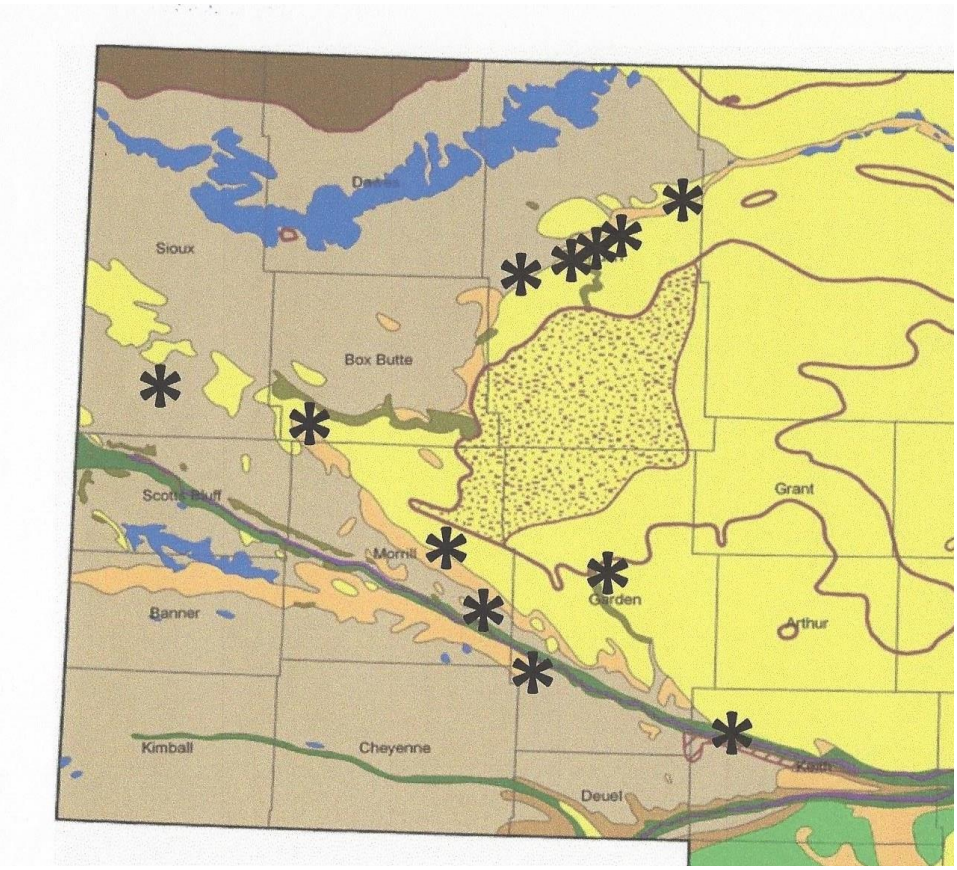
SURVEY FOR *DALEA CYLINDRICEPS* (SANDSAGE PRAIRIE-CLOVER) IN WESTERN NEBRASKA IN 2015



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SUMMARY

Dalea cylindriceps (sandsage prairie-clover) is a perennial herb native to the western Great Plains. It is recognized as a species of conservation concern in all but two of the eight states in which it has been documented and is recognized as a Tier I At-risk Species by the Nebraska Natural Legacy Project. Based on an ecological profile gained from surveys of Nebraska occurrences in 2013 and 2014, further survey was conducted in 2015 focused on the North Platte River, Panhandle Prairies, Pine Ridge, and Upper Niobrara River Biologically Unique Landscapes and surrounding environments of western Nebraska. The 2015 survey resulted in the location of four new element occurrences of *D. cylindriceps*, three in Sheridan County and one in Garden County. An additional 12 previously-known element occurrences were surveyed, with extant populations observed at eight of these sites. Of the 12 extant occurrences of *D. cylindriceps* in Nebraska, two-thirds are associated with Western Sand Prairie. The 12 occurrences had small populations in 2015, each with less than 100 individuals and most with 50 or less. While eight of these occurrences are associated with relatively intact grassland communities, three are limited to roadside right-of-ways and one occurs in degraded pasture. These factors, plus the observed vulnerability of this species to grazing pressure, indicate that *D. cylindriceps* should remain a species of conservation concern in Nebraska.

INTRODUCTION

Purpose of project

Dalea cylindriceps (sandsage prairie-clover) is a perennial herb native to the western Great Plains. Occurrences are known from Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. Despite the large extent of its historical distribution, *D. cylindriceps* has been collected infrequently and occurrences are scattered and local (Locklear 2013b). As noted in *Flora of Nebraska* (Kaul et al. 2011), "This distinctive species is rare almost throughout its wide geographic range." *Dalea cylindriceps* is tracked as a species of conservation concern in all but two of the states in which it has been documented and is ranked G3G4 by NatureServe and as a Tier I At-risk Species by the Nebraska Natural Legacy Project. The 2015 survey continued a multi-year research program to document the ecology and conservation needs of *D. cylindriceps* in Nebraska.

Background

Jim Locklear, director of conservation at Lauritzen Gardens, carried out conservation assessments of *Dalea cylindriceps* for the Nebraska Game and Parks Commission in 2013 and 2014. In 2013, he surveyed 22 sites in Nebraska where this species has been observed or collected in the past (Locklear 2013a). Five relatively small extant occurrences were located during the survey in four northwest Nebraska counties (Box Butte, Morrill, Sheridan, and Sioux counties). Based on this survey, it appeared *D. cylindriceps* has undergone significant population decline in Nebraska, although extensive areas of potential habitat remained to be searched for this species.

Dalea cylindriceps is associated with sandsage prairie throughout most of its range in the western Great Plains. Because of this, Locklear conducted a survey in 2014 to locate and document extant occurrences of this species in the sandsage prairie region of southwestern Nebraska (Chase, Dundy, and Perkins counties). Despite four days of searching, no occurrences of *D. cylindriceps* were found in southwestern Nebraska in 2014 (Locklear 2015).

Outside of southwestern Nebraska, two large and previously-unknown occurrences of *Dalea cylindriceps* were located in 2014 in Garden and Keith counties. The largest of these (in Keith County) is associated with the Western Sand Prairie plant community type of Rolfsmeier and Steinauer (2010). This community corresponds to the Sand Hills Borders Mixed-grass Prairie vegetation of Kaul and Rolfsmeier (1993) and is associated with loamy sand soil types at the western periphery of the Nebraska Sandhills. Two other sizeable occurrences of *D. cylindriceps* observed in Sheridan County in 2013 are also associated with Western Sand Prairie. Based on these observations, occurrences of Western Sand Prairie were particularly targeted for survey.

Plan of work

The 2015 study entailed search for populations of *Dalea cylindriceps* in western Nebraska, focused on the North Platte River, Panhandle Prairies, Pine Ridge, and Upper Niobrara River Biologically Unique Landscapes and surrounding environments. This field work took place over seven days, August 13-19, 2015, and was timed to coincide with the peak flowering period of the species. The search for historical occurrences was guided by locality data derived from herbarium specimens held by the Bessey Herbarium of the University of the Nebraska State Museum. Search for previously unrecorded occurrences was facilitated by locating potential habitat with the aid of topographic and county soil survey maps and attempting to reach this habitat via county roads.

Species Information

Detailed species information for *Dalea cylindriceps* including nomenclature, history, distribution, and ecology are included in recent publications by Locklear (2013a, 2013b). An excellent technical illustration of *D. cylindriceps* by artist Bellamy Parks Jansen appeared in *Common Legumes of the Great Plains: An Illustrated Guide* (Stubbendieck & Conard 1989) and is reproduced in a recent paper by Locklear (2013b) on taxonomic identity and historical accounts of *D. cylindriceps*. Descriptive information is provided below. Figure 1 provides a photograph of a healthy, vigorous plant in flower.

Technical description (from Kaul et al. 2011) – Erect short-lived perennial herbs, glabrous below spikes with stems (1) 3-6 (8) dm all, dotted with small raised glands distally. Leaves alternate, pinnate, leaflets 7-9, oblanceolate, to oblong-ellpitic, (1.2-) 1.5-2.5 cm, sparingly punctate beneath. Spikes dense, axis not visible, (1.5-) 2.5-18 cm; bracts early deciduous, but interfloral ones often held in place by crowded flowers. Flowers with calyx 3.4-4.3 mm, externally pilose, its tube 1.9-2.3 mm, hyaline intervals between the ribs each with 1 row of small, pale glands, its teeth lanceolate to ovate; corolla not conventionally papilionaceous, lower petals not united to form a keel, whitish or pink, the banner 4.7-6.2 mm; epistemonous petals attached at the separation of filaments; stems 5. Pod 2.5-3 mm, distally pilosulous and gland-dotted. Flowering June to September.

Non-technical description – A perennial herb growing from a taproot with one to several erect stems, sometimes branched from the middle, generally 12-24 in. tall but mature individual up to 32 in. tall. Leaves are pale green in color, pinnately compound, an individual leaf composed of 7 to 9 narrow leaflets arranged on both sides of a common axis. Flowers are very small, less than ¼ in. long, whitish, and arranged in dense, elongate (1-6 in.) spike at the stem tip.

Local field characters – With its large size (12-24 in., up to 32 in. tall) and dramatically elongate flower spikes (up to 7 in. long), a mature, multi-stem *D. cylindriceps* plant is a striking and noticeable object in the landscape. When in flower, it is unlikely to be confused with any other

member of the genus *Dalea* or family Fabaceae. However, the flower spikes of single-stem plants are not nearly as long and such individuals bear a superficial resemblance to *Dalea aurea*.

RESULTS

Element occurrences

The 2015 survey resulted in the location of four new element occurrences of *Dalea cylindriceps* in Nebraska, three in Sheridan County and one in Garden County. An additional 12 previously-known occurrences were surveyed and extant populations were observed at eight of these sites. The 12 extant occurrences are listed below by survey site name along with population size in 2015 and plant community type (newly-discovered occurrences are marked with *). Figure 2 shows the location of the 12 occurrences. Appendix A presents detailed locality and ecological information for each occurrence.

The 12 occurrences all had small populations in 2015, each with less than 100 individuals and most with 50 or less. The two largest populations encountered in previous Nebraska surveys were at Rushville South 1986 in Sheridan County (110 plants in 2013) and Eagle Canyon Road in Keith County (> 300 plants in 2014) but the number of plants in both of these occurrences was significantly reduced in 2015, presumably due to cattle grazing.

Occurrence	Population in 2015	Plant community type
Box Butte County		
Kilpatrick Lake	ca. 50	Sandsage Prairie
Keith County		
Eagle Canyon Road	75-100	Western Sand Prairie
Garden County		
Crescent Lake*	11	Sandhills Dune Prairie
Lisco Bridge	ca. 50	Sandsage Prairie
Morrill County		
Broadwater East	< 5	Sandsage Prairie
Northport Northeast	22	Western Sand Prairie
Sheridan County		
Deer Creek Ranch*	ca. 25	Western Sand Prairie
Hay Springs South*	ca. 50	Western Sand Prairie
Rushville South 1983	ca. 10	Western Sand Prairie
Rushville South 1986	< 5	Western Sand Prairie
Skunk Lake*	44	Western Sand Prairie
Sioux County		
Erdman Ranch	69	Western Sand Prairie

Edaphic factors

The 12 extant occurrences of *Dalea cylindriceps* in Nebraska are associated with fine sand and loamy fine sand soil types. The following soil units were identified.

Valent fine sand – six occurrences
Ashollow loamy very fine sand – 1 occurrence
Dailey loamy fine sand – 1 occurrence
Lisco very fine sandy loam – 1 occurrence
Sarben loamy fine sand – 1 occurrence
Valent loamy fine sand – 1 occurrence
Tassel-Busher loamy very fine sands – 1 occurrence

Plant community associations

Of the 12 extant *Dalea cylindriceps* populations in Nebraska, eight occur in the context of relatively intact grassland, three in roadside right-of-ways, and one in degraded pasture. Two-thirds of the occurrences are associated with Western Sand Prairie. Of the 12 occurrences, eight are associated with Western Sand Prairie, three with Sandsage Prairie, and one with Sandhills Dune Prairie.

Figure 2 shows the location of extant occurrences of *Dalea cylindriceps* in Nebraska in relationship to the native vegetation of Nebraska and illustrates the strong association of this species with Western Sand Prairie (= Sand Hills Borders Mixed-grass Prairie on the map.). Western Sand Prairie is identified by Rolfsmeier and Steinauer (2010) as a plant community distinct from the much more widespread Sandhills Dune Prairie. It is fairly densely vegetated by tall and mid-height grasses, primarily *Calamovilfa longifolia* and *Hesperostipa comata*. Kaul and Rolfsmeier (1993) mapped this community under the name "Sandhills Borders Mixed-grass Prairie" and show it distributed around the western periphery of the Nebraska Sandhills. Rolfsmeier and Steinauer (2010) gave Western Sand Prairie a conservation status rank of G3 (vulnerable), noting the community is poorly studied and its range, extent, and condition in Nebraska are poorly known and that many sites are extensively invaded by alien grasses.

Where *Dalea cylindriceps* populations occur in the context of intact grassland (as opposed to roadside occurrences), the plants are not usually distributed uniformly throughout the matrix grassland but are concentrated in areas of more open vegetation where different grasses are prevalent, notably *Aristata purpurea*, *Bouteloua gracilis*, *Schizachryium scoparium*, and *Sporobolus cryptandrus*.

Threats

Competition from weeds – Dalea cylindriceps is usually associated with areas of relatively open vegetation and in such habitat may be in competition with exotic weeds or weedy native annuals. In the sandsage prairie region of southwestern Nebraska, cheatgrass (*Bromus* spp.) and yellow sweetclover (*Melilotus officinalis*) appear to be the main competitive threats. These exotic weeds did not seem to be as prevalent in north-central and northwestern Nebraska where the 2015 survey was conducted, but the native annual *Conyza canadensis*, known as horseweed or mare's tail, infested several sites where *D. cylindriceps* occurred in Sheridan County, although it could not be determined if it had directly excluded *D. cylindriceps* from particular sites.

Grazing –Dalea cylindriceps appears to be sensitive to grazing pressure. Prairie-clovers such as *D. purpurea* are known to be preferred forage of cattle and decrease under heavy grazing pressure. Stubbendieck and Conard (1989) note that *D. cylindriceps* is "grazed by cattle and horses, as well as by wildlife" and "decreases with continued heavy grazing." This relatively large herbaceous plant is certainly a noticeable object to humans and is presumably an easy target for grazers. Indirect evidence of the impact of grazing on this species comes from observation of roadside occurrences where *D. cylindriceps* grows in the vegetated right-of-way but not in the grazed pasture on the other side of the fence. Direct evidence came in 2015 through survey of two occurrences that previously hosted the largest known Nebraska populations—Rushville South 1986 in Sheridan County (110 plants in 2013) and Eagle Canyon Road in Keith County (> 300 plants in 2014). Both of these occurrences showed evidence of grazing and trampling by cattle in 2015 and the number of plants in each had been significantly reduced.

INFORMATION NEEDS

Monitoring studies of existing populations of *Dalea cylindriceps* could help answer questions of life history, demography, and population trends. Research into life history traits (phenology, reproductive ecology, etc.) is needed to determine how these shape demography and population trends. Study is also needed to determine the role and impact of natural disturbance in the presence and abundance of *D. cylindriceps* over time. Such studies will require the location and long-term observation of high quality occurrences of *D. cylindriceps*. The discovery of an occurrence of *D. cylindriceps* on a ranch in Sheridan County owned by Turner Enterprises, Inc. could provide an opportunity for such monitoring studies.

CONCLUSIONS

Surveys for *Dalea cylindriceps* over the past three field seasons (2013-2015) have led to a better understanding of the distribution, ecology, and abundance of this species in Nebraska. The 12 known Nebraska occurrences had small populations in 2015, each with less than 100 individuals and most with 50 or less. While eight of these occurrences are associated with relatively intact grassland communities, three are limited to roadside right-of-ways and one occurs in degraded pasture. These factors, plus the observed vulnerability of this species to grazing pressure, indicate that *D. cylindriceps* should remain a species of conservation concern in Nebraska.

LITERATURE

Engelmann, G. 1862. Chapter 18. Botany. In: F.V. Hayden. On the geology and natural history of the Upper Missouri. C. Sherman & Sons, Philadelphia, Pennsylvania. Pp. 182-209.

Kaul, R.B. and S.B. Rolfsmeier. 1993. Native vegetation of Nebraska. Map, 1: 1,000,000, 16 colors. Conservation and Survey Division, University of Nebraska-Lincoln.

Kaul, R.B, D. Sutherland, and S. Rolfsmeier. 2011. The flora of Nebraska, 2nd ed. School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska.

Locklear, J.H. 2015. Survey for *Dalea cylindriceps* (sandsage prairie-clover) in the sandsage prairie region of southwestern Nebraska. Unpublished report prepared for the Nebraska Natural Heritage Program, Nebraska Game and Parks Commission by Lauritzen Gardens, Omaha, Nebraska.

Locklear, J.H. 2013a. *Dalea cylindriceps* Barneby (sandsage prairie-clover): a survey of historical occurrences in Nebraska. Unpublished report prepared for the Nebraska Natural Heritage Program, Nebraska Game and Parks Commission by Lauritzen Gardens, Omaha, Nebraska.

Locklear, J.H. 2013b. Taxonomic identity and historical accounts of *Dalea cylindriceps* (Fabaceae), a species of conservation concern in the Great Plains (U.S.A.). J. Bot. Res. Inst. Texas 7(2): 879 – 890.

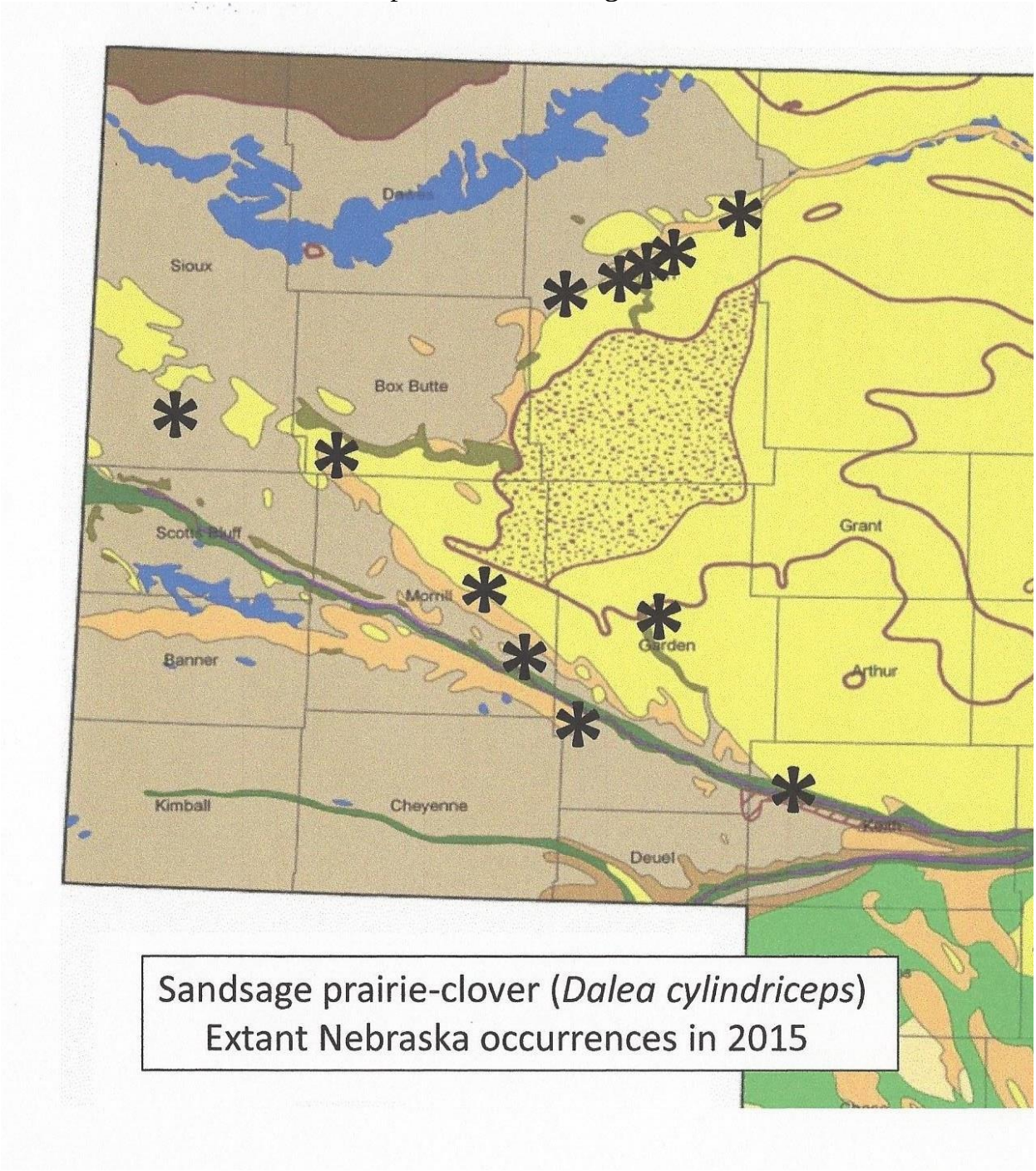
McIntosh, C. B. 1996. The Nebraska Sandhills: the human landscape. University of Nebraska Press, Lincoln, Nebraska.

Rolfsmeier, S.B. and G. Steinauer. 2010. Terrestrial ecological systems and natural communities of Nebraska; Nebraska Natural Heritage Program, Nebraska Game and Parks Commission, Lincoln, Nebraska.

Stubbendieck, J. and E.C. Conard. 1989. Common legumes of the Great Plains: an illustrated guide. University of Nebraska Press, Lincoln, Nebraska.

Figure 1: *Dalea cylindriceps*, Sheridan County, Nebraska, 23 August 2013.

Figure 2: Locations of extant occurrences of *Dalea cylindriceps* in Nebraska in 2015 in relationship to the native vegetation of Nebraska.



Map derived from *Native Vegetation of Nebraska* (Kaul & Rolfsmeier 1993)

Orange = Sand Hills Borders Mixed-grass Prairie = Western Sand Prairie (Rolfsmeier & Steinauer 2010)
Yellow = Sand Hills Mixed-grass Prairie
Tan = Mosaic of Mixed-Grass/Shortgrass Prairie