.01	0.30	1.33	0.81	1.11	
2003	No Densities Collected					
2004	0.04	0.73	1.33	0.81	1.54	
2005	0.11	2.12	4.67	2.66	4.78	
2006	0.09	1.25	4.00	2.40	3.65	
2007	0.05	0.51	3.33	1.22	1.73	
2008	0.05	1.81	4.67	3.10	4.91	
2009	0.10	1.48	3.33	1.52	3.00	
2010	0.06	1.35	4.67	2.51	3.86	
2011	0.03	0.28	2.00	0.82	1.10	
2012	0.06	1.45	4.67	2.51	3.97	

Table 13. Density analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6				Relative	
Site:	Sandy, grazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983	No Densities Collected					
1984	0.21	8.21	16.67	9.85	18.06	
1985	No Densities Collected					
1986	0.27	9.13	24.67	13.90	23.04	
1987	0.39	10.53	21.33	12.19	22.72	
1988	0.23	14.16	20.00	15.73	29.88	
1989	0.21	5.87	17.33	10.12	15.99	
1990	0.17	4.31	15.33	11.36	15.68	
1991	No Densities Collected					
1992	No Densities Collected					
1993	No Densities Collected					
1994	No Densities Collected					
1995	No Densities Collected					
1996	No Densities Collected					
1997	No Densities Collected					
1998	0.08	2.15	7.33	4.43	6.58	
1999	0.63	13.22	4.18	9.60	22.81	
2000	0.09	2.05	8.00	5.11	7.17	
2001	0.10	1.48	8.00	3.67	5.15	
2002	0.09	1.97	5.33	2.78	4.75	
2003	0.06	1.61	5.33	3.00	4.61	
2004	0.07	2.33	5.33	3.18	5.51	
2005	0.08	2.49	4.67	2.39	4.88	
2006	0.12	3.29	7.33	4.16	7.46	
2007	0.15	2.73	7.33	3.39	6.12	
2008	0.12	5.23	9.33	7.14	12.37	
2009	0.28	4.42	8.00	3.73	8.14	
2010	0.19	4.22	12.00	6.35	10.57	
2011	0.02	0.22	1.33	0.56	0.79	
2012	0.13	3.07	10.67	6.30	9.37	

Table 14. Points analysis for native range on the nongrazed grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NG-W & E		Relative		Relative	
Site:	Sandy, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.15	0.64	1.50	0.80	1.44
1988		0.25	0.72	2.00	0.93	1.65
1989		0.45	1.98	5.00	2.86	4.84
1990		0.10	0.51	1.00	0.64	1.15
1991		0.20	0.64	2.00	0.93	1.57
1992		No Points Collected				
1993						
1994		0.03	0.22	0.25	0.23	0.45
1995		0.05	0.26	0.50	0.31	0.58
1996						
1997						
1998		0.03	0.20	0.25	0.23	0.43
1999		0.00	0.00	0.00	0.00	0.00
2000		0.05	0.27	0.50	0.39	0.67
2001		0.08	0.25	0.50	0.24	0.49
2002						
2003		0.05	0.18	0.25	0.16	0.34
2004		0.13	0.54	0.75	0.44	0.98
2005		0.10	0.37	0.75	0.38	0.75
2006		0.15	0.62	1.25	0.65	1.28
2007		0.18	0.81	1.75	0.99	1.80
2008		0.15	1.06	1.50	1.23	2.29
2009		0.05	0.23	0.50	0.33	0.56
2010		0.15	0.57	1.50	0.76	1.33
2011						
2012		0.20	0.77	1.50	0.79	1.56

Table 15. Points analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12		Relative		Relative	
Site:	Sandy, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	Artemisia dracunculus	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987						
1988						
1989						
1990						
1991						
1992				No Points Collected		
1993						
1994						
1995						
1996						
1997						
1998						
1999						
2000						
2001						
2002						
2003		0.33	1.26	2.50	1.22	2.48
2004		0.23	0.80	1.67	0.74	0.74
2005		0.25	0.90	2.17	0.99	1.88
2006		0.05	0.28	0.50	0.34	0.62
2007		0.03	0.16	0.33	0.19	0.35
2008		0.05	0.30	0.50	0.35	0.66
2009		0.05	0.30	0.50	0.37	0.67
2010		0.05	0.30	0.50	0.36	0.66
2011		0.03	0.17	0.33	0.23	0.40
2012		0.07	0.27	0.67	0.37	0.64

Table 16. Points analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12		Relative		Relative	
Site:	Sandy, grazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.43	1.52	3.67	1.71	3.24
1988		0.87	3.25	6.16	2.87	6.13
1989		0.43	1.59	3.28	1.53	3.12
1990		1.50	4.11	9.67	4.24	8.35
1991		0.17	0.90	1.67	1.08	1.98
1992				No Points Collected		
1993						
1994		0.10	0.42	1.00	0.59	1.01
1995		0.02	0.09	0.17	0.10	0.19
1996		0.13	0.33	1.33	0.49	0.82
1997		0.13	0.44	1.33	0.61	1.05
1998		0.07	0.28	0.67	0.38	0.66
1999		0.33	1.13	3.00	1.36	2.49
2000		0.45	1.78	3.00	1.67	3.45
2001		0.35	1.01	2.17	0.96	1.97
2002		0.23	0.84	2.00	0.93	1.77
2003		0.33	1.25	2.17	1.05	2.30
2004		0.32	1.09	2.17	0.97	2.06
2005		0.25	0.80	1.50	0.64	1.45
2006		0.13	0.47	1.33	0.64	1.11
2007		0.12	0.38	1.17	0.52	0.90
2008		0.07	0.32	0.67	0.41	0.72
2009		0.17	0.69	1.50	0.88	1.57
2010		0.12	0.41	1.17	0.61	1.02
2011		0.02	0.08	0.17	0.10	0.18
2012		0.20	0.63	2.00	0.96	1.59

Table 17. Points analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6		Relative		Relative	
Site:	Sandy, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983						
1984		0.36	1.16	2.55	1.12	2.29
1985		0.09	0.33	0.89	0.52	0.85
1986		0.30	1.11	2.42	1.16	2.27
1987		0.53	1.88	4.79	2.13	4.01
1988		0.77	2.73	7.18	3.43	6.16
1989		0.90	3.64	6.84	3.42	7.06
1990		1.04	4.25	8.36	4.33	8.58
1991		0.10	0.48	1.00	0.65	1.14
1992		No Points Collected				
1993		0.23	0.58	2.00	0.86	1.44
1994		0.13	0.64	1.25	0.76	1.40
1995		0.09	0.42	0.92	0.53	0.95
1996		0.12	0.39	1.00	0.47	0.86
1997		0.12	0.46	1.17	0.58	1.03
1998						
1999		0.03	0.15	0.33	0.19	0.34
2000		0.13	0.67	0.83	0.54	1.21
2001		0.04	0.21	0.33	0.22	0.43
2002		0.08	0.48	0.75	0.55	1.03
2003		0.03	0.18	0.33	0.23	0.40
2004		0.09	0.38	0.67	0.36	0.74
2005		0.09	0.43	0.83	0.48	0.91
2006		0.03	0.18	0.25	0.21	0.39
2007		0.09	0.49	0.83	0.54	1.03
2008		0.03	0.22	0.33	0.26	0.48
2009		0.08	0.49	0.67	0.52	1.01
2010		0.03	0.19	0.33	0.23	0.42
2011						
2012		0.07	0.34	0.58	0.36	0.70

Table 18. Points analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6		Relative		Relative	
Site:	Sandy, grazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983		0.28	0.50	2.33	0.72	1.22
1984		0.19	0.66	1.87	0.86	1.53
1985		0.18	0.77	1.79	0.99	1.76
1986		0.21	1.00	1.92	1.15	2.15
1987		0.79	3.06	6.12	3.03	6.08
1988		0.83	3.61	7.27	4.14	7.75
1989		0.92	3.73	7.17	3.80	7.53
1990		1.14	4.25	9.19	4.25	8.50
1991		0.08	0.34	0.84	0.44	0.79
1992		No Points Collected				
1993		1.37	3.13	8.83	3.74	6.87
1994		0.16	0.93	1.50	1.04	1.96
1995		0.03	0.17	0.33	0.21	0.38
1996		0.13	0.42	1.17	0.57	0.98
1997		0.02	0.04	0.17	0.07	0.11
1998		0.02	0.12	0.17	0.14	0.26
1999		0.14	0.48	1.33	0.65	1.13
2000		0.13	0.56	0.92	0.55	1.10
2001		0.18	0.74	1.08	0.65	1.39
2002		0.24	0.92	1.75	0.87	1.79
2003		0.24	1.01	1.92	1.14	2.15
2004		0.33	1.06	2.42	1.10	2.16
2005		0.29	1.06	2.08	1.03	2.09
2006		0.12	0.52	1.00	0.61	1.13
2007		0.07	0.24	0.58	0.28	0.52
2008		0.08	0.33	0.67	0.37	0.70
2009		0.08	0.33	0.75	0.46	0.79
2010		0.10	0.32	1.00	0.49	0.81
2011						
2012		0.08	0.30	0.75	0.39	0.69

Table 19. Density analysis for native range on the nongrazed grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NG-W & E				Relative	
Site:	Shallow, ungrazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983						No Data
1984						No Data
1985						No Data
1986						No Data
1987		0.18	3.61	3.61	6.91	10.52
1988		0.22	10.83	9.90	12.53	23.36
1989		0.68	14.26	6.22	14.90	29.17
1990		0.14	5.72	5.72	8.93	14.65
1991						No Densities Collected
1992		0.06	7.14	2.38	3.13	10.27
1993						No Densities Collected
1994						No Densities Collected
1995						No Densities Collected
1996						No Densities Collected
1997						No Densities Collected
1998		0.02	0.21	0.21	0.71	0.93
1999						
2000		0.06	1.30	6.00	4.29	5.59
2001		0.02	0.14	2.00	0.57	0.71
2002		0.08	0.74	8.00	2.63	3.37
2003		0.08	1.18	6.00	2.38	3.56
2004		0.02	0.93	2.00	1.47	2.40
2005		0.04	0.35	4.00	1.69	2.04
2006		0.34	14.06	28.00	16.94	31.01
2007		0.32	10.47	24.00	10.45	20.91
2008		0.26	8.67	18.00	8.04	16.70
2009		0.30	5.32	8.00	3.99	9.31
2010		0.12	4.47	12.00	7.50	11.97
2011		0.08	1.90	6.00	2.08	3.99
2012		0.24	5.78	18.00	9.20	14.98

Table 20. Density analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12				Relative	
Site:	Shallow, ungrazed		Relative	Percent	Percent	Importance
Species:	Artemisia dracunculus	Density	Density	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987						
1988						
1989						
1990						
1991				No Densities Collected		
1992						
1993				No Densities Collected		
1994				No Densities Collected		
1995				No Densities Collected		
1996				No Densities Collected		
1997				No Densities Collected		
1998						
1999						
2000						
2001						
2002						
2003		0.09	4.88	8.00	7.85	12.74
2004		0.04	1.12	4.00	2.92	4.04
2005		0.04	0.61	2.67	0.84	1.45
2006		0.07	1.53	5.33	2.57	4.10
2007		0.03	0.61	2.67	1.18	1.80
2008						
2009		0.09	2.00	8.00	3.67	5.67
2010		0.04	1.34	4.00	2.20	3.54
2011		0.01	0.33	1.33	0.68	1.01
2012		0.07	1.84	6.67	3.92	5.76

Table 21. Density analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12				Relative	
Site:	Shallow, grazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983					No Data	
1984					No Data	
1985					No Data	
1986					No Data	
1987		0.15	4.84	12.00	6.20	11.04
1988		0.36	16.41	30.67	16.59	33.00
1989		0.40	14.32	34.67	17.91	32.23
1990		0.21	14.69	17.33	14.78	29.47
1991					No Densities Collected	
1992		0.05	8.05	2.67	6.73	14.78
1993					No Densities Collected	
1994					No Densities Collected	
1995					No Densities Collected	
1996					No Densities Collected	
1997					No Densities Collected	
1998		0.05	2.02	2.67	2.49	4.51
1999		0.04	1.32	1.32	2.48	3.80
2000		0.03	0.98	2.67	1.86	2.83
2001		0.01	0.22	1.33	0.50	0.71
2002		0.15	3.82	6.67	3.46	7.28
2003		0.11	2.38	9.33	4.79	7.17
2004		0.07	2.25	4.00	3.57	5.82
2005		0.09	2.08	9.33	3.61	5.69
2006		0.19	3.76	6.67	2.74	6.50
2007		0.07	1.79	6.67	2.38	4.17
2008		0.04	1.52	2.67	1.45	2.96
2009		0.07	1.10	6.67	2.26	3.36
2010		0.04	1.38	2.67	1.52	2.89
2011		0.03	0.54	1.33	0.40	0.94
2012		0.13	3.65	12.00	7.28	10.93

Table 22. Density analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6				Relative	
Site:	Shallow, ungrazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983	No Densities Collected					
1984	0.27	7.06	19.33	7.30	14.36	
1985	No Densities Collected					
1986	0.22	4.30	20.67	7.05	11.35	
1987	0.42	8.41	31.33	12.34	20.76	
1988	0.39	20.37	34.00	21.35	41.72	
1989	0.27	8.32	24.00	15.55	23.86	
1990	0.19	17.62	17.33	17.62	35.25	
1991	No Densities Collected					
1992	0.05	8.02	4.00	6.81	14.83	
1993	No Densities Collected					
1994	No Densities Collected					
1995	No Densities Collected					
1996	No Densities Collected					
1997	No Densities Collected					
1998	0.05	0.74	4.00	2.37	3.11	
1999	0.05	1.15	3.96	2.61	3.76	
2000	0.08	0.79	7.33	3.06	3.85	
2001	0.09	0.66	6.00	1.89	2.55	
2002	0.07	0.71	4.67	1.77	2.48	
2003	0.19	2.50	10.67	5.11	7.62	
2004	0.09	2.01	6.67	3.96	5.97	
2005	0.05	0.70	4.67	1.35	2.05	
2006	0.07	2.33	5.33	2.70	5.03	
2007	0.10	1.32	8.00	2.74	4.06	
2008	0.10	2.96	5.33	3.70	6.65	
2009	0.06	0.53	5.33	1.23	1.76	
2010	0.09	2.67	7.33	4.32	6.99	
2011	0.04	0.62	4.00	1.18	1.81	
2012						

Table 23. Density analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6				Relative	
Site:	Shallow, grazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983	No Densities Collected					
1984	0.27	7.18	22.00	9.03	16.21	
1985	No Densities Collected					
1986	0.21	3.82	19.33	6.27	10.09	
1987	0.25	4.58	18.00	6.93	11.51	
1988	0.51	23.53	36.00	23.99	47.52	
1989	0.25	7.57	22.67	13.74	21.31	
1990	0.25	13.54	19.33	14.40	27.94	
1991	No Densities Collected					
1992	0.05	12.66	4.00	11.92	24.58	
1993	No Densities Collected					
1994	No Densities Collected					
1995	No Densities Collected					
1996	No Densities Collected					
1997	No Densities Collected					
1998	0.03	1.02	3.33	2.18	3.20	
1999	0.05	0.92	0.85	2.14	3.06	
2000	0.03	0.46	3.33	1.41	1.87	
2001	0.05	0.72	5.33	1.59	2.31	
2002	0.05	1.10	4.00	2.09	3.18	
2003	0.13	2.44	4.67	2.50	4.94	
2004	0.07	1.21	6.00	2.61	3.81	
2005	0.13	1.81	10.00	3.18	4.99	
2006	0.09	1.54	8.00	3.10	4.64	
2007	0.12	2.00	10.67	3.89	5.89	
2008	0.27	6.89	14.00	9.16	16.06	
2009	0.23	2.16	16.67	3.96	6.12	
2010	0.26	5.71	20.00	8.47	14.18	
2011	0.15	2.63	12.00	3.45	6.08	
2012	0.09	5.08	7.33	5.81	10.90	

Table 24. Points analysis for native range on the nongrazed grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NG-W & E		Relative		Relative	
Site:	Shallow, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.85	3.47	8.00	4.19	7.65
1988		3.80	13.40	19.00	10.35	23.75
1989		1.15	5.81	11.00	6.21	12.01
1990		1.10	5.31	8.00	5.22	10.53
1991		0.40	1.32	3.50	2.19	3.51
1992		0.05	0.20	0.50	0.33	0.53
1993						
1994						
1995		0.10	0.61	1.00	0.75	1.36
1996		0.25	0.81	2.50	1.28	2.09
1997		0.10	0.35	1.00	0.52	0.87
1998		0.05	0.39	0.50	0.48	0.87
1999		0.10	0.45	1.00	0.63	1.08
2000		0.50	1.86	3.00	1.63	3.48
2001		0.08	0.26	0.50	0.25	0.51
2002		0.05	0.17	0.50	0.22	0.40
2003		0.15	0.46	0.75	0.49	0.95
2004		0.08	0.29	0.75	0.42	0.70
2005		0.23	0.85	1.75	0.89	1.75
2006		0.65	1.87	5.00	2.26	4.13
2007		0.10	0.37	0.75	0.39	0.76
2008		0.13	0.62	1.25	0.87	1.49
2009						
2010		0.03	0.09	0.25	0.13	0.22
2011						
2012		0.10	0.31	1.00	0.48	0.79

Table 25. Points analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12		Relative		Relative	
Site:	Shallow, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987						
1988						
1989						
1990						
1991						
1992						
1993						
1994						
1995						
1996						
1997						
1998						
1999						
2000						
2001						
2002						
2003		0.08	0.29	0.83	0.40	0.69
2004		0.15	0.49	1.50	0.69	1.18
2005		0.08	0.24	0.83	0.35	0.60
2006		0.03	0.12	0.33	0.18	0.30
2007		0.02	0.06	0.17	0.09	0.16
2008						
2009						
2010		0.02	0.08	0.17	0.11	0.18
2011		0.02	0.06	0.17	0.10	0.16
2012						

Table 26. Points analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12		Relative		Relative	
Site:	Shallow, grazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.70	2.40	6.33	2.99	5.39
1988		1.60	6.21	12.33	6.70	12.91
1989		1.30	5.59	9.00	5.29	10.88
1990		0.97	3.49	7.67	4.20	7.68
1991		0.03	0.13	0.33	0.19	0.32
1992		0.10	0.56	1.00	0.78	1.34
1993		0.07	0.17	0.67	0.42	0.58
1994						
1995		0.05	0.30	0.50	0.38	0.69
1996		0.10	0.23	1.00	0.53	0.76
1997		0.23	0.66	2.33	1.17	1.83
1998		0.03	0.15	0.33	0.22	0.37
1999		0.02	0.05	0.17	0.08	0.12
2000		0.28	0.99	1.50	0.81	1.80
2001		0.33	0.92	1.67	0.75	1.67
2002		0.18	0.64	1.83	0.93	1.57
2003		0.32	1.00	2.33	1.15	2.15
2004		0.02	0.06	0.17	0.08	0.14
2005		0.12	0.32	0.83	0.34	0.66
2006		0.05	0.16	0.50	0.24	0.41
2007		0.05	0.13	0.50	0.22	0.36
2008		0.08	0.28	0.67	0.38	0.67
2009		0.03	0.11	0.33	0.18	0.29
2010		0.05	0.13	0.50	0.23	0.36
2011		0.02	0.04	0.17	0.08	0.12
2012		0.02	0.04	0.17	0.08	0.12

Table 27. Points analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6		Relative		Relative	
Site:	Shallow, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983						
1984		0.32	0.84	3.01	1.25	2.09
1985		0.12	0.44	1.21	0.65	1.09
1986		0.33	1.26	3.13	1.61	2.87
1987		0.40	1.41	3.68	1.85	3.26
1988		0.89	3.49	8.17	4.52	8.01
1989		0.45	2.08	3.24	1.99	4.06
1990		1.00	3.82	7.54	4.26	8.09
1991		0.30	1.27	2.83	1.65	2.92
1992		0.22	1.16	2.17	1.47	2.63
1993		0.12	0.36	1.17	0.60	0.97
1994		0.08	0.31	0.75	0.52	0.83
1995		0.08	0.38	0.75	0.42	0.80
1996		0.22	0.70	2.00	0.94	1.64
1997		0.27	0.79	2.67	1.09	1.88
1998		0.03	0.13	0.17	0.13	0.26
1999		0.07	0.24	0.67	0.34	0.58
2000		0.19	0.64	1.08	0.66	1.30
2001		0.17	0.48	1.17	0.56	1.04
2002		0.21	0.91	1.08	0.64	1.56
2003		0.24	0.92	1.75	0.91	1.83
2004		0.17	0.56	1.25	0.58	1.14
2005		0.17	0.52	1.25	0.54	1.07
2006		0.05	0.27	0.50	0.36	0.63
2007		0.05	0.25	0.50	0.33	0.58
2008		0.06	0.38	0.58	0.45	0.84
2009		0.03	0.12	0.25	0.16	0.28
2010		0.09	0.39	0.83	0.52	0.91
2011		0.04	0.16	0.42	0.24	0.40
2012		0.03	0.12	0.33	0.18	0.30

Table 28. Points analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6		Relative		Relative	
Site:	Shallow, grazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983		0.47	0.79	4.00	1.23	2.02
1984		0.21	0.55	2.10	0.89	1.44
1985		0.34	0.99	3.28	1.55	2.54
1986		0.19	0.72	1.85	0.97	1.69
1987		0.40	1.43	3.66	1.76	3.19
1988		0.94	3.38	7.01	3.83	7.20
1989		0.90	4.29	7.42	4.51	8.79
1990		1.02	3.97	8.85	4.75	8.72
1991		0.20	0.73	2.00	1.16	1.88
1992		0.17	0.94	1.67	1.22	2.16
1993		0.60	2.45	5.10	2.87	5.32
1994		0.10	0.50	1.00	0.71	1.21
1995		0.07	0.33	0.67	0.38	0.71
1996		0.10	0.28	0.83	0.46	0.73
1997		0.15	0.40	1.50	0.67	1.06
1998		0.05	0.26	0.50	0.35	0.62
1999		0.08	0.19	0.75	0.37	0.57
2000		0.14	0.46	0.92	0.49	0.95
2001		0.17	0.47	1.33	0.63	1.10
2002		0.25	0.72	1.83	0.82	1.53
2003		0.08	0.29	0.75	0.48	0.77
2004		0.13	0.37	1.00	0.43	0.80
2005		0.21	0.58	1.58	0.63	1.21
2006		0.08	0.36	0.83	0.46	0.82
2007		0.06	0.18	0.58	0.27	0.45
2008		0.08	0.27	0.67	0.36	0.64
2009		0.04	0.16	0.42	0.22	0.38
2010		0.18	0.50	1.58	0.69	1.19
2011		0.08	0.25	0.67	0.33	0.59
2012		0.16	0.42	1.58	0.78	1.20

Table 29. Density analysis for native range on the nongrazed grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NG-W & E				Relative	
Site:	Silty, ungrazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.12	3.33	2.22	3.64	6.97
1988		0.56	17.50	10.29	18.59	36.09
1989		0.04	0.79	0.40	1.35	2.15
1990						
1991		No Densities Collected				
1992		0.06	8.33	8.33	10.00	18.33
1993		No Densities Collected				
1994		No Densities Collected				
1995		No Densities Collected				
1996		No Densities Collected				
1997		No Densities Collected				
1998		0.06	0.66	0.44	1.79	2.45
1999		No Densities Collected				
2000		0.16	1.73	8.00	3.27	5.00
2001		0.08	0.62	8.00	2.26	2.87
2002		0.06	0.67	6.00	2.19	2.86
2003		0.02	0.34	2.00	0.83	1.18
2004		0.14	8.80	10.00	9.03	17.83
2005		0.14	1.54	10.00	3.37	4.91
2006		0.04	0.54	4.00	1.87	2.41
2007		0.04	0.75	4.00	2.03	2.78
2008		0.20	2.78	10.00	3.76	6.54
2009		0.10	1.13	10.00	2.86	3.99
2010		0.14	8.15	12.00	7.97	16.12
2011		0.18	4.39	14.00	6.92	11.30
2012		0.24	5.78	18.00	9.20	14.98

Table 30. Density analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12				Relative	
Site:	Silty, ungrazed		Relative	Percent	Percent	Importance
Species:	Artemisia dracunculus	Density	Density	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.08	0.98	8.00	2.73	3.70
1988		0.31	16.12	26.67	19.19	35.32
1989		0.20	4.06	17.33	6.70	10.76
1990		0.21	6.12	17.33	12.88	19.00
1991		No Densities Collected				
1992						
1993		No Densities Collected				
1994		No Densities Collected				
1995		No Densities Collected				
1996		No Densities Collected				
1997		No Densities Collected				
1998		0.09	1.98	6.67	3.79	5.77
1999		0.09	1.56	1.10	4.11	5.67
2000		0.05	0.52	5.33	2.38	2.90
2001		0.04	0.22	4.00	1.40	1.61
2002		0.09	0.84	5.33	2.34	3.18
2003		0.07	0.39	4.00	1.92	2.32
2004		0.09	1.96	6.67	3.50	5.46
2005		0.04	0.68	2.67	0.88	1.56
2006		0.09	1.95	9.33	4.15	6.10
2007		0.12	1.63	9.33	3.30	4.93
2008		0.16	3.78	8.00	4.65	8.42
2009		0.01	0.16	1.33	0.33	0.48
2010		0.04	2.70	2.67	2.56	5.26
2011		0.05	1.11	5.33	2.42	3.52
2012		0.07	1.84	6.67	3.92	5.76

Table 31. Density analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12				Relative	
Site:	Silty, grazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983					No Data	
1984					No Data	
1985					No Data	
1986					No Data	
1987		0.21	2.02	16.00	5.13	7.15
1988		0.28	19.78	24.00	20.72	40.49
1989		0.43	15.28	34.67	20.73	36.01
1990		0.27	13.76	25.33	22.15	35.91
1991					No Densities Collected	
1992		0.13	9.58	6.67	8.12	17.70
1993					No Densities Collected	
1994					No Densities Collected	
1995					No Densities Collected	
1996					No Densities Collected	
1997					No Densities Collected	
1998		0.11	0.79	6.67	3.19	3.98
1999		0.17	2.23	1.96	7.28	9.51
2000		0.09	0.77	9.33	4.06	4.83
2001		0.09	0.71	8.00	2.65	3.36
2002		0.23	1.68	13.33	4.35	6.03
2003		0.33	4.58	17.33	8.59	13.17
2004		0.12	1.48	10.67	4.60	6.08
2005		0.16	1.79	10.67	3.17	4.96
2006		0.08	0.92	6.67	2.19	3.11
2007		0.04	0.53	4.00	1.24	1.77
2008		0.19	2.06	5.33	3.33	5.39
2009		0.03	0.26	2.67	0.59	0.85
2010		0.11	4.28	10.67	7.01	11.29
2011		0.08	1.13	8.00	2.71	3.84
2012		0.13	3.65	12.00	7.28	10.93

Table 32. Density analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6				Relative	
Site:	Silty, ungrazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983	No Densities Collected					
1984	0.15	2.42	12.67	3.66	6.08	
1985	No Densities Collected					
1986	0.19	3.67	18.00	5.91	9.58	
1987	0.23	4.36	20.00	6.82	11.18	
1988	0.31	19.77	26.67	20.86	40.63	
1989	0.23	7.55	19.33	12.63	20.18	
1990	0.17	10.16	14.67	13.75	23.91	
1991	No Densities Collected					
1992	No Densities Collected					
1993	No Densities Collected					
1994	No Densities Collected					
1995	No Densities Collected					
1996	No Densities Collected					
1997	No Densities Collected					
1998	0.02	0.94	1.33	0.95	1.90	
1999	No Densities Collected					
2000	0.01	0.46	1.33	0.97	1.43	
2001	No Densities Collected					
2002	0.01	0.13	0.67	0.35	0.48	
2003	No Densities Collected					
2004	0.01	0.57	0.67	0.76	1.33	
2005	0.05	1.99	2.00	1.61	3.60	
2006	0.01	0.34	1.33	0.80	1.14	
2007	0.02	0.27	0.67	0.31	0.58	
2008	No Densities Collected					
2009	No Densities Collected					
2010	No Densities Collected					
2011	0.01	0.15	0.67	0.30	0.45	
2012	No Densities Collected					

Table 33. Density analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6				Relative	
Site:	Silty, grazed		Relative	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Density	Density	Frequency	Frequency	Value
1983	No Densities Collected					
1984	0.07	1.74	7.33	2.74	4.47	
1985	No Densities Collected					
1986	0.19	4.04	17.33	6.20	10.23	
1987	0.16	3.16	15.33	5.37	8.53	
1988	0.25	19.74	23.33	21.56	41.30	
1989	0.19	6.77	16.00	9.71	16.49	
1990	0.11	5.56	11.33	8.92	14.48	
1991	No Densities Collected					
1992	No Densities Collected					
1993	No Densities Collected					
1994	No Densities Collected					
1995	No Densities Collected					
1996	No Densities Collected					
1997	No Densities Collected					
1998	0.05	1.94	4.67	3.90	5.84	
1999	0.07	1.72	1.66	2.11	3.83	
2000	0.05	1.22	5.33	3.03	4.25	
2001	0.03	0.35	2.67	0.96	1.31	
2002	0.04	0.96	2.67	1.73	2.69	
2003	0.11	4.58	4.67	4.69	9.27	
2004	0.05	2.43	3.33	2.66	5.09	
2005	0.22	6.26	14.00	5.67	11.93	
2006	0.28	4.36	20.00	6.46	10.82	
2007	0.35	5.29	13.33	4.97	10.26	
2008	0.05	7.39	4.67	8.57	15.96	
2009	0.01	0.09	1.33	0.29	0.39	
2010	0.02	0.97	2.00	1.28	2.25	
2011	0.04	0.68	4.00	1.11	1.79	
2012	0.09	5.08	7.33	5.81	10.90	

Table 34. Points analysis for native range on the nongrazed grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NG-W & E		Relative		Relative	
Site:	Silty, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.30	1.08	3.00	1.36	2.44
1988		1.25	5.58	9.00	5.19	10.76
1989		0.65	1.74	4.00	1.61	3.35
1990		0.40	1.99	3.00	2.14	4.12
1991		1.30	3.66	10.50	4.53	8.19
1992		0.25	1.05	2.50	1.39	2.44
1993		0.05	0.17	0.50	0.26	0.43
1994						
1995		0.10	0.46	1.00	0.56	1.02
1996		0.20	0.65	2.00	1.01	1.65
1997		0.10	0.34	1.00	0.47	0.81
1998		0.03	0.23	0.25	0.26	0.50
1999		0.08	0.43	0.75	0.53	0.96
2000		0.30	1.17	1.75	0.96	2.13
2001		0.15	0.44	1.00	0.46	0.90
2002						
2003		0.03	0.12	0.25	0.15	0.27
2004		0.08	0.33	0.75	0.44	0.77
2005		0.05	0.18	0.50	0.23	0.41
2006		0.33	1.37	2.75	1.49	2.86
2007		0.25	1.20	2.50	1.52	2.72
2008		0.13	0.69	0.75	0.51	1.19
2009		0.05	0.28	0.50	0.35	0.63
2010		0.05	0.22	0.50	0.28	0.51
2011		0.13	0.63	1.25	0.80	1.43
2012		0.10	0.49	1.00	0.62	1.11

Table 35. Points analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12		Relative		Relative	
Site:	Silty, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.10	0.41	1.00	0.51	0.92
1988		0.73	2.24	4.67	2.09	4.33
1989		0.93	3.69	6.67	3.28	6.97
1990		0.60	1.88	4.67	2.20	4.08
1991		0.50	2.54	4.33	2.94	5.48
1992		0.03	0.25	0.33	0.28	0.54
1993		0.30	0.52	2.00	0.80	1.32
1994		0.10	0.49	1.00	0.60	1.09
1995		0.02	0.07	0.17	0.09	0.16
1996		0.07	0.27	0.67	0.36	0.63
1997		1.00	3.20	7.67	3.88	7.07
1998		0.02	0.20	0.17	0.23	0.43
1999		0.12	0.41	1.00	0.61	1.01
2000		0.55	3.25	1.50	1.39	4.64
2001		0.42	1.25	1.67	0.97	2.21
2002		0.18	0.62	1.50	0.79	1.41
2003		0.27	0.97	2.17	1.11	2.08
2004		0.08	0.22	0.83	0.36	0.58
2005		0.12	0.41	0.83	0.37	0.79
2006		0.15	0.58	1.50	0.73	1.31
2007		0.17	0.66	1.67	0.84	1.50
2008		0.07	0.34	0.67	0.42	0.76
2009		0.08	0.49	0.83	0.63	1.12
2010		0.12	0.48	1.00	0.52	1.00
2011		0.07	0.25	0.67	0.37	0.62
2012						

Table 36. Points analysis for native range on the 4.5 month seasonlong grazing system at the Dickinson Research Extension Center.						
System:	West/East/North					
Pasture:	NR-9-12		Relative		Relative	
Site:	Silty, grazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983				No Data		
1984				No Data		
1985				No Data		
1986				No Data		
1987		0.47	1.51	3.67	1.62	3.13
1988		2.17	8.25	15.33	8.44	16.69
1989		1.07	3.76	5.33	2.64	6.41
1990		1.57	5.54	12.00	6.24	11.78
1991		0.20	0.85	2.00	1.30	2.15
1992		0.33	1.45	3.00	1.84	3.28
1993		0.10	0.18	1.00	0.43	0.61
1994		0.95	5.42	8.00	5.33	10.75
1995		0.15	0.74	1.33	0.80	1.54
1996		0.30	0.82	3.00	1.34	2.16
1997		0.33	0.82	2.67	1.10	1.92
1998		0.05	0.37	0.33	0.33	0.71
1999		0.33	0.89	2.50	1.01	1.89
2000		0.97	3.36	3.67	1.90	5.26
2001		0.77	2.75	4.83	2.50	5.25
2002		0.37	1.09	3.00	1.24	2.32
2003		0.68	2.65	4.33	2.14	4.79
2004		0.25	0.80	2.17	0.99	1.79
2005		0.33	1.21	2.17	0.97	2.17
2006		0.42	1.55	2.89	1.37	2.92
2007		0.03	0.12	0.33	0.16	0.29
2008		0.07	0.30	0.67	0.39	0.70
2009		0.13	0.45	1.33	0.70	1.16
2010		0.23	0.73	2.00	0.89	1.62
2011		0.10	0.50	1.00	0.62	1.11
2012		0.08	0.24	0.83	0.37	0.61

Table 37. Points analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6		Relative		Relative	
Site:	Silty, ungrazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983						
1984		0.21	0.52	2.11	0.86	1.38
1985		0.16	0.53	1.64	0.88	1.41
1986		0.16	0.49	1.45	0.62	1.11
1987		0.73	2.31	6.73	3.02	5.34
1988		1.24	3.95	10.72	5.06	9.01
1989		0.64	2.39	5.00	2.46	4.84
1990		0.87	3.11	7.90	3.62	6.73
1991		0.27	1.09	1.67	0.90	1.99
1992						
1993						
1994		0.02	0.08	0.17	0.10	0.18
1995						
1996		0.03	0.17	0.33	0.23	0.40
1997						
1998		0.01	0.04	0.08	0.06	0.11
1999		0.04	0.13	0.33	0.16	0.29
2000		0.08	0.44	0.42	0.34	0.79
2001		0.09	0.33	0.58	0.35	0.68
2002		0.03	0.15	0.33	0.21	0.36
2003		0.09	0.77	0.67	0.76	1.53
2004		0.05	0.19	0.50	0.29	0.48
2005		0.03	0.13	0.17	0.13	0.25
2006		0.02	0.11	0.08	0.08	0.19
2007		0.01	0.05	0.08	0.06	0.11
2008		0.01	0.06	0.08	0.08	0.14
2009		0.00	0.00	0.00	0.00	0.00
2010		0.01	0.03	0.08	0.05	0.09
2011						
2012						

Table 38. Points analysis for native range on the twice-over rotation grazing system at the Dickinson Research Extension Center.						
System:	West/East					
Pasture:	NR-1-6		Relative		Relative	
Site:	Silty, grazed	Basal	Basal	Percent	Percent	Importance
Species:	<i>Artemisia dracunculus</i>	Cover	Cover	Frequency	Frequency	Value
1983		0.08	0.12	0.67	0.20	0.33
1984		0.19	0.53	1.88	0.75	1.28
1985		0.16	0.42	1.60	0.69	1.11
1986		0.55	1.49	5.19	1.96	3.44
1987		0.35	1.19	3.18	1.49	2.68
1988		1.17	4.21	8.96	5.00	9.21
1989		0.68	2.50	5.12	2.61	5.11
1990		0.75	3.18	6.86	4.07	7.26
1991		0.18	0.77	1.83	1.08	1.85
1992		0.02	0.05	0.17	0.09	0.14
1993		0.12	0.20	0.67	0.44	0.64
1994		0.03	0.12	0.25	0.17	0.29
1995		0.01	0.03	0.08	0.04	0.07
1996		0.02	0.08	0.17	0.10	0.18
1997		0.05	0.11	0.50	0.22	0.33
1998						
1999		0.08	0.18	0.75	0.32	0.49
2000		0.23	0.76	1.58	0.89	1.65
2001		0.16	0.36	1.00	0.46	0.82
2002		0.26	0.63	1.50	0.68	1.30
2003		0.21	0.73	1.17	0.64	1.37
2004		0.19	0.52	1.50	0.66	1.18
2005		0.16	0.43	1.08	0.48	0.91
2006		0.13	0.40	1.08	0.55	0.95
2007		0.06	0.16	0.50	0.25	0.41
2008		0.02	0.05	0.17	0.11	0.16
2009		0.01	0.02	0.08	0.05	0.07
2010		0.03	0.06	0.25	0.12	0.18
2011		0.03	0.06	0.33	0.15	0.21
2012		0.04	0.11	0.42	0.22	0.32