Appendix 15 - Threatened and Endangered Species Report

SUMMIT CARBON SOLUTIONS

South Dakota Survey Results and Habitat Assessments for:

Dakota Skipper (*Hesperia dacotae*),
Topeka Shiner (*Notropis topeka*) and Northern Redbelly Dace (*Chrosomus eos*),
Western Prairie Fringed Orchid (*Platanthera praeclara*), Lined Snake (*Tropidoclonion lineatum*),
Northern Long-Eared Bat (*Myotis septentrionalis*)
Monarch Butterfly (Danaus plexippus)
Western Regal Fritillary (Argynnis idalia occidentalis)

Project Name:
SCS Carbon Transport LLC
Midwest Carbon Express (MCE) Project

SUMMIT CARBON SOLUTIONS

Revision History

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SUMMIT CARBON SOLUTIONS

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1 Introduction

SCS Carbon Transport LLC (SCS) is preparing for construction of the SCS Midwest Carbon Express Project (MCE Project). The MCE Project encompasses a proposed carbon dioxide pipeline in Minnesota, Iowa, Nebraska, South Dakota, and North Dakota and sequestration facilities in North Dakota. This report is specific to South Dakota (hereafter referred to as the "Project"); species surveys and habitat assessments for other states along the MCE Project are discussed separately.

The species discussed in this report include both federally listed species pursuant to the Endangered Species Act and state listed species pursuant to SDCL 34A-8. Federally listed species that could be relevant to the Project were identified through informal consultation with the U.S. Fish and Wildlife Service (USFWS) (informal consultation between SCS and the USFWS, January 25, 2022). State listed species that could be relevant to the Project were identified through informal consultation with the South Dakota Game, Fish, and Parks (SDGFP) (informal consultation between SCS and SDGFP, January 25, 2022, and siting recommendations provided to SCS by SDGFP on February 16, 2022). Other federally listed species, such as whooping crane (*Grus americana*), may also be present along the route in South Dakota; however, the USFWS determined that survey for these species was not required since SCS would implement mitigation measures that would avoid impacts to these species. Mitigation measures include actions such as pausing construction when whooping cranes are observed migrating through the Project site.

Species and data discussed in this report include:

- survey methodologies and results for Dakota skipper (*Hesperia dacotae*), a federally listed threatened species of butterfly in South Dakota,
- survey methodologies and results for Topeka shiner (*Notropis topeka*), a federally listed threatened fish, and northern redbelly dace (*Chrosomus eos*), a state listed threatened fish as well as the results of a desktop habitat assessment,
- survey methodologies and results for western prairie fringed orchid (*Plantanthera praeclara*), a federally listed threatened plant,
- survey methodologies and results for lined snake (*Tropidoclonion lineatum*), a state listed endangered snake in South Dakota,
- methodologies and results of a desktop habitat assessment in South Dakota for northern long-eared bat (NLEB) (*Myotis septentrionalis*), a federally listed endangered species, and
- methodologies and results of a habitat assessment for monarch butterfly (*Danaus plexippus*) and western regal fritillary (*Argynnis idalia occidentalis*), monarch is a federal candidate species and western regal fritillary is a proposed federally threatened butterfly.

Surveys were completed for Dakota skipper in 2022, 2023, and 2024 (Summit 2022a, 2023a, 2024a). No Dakota skipper were observed during the survey effort and suitable habitat along the route was extremely limited. Survey results are included in this report as well as an assessment of potentially suitable habitat on the route as currently configured in South Dakota. Unsurveyed areas of potentially suitable habitat are scheduled for survey in 2025 if access is available.

Surveys were completed for Topeka shiner and northern redbelly dace habitat in 2022 (Summit 2022b) at streams that have historically, or currently, supported one or both species. Suitable habitat was present at some of the crossings. Subsequently, a desktop assessment of habitat for both species has been

completed on the route as currently configured in South Dakota. Unsurveyed areas of stream crossings that may support either species are not scheduled as SCS will mitigate impacts to these streams through trenchless crossing methods as agreed to with SDGFP and the USFWS (informal consultation with both agencies, January 25, 2022).

Surveys were completed for western prairie fringed orchid in 2022, 2023, and 2024 (Summit 2022c, 2023b, 2024b). No western prairie fringed orchid were observed during the survey effort and suitable habitat along the route was limited. Survey results are included in this report as well as an assessment of potentially suitable habitat on the route as currently configured in South Dakota. Unsurveyed areas of potentially suitable habitat are scheduled for survey in 2025 if access is available.

Surveys were completed for lined snake in 2022 (Summit 2022d). No lined snake were observed during the survey effort and suitable habitat along the route was very limited. Survey results are included in this report as well as an assessment of potentially suitable habitat on the route as currently configured in South Dakota. Unsurveyed areas of potentially suitable habitat are not scheduled for survey in 2025 as the only area of potentially suitable habitat on the route will be avoided via an HDD crossing associated with the Big Sioux River.

Surveys for NLEB have not been required on the MCE Project. However, the NLEB was listed as an endangered species by the USFWS on November 29, 2022 (87 FR 73488), with a final rule effective date of March 31, 2023 (88 FR 4908). As part of the listing effort, the USFWS created a *Standing Analysis and Implementation Plan – Northern Long-Eared Bat Assisted Determination Key, Version 1.1* (USFWS 2023b) for identifying suitable habitat and potential consultation or mitigation measures. This report implements those measures for habitat analysis in South Dakota and describes the results of that effort. In particular, this report is intended to assess the likelihood that a wooded area crossed by the proposed Project in South Dakota could provide suitable summer roosting, foraging, and commuting habitat for NLEB. This assessment was completed at both a stand level relative to stand habitat characteristics, as well as at a landscape level to assess the connection among or between habitats.

Surveys for monarch butterfly and regal fritillary have not been required on the Project. However, the monarch butterfly is a candidate species and the regal fritillary is a proposed threatened species. Consequently, SCS has completed a habitat assessment for these two species as well as reported the number of each species that has been recorded to date during surveys for Dakota skipper.

2 Dakota Skipper

Dakota skipper is a small species of butterfly that inhabits remnant native prairies in North Dakota, South Dakota, Minnesota, and Canada.

2.1 Methods

2.1.1 Habitat Assessment

The USFWS has defined two types of Dakota skipper habitat, Type A and Type B (USFWS 2022a). Type A habitat consists of low wet-mesic prairie with little topographic relief that occurs on near-shore glacial lake deposits. Type B habitat occurs in the western extent of the Dakota skipper's range, on rolling terrain over gravelly glacial moraine deposits.

Dakota skippers are obligate residents of undisturbed, high-quality prairie including wet-mesic tallgrass prairie and dry-mesic mixed grass prairie (Royer and Marrone 1992a); they do not inhabit "non-native

grasslands, weedy roadsides, tame hayland, or other habitats that are not remnant prairie, including reconstructed prairie (USFWS 2018; 2021; 2022a). According to the USFWS:

"High-quality prairie contains a high diversity of native species, including flowering herbaceous species (forbs). Degraded habitat consists of a high abundance of non-native plants, woody vegetation, and a low abundance of native grasses and flowering forbs available during the larval growth period and a low abundance of native flowering forbs available during adult nectaring periods..... Therefore, based on the information above, we identify the necessary physical or biological features for the Dakota skipper as nondegraded native tallgrass prairie and native mixed-grass prairie habitat devoid of non-native plant species, or habitat in which non-native plant species and non-native woody vegetation are maintained at levels that allow persistence of native tall grass species and forbs and, therefore, the persistence of the Dakota skipper" (USFWS 2015).

Recently, the USFWS amended this definition somewhat by noting that within Type A habitat three species are almost always present and blooming during the Dakota skipper's flight period: prairie lily *(Lilium philadelphicum),* bluebell bellflower (*Campanula rotundifolia),* and mountain deathcamas (smooth camas; *Zigadenus elegans)* (USFWS 2022a). In particular, mountain deathcamas is a strong indicator of Dakota skipper Type A habitat in South Dakota (USFWS 2022a). For Type B habitat, the USFWS notes that this habitat typically supports a high diversity and abundance of native forbs including: purple prairie clover *(Dalea purpurea),* white prairie clover (*D. candida),* yellow sundrops *(Calylophus serrulatus),* lambstongue groundsel *(Senecio integerrimus),* groundplum milkvetch *(Astragalus crassicarpus),* eastern pasqueflower *(Pulsatilla patens),* old man's whiskers (prairie smoke, *Geum triflorum),* western silver aster *(Symphyotrichum sericeum),* dotted blazing star *(Liatris punctata),* tall blazing star (*L. aspera),* meadow zizia (heartleaf golden alexanders; *Zizia aptera),* blanket flower *(Gaillardia sp.),* prairie sagewort *(Artemisia frigida),*and leadplant *(Amorpha canescens)* (USFWS 2022a).

Non-native grasses such as smooth brome (*Bromus inermis*) or Kentucky bluegrass (*Poa pratensis*), as well as non-native forbs such as Canada thistle (*Cirsium arvense*) or leafy spurge (*Euphorbia esula*), often outcompete native prairie vegetation and lead to the deterioration or elimination of Dakota skipper habitat (USFWS 2015). Smooth brome and Kentucky bluegrass in particular pose the greatest threat to native plant composition in Dakota skipper habitat (USFWS 2018). Further, pastures and prairies that are dominated by non-native grasses and forbs, or areas of cultivation, fragment habitat for Dakota skipper which may be incapable of moving more than 0.6 miles between patches of high-quality prairie habitat (USFWS 2014; 2018). The loss of habitat is the greatest factor in the decline of Dakota skipper (USFWS 2014, Davis 2020).

Because Dakota skipper have very specific habitat requirements, identifying suitable habitat for occupancy surveys is a key step in determining where, or if, to conduct surveys (USFWS 2022a). Potential locations of suitable habitat for Dakota skipper within the Project footprint were discussed with the USFWS in January 2022 (informal consultation January 25, 2022). The USFWS recommended using modeled Dakota skipper habitat (USFWS 2022b) to help identify landscape-level areas that have historically supported the species, combined with recent records of Dakota skipper presence, aerial imagery, and any field data to determine potentially suitable Dakota skipper habitat. The USFWS also noted that if occupancy surveys could not be completed due to the short flight window, weather constraints, or lack of access, that determining habitat suitability in lieu of occupancy surveys was appropriate and the best alternative (informal consultation January 25, 2022).

Based on this direction, WESTECH Environmental Services, Inc. (WESTECH) utilized a variety of measures to identify potentially suitable habitat on the Project prior to field investigation, including a review of: a) mapped Dakota skipper habitat (USFWS 2022b); b) Dakota skipper occupancy records (USFWS 2018; Davis 2020); c) aerial imagery; d) vegetation and wetland surveys completed in 2022 as well as spring surveys in 2023; and e) the results of 2022 and 2023 Dakota skipper survey. Many of these areas were presented in the *Summit Carbon Solutions Midwest Carbon Express 2022 Dakota Skipper Study Plan* (WESTECH 2022) which was provided to the USFWS for review and comment; no comments were received, and both the North Dakota and South Dakota field offices stated that the study plan was acceptable (pers. comm. Charlene Bessken USFWS South Dakota Ecological Services Field Office to John Beaver WESTECH on April 6, 2022; Heidi Riddle USFWS North Dakota Ecological Services Field Office to John Beaver WESTECH on April 21, 2022).

Surveys were led and supervised by biologists Mr. Jim Reiser and Mr. Jameson Reiser. Mr. Jim Reiser possesses a USFWS recovery permit (Permit number ES66113B) to conduct and directly supervise Dakota skipper surveys and has over 40 years' experience in *Lepidoptera* survey, including several surveys specifically for Dakota skipper. Mr. Jameson Reiser possesses a USFWS recovery permit (Permit number ESPER2616267) to conduct and directly supervise Dakota skipper surveys and has over 10 years' experience in *Lepidoptera* survey, including several surveys specifically for Dakota skipper. Additional qualified biologists who worked under the supervision of the permit holders included: Pete Christensen, Dave Hagen, John Beaver, and Lisa Larsen. Messrs. Christensen and Hagen both have previous experience in completing surveys for Dakota skipper, their habitat, and surveys for other rare *Lepidoptera* (e.g., Carson wandering skipper (*Pseudocopaeodes eunus obscurus*) or monarch (*Danaus plexippus*)), as well as extensive experience in prairie vegetation surveys. Ms. Larsen and Mr. Beaver are plant ecologists with 30 and 25 years' field survey experience respectively. Dan Culwell, Morgan Byrne, and Jeremiah Makahununiu also participated in surveys and operated the sub-meter GPS units to record survey tracks and to ensure surveys occurred within the appropriate survey corridor and on property where access was granted by the landowner. Finally, in 2023, three sites were evaluated subsequent to the primary survey led by Mr. Reiser as these areas were accessible after the Dakota skipper flight period. Ms. Prah and Mr. Lund, two experienced vegetation ecologists, assessed vegetation and habitat at these sites, all of which were dominated by non-native grasses and forbs and are unsuitable for Dakota skipper.

Surveys to identify Dakota skipper habitat, and potentially complete occupancy surveys for the species where suitable habitat is present, were scheduled for the adult flight period which typically occurs in late June/early July when flowering plants are at the optimal phenological stage (USFWS 2018). In 2024, the first documented Dakota skipper emergence was in North Dakota, on June 25 (pers. comm. Araceli Morales Santos to Jim Reiser on June 25, 2024). Project surveys commenced after this date when plants were readily identifiable and prioritized sites for potential, more intensive occupancy surveys as described in the *2022 Dakota Skipper (Hesperia dacotae) North Dakota Survey Protocol* (USFWS 2022a). Surveys in 2022 and 2023 likewise commenced after the first documented Dakota skipper emergence. Note that although this protocol states North Dakota, it is appropriate in South Dakota as well. As described in the protocol, assessing habitat prior to implementing occupancy surveys is a key criterion of the protocol. To assist in identifying Dakota skipper habitat, all biologists visited Ordway Prairie Ranch in South Dakota to observe habitat characteristics in an area that has supported Dakota skipper in the recent past. This property is owned by The Nature Conservancy and is approximately 1 mile south of the Project near Leola, South Dakota. Jim Reiser has surveyed Ordway Prairie in the past for The Nature Conservancy and documented Dakota skipper on the property in the early 2000s.

WESTECH preliminarily identified 70 areas of potentially suitable habitat along the route in North Dakota and South Dakota, of which 54 areas were surveyed for habitat or occupancy in 2022. Results of the 2022 survey are presented in the *Summit Carbon Solutions 2022 Dakota Skipper (Hesperia dacotae) Survey Report* (Summit 2022a). No Dakota skipper were observed at the sites in 2022 and only two areas of suitable habitat were identified in North Dakota, none were identified in South Dakota. In 2023, 15 areas of potentially suitable habitat were identified for survey in South Dakota along the route as configured in June 2023. As a result of subsequent reroutes in South Dakota, most of the previously surveyed habitat in 2022 and 2023 is no longer on the current route. Areas of potentially suitable habitat that have been identified using aerial imagery and mapped Dakota skipper habitat (USFWS 2022b) were scheduled for survey in 2024 if access was available. An overview of 2022, 2023, and 2024 survey sites and unsurveyed potentially suitable habitat in South Dakota is presented in Figure 1.

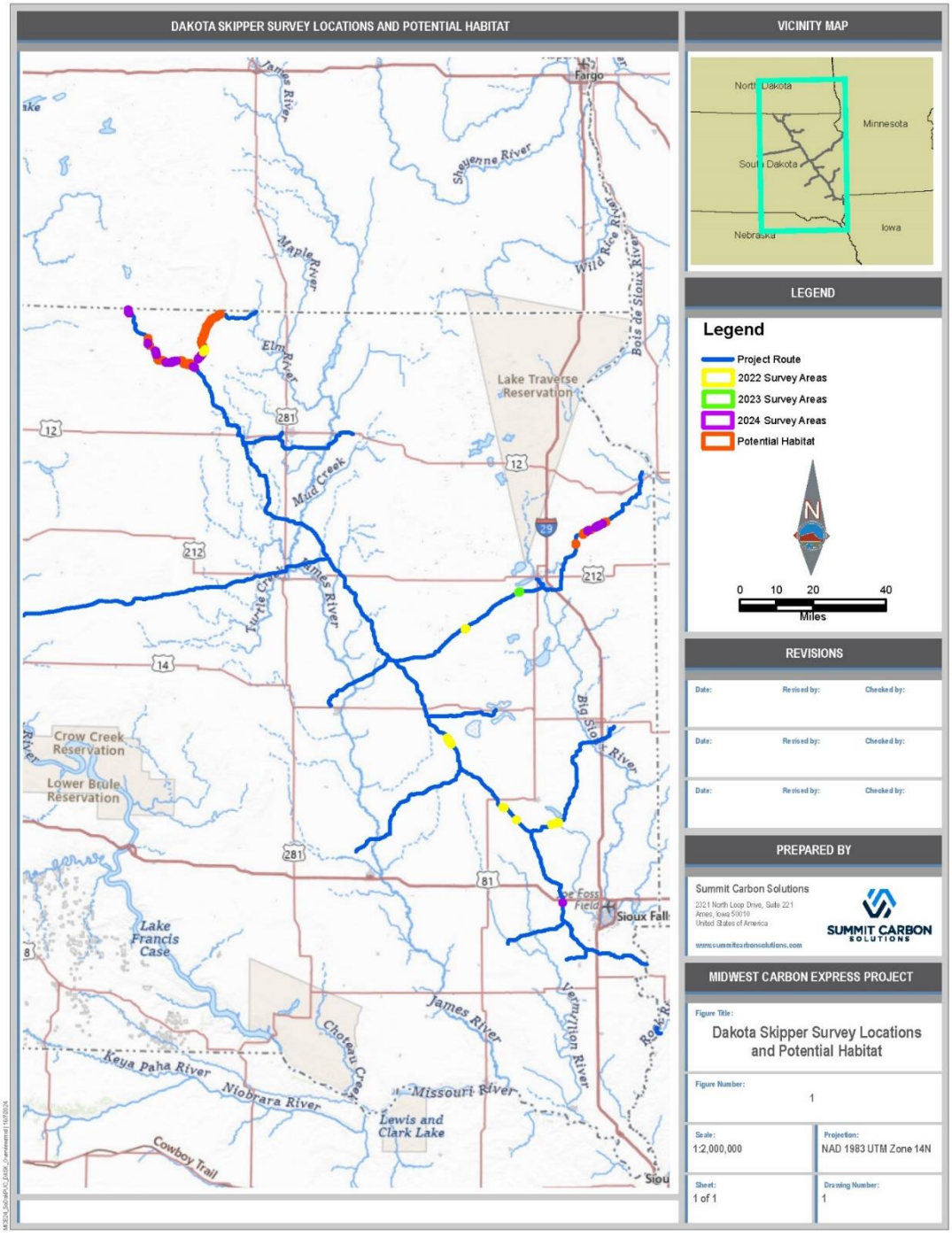
At each survey site in South Dakota where access was allowed, biologists recorded dominant vegetation, recorded all butterfly species observed, photographed the site, and determined if the area was consistent with suitable habitat characteristics for Dakota skipper. Biologists used several lines of evidence to determine if a site supported suitable habitat for Dakota skipper, including: 1) the description of Dakota skipper habitat provided by the USFWS in numerous publications (USFWS 2014; 2015; 2018; 2021; 2022a), 2) comparison with the Ordway Prairie reference area, and 3) Messrs. Reisers' experience in surveying, and locating, Dakota skipper on previous efforts.

All butterfly species that were observed at a site were identified, if possible, either through capture and safe release, or at a distance. Primary resources for identifying butterflies included a review of specimens previously collected by Mr. Jim Reiser and available on-site, as well as *Kaufman Field Guide to Butterflies of North America* (Kaufman 2006), *National Audubon Society Field Guide to North American Butterflies* (Pyle 1981), *Field Guide to Butterflies of South Dakota* (Marrone 2002), and *Butterflies of North Dakota: An Atlas and Guide* (Royer 1988).

2.1.2 Dakota Skipper Occupancy Survey

In 2022, occupancy surveys were conducted at two sites with suitable habitat within a 300-feet wide Environmental Study Area (ESA) that was centered on the proposed pipeline centerline (i.e., 150 feet either side of the Project centerline). This survey width was the allowable access space on each property consistent with landowner agreement. Per the USFWS's Dakota skipper survey protocol, walking routes within the survey area were established to ensure the entirety of each habitat patch was adequately surveyed. Biologists slowly walked routes parallel to each other and spaced approximately 10 meters apart in accordance with the survey protocol (USFWS 2022a). Surveys were completed after 1000 hours (10:00 am) when air temperatures were above 70˚ F, wind speeds were less than 19 miles/hour, and skies were primarily clear. Three repeat surveys were completed at each of the two sites. Although it is preferable if surveys are completed at least 48 hours apart, in some cases this amount of time

Figure 1. Dakota Skipper Survey Locations and Potential Habitat



could not be allowed between surveys to avoid inclement weather and still complete the survey within the flight window. In these cases, surveys were completed under optimal weather conditions at least 24 hours apart. In addition to a general site description form that was completed at all sites, a Dakota Skipper Flowering Plant Line Count Data Sheet was completed at each site on each day of occupancy survey. Surveys followed the *2022 Dakota Skipper (Hesperia dacotae) North Dakota Survey Protocol* (USFWS 2022a).

Unlike 2022 where occupancy surveys were completed at two sites in North Dakota with suitable Dakota skipper habitat, no areas of suitable habitat were identified in 2023 in South Dakota and therefore an occupancy survey was not completed; however, all butterflies observed at each site were recorded. In 2024, two occupancy surveys were completed at areas with suitable habitat in South Dakota. One of these areas was inaccessible in 2023 while the second area is on the new SDL-514 lateral east of Watertown, South Dakota.

2.2 Results

No Dakota skipper were observed at any location in South Dakota in any survey year. Appendix A contains field forms for all South Dakota sites where habitat survey was completed and also lists all *Lepidoptera* species that were observed at a site. In total, 26 sites totally approximately 495 acres have been surveyed on the current Project route in either 2022, 2023, or 2024. Additional areas were surveyed on previous routes that are no longer part of the Project.

Most survey sites are dominated by either smooth brome, Kentucky bluegrass, yellow sweetclover (*Melilotus officianale*), or a combination of the three. Native forbs and grasses are present within some of these sites but not with sufficient diversity or abundance to support Dakota skipper and Messrs. Reiser determined that they were unsuitable for Dakota skipper after walking the areas and identifying butterflies on site. In particular, larval host grasses, such as little bluestem were often lacking in adequate quantities to support Dakota skipper and/or if little bluestem was present at more than a trace cover, there were few nectar sources.

Ordway Prairie South Dakota is the closest area to the Project with known, relatively recent populations of Dakota skipper and occurs approximately 1 mile south of the Project near Leola, South Dakota. To date, only two of the surveyed areas on the current route in South Dakota provide suitable habitat for Dakota skipper somewhat similar to that on Ordway Prairie. Occupancy surveys for Dakota skipper were completed at these sites; none were observed. The two areas of suitable habitat on the Project are not as high-quality as that on Ordway Prairie, but relative to the other survey areas on the Project, these sites had a greater compliment of native vegetation and appeared to have the highest potential to support Dakota skipper. Vegetation and butterfly species observed at these sites are noted on field forms in Appendix A.

Although almost all areas of potentially suitable habitat in South Dakota were surveyed in either 2022 or 2023, the route has changed and most of the previously surveyed sites are no longer on the current route. There are currently 2 general areas of potentially suitable habitat within a 300-foot ESA that have been identified from previous surveys in the general area, aerial imagery, mapped Dakota skipper habitat (USFWS 2022b), and proximity to recent records of Dakota skipper. Areas of unsurveyed, potentially suitable habitat along the current route are depicted in Figure 1. The majority of this area occurs north of Leola, South Dakota, primarily on the recently rerouted portion of NDT-211.

Table 1 summarizes Dakota skipper habitat along the Project within South Dakota by county. Note that all suitable and unsuitable habitat acres are based on data from 2022, 2023, and 2024. All potentially suitable habitat acres are based on unsurveyed areas along the current route.

Table 1. Dakota skipper suitable, unsuitable, and potentially suitable habitat surveyed in South Dakota Environmental Study Area

County	Suitable Habitat (Acres)	Unsuitable Habitat (Acres)	Potentially Suitable (Acres)	Total Acres
CLARK	0.0	15.7	0.0	15.7
CODINGTON	0.0	13.3	9.0	22.3
GRANT	5.0	82.5	119.0	206.4
KINGSBURY	0.0	62.9	0.0	62.9
LAKE	0.0	59.0	0.0	59.0
MCPHERSON	26.1	229.9	788.1	1044.1
MINNEHAHA	0.0	0.3	0.0	0.3
TOTAL SOUTH DAKOTA	**31.1**	**463.7**	**916.0**	**1410.8**

2.3 Summary

SCS has completed survey for Dakota skipper habitat and individuals along the Project in South Dakota in 2022, 2023, and 2024. No Dakota skipper were observed in any year. Most of the sites surveyed in 2022 and 2023 are no longer on the current route. Two general areas of potentially suitable habitat have been identified along the route as currently configured; it is unknown if suitable habitat is actually present at these sites. Survey is scheduled for 2025 if access is available. If suitable habitat is present, then occupancy surveys will be completed consistent with the USFWS's protocol (USFWS 2022a).

3 Topeka Shiner and Northern Redbelly Dace

The Topeka shiner is found in small-to mid-size prairie streams in the central prairie of the United States with relatively high-water quality and cool to moderate temperatures. Many of these streams exhibit perennial flow, although some become intermittent during summer or periods of prolonged drought. The Topeka shiner's historic range includes portions of Iowa, Kansas, Minnesota, Missouri, Nebraska, and South Dakota (USFWS 2004).

Northern redbelly dace prefers shallow, slow-moving creeks or ponds with cold, clear waters. The species is a sight-feeder; consequently, clear water in creeks lined with sand or gravel, as opposed to mud, is preferred although they may inhabit small marshes and beaver ponds (NGPC 2022).

In South Dakota, several creeks are known to support Topeka shiner and/or northern redbelly dace. The USFWS and SDGFP provided a list of those streams and spatial data to SCS for review relative to stream crossing methods; those streams are shown in Figure 2 relative to the Project route. In total, 17 streams or rivers in South Dakota that support Topeka shiner and/or northern redbelly dace would be crossed by the Project at 36 crossing locations since, in some cases, a single stream or river would be crossed in more than one location (e.g., Big Sioux River).

Figure 2. Topeka Shiner and Northern Redbelly Dace Survey Locations and Streams with Reported Presence

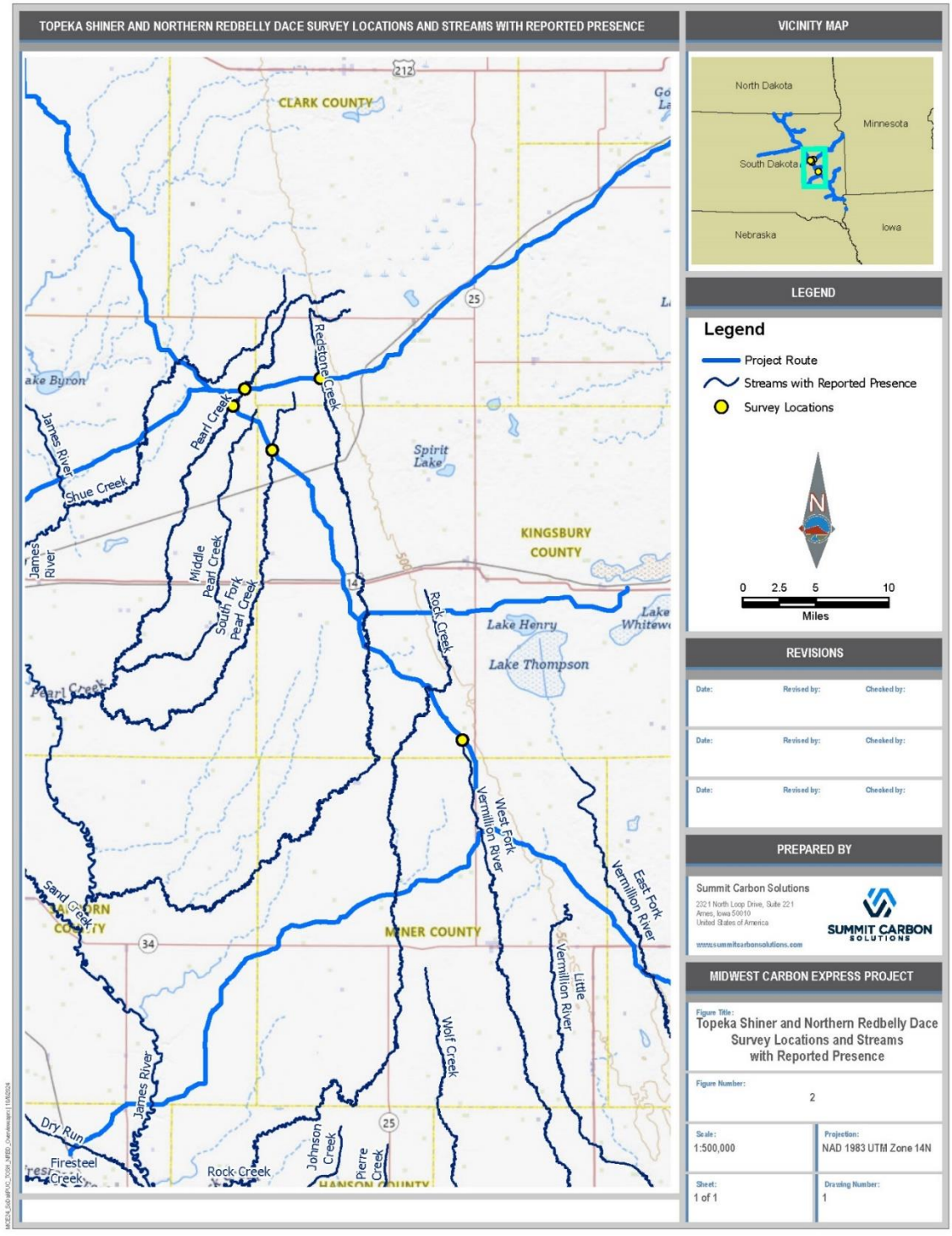


Table 2 presents a summary of streams or rivers in South Dakota that currently, or historically, support Topeka shiner and/or northern redbelly dace and that would be crossed by the Project.

Table 2. Topeka shiner and/or northern redbelly dace waterbodies in South Dakota Environmental Study Area

Stream Name	County	Pipeline Route ID	Species	Flow Regime at Crossing
Big Sioux River	Union	IAL-510	Topeka shiner	Perennial
Big Sioux River	Brookings	SDL-513	Topeka shiner	Perennial
Big Sioux River	Codington	SDL-514	Topeka shiner	Perennial
Big Sioux River	Lincoln	SDM-104	Topeka shiner	Perennial
Big Sioux River	Codington	SDT-208	Topeka shiner	Perennial
Camp Creek	Turner	SDT-212	Topeka shiner	Wetland
Deer Creek	Brookings	SDL-513	Topeka shiner Northern Redbelly Dace	Perennial
Dry Run	Sanborn	SDT-410	Topeka shiner	Intermittent
Dry Run	Davison	SDT-410	Topeka shiner	Perennial
East Fork Vermillion River	Lake	SDM-104	Topeka shiner	Perennial
East Fork Vermillion River	Turner	SDT-212	Topeka shiner	Perennial
James River	Brown	SDL-515	Topeka shiner	Perennial
James River	Spink	SDM-105	Topeka shiner	Perennial
James River	Beadle	SDT-207	Topeka shiner	Perennial
James River	Spink	SDT-209	Topeka shiner	Perennial
James River	Sanborn	SDT-410	Topeka shiner	Perennial
Long Creek	Turner	SDT-212	Topeka shiner	Perennial
Long Creek	Turner	SDT-409	Topeka shiner	Intermittent
Middle Pearl Creek	Beadle	SDM-104	Topeka shiner	Upland
North Fork Yellow Bank River	Grant	SDL-514	Northern Redbelly Dace	Perennial
Pearl Creek	Beadle	SDM-104	Topeka shiner	Natural Pond
Pearl Creek	Beadle	SDT-208	Topeka shiner	Wetland
Redstone Creek	Kingsbury	SDM-104	Topeka shiner	Perennial
Redstone Creek	Clark	SDT-208	Topeka shiner	Ephemeral
Redstone Creek	Kingsbury	SDT-411	Topeka shiner	Perennial
Rock Creek	Kingsbury	SDM-104	Topeka shiner	Intermittent

Table 2. Topeka shiner and/or northern redbelly dace waterbodies in South Dakota Environmental Study Area				
Stream Name	**County**	**Pipeline Route ID**	**Species**	**Flow Regime at Crossing**
Rock Creek	Miner	SDT-410	Topeka shiner	Perennial
Rock Creek	Kingsbury	SDT-411	Topeka shiner	Intermittent
Shue Creek	Beadle	SDM-105	Topeka shiner	Perennial
Shue Creek	Beadle	SDT-207	Topeka shiner	Perennial
South Fork Pearl Creek	Kingsbury	SDM-104	Topeka shiner	Wetland
West Fork Vermillion River	Kingsbury	SDM-104	Topeka shiner Northern Redbelly Dace	Wetland
West Fork Vermillion River	Turner	SDT-212	Topeka shiner Northern Redbelly Dace	Perennial
West Fork Vermillion River	Miner	SDT-410	Topeka shiner Northern Redbelly Dace	Intermittent
West Fork Vermillion River Tributary	Kingsbury	SDT-212	Topeka shiner Northern Redbelly Dace	Intermittent
Willow Creek	Codington	SDL-514	Topeka shiner	Perennial

During informal consultation with the USFWS and the SDGFP (January 25, 2022), both agencies agreed that if waterbodies that support Topeka shiner and/or northern redbelly dace are crossed using trenchless techniques, i.e., bore or horizontal directional drill, then surveys and habitat assessments are not required as there would be no impact to either species. The agencies also agreed that survey and assessment was not required at Middle Pearl Creek since the crossing location of this stream is an upland swale and entirely cultivated without a channel or stream. The agencies did recommend survey at five streams to determine if suitable habitat for either species is present and to sample for the species should there be water within the stream (pers. comm. Charlene Bessken USFWS South Dakota Ecological Field Services Office to John Beaver WESTECH Environmental Services, Inc, April 4, 2022). Those streams include: West Fork Vermillion River (north crossing, SDM-104), Redstone Creek (north crossing, SDT-208), South Fork Pearl Creek (SDM-104), and two crossings of Pearl Creek (north crossing, SDT-208 and south crossing, SDM-104) (Figure 2). All these sites are minor streams that may, or may not, support habitat for the species. In some cases, these sites are fully-vegetated wetlands without an active channel or adequate water to support Topeka shiner or northern redbelly dace.

Although the USFWS and SDGFP initially indicated that survey for both species would be required, subsequent input from the USFWS stated that presence/not detected surveys for Topeka shiner a year prior to construction would not be adequate to document whether Topeka shiner would be present in subsequent years. Also, the USFWS stated that the individual (Karrie Johnson) with the Topeka shiner scientific collection permit could not survey for the Project without a U.S. Army Corps of Engineers

(USACE) permit already in place. Consequently, SCS completed a habitat assessment at the five streams in question to facilitate further conversation with the USFWS and SDGFP regarding appropriate crossing methods at each site.

3.1 Methods

Habitat assessments were completed at each crossing by Karrie Johnson on June 13, 2022 working for WESTECH. Ms. Johnson has extensive experience surveying for prairie fish in South Dakota and has a scientific collector's permit to survey for Topeka shiner. However, since the Service indicated that Ms. Johnson's permit was not valid for the Project at this stage, only a habitat assessment was completed to document stream characteristics and the likelihood of fish presence.

At each stream crossing, the center-point of the survey corridor was identified and marked using a Trimble Geo7X Global Network Satellite System. Surveys were conducted within an ESA 150-feet up and downstream either side of the center-point for a total survey width of 300-feet.

Habitat characteristics were recorded at each crossing including pool, riffle, run habitat, stream substrate, water depth and width, water regime, channel depth and width, bank vegetation, channel vegetation (if any), and any impacts at the streams. Photographs were taken of each crossing.

3.2 Results

Habitat characteristics at each crossing are described below in Table 3. Field forms and site photos are provided in Appendix B. Three of the five streams are intermittent waterbodies or wetland swales with poor potential for supporting any fish at the Project crossing, including: Redstone Creek (north crossing, SDT-208), South Fork Pearl Creek (SDM-104), and West Fork Vermillion River (SDM-104). Further, both the South Fork Pearl Creek and the West Fork Vermillion River also have dugouts within the channel that may inhibit fish passage. The South Fork Pearl Creek also has elevated culverts downstream of the pipeline crossing that inhibit fish passage. Because fish habitat is lacking at these three waterbodies, standard wetland crossing methods are recommended.

Both crossings of Pearl Creek (north and south) do have potential to support fish and are listed by the USFWS and SDGFP as containing Topeka shiner and/or northern redbelly dace downstream of the proposed crossing locations. Consequently, trenchless crossings of these two waterbodies are recommended at these sites.

Table 3. Habitat characteristics at five Topeka shiner and/or northern redbelly dace waterbodies in South Dakota Environmental Study Area

Waterbody Name	**Habitat Characteristics**
Redstone Creek (north crossing, SDT-208)	Ditched intermittent stream, ponded water at time of survey due to high rainfall. Large wetland fringe. Dugout and drainage structure upstream. No fish observed and habitat has poor potential to support fish.
Pearl Creek (north crossing, SDT-208)	Meandering intermittent stream with no structures or alterations near pipeline crossing. Narrow, adjacent fringe wetlands. No fish observed but potential to support fish.

Table 3. Habitat characteristics at five Topeka shiner and/or northern redbelly dace waterbodies in South Dakota Environmental Study Area	
Waterbody Name	**Habitat Characteristics**
Pearl Creek (south crossing, SDM-104)	May be a perennial stream. Deep pools of water in meandering stream bends. Upstream bridge on adjacent county road. Large wetland fringe in places. No fish observed but potential to support fish.
South Fork Pearl Creek (SDM-104)	Intermittent stream with standing water due to high rainfall; streambed is entirely vegetated. Dugout area upstream and elevated culverts downstream on county road. No fish observed and habitat has poor potential to support fish.
West Fork Vermillion River (north crossing, SDM-104)	Wetland swale with standing water due to high rainfall; streambed is entirely vegetated. No ordinary high-water mark or defined channel. Dugout area downstream. No fish observed and habitat has poor potential to support fish.

3.3 Summary

Seventeen streams or rivers in South Dakota that support Topeka shiner and/or northern redbelly dace would be crossed by the Project at 36 crossing locations since, in some cases, a single stream or river would be crossed in more than one location. Thirty-two (32) stream crossings would be crossed using trenchless methods to avoid impacts to either species consistent with mitigation guidance received from the USFWS and SDGFP. Four streams do not support habitat at the crossing location and include: Middle Pearl Creek (SDM-104), Redstone Creek (north crossing, SDT-208), South Fork Pearl Creek (SDM-104), and West Fork Vermillion River (SDM-104). These streams may be crossed using standard wetland construction procedures.

4 Western Prairie Fringed Orchid

Western prairie fringed orchid is a native, long-lived perennial forb typically found in tallgrass prairie and native mesic meadows and wetlands. The conversion of native prairie or native wetland to cropland has been the primary cause of population decline, though livestock grazing, annual haying, invasive plant introduction, and herbicide use also negatively impact the species (NGPC 2022).

This section documents the results of pedestrian surveys for western prairie fringed orchid habitat and western prairie fringed orchid individuals or populations along the current Project route in South Dakota. Preliminary pre-construction field surveys to identify potentially suitable habitat for western prairie fringed orchid were conducted by Perennial Environmental Services (Perennial) in 2021, and a desktop habitat assessment was conducted by WESTECH in March 2022. WESTECH conducted pedestrian surveys for western prairie fringed orchid along the Project route in early July 2022, 2023, and 2024 where access was allowed.

4.1 Methods

Western prairie fringed orchid is generally found in wet to mesic tallgrass prairies and complexes of wet or mesic prairie and sedge communities (Taft and Solecki 1990). The species requires deep moist soils and may occasionally be found in roadside ditches adjacent to mesic prairies and wetland complexes (Sheviak and Bowles 2003; USFWS 1996; NGPC 2022). The conversion of native prairie to cropland has

been the primary cause of population decline, though overgrazing, annual haying, invasive plant introduction, and herbicide use can also negatively impact the species (NGPC 2022).

Because western prairie fringed orchid has specific habitat requirements, identifying suitable habitat is a key step in determining where to conduct surveys. Prior to initiating surveys, WESTECH contacted Gerry Steinauer, a biologist and ecologist for the Nebraska Game and Parks Commission (NGPC) and the Nebraska Natural Heritage Program (NNHP), to discuss habitat requirements for the western prairie fringed orchid in Nebraska. Mr. Steinauer provided a habitat description to aid desktop analysis and field surveys (Steinauer 2013). This habitat description provides a summary of field indicators for suitable orchid habitat in Nebraska, although it is also generally applicable in South Dakota.

In addition to the habitat description, WESTECH utilized a variety of measures to select areas of potentially suitable habitat within the Project ESA, including a review of: 1) the mapped range of western prairie fringed orchid (USFWS 2022), 2) aerial imagery, and 3) results of initial habitat assessments completed by Perennial in 2021, and 4) wetland surveys conducted for the Project in 2021 and 2022. These areas were presented in the *Summit Carbon Solutions Midwest Carbon Express 2022 Western Prairie Fringed Orchid Study Plan* (WESTECH 2022a) and was provided to the USFWS for review and comment; no comments were received, and both the South Dakota and North Dakota field offices stated that the study plan was acceptable (pers. comm. Charlene Bessken USFWS South Dakota Ecological Services Field Office to John Beaver WESTECH on April 6, 2022; Heidi Riddle USFWS North Dakota Ecological Services Field Office to John Beaver WESTECH on April 21, 2022).

The Project preliminarily identified 444 acres of potentially suitable habitat along the route in South Dakota as it was configured in May 2022 (WESTECH 2022b) of which approximately 403 acres were surveyed that year. In 2023, surveys were completed where suitable habitat had been verified in 2022 and where access was allowed, and in a few areas that were inaccessible in 2022. Surveys were repeated in areas of suitable habitat in 2023 even though no plants were observed in 2022 because western prairie fringed orchid is cryptic and may not flower every year. Potentially suitable habitat that has not been surveyed also occurs on the current route due to route variations since the 2023 survey was completed; these areas were surveyed in 2024 where access was allowed. Survey locations for western prairie fringed orchid in 2022, 2023, and 2024, and potentially suitable habitat in unsurveyed areas are shown on Figure 3.

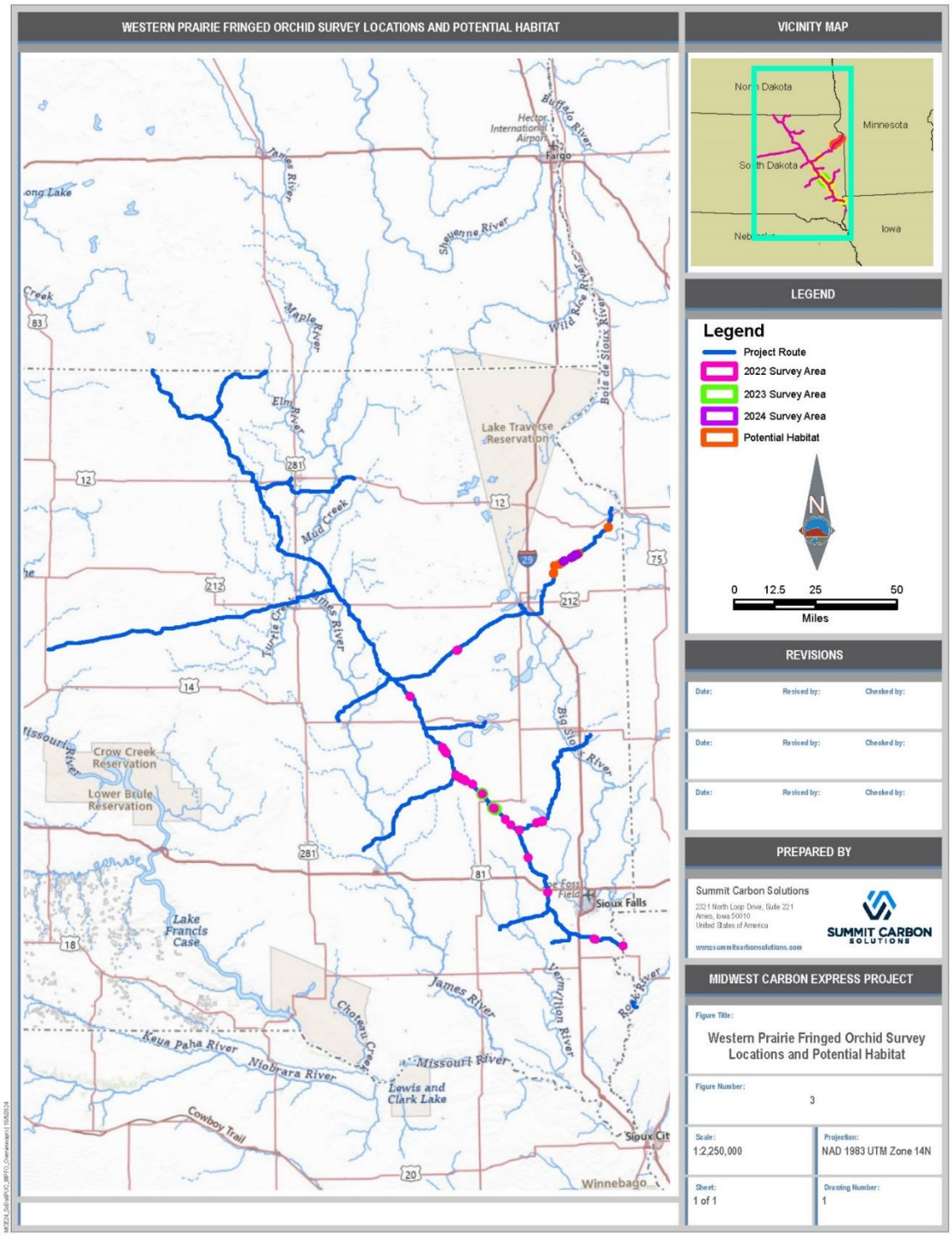
Pedestrian surveys for western prairie fringed orchid took place July 9 – 13, 2022, July 10 – 12, 2023, and July 9, 2024; surveys were led by Alicia Admiraal with assistance from Charity Grummert, Erik Henry, and Morgan Byrne with WESTECH. Ms. Admiraal has more than 20 years' experience throughout the Midwest with botanical surveys and habitat characterizations, including for western prairie fringed orchid and other rare species. Ms. Grummert has more than 10 years' experience throughout the Midwest and Great Plains with botanical surveys and habitat characterizations, including for western prairie fringed orchid and other rare species. Ms. Byrne and Mr. Henry have experience with numerous biological surveys and operated the GPS unit during survey and assisted with searching for western prairie fringed orchid.

At each site, surveyors walked slowly back and forth across the width of the ESA, which consisted of a 300-feet wide corridor (150-feet either side of the proposed pipeline centerline). The ESA was wider in some areas where additional workspace would be required during construction. Surveyors visually scanned the entire potential habitat area. Notes regarding topography, plant species, and hydrology were recorded for indications of habitat.

Field data pertinent to the surveyed area were used to characterize the habitat according to a rating system created by WESTECH that corresponds to rankings defined in the NNHP Ecological Community Survey Form guidance document (NNHP 2015). Habitat for western prairie fringed orchid was evaluated and rated according to the following criteria:

- Excellent (A) – completely native tall-grass/lowland/mesic prairie, appears to be mowed or lightly grazed every year or two. Suitable hydrology present.
- Good (B) – primarily native tall-grass/lowland/mesic prairie, appears to be hayed or lightly grazed every year or two. Suitable hydrology present.
- Fair (C) – mix of native tall-grass/lowland/mesic prairie and non-native vegetation, appears to be hayed or lightly grazed approximately every year or two. Suitable hydrology present.
- Poor (D) – primarily non-native vegetation with a minor native tall-grass/lowland/mesic prairie component, appears to be hayed or lightly grazed every year or two, or is a mix of native and non-native plant species but heavily grazed and/or sprayed to reduce broadleaf species. Suitable hydrology present.
- Unsuitable – entirely or almost entirely non-native vegetation dominated by aggressive non-native grasses such as smooth brome (*Bromus inermis*) and/or other invasive grasses and noxious weeds. Suitable hydrology is absent.

Figure 3. Western Prairie Fringed Orchid Survey Locations and Potential Habitat



Survey forms were completed at each site. If populations or individuals of western prairie fringed orchid had been encountered, they would have been recorded on an Element Occurrence Rare Plant Survey Form, and the population boundary would have been mapped using sub-meter resource grade GPS units.

4.2 Results

No western prairie fringed orchid individuals or populations were observed in any year in any of the areas that support suitable habitat for the species, or at any of the other survey sites within the Project survey corridor. The majority of survey sites are dominated by non-native grasses and/or disturbed by grazing or agriculture. Completed Orchid Survey Forms are presented in Appendix C; a site photograph is included with each respective survey form.

In total, approximately 428 acres of potentially suitable habitat have been surveyed in South Dakota in 2022, 2023, and/or 2024.

Most surveyed sites are Unsuitable as orchid habitat. Agriculture is the primary industry in eastern South Dakota where orchid surveys occurred. The majority of the landscape has been converted to cultivated cropland planted with corn or soybeans, though areas of pastureland and hay land are also common. The most common reasons sites were classified as Unsuitable or Poor are:

- The area is dominated by non-native grasses such as smooth brome or reed canary grass (*Phalaris arundinacea*). Western prairie fringed orchid is typically not found in grasslands that are completely dominated by smooth brome or reed canary grass (Steinauer 2013). Other non-native grasses such as Kentucky bluegrass (*Poa pratensis*), timothy grass (*Phleum pratense*), and redtop (*Agrostis stolonifera*) were also commonly encountered during surveys, but usually in addition to a native grass component.
- The site lacks suitable hydrology to support orchids.
- The site is overgrazed.
- The site is sprayed with herbicides to kill forb species.
- The site is dominated with noxious weeds such as leafy spurge (*Euphorbia esula*) or Canada thistle (*Cirsium arvense*). Other commonly encountered weeds included musk thistle (*Carduus nutans*) and bull thistle (*Cirsium vulgare*).
- The site had been previously disturbed or re-seeded.

A summary of surveyed acreage and habitat quality in South Dakota is presented by county in Table 4. Unsurveyed areas of potential habitat are also included in Table 4. These areas will be surveyed in 2025 if access is available.

Table 4. Western Prairie Fringed Orchid Suitable Habitat Quality in South Dakota Environmental Study Area

County	Habitat Quality (acres within each category)					
	Good	Fair	Poor	Unsuitable	Potentially Suitable	Total Acres
CLARK	--	--	--	13.5	--	13.5

Table 4. Western Prairie Fringed Orchid Suitable Habitat Quality in South Dakota Environmental Study Area						
County	Habitat Quality (acres within each category)					
	Good	Fair	Poor	Unsuitable	Potentially Suitable	Total Acres
CODINGTON	--	--	--	--	12.0	12.0
GRANT	7.0	14.9		58.6	50.9	131.4
KINGSBURY	--	--	--	64.4	--	64.4
LAKE	--	--	54.7	33.9	3.1	91.7
LINCOLN	--	--	--	13.6	1.1	14.7
MINER	--	--	--	95.4	--	95.4
MINNEHAHA	--	4.7	--	0.3	--	5.0
TOTAL SOUTH DAKOTA	**7.0**	**19.6**	**54.7**	**279.8**	**67.1**	**428.1**

4.3 Summary

In July 2022, 2023, and 2024 experienced botanists surveyed approximately 428 cumulative acres for western prairie fringed orchid and suitable habitat. No western prairie fringed orchid individuals or populations were observed in any of the areas.

Most of the surveyed habitat along the Project route in South Dakota is rated as either Unsuitable or Poor for western prairie fringed orchid. This lack of suitable habitat is consistent with the general loss of habitat for western prairie fringed orchid due primarily to cultivation and the dominance of non-native vegetation that has replaced high-quality native prairie (NGPC 2022).

Survey will be completed in July 2025 on approximately 67 acres of potentially suitable habitat in Codington, Grant, Lake, and Lincoln counties if access is available.

5 Lined Snake

The lined snake is a small fossorial species of snake typically found in a variety of habitats including "prairie grasslands, scattered oak forests, and residential and suburban areas; however, most literature suggests this species inhabits remnant, undisturbed prairies along woodland corridors" (Amphibians and Reptiles of South Dakota 2022). In South Dakota, the lined snake has been documented along the Big Sioux River and James River in Minnehaha, Hutchinson, Lincoln, and Union counties (Amphibians and Reptiles of South Dakota 2024).

This section documents the results of survey for lined snake in 2022 and summarizes potential habitat on the current route.

5.1 Methods

Based on these habitat descriptions, WESTECH utilized a variety of measures to identify potentially suitable habitat on the Project, including a review of: a) lined snake habitat identified by the SDGFP Environmental Review Tool (SDGFP 2022b); b) aerial imagery; and c) pre-construction habitat assessments

completed by Perennial Environmental Services in 2021. Based on this review, there is very little non-cultivated habitat within the mapped range of lined snake (SDGFP 2022b) along the Project. WESTECH identified approximately 5 acres of potentially suitable habitat for lined snake on the route as it was configured in 2022, all located west of the Big Sioux River within Lincoln County, South Dakota. However, only 1 site of potential habitat occurs on the current route (Figure 4).

WESTECH coordinated with SDGFP in spring 2022 on survey techniques and timing. Surveys for lined snake took place in the summer when the species is most active, which was determined to be between May 1 and September 30, at sites where potentially suitable habitat was identified. Surveyors walked the entire ESA within these areas. The ESA was 300-feet wide; 150-feet either side of the Project centerline, with a wider ESA in areas where additional workspace is required. Notes regarding topography, plant species, and potential hiding cover were recorded for indications of habitat. Areas with hiding cover were searched to locate lined snake. Habitat boundaries were mapped with a sub-meter, resource-grade GPS unit, if found.

5.2 Results

A pedestrian survey for lined snake was completed by Jessica Allewalt and Charity Grummert of WESTECH on July 11, 2022. Ms. Allewalt has over 15 years of experience conducting wildlife surveys in the Midwest. The survey was conducted on a parcel of potential habitat that is no longer on the current route.

No lined snakes or evidence of their presence was observed during 2022 field surveys in Lincoln County, South Dakota. No suitable lined snake habitat was observed. No snakes or other herptiles were observed.

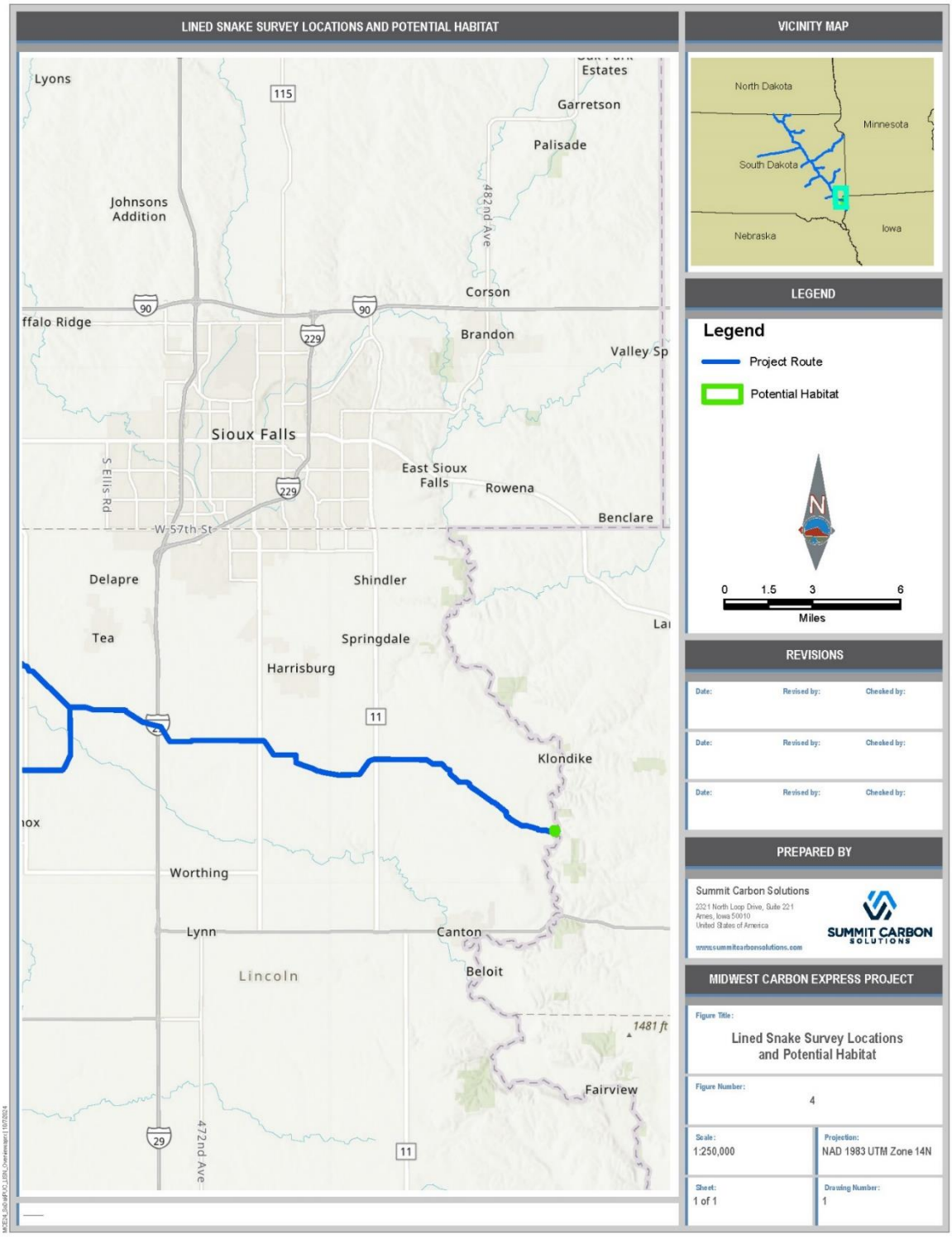
The accessible site consisted of approximately 2 acres and was surveyed on July 11, 2022. The majority of the upland portion of the site was dominated by introduced perennial grasses such as smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*). The herbaceous wetland within the swale was comprised of reed canary grass (*Phalaris arundinacea)*, a non-native graminoid. No lined snake habitat indicators were observed including native mesic prairie, down wood, crawfish burrows, debris piles, or other areas that could provide hiding cover. The adjacent lands consisted primarily of cultivated cropland.

The 1 area of potentially suitable habitat on the current route appears to be a dense, narrow stand of deciduous trees likely dominated by green ash (*Fraxinus pennsylvanica*) and plains cottonwood (*Populus deltoides*) on the edge of the Big Sioux River; the surrounding landscape is cultivated. Because of the lack of open canopy and grassland, this site likely does not provide habitat for lined snake. Further, the Big Sioux River will be crossed using HDD technology which will avoid this one area of potentially suitable habitat. The Big Sioux River will also be crossed further south in Union County. Although Union County is within the historical range of lined snake, and the Big Sioux River corridor could provide habitat for the species at this location, the last record of lined snake in Union County is from 1923 (Amphibians and Reptiles of South Dakota 2024) and it is assumed the species would not be present at this site.

5.3 Summary

Surveys for lined snake were completed in 2022 on one accessible parcel; no lined snakes were observed, and suitable habitat was not present. The only area of potentially suitable habitat on the current route occurs at the Big Sioux River in Lincoln County; however, the likelihood that this area is occupied is low due to high tree cover. Further, this site will not be affected since the Big Sioux River will be crossed using HDD technology which will avoid this site.

Figure 4. Lined Snake Survey Locations and Potential Habitat



6 Northern Long-Eared Bat Habitat Assessment

This section documents the results of a desktop habitat assessment in South Dakota for NLEB, conducted by WESTECH. The NLEB was listed as an Endangered species by the U.S. Fish and Wildlife Service (USFWS) on November 29, 2022 (87 FR 73488), with a final rule effective date of March 31, 2023 (88 FR 4908). This section is intended to assess the likelihood that a wooded area crossed by the proposed Project in South Dakota could provide suitable summer roosting, foraging, and commuting habitat for NLEB. This assessment was completed at both a stand level relative to stand habitat characteristics, as well as at a landscape level to assess the connection among or between habitats.

6.1 Methods

6.1.1 Northern Long-Eared Bat Habitat Description

WESTECH mapped all wooded areas within an ESA centered on the Project centerline in South Dakota. Wooded areas were identified from high-resolution aerial imagery and were defined as any tree, or collection of trees, that were visible within the ESA. This level of mapping resulted in higher-resolution habitat than that obtained from remote sensing data. The ESA size varied depending on the Project workspace but included at least 150-feet either side of the centerline, and often included an area 250-feet either side of the centerline. A total of 129 wooded areas were mapped within the ESA in South Dakota. Following mapping, each wooded area was then assessed relative to several habitat components that define the suitability of each wooded area as habitat for NLEB. The general location of these wooded areas in South Dakota is displayed in Figure 5.

The term “wooded area” is not clearly defined by the USFWS, and its use varies in peer-reviewed literature and USFWS documents. The USFWS notes that suitable summer habitat for NLEB includes a wide variety of “forested/wooded habitats” where they roost, forage and commute as well as some adjacent, interspersed non-forested habitats such as wetlands, pastures, and agricultural areas (USFWS 2023a). The USFWS also states, in their 2016 determination, that Critical Habitat was not warranted, and that “the species’ specific needs and preferences for these habitat elements are relatively flexible, plentiful, and widely distributed” (87 FR 24710).

Although NLEB are flexible in their summer habitat needs, the USFWS has recently provided guidance on a definition of potentially suitable habitat for NLEB (USFWS 2023b). This guidance includes a broad description of components in suitable summer habitat (e.g., trees > 3 inches diameter at breast height (dbh), typically intact mixed-type forests with small gaps, etc.). The USFWS also cites three examples of unsuitable habitat, including:

1. Individual trees that are greater than 1,000 feet from forested/wooded areas;
2. Trees found in highly developed urban areas (e.g., street trees, downtown areas); and
3. A pure stand of less than 3-inch dbh trees that are not mixed with larger trees.

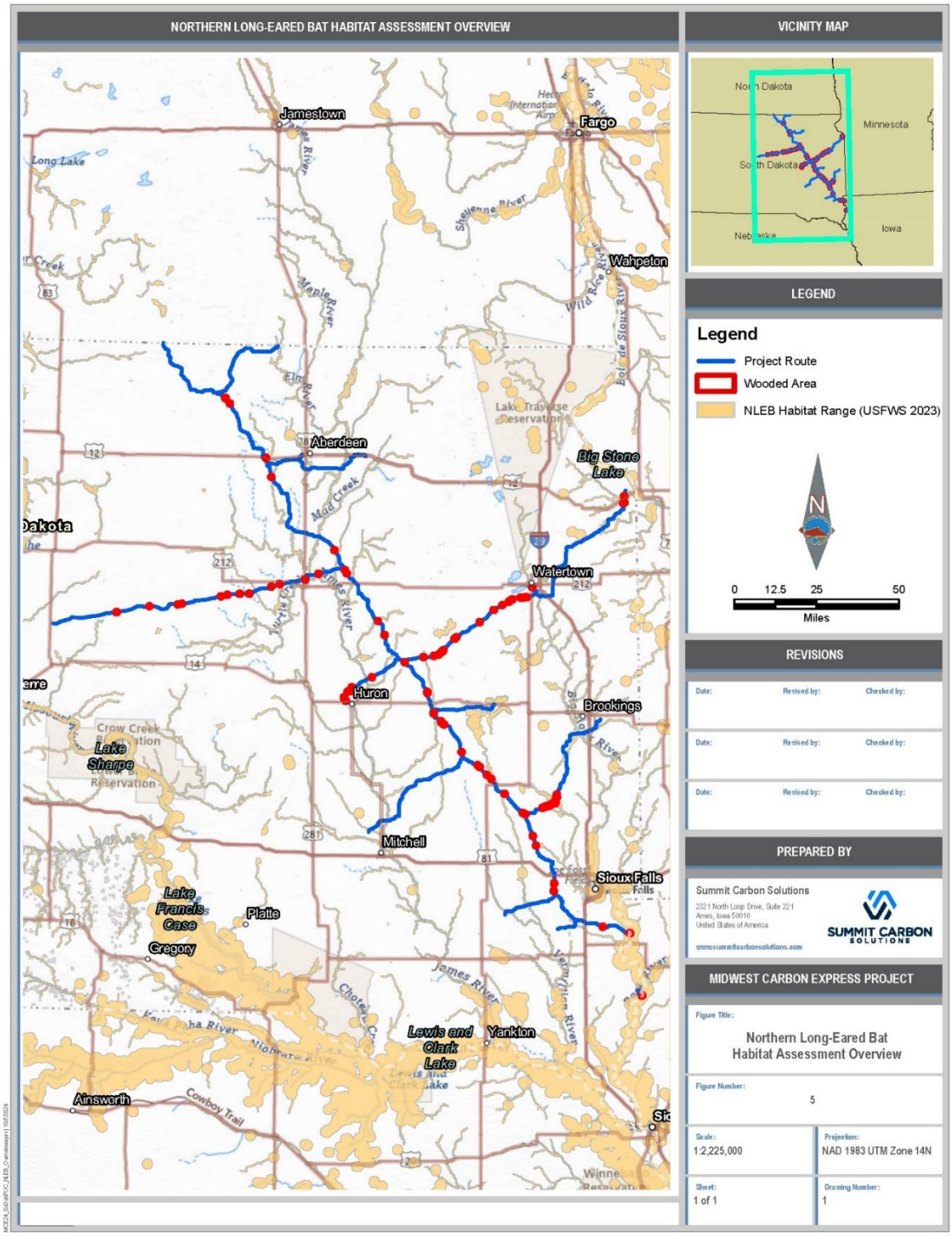
Much of the habitat guidance for NLEB is based on guidance the USFWS previously provided for Indiana bat (*Myotis sodalis*). In particular, the guidance regarding a 1,000-foot distance to forested/wooded areas is based on guidance for Indiana bat which clarifies the likelihood that Indiana bat, and by inference NLEB, would be present in summer foraging and roosting habitat (USFWS 2011). This guidance includes two additional rules for determining likelihood of use based on habitat connectivity or isolation, and states:

> "In summary, if both of the following conditions are true, Indiana bat presence [and by inference NLEB] is unlikely within and near the project area during the summer period…
>
> 1. No suitable foraging or roosting habitat is in the project area or within 1,000 feet of the project area boundary.
>
> 2. Commuting habitat, if occurs in or within 1,000 feet of the project area boundary, is, more than 1,000 ft, or if connected more than 2.5 miles, from suitable roosting or foraging habitat." (USFWS 2011).

Although Indiana bats were documented crossing open areas greater than 3,000 feet in an agricultural landscape (Kniowski 2011), that study occurred in a landscape with numerous, connected forested fence rows and interspersed woodlots adjacent to a large riparian system; consequently, the degree of openness in that study was lower than in most agricultural settings on the western perimeter of NLEB range. In contrast, most other research indicates that Indiana bats predominately forage, roost, and travel within wooded habitats or along their edges (USFWS 2011) even when following wooded habitats, rather than crossing large open areas, which results in greater flight distance (Murray and Kurta 2004). As a result, the USFWS states that, "NLEBs stay close to forest and woods – only those non-forested areas within 1000' of forest or woods are presumed suitable for the species" (USFWS 2023c).

Based on these descriptions and guidance, wooded areas crossed by the Project ESA were classified relative to their degree of isolation or connectivity to other wooded areas, as well as the individual stand characteristics. WESTECH reviewed literature on NLEB habitat and used it to identify relevant habitat characteristics that could be evaluated with aerial imagery and field survey habitat notes and data (e.g., forested, cultivated, pasture, etc.). WESTECH also used the USFWS's recently published and updated range map for NLEB (USFWS 2023c) which is more specific than the previous version. These data were overlain with 2.5 mile and 1,000-foot buffers surrounding wooded areas within the Project ESA consistent with the USFWS's guidance for determining habitat connectivity and suitability. Each wooded area was then evaluated to determine if it was within, and connected to, the mapped NLEB range at 2.5 miles and 1,000 feet or to unmapped habitat that appeared suitable for foraging and roosting. The USFWS's updated NLEB range map is shown on Figure 5.

Figure 5. Northern Long-Eared Bat Habitat Assessment Overview



Numerous scientific articles on NLEB indicate that the species prefers intact, closed-canopy forests for foraging, although individuals will forage along the forest edge (Patriquin and Barclay 2003, Jung et al. 1999, Barbour and Davis 1969). The NLEB rarely flies through non-forested areas, particularly large non-forested areas such as agricultural fields (White et al. 2017, Henderson and Broders 2008, Hogberg et al. 2002). Foraging areas typically vary between 46 hectare (ha) and 65 ha (114 acre (ac) and 160 ac) within intact forests (Broders et al. 2006, Owen et al. 2003), but may be as small as 6 ha (14 ac) in fragmented forest and agricultural landscapes (Henderson and Broders 2008). Lausen (2009) suggests that since the NLEB rarely fly in open areas it is not surprising that home ranges are smaller in areas where forest patch size is smaller.

Roosting occurs primarily within intact, closed-canopy, deciduous forests (USFWS 2022c, Broders and Forbes 2004, Menzel et al. 2002, Owen et al. 2002, Foster and Kurta 1999). The NLEB rarely ventures more than a few meters from forested habitat (White et al. 2017), although some individuals may commute between roosting and foraging sites through open landscapes. As noted, the USFWS has identified 1,000 feet as the approximate boundary beyond which NLEB are unlikely to commute between disconnected wooded areas.

Roost tree species and diameter are highly variable (USFWS 2022c, Lacki and Schwierjohann 2001, Foster and Kurta 1999) although snag density, tree density, and presence of cavities or loose bark do appear to be important roosting features (Menzel et al. 2002, Owen et al. 2002, 2003, Foster and Kurta 1999). In a forest–agricultural landscape, females may exclusively use deciduous species (Foster and Kurta 1999) rather than coniferous species (e.g., eastern red cedar (*Juniperus virginiana*)) such as often occur in planted shelterbelts. Proximity to water has also been identified as an important feature for roosting and foraging (USFWS 2022c, Henderson and Broders 2008, Carter and Feldhamer 2005, Sasse and Perkins 1996). Commuting habitat typically consists of narrow lines of trees, such as occur in shelterbelts or fencerows, narrow wooded drainages, and wooded tracts that are connected to roosting and foraging habitat (USFWS 2011).

6.1.2 Northern Long-Eared Bat Habitat Classification

Based on the literature noted above, aerial imagery, and Project vegetation data, WESTECH used the following criteria to assess the quality of NLEB habitat within the ESA, as well as the suitability based on the USFWS's 2023 guidance (USFWS 2023b).

1. A wooded area is within the Project ESA and is within NLEB distribution as defined by the USFWS's *Species Status Assessment Report for the Northern long-eared Bat (Myotis septentrionalis)* (USFWS 2022c); the entire Project ESA is within the Midwest Representation Unit of the NLEB's distribution based on this guidance. Note however, that in South Dakota most potentially suitable, or occupied, habitat occurs along primary riparian drainages and associated wooded habitat (USFWS 2023b, Figure 1; USFWS 2022c, Figure 3.3).

2. Wooded areas that met any of the following three criterion were classified as Unsuitable Habitat:
   - Individual trees that are greater than 1,000 feet from forested/wooded areas;
   - Trees found in highly developed urban areas (e.g., street trees, downtown areas); and
   - A pure stand of less than 3-inch dbh trees that are not mixed with larger trees (USFWS 2023b).

3. If wooded areas did not qualify as Unsuitable, they were then classified according to one or more of the following four descriptive habitat components:
    a. Stand Size: The wooded area is part of a stand that is at least 6 ha (14 ac) (Henderson and Broders 2008). Note that this is the smaller stand size found to support NLEB based on a study of fragmented forested and agricultural landscapes and is therefore a conservative estimate of stand size relative to NLEB use.
    b. Tree Canopy Cover: The wooded area contains a relatively closed canopy (e.g., at least 50 percent canopy closure) (Sasse and Pekins 1996). Note that this is a minimum; the average forest canopy cover in this study was 78 percent. Given that the Project occurs in a more fragmented agricultural landscape than where these surveys were conducted, and that the Project is in the Great Plains and
    Midwest where tree density is often lower, an estimated value of 50 percent canopy closure was used as a conservative indicator of closed canopy.
    c. Tree Structure: Snags and trees with exfoliating bark, deeply furrowed bark, cavities, and crevices may be present (Lacki and Schwierjohann 2001, Carter and Feldhamer 2005, Lacki et al. 2009, Park 2010). Since there are no Project data on tree size or condition, the presence of these features was classified relative to estimated woodland structure based on aerial imagery. Stands classified as Large or Moderate Tree Structure are assumed to provide these features, while stands classified as Small Tree Structure are assumed to have a low likelihood of providing these features.
    d. Proximity to Water: The wooded area is proximal to a waterbody, stream, river, pond, or reservoir (Sasse and Perkins 1996, Carter and Feldhamer 2005, Henderson and Broders 2008). One study found that during the driest months water was within 750 m (492 ft) of a roost (Carter and Feldhamer 2005). Since water may or may not be present in a drainage or pond depending on precipitation it was assumed that if a wooded area occurred within 750 m of a drainage, stream, or river, or if a pond (even dry) was visible on aerial imagery within 750 m of the wooded area, then the site was proximal to water.

These habitat components were evaluated for each wooded area to estimate habitat quality for NLEB (Table 5). Note that Table 5 describes the estimated quality of habitat that a wooded area provides for NLEB, not the likelihood of actual NLEB presence.

Table 5. Northern Long-Eared Bat Habitat Quality Description

Habitat Components	Habitat Quality	Habitat Description and Example
Wooded area > 6 ha (14 ac). > 50% tree cover Large or mixed structure trees, and Water within 750 m (492 ft).	High	Larger, wooded areas typically along streams and rivers, or larger wooded areas connected along upland draws and valleys; e.g., the Platte River riparian corridor.

Table 5. Northern Long-Eared Bat Habitat Quality Description		
Habitat Components	**Habitat Quality**	**Habitat Description and Example**
Three of the four habitat components noted above.	Moderate	Variably sized wooded areas typically with closed canopy, mixed or large tree structure, and often proximal to water; e.g., scattered woodlands in hilly pastures or cultivated areas.
Two of the four habitat components noted above.	Low	Small, wooded areas of variable canopy cover that occur as narrow stands or small pockets of trees, occasionally near water; e.g., larger shelterbelts.
Zero or one of the four habitat components noted above.	Very Low	Very small, wooded areas or small groups of individual trees not near water, e.g., narrow shelterbelts or woodlots around farmhouses in a highly fragmented, cultivated landscape.

6.1.3 Northern Long-Eared Bat Habitat Connection

Subsequent to this assessment of habitat quality, each wooded area was evaluated relative to its connection to, or isolation from, other wooded areas and the USFWS's mapped NLEB range. This assessment of habitat connection was completed according to the USFWS's guidance, and its supporting literature, for determining whether potentially suitable habitat was isolated and therefore unlikely to actually be available (i.e., suitable) for NLEB. Isolated habitat was identified according to the USFWS's guidance (USFWS 2023a) as referenced for Indiana bat and utilized for NLEB as follows:

1. "No suitable foraging or roosting habitat is in the project area or within 1,000 feet of the project area boundary.

2. Commuting habitat, if occurs in or within 1,000 feet of the project area boundary, is more than 1,000 ft, or if connected more than 2.5 miles, from suitable roosting or foraging habitat". (USFWS 2011).

Wooded areas that do not meet these criteria and are not isolated were classified as Suitable Habitat.

In a fragmented agricultural landscape such as occurs throughout most of the Project area, almost all of the suitable, and/or occupied habitat occurs within approximately 1,000 feet of wooded riparian or forested corridors and associated tributaries and woodlots (USFWS 2023b, USFWS 2022c, NDGF 2015, SDGF 2023, MDNR 2023, Kaminski et al. 2020). At a landscape scale relative to NLEB habitat, the numerous small, wooded areas around farm residences and shelterbelts on the Project in South Dakota are often not connected to more contiguous wooded areas that could provide suitable foraging or roosting habitat consistent with the two criteria noted above. Consequently, small, wooded areas that occur in monoculture agricultural landscapes are often isolated at a landscape level from suitable roosting and foraging habitat even if some wooded areas are within 1,000 feet of each other or connected by commuting habitat.

In order to evaluate these criteria in the agricultural landscape along the Project, these small, wooded areas and shelterbelts were examined according to 1) their connection with other wooded areas within 1,000 feet or the USFWS's mapped NLEB range (USFWS 2023d), and 2) if those proximal wooded areas were ultimately within 1,000 feet of suitable roosting or foraging habitat or the USFWS's mapped NLEB range (USFWS 2023d). This process was continued out to 2.5 miles from the Project footprint per the USFWS's guidance (USFWS 2023b, USFWS 2011).

Frequently, small, wooded areas and shelterbelts within the Project ESA are not connected to suitable roosting and foraging habitat because they are separated by more than 1,000 ft, or if they are connected to small, fragmented wooded areas within 1,000 ft, those proximal areas are then isolated by more than 1,000 feet to suitable habitat. On many portions of the route, particularly in South Dakota, wooded areas exist as scattered stands around farm residences that may be within 1,000 feet of another farm tree stand or shelterbelt, but that are ultimately unconnected to suitable roosting and foraging habitat within 2.5 miles. In several cases, there is no suitable roosting and foraging habitat within 2.5 miles of the Project wooded area, a result that is also confirmed by the USFWS's updated NLEB range map which shows large areas that are outside the species' range due to cultivation and a lack of trees (Figure 5). These types of wooded areas were classified as Isolated Habitat indicating that while stand size, canopy cover, tree structure, and/or proximity to water might satisfy physical habitat requirements for NLEB, these sites are too removed from suitable roosting and foraging habitat, often at a landscape level, to qualify as Suitable Habitat themselves.

6.2 Results

Overall, most wooded areas within the ESA in South Dakota occur as small, isolated shelterbelts or woodlots surrounding farm residences, there are few areas of Suitable habitat on the Project in South Dakota. Table 6 summarizes the approximate acreage of wooded areas by suitability and habitat quality within the ESA in South Dakota.

Table 6. Northern Long-Eared Bat Habitat Assessment in South Dakota Environmental Study Area

State	Habitat Quality	Habitat Type			Grand Total
		Suitable	Unsuitable	Isolated	
South Dakota	High	4.3	0.0	0.0	4.3
	Moderate	13.4	0.9	7.6	21.9
	Low	5.6	4.1	24.0	33.8
	Very Low	2.0	0.4	1.9	4.3
Grand Total		**25.2**	**5.5**	**33.6**	**64.3**

The general lack of NLEB habitat along the Project is not surprising given its location within a highly fragmented agricultural landscape. Some researchers speculate that NLEB is a recent occupant of midwestern plains states due to the relatively recent expansion of forests into areas that were formerly tallgrass prairie but that have become dominated by trees with the exclusion of fire in areas that cannot be farmed (White et al. 2017). In this type of landscape, wooded areas adjacent to cropland and pastures more closely resemble a "shredded habitat" rather than a series of isolated, blocky habitat islands as occur where extensive forests have been removed by logging (White et al. 2017). As a result, NLEB use is

primarily restricted to those wooded areas that occur as larger habitat aligned on valleys, creeks, and rivers, and proximal wooded areas (typically within 1,000 feet) that could serve as roost sites (USFWS 2023b, USWFS 2022c, White et al. 2017, Henderson and Broders 2008, Henderson et al. 2008). The Action Area depicted in the USFWS's Determination Key (USFWS 2023b), the distribution of documented acoustic calls, captures, and hibernacula (USFWS 2022c), and the USFWS's revised NLEB range map (USFWS 2023d) confirm that NLEB are rarely observed outside of contiguous wooded habitat, or wooded areas that are connected with commuting habitat within 1,000 feet of those areas. Most of this type of habitat on the Project in South Dakota occurs near the Missouri River, in small, forested areas around Huron and in small, forested areas near Watertown.

6.3 Summary

The proposed Project would traverse areas in South Dakota with various types of habitat for NLEB. This section documents the results of a desktop habitat assessment for NLEB and is intended to assess the quality and type of habitat that a wooded area within the Project ESA and footprint in South Dakota could provide for NLEB.

The Project in South Dakota occurs in a highly fragmented landscape with limited wooded areas. Most of the wooded areas that do occur within the Project ESA are comprised of small, isolated stands surrounded by large areas of cultivation; it is unlikely that these types of isolated wooded areas provide habitat for NLEB. Almost all wooded areas with Suitable Habitat for NLEB are located along creeks, rivers, wooded valleys, and associated tributaries; however, it is unknown if NLEB are actually present at these sites and the USFWS notes that based on the best available science, most Suitable Habitat is now expected to be unoccupied (USFWS 2023e).

7 Monarch and Western Regal Fritillary Habitat Assessment

Monarch was listed as a candidate under the Endangered Species Act on December 15, 2020 by the USFWS. Western regal fritillary was proposed for listing as a threatened species under the ESA on August 4, 2024 by the USFWS. The eastern regal fritillary (*Argynnis idalia idalia*) subspecies was proposed for listing as an endangered species under the Endangered Species Act on the same date; however, this subspecies occurs only in Pennsylvania. Consequently, only the western regal fritillary subspecies is considered in this report.

Data for this assessment were compiled from two primary sources: 1) habitat field data and butterfly records that were collected during surveys for Dakota skipper (*Hesperia dacotae*) in 2022, 2023, and 2024; and 2) vegetation field data collected during wetland delineations that documented the presence of milkweed (*Asclepias sp*.) or violet (*Viola sp.*); these species are important larval host or nectar plants for monarch or regal fritillary.

7.1 Methods

7.1.1 Monarch Biology and Habitat Description

Monarchs are large, conspicuous butterflies with bright orange wings and black borders and veins. The monarch life cycle differs among regions. In the eastern and western United States, monarchs complete long-distance migrations and live for an extended period of time (Herman and Tatar 2001). In other parts of the world, monarchs breed year-round. Both U.S. populations of monarch migrate to overwinter sites in the fall; the eastern population (which includes South Dakota and the surrounding the Project area)

overwinters primarily in central Mexico while the western population overwinters along the California coast and into northern Baja California (Solensky 2004).

Migration flights to overwinter habitat can last for more than two months and cover more than 1,800 miles (Urquhart and Urquhart 1978, Brower 1996); monarchs that complete this migration are in reproductive diapause and may live for up to nine months (Herman and Tatar 2001). In contrast, over-wintered monarchs break diapause, mate, and migrate to summer habitat where they feed on a diversity of flowering plants but require various species of milkweed for egg-laying and larval feeding (USFWS 2022d). These monarchs breed along the migratory path from winter to summer habitats; two to three successive generations of monarch are required to complete this journey meaning that generations reach summer habitat having never been in that location before (Flockhart et al. 2013).

Eggs are laid on milkweed, which is likely an obligate host plant and larvae emerge within two to five days (Zalucki 1982). The larval stage lasts for 9 to 18 days, while the chrysalis phase lasts for 6 to 14 days (Zalucki 1982). In total, between 17 and 37 days are required for monarchs to reach maturity; the exact timing of egg-laying and the length of time required to reach maturity is primarily based on temperature and precipitation (Flockhart et al. 2013, Flockhart et al. 2017). Since monarchs reproduce along the northern migratory journey, there is seasonal and geographic variation; monarchs reproduce sooner further south and later further north. In general, egg-laying, and larval development occur between approximately 70 and 90˚F (Zalucki 1982).

In South Dakota, and throughout the entire Project area, monarchs use a variety of habitats from native prairie to roadside ditches, and residential areas. Unlike other rare butterfly species, monarch are not solely dependent on high-quality native prairie as long as adequate nectar and larval host plants, particularly milkweed, are available. The specific optimal amount of habitat and its spatial distribution are unknown, as are optimal distances between habitat patches, optimal patch sizes and milkweed density, and characteristics of patches selected for female oviposition (USFWS 2020).

Since monarchs use a wide variety of habitats in their summer range, provided suitable nectar sources are available, specific habitat mapping is not as indicative of monarch presence as it is for other species such as Dakota skipper or regal fritillary. However, milkweed species are a key indicator of the potential for monarch presence. Milkweed presence was recorded during wetland delineations in wetland and upland plots if the plants were common; individual milkweeds may not have been recorded. Further, milkweed presence was recorded during surveys for Dakota skipper and during general biological survey where they were prevalent (such as in a road ditch).

7.1.2 Western Regal Fritillary Biology and Habitat Description

The regal fritillary is a large, colorful butterfly found in native grasslands; the western population occurs in the central and northern plains and the Midwest (including South Dakota and the entire Project area), while the eastern population occurs at a single location in Pennsylvania (USFWS 2023f). Regal fritillary lay eggs in late summer and fall, the first instar larvae overwinter in grassland vegetation, usually in shaded microsites, and emerge in the spring in search of violets, which is their only larval food (Wagner et al. 1997, Royer and Marrone 1992b). Typical adult emergence dates are late May and June (Wagner et al. 1997). The adult flight period occurs from late spring to mid-autumn depending on location and weather; male regal fritillary often die by early August while female regal fritillary become more active in late August prior to egg-laying and may survive into October (Wagner et al. 1997).

Unlike monarchs, regal fritillary are not migratory but may move substantial distances during their lifespan. Some individuals may be capable of moving more than 100 miles; however, mark-recapture studies and other evidence indicate that typical dispersal distances are more likely between 10 and 25 miles (Selby 2007, USFWS 2023f). Females are longer-lived than males and are more prone to dispersal, particularly across larger distances as male regal fritillary typically remain close to natal sites (Nagel et al. 1991, Schweitzer 1989). In addition to sex-specific behavior, nectar availability, habitat isolation, and habitat edge "permeability" likely affect dispersal. In particular, trees appear to restrict dispersal, only 8 percent of regal fritillaries were documented crossing treed areas compared to 25 percent of individuals that crossed crops, 29 percent that crossed fields, and 43 percent that crossed roads (Ries and Debinski 2001).

Unlike monarchs which are more general in their habitat needs as long as sufficient nectar sources and larval host plants are available, primarily milkweed species, the regal fritillary is considered an indicator of the health of native prairie and a specialist species (Royer and Marrone 1992b, Swengel 1996). However, unlike Dakota skipper which do not inhabit degraded prairie (USFWS 2018 and 2024a), regal fritillary may occur in old fields that have reverted to grasslands or "degraded" native prairie (Swengel 2001, Helzer 2012) provided there are adequate nectar sources. However, grasslands that are highly invaded with non-native species such as Kentucky bluegrass (*Poa pratensis*) and/or smooth brome (*Bromus inermis*) have been shown to decrease the number of butterflies, including regal fritillary, because these grasses reduce the diversity and abundance of flowering nectar sources (Kral-Obrien et al. 2019).

In eastern South Dakota, and throughout the Project area, habitat for regal fritillary is limited. Most native prairie has been converted to agriculture and most remaining pastures, including unplowed pastures, are dominated by Kentucky bluegrass and/or smooth brome. In its species assessment for regal fritillary, the USFWS determined that the Northern Glaciated Plains Analytical Unit, which contains the Project area in South Dakota, provides a medium level of habitat resiliency (i.e., ability of populations to withstand environmental change). Further north and west in North Dakota, habitat resiliency is high while further east and south in Iowa and Minnesota, habitat resiliency is low (USFWS 2023f). Resiliency is, in large part, a function of existing landscape disturbances. The USFWS has determined that the primary factors contributing to habitat decline and a lack of resiliency for regal fritillary are habitat conversion from agriculture, herbicide use, drought, and invasive grasses (USFWS 2023f).

Violets are a critical habitat component for regal fritillaries as the larvae only feed on violets until they pupate and emerge as adults. Like milkweed, violets were recorded during wetland delineations and Dakota skipper surveys. However, very few violets were observed during any survey effort. This lack of observation is likely due to a few factors: 1) violets are small plants that rarely contribute more than one percent cover on a delineation plot, consequently, violets would typically not be recorded on wetland or upland delineation plots; 2) violets often flower early in the season and would not be readily noticed during summer surveys for Dakota skipper; and 3) violets are typically not common in disturbed landscapes such as exist along the Project in South Dakota. No violets were recorded at any plot or survey site in South Dakota although a few violets were recorded at sites in North Dakota and Nebraska.

Although violets were not recorded on the Project in South Dakota, they likely exist albeit at low densities. However, the lack of obvious violets at a site does not preclude that site from supporting regal fritillary. One prairie in Illinois less than 1 square mile in size supported hundreds of adult regal fritillaries annually, but repeated searches for violets found only 3 plants (Williams 1999).

A better indicator of potential habitat for regal fritillary is likely the presence of native prairie, particularly larger and/or connected tracts of native prairie that are relatively free of non-native species. Modeled suitability habitat for regal fritillary in South Dakota shows that the highest likelihood of suitable habitat on the Project is between Watertown and Milbank, South Dakota in Lake and Grant counties (SDL-514), west of Leola, South Dakota in McPherson County (NDT-211 and NDM-106), and east of Pierre, South Dakota in Hyde and Hand counties (SDL-320) (USFWS 2023). This modeled habitat corresponds to the most suitable habitat surveyed for Dakota skipper in 2022, 2023, and 2024 with the exception of habitat on SDL-320 which is outside the range of Dakota skipper.

7.2 Results

7.2.1 Monarch

Several species of milkweed were recorded as they may all serve as larval host plants or as nectar sources. Milkweed species recorded on the Project include: showy milkweed (Asclepias speciosa), common milkweed (Asclepias syriaca), swamp milkweed (Asclepias incarnata), broadleaf milkweed (Asclepias latifolia), green milkweed (Asclepias viridiflora), and whorled milkweed (Asclepias verticillata). Common milkweed and showy milkweed were the most commonly recorded milkweed species and are frequently observed at the margins of wetlands and in road ditches. Swamp milkweed typically grows in wetlands while broadleaf milkweed, green milkweed, and whorled milkweed are more commonly observed in native prairies and drier habitats.

Table 7 summarizes the number of wetland or upland delineation plots completed in South Dakota throughout the life of the Project, as well as the number of those plots where a milkweed species was present.

Table 7: Milkweed prevalence at wetland and upland delineation plots in South Dakota Environmental Study Area

County	Total # of Plots	# of Plots with Milkweed	% of Plots with Milkweed
BEADLE	395	4	1.0%
BROWN	218	2	0.9%
CLARK	209	3	1.4%
CODINGTON	85	1	1.2%
EDMUNDS	344	4	1.2%
HAMLIN	98	5	5.1%
HAND	499	1	0.2%
HYDE	250	0	0.0%
KINGSBURY	315	1	0.3%

Table 7: Milkweed prevalence at wetland and upland delineation plots in South Dakota Environmental Study Area			
County	**Total # of Plots**	**# of Plots with Milkweed**	**% of Plots with Milkweed**
LAKE	263	3	1.1%
LINCOLN	138	3	2.2%
MCCOOK	8	0	0.0%
MCPHERSON	898	9	1.0%
MINER	162	7	4.3%
MINNEHAHA	242	10	4.1%
SPINK	685	10	1.5%
SULLY	111	1	0.9%
TURNER	40	0	0.0%
GRAND TOTAL	**4,960**	**64**	**1.3%**

In addition to these plots where milkweed was recorded, surveyors also recorded populations at 18 other locations throughout the Project area in South Dakota.

Further, milkweed species were recorded during surveys for Dakota skipper in 2022, 2023, and 2024. These surveys were focused on areas that might support native prairie based on aerial photo interpretation and pedestrian surveys. Most sites did not contain undisturbed, native prairie suitable for Dakota skipper, and no Dakota skipper have been observed on the Project to date. However, milkweeds were recorded in several of these grassland habitats, Table 8 summarizes milkweed prevalence at Dakota skipper survey sites; data are compiled from 2022, 2023, and 2024.

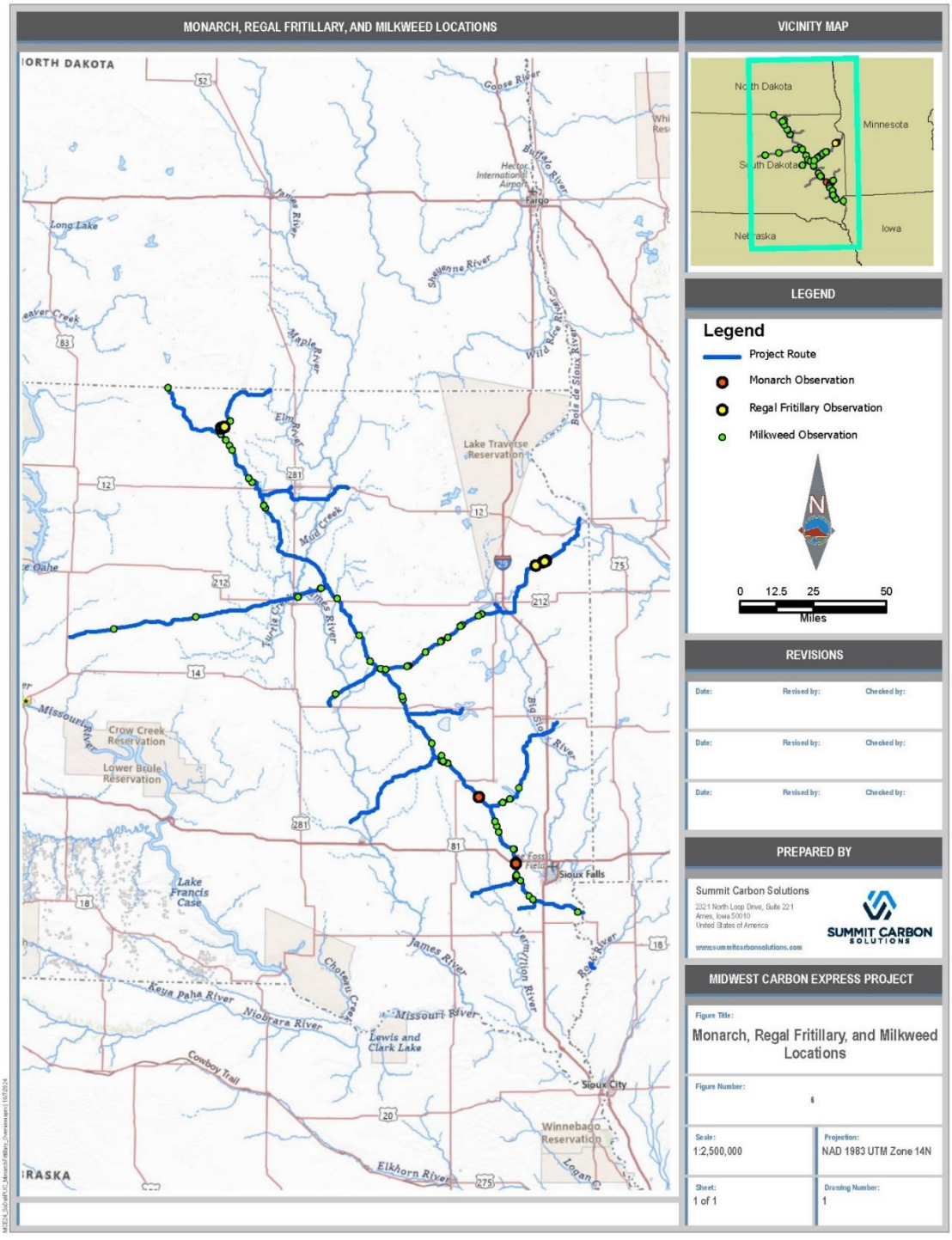
Table 8: Milkweed prevalence at Dakota skipper survey sites in South Dakota Environmental Study Area.			
County	**Total # of Survey Sites**	**# of Sites with Milkweed**	**% of Sites with Milkweed**
CODINGTON	1	0	0.0%
GRANT	3	0	0.0%

Table 8: Milkweed prevalence at Dakota skipper survey sites in South Dakota Environmental Study Area.			
County	**Total # of Survey Sites**	**# of Sites with Milkweed**	**% of Sites with Milkweed**
KINGSBURY	2	2	100.0%
LAKE	5	1	20.0%
MCPHERSON	19	4	21.1%
MINNEHAHA	2	2	100.0%
GRAND TOTAL	**31**	**9**	**29.0%**

In contrast to wetland and upland delineation plots that are distributed across the Project, often within cultivated areas, more sites that were suspected of providing habitat for Dakota skipper did contain milkweed compared to wetlands that are somewhat randomly located on the landscape. Approximately 29 percent of sites surveyed for Dakota skipper supported one or more species of milkweed, while only 1 percent of sites associated with wetlands in South Dakota supported milkweed. However, even with more prevalent milkweed, monarchs were not frequently observed during surveys for Dakota skipper, a time of year when monarchs are present and active in South Dakota. In total, only 4 monarch butterflies were observed over 3 years of survey in South Dakota. One individual was observed at a site in Lake County, 2 individuals were observed at a site in McPherson County, and 1 individual was observed at a site in Minnehaha County. Interestingly, milkweed was only recorded at the Lake County site, milkweed was not present at the sites in McPherson or Minnehaha counties where monarchs were recorded. Figure 6 shows the location of milkweeds recorded during Project surveys and the location of monarchs that were observed during Project surveys.

In summary, milkweed is widely distributed along the Project in South Dakota, although at low densities. Even in areas with potentially higher-quality butterfly habitat, milkweed is relatively uncommon. Few monarch butterflies were observed over 3 years of multiple survey days that were led by experts in butterfly identification. Consequently, it appears that there is little suitable habitat for monarch on the Project in South Dakota, although occasional individuals may occur throughout the Project.

Figure 6. Monarch and Regal Fritillary Habitat Assessment Overview



7.2.2 Western Regal Fritillary

Most of the habitat that has been surveyed in McPherson, Lake, and Grant counties has not been suitable for Dakota skipper due to the prevalence of invasive grasses, such as Kentucky bluegrass and smooth brome, the lack of little bluestem (Schizachryium scoparium) which is a common larval host plant for Dakota skipper, and the lack of enough, suitable nectar sources. However, several of these surveyed areas do have native prairie components and do support nectar sources that may be used by regal fritillary even if the sites are not "pristine". In fact, regal fritillaries were observed during survey for Dakota skipper in South Dakota at 4 sites. Table 9 summarizes regal fritillary observations in South Dakota over 3 years of survey. Figure 6 shows the location of regal fritillaries that were observed during Project surveys.

Table 9: Regal fritillary observations at survey sites in South Dakota Environmental Study Area

County	Total # of Survey Sites	# of Sites with Regal Fritillary	% of Sites with Regal Fritillary	Total # of Regal Fritillary Observed
CODINGTON	1	0	0.0%	0
GRANT	3	3	100.0%	10
KINGSBURY	2	0	0.0%	0
LAKE	5	0	0.0%	0
MCPHERSON	19	1	5.3%	1
MINNEHAHA	2	0	0.0%	0
GRAND TOTAL	**31**	**3**	**9.7%**	**11**

The Grant County sites occur in unplowed, glaciated plains that are interspersed with pothole wetlands. Although regal fritillaries were observed at the Grant County sites, only 1 site was dominated by native grasses; interestingly, native forb diversity at this site was very low. The other two sites were dominated by smooth brome and Kentucky bluegrass but still supported native forbs. The McPherson County site was likewise dominated by Kentucky bluegrass and smooth brome, but also supported several native grasses as well as numerous native forbs. Copies of field forms for these sites are included in Appendix A as part of Dakota skipper reporting. Similar habitat to these sites likely occurs on other portions of the Project in McPherson and Grant counties but could not be accessed.

7.3 Summary

Habitat for monarch is widely scattered across the Project in South Dakota based on the widely scattered milkweed observations that were recorded during wetland delineations and survey for Dakota skipper. Although milkweed occurs at several sites on the Project, only 3 monarchs have been observed in South Dakota over 3 years of survey.

Habitat for regal fritillary is more concentrated than that for monarch because regal fritillary typically rely on native prairie. The primary areas of potential habitat for regal fritillary occur between Watertown and Milbank, South Dakota in Lake and Grant counties (SDL-514), west of Leola, South Dakota in McPherson County (NDT-211 and NDM-106), and east of Pierre, South Dakota in Hyde and Hand counties (SDL-320). Ten regal fritillary were observed across 3 sites in Grant County while 1 regal fritillary was observed at a site in McPherson County. It is likely that additional suitable habitat for regal fritillary occurs along the Project in these counties but could not be accessed for survey.

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Appendix A –
2022, 2023, and 2024 Dakota Skipper Survey Forms Midwest Carbon Express Project: South Dakota

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Jim, JT, DH, DC, PC, JB Date: 7/03/2022	Site ID: No_Hab_DASK_026
Vegetation Community Type: AGRCRI/POAPRI/BROINE	Grazing: None	Tract #s: (viewed from road) SD-MP-0695.100 SD-MP-0692.100 SD-MP-0691.100 SD-MP-0690.100 SD-MP-0694.100 SD-MP-0693.100
Photo #s (Initial-#) DC 380		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA 40		GYPPAN 2		MELOFF T	
AGRCRI 30		SPHCOC 1		TRADUB T	
BROINE 25		MEDSAT 5			

Butterfly Species Observed:

None

NOTES (Mgmt, context, mapping, etc):

Observed from road. Non-native pasture.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: JB, DH, PC, DC, JR, JTR Date: 7/03/2022	Site ID: No_Hab_DASK_027
Vegetation Community Type: POAPRA/BROINE/forb	Grazing: None	Tract #s: SD-MP-211.276.100 SD-MP-211.275.190
Photo #s (Initial-#) DC 381-386		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES		PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA 60	SCHSCO T	ACHMIL 2	AMOCAN T	LACOBL T	ROSARK T
BROINE 15	PANVIR T	SOLMOL T	ECHANG T	MELOFF T	SYMOCC 2
AGRSMI 2		PSOARG 1	ANECAN T	MEDLUP T	
HORJUB T		ARTABS T	ANEMONE sp. T		
CARPRA T		AMBPSI 1	AGOSERIS sp. T		
ANDGER T		TAROFF T	GAIARI T		
STISPA T		CIRFLO T	ASTCRA T		
STIVIR 5		ARTFRI T	ANTHOW T		
CARHEL 1		RATCOL T	PSOESC T		
CARSAR T		EUPESA 15	SOLCAN T		
AGRTRA T		ONOMOL T	GUTSAR T		

Butterfly Species Observed:

Monarchs, Cabbage, Silver-bordered fritillary, Tawny-edged skipper, Melissa blue, variegated fritillary, clouded sulphur, Acmon blue, common sooty wing, wood nymph Buckeye, Aphrodite fritillary, Tharos crescent, regal fritillary, alfalfa, inornate ringlet, long dash.

NOTES (Mgmt, context, mapping, etc):

Potholes interspersed in pasture. Highly invaded by POAPRA/BROINE/EUPESU but understory of native prairie.

2-5 mph winds, 85˚, humid, 10% cloud cover.

1 STG – tipi rings (?)

Ranchers observing survey

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DC, JB Date: 7/03/2022	Site ID: No_Hab_DASK_028
Vegetation Community Type: POAPRA/AGRSMI	Grazing: Light	Tract #s: SD-MP-211.275.110 SD-MP-211.275.100 SD-MP-211.274.190
Photo #s (Initial-#) DC 387-388 to SW		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA 65		PSOARG 4	GUTSAR 1	LEPDEN 1	
AGRSMI 15		SPHCOC 1		LOTCOR 3	
BOUGRA 2		ARTLUD 2			
STIVIR 1		ACHMIL 2			
KOECRI T		CIRFLO T			
STISPA T		TAROFF T			
BROINE 1		AMBPSI 1			
BUCDAC T		ONOMOL T			
		POTPEN T			
		RATCOL T			
		ARTDRA T			

Butterfly Species Observed:

None

NOTES (Mgmt, context, mapping, etc):

Highly invaded prairie.
Not nearly as diverse as No_Hab_DASK_027.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/05/2022	Site ID: No_Hab_DASK_029
Vegetation Community Type: Improved Pasture	Grazing: Heavy	Tract #s: SD-CL-208-081.000 (not accessed) Visual survey from 435 Ave. Landowner denial.
Photo #s (Initial-#) DH 601		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		CIRUND			
POAPRA		PSOTEN			
		MEDSAT			

Butterfly Species Observed:

NONE

NOTES (Mgmt, context, mapping, etc):

Standing water visible over part of CL. Approximately MP 27-28.
No coneflower or bluestem observed from road.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/05/2022	Site ID: No_Hab_DASK_030
Vegetation Community Type: Improved Pasture	Grazing: Light	Tract #s: SD-KI-0273.110 SD-KI-0273.100 SD-KI-0273.000
Photo #s (Initial-#) DH 605		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		CIRARV			
POAPRA		PSOLAN			
		ASCSPE			

Butterfly Species Observed:

Alfalfa
Checkered white

NOTES (Mgmt, context, mapping, etc):

Access from 430th Avenue.
Brief survey due to incoming storm.
MP 120.8-121.7
No coneflower or bluestem observed.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/05/2022	Site ID: No_Hab_DASK_031
Vegetation Community Type: Improved Pasture	Grazing: Light	Tract #s: SD-KI-0271.000 SD-KI-0270.000 SD-KI-0269.000
Photo #s (Initial-#) DH 603-604		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		CIRARV		MELOFF	
POAPRA		MEDSAT			

Butterfly Species Observed:

NONE

NOTES (Mgmt, context, mapping, etc):

Access from 431st Avenue.
Brief survey due to incoming storm.
MP 119.6-120.5
No coneflower or bluestem observed.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/06/2022	Site ID: No_Hab_DASK_032
Vegetation Community Type: Improved Pasture	Grazing: None	Tract #s: SD-LA-0182.000
Photo #s (Initial-#) DH 701-703		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		ASCSPE		MELOFF	
POAPRA		ASCTUB			
		MEDSAT			

Butterfly Species Observed:

Alfalfa
Monarch

NOTES (Mgmt, context, mapping, etc):

Approximately MP 90.1-90.3
No coneflower or bluestem observed.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/06/2022	Site ID: No_Hab_DASK_033
Vegetation Community Type: Improved Pasture	Grazing: Livestock present/Unknown	Tract #s: SD-LA-206-034.200 (not accessed)
Photo #s (Initial-#) DH 701		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE					
POAPRA					
PHAARU					

Butterfly Species Observed: NONE	NOTES (Mgmt, context, mapping, etc): Not accessible due to high water to S. Viewed from 240th St.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/06/2022	Site ID: No_Hab_DASK_034
Vegetation Community Type: Introduced Perennial Grasses	Grazing: Livestock present/Unknown grazing level	Tract #s: SD-LA-206-031.200 SD-LA-206-029.110 SD-LA-206-029.000 (not accessed)
Photo #s (Initial-#) None		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE					
PHAARU					

Butterfly Species Observed:

NONE

NOTES (Mgmt, context, mapping, etc):

Not accessible. Landowner denial to S and E; flooded creek to N. Vegetation description based on nearby vegetation.

MP 5.3-6.5

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/06/2022	Site ID: No_Hab_DASK_035
Vegetation Community Type: Introduced Perennial Grasses	Grazing: Light	Tract #s: SD-MI-0098.110 SD-MI-0098.111 SD-MI-0102.102 (not accessed – viewed from road through binoculars)
Photo #s (Initial-#) DH 704		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE 60		CIRARV 4		MELOFF 1	
PHLPRA 8		CIRUND T			
POAPRA 25		ASCSPE T			
		MEDSAT T			

Butterfly Species Observed:

Clouded Sulphur - 1
Alfalfa - 2
Tawny-edged skipper - 1

NOTES (Mgmt, context, mapping, etc):

Rolling hills.
No bluestem or coneflower observed.
Would only be accessible from the south due to flooding.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH Date: 7/06/2022	Site ID: No_Hab_DASK_036
Vegetation Community Type: Fallow crop	Grazing: None	Tract #s: SD-MI-0094.200 (not accessed per landowner denial; Viewed from SD-MI-0095.000)
Photo #s (Initial-#) DH 705		
DASK Habitat Type: Unsuitable		

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
				RUMCRI	
				CHEALB	

Butterfly Species Observed:

Cabbage white
Alfalfa
Monarch

NOTES (Mgmt, context, mapping, etc):

More feral than fallow. Many annual weeds and some volunteer corn. Probably fallow more than one year.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/04/2023 Time of Day: 1300	Site ID: No_Hab_DASK_117 Tract #s: SD-MP-0732.000 SD-MP-0733.000 SD-MP-0734.000
Vegetation Community Type: Tame pasture	Grazing: **None** Light Moderate Heavy	
Photo #s (Initial-#) PC2156-2159 NESW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 70	Percent Cloud Cover: 50	Windspeed (MPH): 4-6

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 25	None	MEDSAT: 4	SOLMOL: 1	MELOFF: 1	SYMOCC: 4
AGRTRA: 3		*ARTABS: 1	SENINT: trace	GRISQU: 1	
POAPRA: 60		TAROFF: trace	ACHMIL: trace		
STIVIR: trace		ARTLUD: 7	ANECYL: trace		
AGRINT: trace		*CONARV: 3	ARTDRA: trace		
AGRSMI: 1		ASTFAL: 9	GAUCOC: 1		
HORJUB: 1		RATCOL: 2	PSOARG: 2		
		LACPUL: trace	DALPUR: trace		

Butterfly Species Observed and Number of Each:

Painted lady	1	Cabbage white	2
Common wood nymph	30+	Variegated fritillary	1
Great gray copper	30+	Long dash skipper	1

NOTES (Mgmt, context, mapping, etc):

Dominated by Kentucky bluegrass and smooth brome, better forb diversity but essentially no larval host plants.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/04/2023 Time of Day:1200	Site ID: No_Hab_DASK_118 Tract #s: SD-MP-0731.000 SD-MP-0730.000
Vegetation Community Type: Tame pasture	Grazing: **None** Light Moderate Heavy	
Photo #s (Initial-#) PC2152-2155 NESW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 70	Percent Cloud Cover: 95	Windspeed (MPH): 4-6

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 65	None	MEDSAT: 4	DALPUR: trace	MELOFF: 1	ROSARK: 4
AGRCRI: 2		ACHMIL: 1	GAUCOC: 1		SYMOCC: trace
POAPRA: 10		ASTFAL: trace	COMUMB: 1		
CARHEL: 8		LACPUL: trace	ARTDRA: trace		
		ASCSPE: trace	LIAPUN: trace		
		ERISTR: trace	SOLMOL: trace		
		*CIRARV: 1	RATCOL: trace		
		ARTFRI: 2	AMOCAN: trace		
		*CONARV: trace	LYGJUN: trace		
		ARTLUD: 3			

Butterfly Species Observed and Number of Each:

Common wood nymph 2 Delaware skipper 2

Painted crescent (F) 1

NOTES (Mgmt, context, mapping, etc):

Dominated by smooth brome and Kentucky bluegrass, better forb diversity but no larval host plants.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/02/2023 Time of Day:1515	Site ID: No_Hab_DASK_119 Tract #s: SD-MP-0711.100
Vegetation Community Type: Non-native grassland (pasture)	Grazing: **None** Light Moderate Heavy	
Photo #s (Initial-#) PC2113 W		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 89	Percent Cloud Cover: 0	Windspeed (MPH): 7+

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 60	None	MEDSAT: 15		MELOFF: 7	None
POAPRA: 20					

Butterfly Species Observed and Number of Each:
None

NOTES (Mgmt, context, mapping, etc):
Dominated by smooth brome, Kentucky bluegrass, and alfalfa.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/04/2023 Time of Day:1100	Site ID: No_Hab_DASK_120 Tract #s: SD-MP-0705.100 SD-MP-0704.100 SD-MP-0703.110 SD-MP-0703.100 SD-MP-0703.000
Vegetation Community Type: Tame pasture	Grazing: None **Light** Moderate Heavy	
Photo #s (Initial-#) PC2148-2151 NESW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 68	Percent Cloud Cover: 0	Windspeed (MPH): 6

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 75	None	MEDSAT: 2	GAIARI: trace	*ARTABS: 1	ROSARK: 1
AGRCRI: 6		PSOARG: 2	ARTFRI: 1	MELOFF: 4	
POAPRA: 18		LYGJUN: trace	SOLMOL: 2	ERYASP: trace	
CARHEL: 5		GRISQU: 1	ACHMIL: trace		
DACGLO: 3		DALPUR: trace	LACPUL: trace		
STISPA: trace		ECHANG: trace	ARTLUD: 3		

Butterfly Species Observed and Number of Each:

Red admiral	1	Painted crescent	1
Common wood nymph	5	Long dash skipper	1

NOTES (Mgmt, context, mapping, etc):
Dominated by smooth brome and Kentucky bluegrass.
* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/04/2023 Time of Day:0945	Site ID: No_Hab_DASK_121 Tract #s: SD-MP-0701.110 SD-MP-0702.100 SD-MP-0703.100
Vegetation Community Type: Mixed native/tame pasture	Grazing: None **Light** Moderate Heavy	
Photo #s (Initial-#) PC2144-2147 NESW including vernal pool		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 66	Percent Cloud Cover: 80	Windspeed (MPH): 6

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 45	None	PSOARG: 3	*CIRARV: 1	ARTABS: 1	None
AGRCRI: 5		RATCOL: 1	LIAPUN : trace	MELOFF: 5	
AGRTRA: 5		DALPUR: trace	SOLMOL: 2		
AGRSMI: 3		ARTDRA: trace	*CONARV: 1		
CARHEL: 18		CIRUND: trace	ACHMIL: trace		
BOUGRA: 30		ARTFRI: 1	OXYSER: trace		
POAPRA: 15		GRISQU: 4	ASTCRA: trace		
		ASTFAL: 1	ANECYL: trace		
		ANTMIC: trace	GAUCOC: trace		

Butterfly Species Observed and Number of Each:

Common wood nymph 1

NOTES (Mgmt, context, mapping, etc):

Dominated by smooth brome, Kentucky bluegrass, and blue grama. Better forb diversity but no larval host plants. Per Jim Reiser unsuitable for DASK.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/04/2023 Time of Day:0830	Site ID: No_Hab_DASK_122 Tract #s: SD-MP-0690.100 SD-MP-0691.100 SD-MP-0692.100 SD-MP-0693.100 SD-MP-0694.100 SD-MP-0692.110
Vegetation Community Type: Tame pasture	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) PC2136-2139 NESW, PC2140-2143 NESW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 64	Percent Cloud Cover: 100 (light rain)	Windspeed (MPH): 5-9

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 95	None	*ARTABS: 3	ARTLUD 1	MELOFF: 12	None
AGRREP: 3		*CIRARV: 4	AMBPSI: trace	TRADUB: trace	
POAPRA: 7		RATCOL: trace	GAUCOC: trace	LACSER: trace	
STICOM: 1		SOLMOL: trace	OXYLAM: trace		
		ACHMIL: trace	DALPUR: 1		
		TAROFF: trace	LIAPUN: 1		
		GLYLEP: trace	PSOARG: 2		
		MEDSAT: 2			

Butterfly Species Observed and Number of Each:
None

NOTES (Mgmt, context, mapping, etc):
Dominated by almost 100% smooth brome.
* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen Date: 7/3/2023 Time of Day: 1320	Site ID: No_Hab_DASK_123 Tract #s: SD-MP-2666 SD-MP-0683.000 SD-MP-2667 SD-MP-0682.000 SD-MP-0681.000 SD-MP-0680.000
Vegetation Community Type: Disturbed grassland	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) PC2125-2128 NESW, PC2129-2132-NESW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 80	Percent Cloud Cover: 10	Windspeed (MPH): 4

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 85	None	PSOARG: trace		TRADUB: trace	SYMOCC: 0-5
AGRCRI: 2		ACHMIL: trace		MELOFF: 2	
POAPRA: trace		SYMLAN: trace			
ALOARU: trace		CIRARV: trace			
PHAARU: trace		MEDSAT: trace			
		ERISTR: trace			
		SOLGIG: trace			

Butterfly Species Observed and Number of Each:

Common wood nymph	10+	Checkered white	5
Alfalfa	10+	Cabbage	10+

NOTES (Mgmt, context, mapping, etc):

Dominated by smooth brome, minimal nectar sources.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen, Culwell, Larsen, Reiser, Reiser Jr. Date: 07/04/2023 Time of Day: 1415	Site ID: No_Hab_DASK_124 Tract #s: SD-MP-211.275.170 SD-MP-211.275.160 SD-MP-211.275.155 SD-MP-211.275.150 SD-MP-211.275.140 SD-MP-211.275.130
Vegetation Community Type: Tame pasture	Grazing: **None** Light Moderate Heavy	
Photo #s (Initial-#) PC2160-2163 NESW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 77	Percent Cloud Cover: 75	Windspeed (MPH): 2-3

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 50	None	*ARTABS: 3		MELOFF: 3	None
POAPRA: 10		ARTLUD: 4		GRISQU: 2	
AGRINT: 10		ACHMIL: 2			
STIVIR: 5		LOTCOR: trace			
AGRCRI: 5		*EUPESU: trace			
		AMBPSI: trace			
		RATCOL: 1			

Butterfly Species Observed and Number of Each:

Common wood nymph	2	Tawny-edged skipper	1
Alfalfa	1	Long dash skipper	1

NOTES (Mgmt, context, mapping, etc):
Dominated by smooth brome and other non-native grasses. Minimal forb diversity.
* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Prah Date: 7/15/2023 Time of Day: 1130 AM	Site ID: No_Hab_DASK_125 Tract #s: SD-MP-0667.000
Vegetation Community Type: Disturbed grassland	Grazing: **None** Light Moderate Heavy	
Photo #s (Initial-#) CP11 - 44		
DASK Habitat Type: Mesic Native Prairie	Upland Native Prairie **Unsuitable**	
Temperature (F): 80	Percent Cloud Cover: 1%	Windspeed (MPH): 5 MPH

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 50	None	SOLMOL: 5		MELOFF: 30	SYMOCC: 10
ELYREP: 15		PSOARG: 3			
ANDGER: 3		RATCOL: 2			
ANDSCO: 2		ECHANG: trace			
STICOM: 2		*ARTABS: 25			
POAPRA: 15		AMBPSI: 3			
		*CIRARV: 2			

Butterfly Species Observed and Number of Each:

None

NOTES (Mgmt, context, mapping, etc):

Disturbed grassland dominated by non-native grasses, primarily smooth brome, absinth wormwood also common. Some small patches dominated by natives, primarily on ridges, but too small and not enough little bluestem or nectaring sources to support Dakota skipper.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Prah Date: 7/15/2023 Time of Day: 1430 PM	Site ID: No_Hab_DASK_126 Tract #s: SD-MP-0664.000 SD-MP-0663.000 SD-MP-0661.000
Vegetation Community Type: Native/non-native grassland	Grazing: **None** Light Moderate Heavy	
Photo #s (Initial-#) CP11 - 44		
DASK Habitat Type: Mesic Native Prairie	Upland Native Prairie **Unsuitable**	
Temperature (F): 77	Percent Cloud Cover: 1-5%	Windspeed (MPH): 5-10 MPH

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 35	None	SOLMOL: 5		MELOFF: 15	SYMOCC: 10
ELYREP: 5		PSOARG: 3			
ANDGER: 3		RATCOL: 2			
ANDSCO: 1		ECHANG: trace			
STIVIR: 20		*ARTABS: 2			
POAPRA: 10		AMBPSI: 3			
STISPA: 5		*CIRARV: 2			
		ACHMIL: 5			
		CIRUND: 2			
		SYMFAL: 3			
		ARTLUD: 5			

Butterfly Species Observed and Number of Each:

None

NOTES (Mgmt, context, mapping, etc):

Some areas that are primarily native prairie, but lacking adequate amounts of little bluestem and/or coneflower and other nectar plants. Smooth brome is common and yellow sweet clover is dense in areas. Minimal bare ground.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Lund Date: 7/13/2023 Time of Day: 1430 PM	Site ID: No_Hab_DASK_127 Tract #s: SD-MP-0658.000 SD-MP-0657.000 SD-MP-0656.000
Vegetation Community Type: Native/non-native grassland	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) NL 7088 - 7114		
DASK Habitat Type: Mesic Native Prairie	Upland Native Prairie **Unsuitable**	
Temperature (F): 77	Percent Cloud Cover: 1-5%	Windspeed (MPH): 5-10 MPH

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 30	None	ARTLUD: 8		MELOFF: 10	SYMOCC: 5
ELYREP: 5		PSOARG: 2			
ANDGER: 1		RATCOL: 1			
ANDSCO: trace		ECHANG: trace			
STIVIR: 10		*ARTABS: trace			
POAPRA: 15		AMBPSI: 3			
STISPA: 3		ACHMIL: 2			
AGRSMI: 5		CIRUND: 1			
		SYMFAL: 1			

Butterfly Species Observed and Number of Each:

None

NOTES (Mgmt, context, mapping, etc):

Minimal little bluestem. Primarily dominated by smooth brome and Kentucky bluegrass. Low forb diversity.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Christensen Date: 7/3/2023 Time of Day: 0920	Site ID: No_Hab_DASK_128 Tract #s: SD-MP-0653.100 SD-MP-0653.000 SD-MP-211-306.000 SD-MP-0652.000 SD-MP-0652.300 SD-MP-0651.000
Vegetation Community Type: Disturbed grassland	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) PC2114-2117 PC2133-2135-SE, S, SW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 75	Percent Cloud Cover: 15	Windspeed (MPH): 2

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 70		TAROFF: trace		MELOFF: 2	
AGRCRI: trace		CONARV: trace			
POAPRA: trace		ARTFRI: trace			

Butterfly Species Observed and Number of Each:

Common wood nymph 6

Alfalfa 10+

NOTES (Mgmt, context, mapping, etc):

Dominated by smooth brome; nearly zero percent forb cover

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Culwell, Larsen Date: 07/03/2023 Time of Day:1130	Site ID: No_Hab_DASK_129 Tract #s: SD-CO-208-024.000 SD-CO-208-026.000 SD-CO-208-027.300
Vegetation Community Type: Non-native grassland	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) DC103 NE, DC104 SW, DC105 SW		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 86	Percent Cloud Cover: 0	Windspeed (MPH): 5-9

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE 25	None	None		MELOFF: trace	None
STIVIR: 8				TRADUB: trace	
POAPRA 20					

Butterfly Species Observed and Number of Each:

Wood nymph 1 Alfalfa 1

NOTES (Mgmt, context, mapping, etc):

Dominated by smooth brome and Kentucky bluegrass, no perennial forbs observed.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Culwell, Larsen Date: 07/03/2023 Time of Day:1330	Site ID: No_Hab_DASK_130 Tract #s: SD-LA-0198.000 SD-LA-0200.000 SD-LA-0199.000
Vegetation Community Type: Non-native grassland pasture	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) DC92 NW, DC93 SE, DC100 E, DC101 W		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 86	Percent Cloud Cover: 5-10	Windspeed (MPH): 5-10

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE: 95	None	None		*CONARV: 10	None

Butterfly Species Observed and Number of Each:
None

NOTES (Mgmt, context, mapping, etc):
Dominated by almost 100% smooth brome.
* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: Culwell, Larsen Date: 07/03/2023 Time of Day:1100	Site ID: No_Hab_DASK_131 Tract #s: SD-LA-0198.000
Vegetation Community Type: Mixed grass	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) DC95 NW, DC96 SE		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 85	Percent Cloud Cover: 5-10	Windspeed (MPH): 5-10

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
ANDSCO: 4	None	ACHMIL: trace	LITINC: trace	MELOFF: trace	ROSARK: trace
CARFIL: 6		DALCAN: 1	ASTCRA: 1	*CARNUT: trace	
CARHEL: 4		LIAPUN: trace	VER spp.: 1		
STICOM: 15		DALPET: 2			
POAJUN: 2		OXYSER: 1			
STIVIR: 8		HELANN: 1			
BOUGRA: 18		TAROFF: 1			
CALLON: 1		ASTMIS: 4			
BOUCUR: 14		RATCOL: trace			

Butterfly Species Observed and Number of Each:

Cabbage white	2	Viceroy	3
Alfalfa	5	Melissa blue	9

NOTES (Mgmt, context, mapping, etc):

Less disturbed prairie but unlike reference sites with high forb abundance and diversity and more extensive little bluetem. Also isolated from other habitat by surrounding cropland. Per Jim Reiser unsuitable DASK habitat.

* = noxious weed

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH, MB Date: 7/2/24 Time of Day: 1130 hrs	Site ID: DASK-007 Tract #s: SD-MP-0687.500 SD-MP-068.510
Vegetation Community Type:	Grazing: None Light **Moderate** Heavy	
Photo #s (Initial-#) DH030 (N&S), DH031 (N&S), DH032 (N&S), DH033 (N&S), DH021 (N&S), DH 034 (N&S)		
DASK Habitat Type: Mesic Native Prairie **Upland Native Prairie** Unsuitable		

Temperature (F): 70F Percent Cloud Cover: 10-20 Windspeed (MPH): 10

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA		ARTABS	AMBPSI	MELOFF	SYMALB
BROINE		MEDSAT	PLALAN	GRISQU	
STICOM		ARTLUD			
SCHSCO		GEUMAC			
HORJUB		PEDARG			
STIVIR		RATCOL			
KOEMAC		Lupinus sp.			
AGRTRA		CONARV			
		ECHANG			
		ACHMIL			
		CIRUND			

Butterfly Species Observed and Number of Each: See Flowering Plant form DASK-002 Survey #1	NOTES (Mgmt, context, mapping, etc): Hilltop habitat looks marginal for DASK.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: DH, MB Date: 7/2/24 Time of Day: 1350 hrs	Site ID: DASK-008 Tract #s: SD-MP-0697.500 SD-MP-0696.500
Vegetation Community Type:	Grazing: None Light Moderate Heavy	
Photo #s (Initial-#) DH020 (N&S)		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie Unsuitable		
Temperature (F): 70F	Percent Cloud Cover: 10-20	Windspeed (MPH): 10

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		MEDSAT		TRADUB	ROSARK
AGRCRI		ARTABS			
STICOM		CONARV			
AGRINT		CIRARV			
ALOPRA		HELMAX			
		ASCSPE			

Butterfly Species Observed and Number of Each:
Melissa blue – 1
Alfalfa – 6
Cabbage white - 1

NOTES (Mgmt, context, mapping, etc): Vegetation and habitat not suitable for DASK:

- Abundant BROINE (smooth brome)
- Little bare ground
- Abundant litter
- Few to no native prairie species

Very unlikely DASK would be present.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: MB, DH, JR Date: 7/2/24 Time of Day: 1500 hrs	Site ID: DASK-009 Tract #s: SD-MP-0681.510 SD-MP-0680.510
Vegetation Community Type:	Grazing: None Light Moderate Heavy	
Photo #s (Initial-#) DH035 (N&S), DH036 (N&S)		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie Unsuitable		

Temperature (F): 70F Percent Cloud Cover: 10-20 Windspeed (MPH): 10

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		MEDSAT	HELMAX	MELOFF	
AGRCRI		CONARV	DALPUR	ERISTR	
POAPRA		ARTABS	CIRUND		
STICOM		ARTFRI			
		GEUMAC			
		PEDARG			
		ACHMIL			
		EUPESU			
		RATCOL			
		CIRARV			
		ECHANG			

Butterfly Species Observed and Number of Each:
Alfalfa - 5

NOTES (Mgmt, context, mapping, etc):
ECHANG, RATCOL, and STICOM off-ROW.
Cattle running on tract; disturbed area. Dominated by BROINE; remaining species interspersed. Not much bare ground.
Butterfly species were observed while walking vegetation transects; no official survey for DASK. No good-quality habitat adjacent to tract.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: MB, DH Date: 7/2/24 Time of Day: 1530 hrs	Site ID: DASK-010 Tract #s: SD-MP-0667.500 SD-MP-0666.500
Vegetation Community Type:	Grazing: None **Light** Moderate Heavy	
Photo #s (Initial-#) DH022 (W&E), DH037 (E&W)		
DASK Habitat Type: Mesic Native Prairie	Upland Native Prairie **Unsuitable**	

Temperature (F): 70F Percent Cloud Cover: 10-20 Windspeed (MPH): 10

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		ARTABS		MELOFF	
POAPRA		CONARV		TRADUB	
AGRCRI		PEDARG			
		MEDSAT			
		EUPESU			
		CIRARV			
		ACHMIL			
		CIRUND			

Butterfly Species Observed and Number of Each:
None seen.

NOTES (Mgmt, context, mapping, etc):
Very thick vegetation dominated by BROINE, MELOFF, and POAPRA. Also lots of ARTABS and AGRCRI. No bare ground. Cattle currently on both tracts; disturbed area. Terrible DASK habitat.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3334 Date: 7/3/24 Time of Day: 1400 hrs	Site ID: DASK-011 Tract #s: SD-GR-514-083.000 SD-GR-514-084.000
Vegetation Community Type:	Grazing: None **Light** Moderate Heavy	
Photo #s (Initial-#) PC2312 – 2315 (NESW)		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie **Unsuitable**		
Temperature (F): 76F	Percent Cloud Cover: 15	Windspeed (MPH): 5

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
PHLPRA		SOLGIG		MELALB	SYMOCC
BROINE		CIRARV		ERISTR	AMOCAN
POAPRA		ARTABS			
STIVIR		ANECAN			
STISPA		VERHAS			
ELYREP		RUMCRI			
		TRIREP			
		PEDARG			
		ACHMIL			
		LITMOL			
		VERSTR			

Butterfly Species Observed and Number of Each:
Meadow fritillary – 1
Regal fritillary – 5
Tawny-edged skipper – 4
Alfalfa – 5
Red admiral – 1
Clouded sulphur - 1

NOTES (Mgmt, context, mapping, etc):
East half of tract SD-GR-514-083.000 is cultivated field.
Heavily sodded.
Nonnative prairie.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3334 Date: 7/3/24 Time of Day: 1500 hrs	Site ID: DASK-012 Tract #s: SD-GR-514-072.000 SD-GR-514-073.000
Vegetation Community Type:	Grazing: None Light Moderate Heavy	
Photo #s (Initial-#) PC2724 – 2727 (NESW), PC2728 – 2731 (NESW)		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie Unsuitable		

Temperature (F): 75F Percent Cloud Cover: 5 Windspeed (MPH): 5

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		ACHMIL		MELOFF	SYMOCC
POAPRA		TRIPRA		MEDLUP	
ALOPRA		VERSTR			
HORJUB		PEDARG			
ELYREP		CIRVUL			
BOUGRA		AMBPSI			
		ARTLUD			
		TAROFF			
		CIRARV			
		RATCOL			
		LITMOL			

Butterfly Species Observed and Number of Each:
Regal fritillary – 3
Alfalfa - 2

NOTES (Mgmt, context, mapping, etc):
Poa and Bromus-dominated pasture.
Planted to improved pasture.
Almost no native grasses / perennial forbs.

DAKOTA SKIPPER VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3334 Date: 7/3/24 Time of Day: 1600 hrs	Site ID: DASK-013 Tract #s: SD-GR-514-075.000 SD-GR-514-076.000
Vegetation Community Type:	Grazing: None Light Moderate Heavy	
Photo #s (Initial-#) PC2732-2735		
DASK Habitat Type: Mesic Native Prairie Upland Native Prairie Unsuitable		

Temperature (F): 76F Percent Cloud Cover: 10 Windspeed (MPH): 5

CLASS/SPECIES COVER

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA		ACHMIL			
BROINE		VERSTR			
STISPA		RATCOL			
		ARTABS			

Butterfly Species Observed and Number of Each:
Alfalfa – 4
Regal fritillary – 2
Tawny-edged skipper – 3
Meadow fritillary – 1
Red admiral – 1
Coral hairstreak - 1

NOTES (Mgmt, context, mapping, etc):

Dakota Skipper Flowering Plant Line Count Data Sheet

Site name/ID DASK-002, Survey 1 Date: 7/2/24 Time of Day: 0950 hrs
County McPherson, SD Legal:¼S,T,R
Survey 1 of 3 Observer(s) MB, JTR, DH
Temp. (F): 70 Percent Cloud Cover: 10 Windspeed (mph): 10

Species	Tally: flowering stems	n	Tally: non-flowering stems	n
Purple coneflower		38		1
Milkweed (all spp.)		1		1
Vetch (all spp.)		28		19
Alfalfa*		157		1
Thistle (all spp.)		10		660
Yellow coneflower		312		84
Prairie Violet				
Goldenrod				
Wild Rose		37		38
Curlycup gumweed				
Blazing star				
Penstemon spp.		1		0
Smooth fleabane		15		0
Western wallflower				
Prairie lily				
Purple prairie clover				
Black-eyed Susan				
Scarlet globemallow				
Maximilian sunflower		0		50
Spiderwort				
Harebell				
Silverleaf scurfpea		157		883
Leadplant				
Wild bergamot				
R. Mtn. bee-plant				
Blanket flower		5		0
Dandelion				

Butterfly species Observed and Number of Each:
Alfalfa – 32
Melissa blue – 2
Mystic – 3
Clouded sulphur – 1
Wood nymph – 1
Crescent - 1

Notes: Survey tracts = SD-MP-0687.500, 0683.510. Vegetation transect along entire length of survey area.

Dakota Skipper Flowering Plant Line Count Data Sheet

Site name/ID DASK-002, Survey 2 Date: 7/3/24 Time of Day: 0918 hrs
County McPherson, SD Legal:¼S,T,R
Survey 2 of 3 Observer(s) JM, JR, MB, JTR, DH, PC
Temp. (F): 73 Percent Cloud Cover: 0-2 Windspeed (mph): 4-12; 8.5 average

Species	Tally: flowering stems	n	Tally: non-flowering stems	n
Purple coneflower		38		1
Milkweed (all spp.)		1		1
Vetch (all spp.)		28		19
Alfalfa*		157		1
Thistle (all spp.)		10		660
Yellow coneflower		312		84
Prairie Violet				
Goldenrod				
Wild Rose		37		38
Curlycup gumweed				
Blazing star				
Penstemon spp.		1		0
Smooth fleabane		15		0
Western wallflower				
Prairie lily				
Purple prairie clover				
Black-eyed Susan				
Scarlet globemallow				
Maximilian sunflower		0		50
Spiderwort				
Harebell				
Silverleaf scurfpea		157		883
Leadplant				
Wild bergamot				
R. Mtn. bee-plant				
Blanket flower		5		0
Dandelion				

Butterfly species Observed and Number of Each:
Alfalfa – 24
Cabbage white – 1
Wood nymph – 2
Tawny-edged skipper – 4
Pearl crescent – 3
Bronze copper – 1
Peck's skipper – 1
Melissa blue – 4
American painted lady – 1
Ochre ringlet - 1
Checkered white – 3
Clouded sulphur - 4
Notes:

Dakota Skipper Flowering Plant Line Count Data Sheet

Site name/ID DASK-002, Survey 3 Date: 7/5/24 Time of Day: 0945 hrs
County McPherson, SD Legal:¼S,T,R
Survey 3 of 3 Observer(s) JM, JR, MB, JTR, DH, PC
Temp. (F): 70 Percent Cloud Cover: 40 Windspeed (mph): 10

Species	Tally: flowering stems	n	Tally: non-flowering stems	n
Purple coneflower		38		1
Milkweed (all spp.)		1		1
Vetch (all spp.)		28		19
Alfalfa*		157		1
Thistle (all spp.)		10		660
Yellow coneflower		312		84
Prairie Violet				
Goldenrod				
Wild Rose		37		38
Curlycup gumweed				
Blazing star				
Penstemon spp.		1		0
Smooth fleabane		15		0
Western wallflower				
Prairie lily				
Purple prairie clover				
Black-eyed Susan				
Scarlet globemallow				
Maximilian sunflower		0		50
Spiderwort				
Harebell				
Silverleaf scurfpea		157		883
Leadplant				
Wild bergamot				
R. Mtn. bee-plant				
Blanket flower		5		0
Dandelion				

Butterfly species Observed and Number of Each:
Cabbage white – 1
Checkered white - 1
Tawny-edged skipper – 1
Melissa blue – 6
Clouded sulphur – 1
Alfalfa – 30
Pearl crescent – 3
Wood nymph – 2
Long dash skippers – 4
Peck's skipper – 2
Delaware skipper – 1
Variegated fritillary - 1

Dakota Skipper Flowering Plant Line Count Data Sheet

Site name/ID DASK-003, Survey 1 Date: 7/3/24 Time of Day: 1630 hrs
County Grant, SD Legal:¼S,T,R
Survey 1 of 3 Observer(s) JM, JR, JTR, DH, PC
Temp. (F): 76 Percent Cloud Cover: 10 Windspeed (mph): 5

Species	Tally: flowering stems	n	Tally: non-flowering stems	n
Purple coneflower		6		0
Milkweed (all spp.)				
Vetch (all spp.)				
Alfalfa*				
Thistle (all spp.)		0		4
Yellow coneflower		41		13
Prairie Violet				
Goldenrod				
Wild Rose				
Curlycup gumweed				
Blazing star				
Penstemon spp.				
Smooth fleabane				
Western wallflower				
Prairie lily				
Purple prairie clover				
Black-eyed Susan				
Scarlet globemallow				
Maximilian sunflower				
Spiderwort				
Harebell				
Silverleaf scurfpea		14		7
Leadplant		0		2
Wild bergamot				
R. Mtn. bee-plant				
Blanket flower				
Dandelion				

Butterfly species Observed and Number of Each:
Red admiral – 1
Coral hairstreak – 2
Tawny-edged skipper – 3
Regal fritillary – 2
Alfalfa – 4
Meadow fritillary - 1

Notes:

Dakota Skipper Flowering Plant Line Count Data Sheet

Site name/ID DASK-003, Survey 2 Date: 7/5/24 Time of Day: 1511 hrs
County Grant, SD Legal:¼S,T,R
Survey 2 of 3 Observer(s) JM, JR, JTR, DH, PC
Temp. (F): 77 Percent Cloud Cover: 55 Windspeed (mph): 8

Species	Tally: flowering stems	n	Tally: non-flowering stems	n
Purple coneflower		6		0
Milkweed (all spp.)				
Vetch (all spp.)				
Alfalfa*				
Thistle (all spp.)		0		4
Yellow coneflower		41		13
Prairie Violet				
Goldenrod				
Wild Rose				
Curlycup gumweed				
Blazing star				
Penstemon spp.				
Smooth fleabane				
Western wallflower				
Prairie lily				
Purple prairie clover				
Black-eyed Susan				
Scarlet globemallow				
Maximilian sunflower				
Spiderwort				
Harebell				
Silverleaf scurfpea		14		7
Leadplant		0		2
Wild bergamot				
R. Mtn. bee-plant				
Blanket flower				
Dandelion				

Butterfly species Observed and Number of Each:
Alfalfa – 6
Cabbage white – 1
Red admiral – 2
Coral hairstreak – 1
American painted lady – 1
Wood nymph - 2

Notes:

Dakota Skipper Flowering Plant Line Count Data Sheet

Site name/ID DASK-003, Survey 3 Date: 7/6/24 Time of Day: 0853 hrs
County Grant, SD Legal:¼S,T,R
Survey 3 of 3 Observer(s) JM, JR, JTR, DH, PC
Temp. (F): 80 Percent Cloud Cover: 10 Windspeed (mph): 10

Species	Tally: flowering stems	n	Tally: non-flowering stems	n
Purple coneflower		6		0
Milkweed (all spp.)				
Vetch (all spp.)				
Alfalfa*				
Thistle (all spp.)		0		4
Yellow coneflower		41		13
Prairie Violet				
Goldenrod				
Wild Rose				
Curlycup gumweed				
Blazing star				
Penstemon spp.				
Smooth fleabane				
Western wallflower				
Prairie lily				
Purple prairie clover				
Black-eyed Susan				
Scarlet globemallow				
Maximilian sunflower				
Spiderwort				
Harebell				
Silverleaf scurfpea		14		7
Leadplant		0		2
Wild bergamot				
R. Mtn. bee-plant				
Blanket flower				
Dandelion				

Butterfly species Observed and Number of Each:
Alfalfa – 10
Cabbage white – 1
Wood nymph – 2
American painted lady – 1
Meadow fritillary – 1
Red admiral - 2

Notes:

Appendix B –
2022 Topeka Shiner and Northern Redbelly Dace Survey Forms
Midwest Carbon Express Project: South Dakota

WESTECH Watercourse Survey Form

Project: Redstone Creek
Date: 6-13-2022 County: Clark
Crew: K.Johnson/L.Wetzel State: South Dakota

Site ID: Site 1
Waterbody Name: Redstone Creek
Waterbody Type: ☐ Stream ☒ Ditch ☐ Canal ☐ Swale

Photos (photographer initials-photo#)

Linear Project	Other Photos
Ahead: Photo 3	Structure: 9
Behind: Photo 5	Dugout: 10
Upstream: Photo 1, 4, 7	
Downstream: Photo 2, 6, 8	

Comments (notes on fish habitat, erosion, livestock impacts, etc.)

- No fish observed, Fish habitat low, Flows south
- water higher than normal at site observation date.
- Ditched intermittent stream
- Large wetland fringe with flat topography. Varies 6" to 12" from streamd to wetland borthdary.
- Evidence of Past Grazing.
- Dugout and Drainage structure upstream

Ordinary High Water Mark (OHWM) Criteria (check all that apply) (see definition on Page 2, Box A)

☐ Slope break ☐ Sediment/debris change ☒ Vegetation change ☐ Other (describe in comments) ☐ None (swale)

OHWM Characteristics (average within survey segment)

Width: 18 ft Depth: 1.5 ft (OHWM to channel bottom) Stream Gradient: 0.5 %

Conditions at time of survey:

☐ Dry ☐ Standing Water ☒ Flowing
☐ Other:

Substrate Composition (choose a representative location within survey segment)

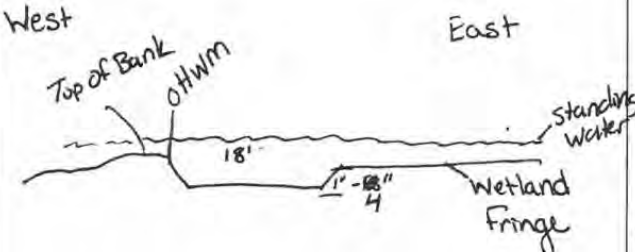
Relative to OHWM	Clay/silt	Sand	Gravel (<3" dia.)	Cobbles (3-10" dia.)	Boulders (>10" dia.)	Visible developed soil horizons?
Above	100 %	%	%	%	%	☒Yes ☐No
Below	100 %	%	%	%	%	☒Yes ☐No

Bank Characteristics (choose a representative location within survey segment)

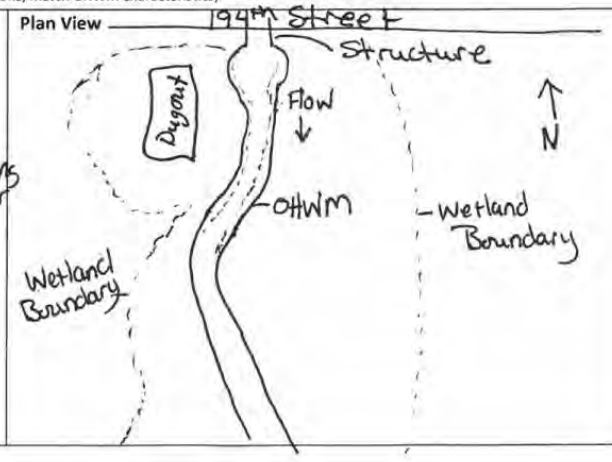
Downstream Bank	Height (OHWM to top of bank)	Slope above OHWM Break	Vegetation (use 6-letter code) Trees	Shrubs	Herbs	Noxious Weeds
Left	0.33 ft	☒Gentle (0-10%) ☐Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Phleum pratense Eleocharis acicularis Typha angustifolia	
Right	0.33 ft	☒Gentle (0-10%) ☐Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Phleum pratense Eleocharis acicularis Typha angustifolia	

Site Drawings (show dimensions; match OHWM characteristics)

Cross Section



Plan View



WESTECH Watercourse Survey Form

Flow Regime (must add to 100%)			Aquatic Habitat -N/A=			
Riffle	Run	Pool	Boulders	Logs/Debris	Undercut Banks	Structures
%	%	100 %	%	%	upstream %	%

Culvert present? ☐ Yes ☒ No If present, culvert diameter: Bridge on 194th Street

Hydrogeomorphic Classification (choose one) (see definitions on Page 2, Box B)

☒ Riverine ☐ Depressional ☐ Slope ☐ Mineral soil flats ☐ Lacustrine fringe

Cowardin Classification (see definitions, Box C)

System (select one)	Sub-system (select one)	Class (select one)	Special Modifiers (select all that apply)	Cowardin Code:
☒ Riverine	☐ Lower Perennial (R2) ☐ Upper Perennial (R3) ☒ Intermittent (R4) ☐ Ephemeral (R6) ☐ Tidal (R1) ☐ Unknown Perennial (R5)	☐ Rock bottom (RB) ☒ Unconsolidated Bottom (UB) ☐ Aquatic Bed (AB) ☐ Rocky Shore (RS) ☐ Unconsolidated Shore (US) ☐ Streambed (SB) ☐ Open water (OW)	☐ Beaver (b) ☒ Partly drained/ditched (d) ☐ Farmed (f) ☐ Diked/Impounded (h) ☐ Managed (m) ☐ Artificial substrate(r) ☐ Spoil (s) ☐ Excavated (x)	PEM1C Cowardin Code: System Letter + Subsystem # + Class Letter + Subclass # Ex: headwater perennial stream with rocky substrate = R3RB2
☐ Lacustrine	☐ Limnetic (L1) ☐ Littoral (L2)			

A. Ordinary High Water Mark (OHWM) Definition

That line on the shore established by the fluctuations of water and indicated by physical characteristics such as:

- a clear, natural line impressed on the bank;
- a slope break;
- shelving;
- a sediment/debris change;
- changes in soil character;
- a vegetation change;
- presence of litter/debris; or
- destruction of terrestrial vegetation.

OHWM is the extent of water in the majority of years, not in response to extraordinary events.

B. Hydrogeomorphic Classification

Riverine: Wetlands whose water source is overbank flow from a channel. Example: wetlands adjacent to streams and rivers.

Depressional: Wetlands whose water source is return flow from groundwater and/or surface flow into a closed basin. Example: prairie potholes.

Slope: Wetlands whose water source is return flow from groundwater. Example: spring, seep, or fen.

Mineral Soil Flats: Wetlands whose water source is precipitation. Example: saline flat.

Lacustrine fringe: Wetlands whose water source is overbank flow from a lake. Example: marsh surrounding a lake.

C. Cowardin Classification

Situated in a channel; water, when present, usually flowing.	**Riverine**
Area < 20 acres; no wave formed or bedrock shoreline feature present **AND** water < 2 m deep.	**Palustrine (Open Water)**
Area < 20 acres; with wave formed or bedrock shoreline feature present **OR** water > 2 m deep.	**Lacustrine**
Area ≥ 20 acres.	

- **Riverine**
  - **Lower Perennial**
    - Rock Bottom
    - Unconsolidated Bottom
    - Aquatic Bed
    - Rocky Shore
    - Unconsolidated Shore
    - Emergent
  - **Upper Perennial**
    - Rock Bottom
    - Unconsolidated Bottom
    - Aquatic Bed
    - Rocky Shore
    - Unconsolidated Shore
  - **Intermittent**
    - Streambed

Lower Perennial (R2): Typically has low gradients and slow water velocity, substrates consist of sand and mud, and well-developed floodplains.

Upper Perennial (R3): Typically has steep gradients and fast water velocity, substrates consist of rock, cobbles, or gravel with sand, and absent or poorly-developed floodplains.

Intermittent (R4): Surface water flowing during a portion of the year (e.g., when the groundwater table is seasonally elevated or when seasonal snowpack melts). May have isolated pools form in channel when there is no water flow.

Ephemeral (R6): Surface water flowing or pooling only in direct response to precipitation (e.g., rain or snowfall). A snowfall event is distinguished from melting snowpack that is continuous, such as for weeks or months at a time.

Common RIVERINE Subclasses (Substrate) for Cowardin Code:

R2 = **UB** – 1=Cobble-Gravel, 2=Sand, 3=Mud, 4=Organic;
AB – 1=Algal, 2=Aquatic Moss, 3=Rooted Vascular, 4=Floating Vascular;
EM – 2=Nonpersistent.

R3 = **RB** – 1=Bedrock, 2=Rubble; **UB, AB, & EM** as above.

R4 = **SB only** – 1=Bedrock, 2=Rubble, 3=Cobble-Gravel, 4=Sand, 5=Mud, 6=Organic, 7=Vegetated.

R6 = Ephemeral (no subclass).

UB: substrate is ≥ 25% mud, silt, or other fine particles.
RB: substrate is ≥ 75% stones, boulders, or bedrock
AB: vegetation growing on or below the water surface for most of the growing season.

Site 1 - Redstone Creek

Photo 1: Facing North from South Project Limit Line (Upstream)

Photo 2: Facing South from South Project Limit Line (Downstream)

Site 1 - Redstone Creek

Photo 3: Facing West from Central Project Limit (Ahead)

Photo 4: Facing North from Central Project Limit (Upstream)

Site 1 - Redstone Creek

Photo 5: Facing East from Central Project Limit (Behind)

Photo 6: Facing South from Central Project Limit (Downstream)

Site 1 - Redstone Creek

Photo 7: Facing North from North Project Limit (Upstream)

Photo 8: Facing South from North Project Limit (Downstream)

Site 1 - Redstone Creek

Photo 9: Facing North at Structure Upstream of Project Limit

Photo 10: Facing South at Dugout Upstream of Project Limit

WESTECH Watercourse Survey Form

Project: Pearl Creek (North Crossing)
Date: 6-13-2022 County: Beadle
Crew: K.Johnson/R.Wetzel State: South Dakota

Site ID: Site 2
Waterbody Name: Pearl Creek
Waterbody Type: ☒ Stream ☐ Ditch ☐ Canal ☐ Swale

Photos (photographer initials-photo#)

Linear Project	Other Photos
Ahead: Photo 5	
Behind: Photo 3	
Upstream: Photos 1, 4, 7	
Downstream: Photos 2, 6, 8	

Comments (notes on fish habitat, erosion, livestock impacts, etc.)

- No fish observed, Fish Habitat Good, Flows South.
- Normal flow of water at time of site observation.
- Meandering intermittent Stream with no alterations
- Banks define Stream with narrow adjacent wetlands
- No evidence of recent past grazing.
- No structures or alterations in proximity to site.

Ordinary High Water Mark (OHWM) Criteria (check all that apply) (see definition on Page 2, Box A)

☒ Slope break ☒ Sediment/debris change ☒ Vegetation change ☐ Other (describe in comments) ☐ None (swale)

OHWM Characteristics (average within survey segment)

Width: 8 ft Depth: 6" - 2' ft (OHWM to channel bottom) Stream Gradient: 2 %

Conditions at time of survey:

☐ Dry ☐ Standing Water ☒ Flowing
☐ Other:

Substrate Composition (choose a representative location within survey segment)

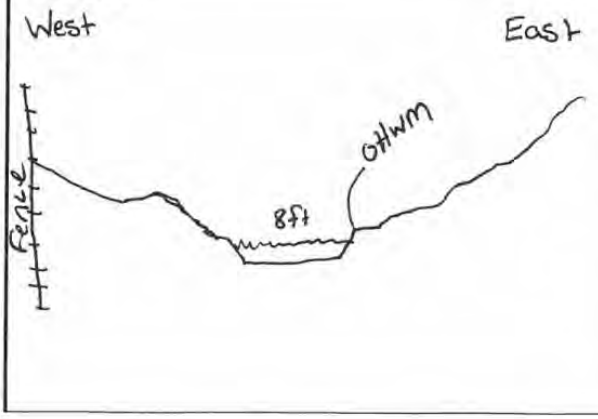
Relative to OHWM	Clay/silt	Sand	Gravel (<3" dia.)	Cobbles (3-10" dia.)	Boulders (>10" dia.)	Visible developed soil horizons?
Above	100 %	%	%	%	%	☒Yes ☐No
Below	70 %	17 %	10 %	3 %	%	☒Yes ☐No

Bank Characteristics (choose a representative location within survey segment)

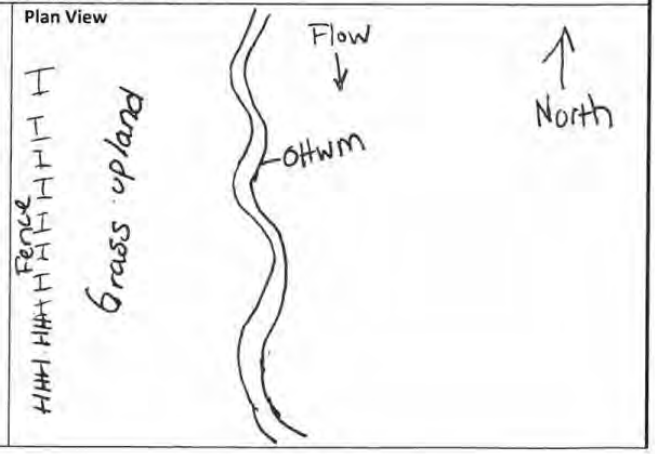
Downstream Bank	Height (OHWM to top of bank)	Slope above OHWM Break	Vegetation (use 6-letter code) Trees	Shrubs	Herbs	Noxious Weeds
Left	2 ft	☒Gentle (0-10%) ☐Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Bromus enermis, Poa pratensis, Phalaris arundinacea, Spartina pectinata, Scirpus atrovirens	
Right	2 ft	☐Gentle (0-10%) ☒Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Bromus enermis, Phalaris arundinacea, Spartina pectinata, Eleocharis acicularis, Scirpus atrovirens, Dodecatheon pulchellum, Urtica dioica	

Site Drawings (show dimensions; match OHWM characteristics)

Cross Section



Plan View



WESTECH Watercourse Survey Form

Flow Regime (must add to 100%)			Aquatic Habitat – N/A			
Riffle	Run	Pool	Boulders	Logs/Debris	Undercut Banks	Structures
%	75 %	25 %	%	%	%	%

Culvert present? ☐ Yes ☒ No If present, culvert diameter: _____

Hydrogeomorphic Classification (choose one) (see definitions on Page 2, Box B)

☒ Riverine ☐ Depressional ☐ Slope ☐ Mineral soil flats ☐ Lacustrine fringe

Cowardin Classification (see definitions, Box C)

System (select one)	Sub-system (select one)	Class (select one)	Special Modifiers (select all that apply)	Cowardin Code:
☒ Riverine	☐ Lower Perennial (R2) ☐ Upper Perennial (R3) ☒ Intermittent (R4) ☐ Ephemeral (R6) ☐ Tidal (R1) ☐ Unknown Perennial (R5)	☐ Rock bottom (RB) ☐ Unconsolidated Bottom (UB) ☐ Aquatic Bed (AB) ☐ Rocky Shore (RS) ☐ Unconsolidated Shore (US) ☒ Streambed (SB) ☐ Open water (OW)	☐ Beaver (b) ☐ Partly drained/ditched (d) ☐ Farmed (f) ☐ Diked/Impounded (h) ☐ Managed (m) ☐ Artificial substrate(r) ☐ Spoil (s) ☐ Excavated (x)	PEM1C Cowardin Code: System Letter + Subsystem # + Class Letter + Subclass # Ex: headwater perennial stream with rocky substrate = R3RB2
☐ Lacustrine	☐ Limnetic (L1) ☐ Littoral (L2)			

A. Ordinary High Water Mark (OHWM) Definition

That line on the shore established by the fluctuations of water and indicated by physical characteristics such as:

- a clear, natural line impressed on the bank;
- a slope break;
- shelving;
- a sediment/debris change;
- changes in soil character;
- a vegetation change;
- presence of litter/debris; or
- destruction of terrestrial vegetation.

OHWM is the extent of water in the majority of years, not in response to extraordinary events.

B. Hydrogeomorphic Classification

Riverine: Wetlands whose water source is overbank flow from a channel. Example: wetlands adjacent to streams and rivers.

Depressional: Wetlands whose water source is return flow from groundwater and/or surface flow into a closed basin. Example: prairie potholes.

Slope: Wetlands whose water source is return flow from groundwater. Example: spring, seep, or fen.

Mineral Soil Flats: Wetlands whose water source is precipitation. Example: saline flat.

Lacustrine fringe: Wetlands whose water source is overbank flow from a lake. Example: marsh surrounding a lake.

C. Cowardin Classification

Situated in a channel; water, when present, usually flowing.	**Riverine**
Area < 20 acres; no wave formed or bedrock shoreline feature present **AND** water < 2 m deep.	**Palustrine (Open Water)**
Area < 20 acres; with wave formed or bedrock shoreline feature present **OR** water > 2 m deep.	**Lacustrine**
Area ≥ 20 acres.	

- **Riverine**
  - **Lower Perennial**: Rock Bottom; Unconsolidated Bottom; Aquatic Bed; Rocky Shore; Unconsolidated Shore; Emergent
  - **Upper Perennial**: Rock Bottom; Unconsolidated Bottom; Aquatic Bed; Rocky Shore; Unconsolidated Shore
  - **Intermittent**: Streambed

Lower Perennial (R2): Typically has low gradients and slow water velocity, substrates consist of sand and mud, and well-developed floodplains.

Upper Perennial (R3): Typically has steep gradients and fast water velocity, substrates consist of rock, cobbles, or gravel with sand, and absent or poorly-developed floodplains.

Intermittent (R4): Surface water flowing during a portion of the year (e.g., when the groundwater table is seasonally elevated or when seasonal snowpack melts). May have isolated pools form in channel when there is no water flow.

Ephemeral (R6): Surface water flowing or pooling only in direct response to precipitation (e.g., rain or snowfall). A snowfall event is distinguished from melting snowpack that is continuous, such as for weeks or months at a time.

Common RIVERINE Subclasses (Substrate) for Cowardin Code:

R2 = **UB** – 1=Cobble-Gravel, 2=Sand, 3=Mud, 4=Organic;
AB – 1=Algal, 2=Aquatic Moss, 3=Rooted Vascular, 4=Floating Vascular;
EM – 2=Nonpersistent.

R3 = **RB** – 1=Bedrock, 2=Rubble; **UB, AB, & EM** as above.

R4 = **SB only** – 1=Bedrock, 2=Rubble, 3=Cobble-Gravel, 4=Sand, 5=Mud, 6=Organic, 7=Vegetated.

R6 = Ephemeral (no subclass).

UB: substrate is ≥ 25% mud, silt, or other fine particles.
RB: substrate is ≥ 75% stones, boulders, or bedrock
AB: vegetation growing on or below the water surface for most of the growing season.

Site 2 - Pearl Creek

Photo 1: Facing Northeast from South Project Limit (Upstream)

Photo 2: Facing Southeast from South Project Limit (Downstream)

Site 2 - Pearl Creek

Photo 3: Facing West from Central Project Limit (Behind)

Photo 4: Facing North from Central Project Limit (Upstream)

Site 2 - Pearl Creek

Photo 5: Facing East from Central Project Limit (Ahead)

Photo 6: Facing South from Central Project Limit (Downstream)

Site 2 - Pearl Creek

Photo 7: Facing North from North Project Limit (Upstream)

Photo 8: Facing South from North Project Limit (Downstream)

WESTECH Watercourse Survey Form

Project: Pearl Creek (South Crossing)
Date: 6-13-2022 County: Beadle
Crew: K. Johnson/R. Wetzel State: South Dakota

Site ID: Site 3
Waterbody Name: Pearl Creek
Waterbody Type: ☒ Stream ☐ Ditch ☐ Canal ☐ Swale

Photos (photographer initials-photo#)	
Linear Project	Other Photos
Ahead: Photo 3	Photo 9: Structure
Behind: Photo 5	Photo 10: SW
Upstream: Photo's 1, 4, 7	From Structure
Downstream: Photo's 2, 6, 8	

Comments (notes on fish habitat, erosion, livestock impacts, etc.)
- No fish observed, Fish Habitat Good, Flows East.
- Normal flow through deep water habitat that is a permanent stream.
- Left bank is near waters edge due to steep upland slope, right bank has large wetland fringe.
- Deep pools of water with meandering stream fragments
- Upstream Structure on 196th Street.

Ordinary High Water Mark (OHWM) Criteria (check all that apply) (see definition on Page 2, Box A)

☒ Slope break ☐ Sediment/debris change ☒ Vegetation change ☐ Other (describe in comments) ☐ None (swale)

OHWM Characteristics (average within survey segment)

Width: 20 ft Depth: >3 ft (OHWM to channel bottom) Stream Gradient: 0.5 %

Conditions at time of survey:

☐ Dry ☒ Standing Water ☒ Flowing
☐ Other:

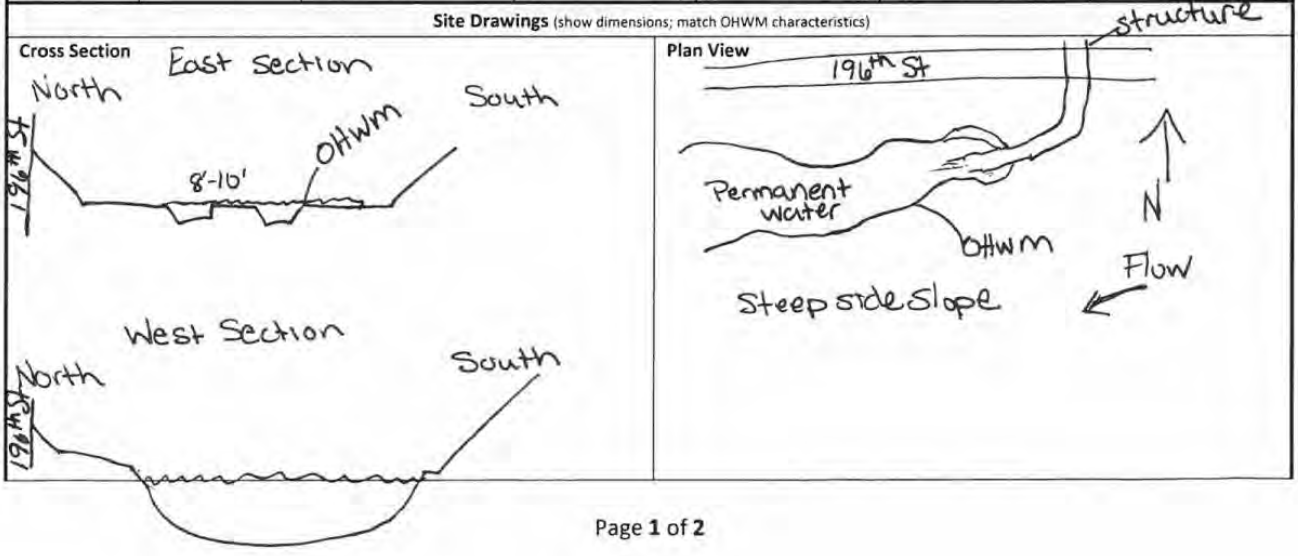
Substrate Composition (choose a representative location within survey segment)

Relative to OHWM	Clay/silt	Sand	Gravel (<3" dia.)	Cobbles (3-10" dia.)	Boulders (>10" dia.)	Visible developed soil horizons?
Above	100 %	%	%	%	%	☒Yes ☐No
Below	100 %	%	%	%	%	☒Yes ☐No

Bank Characteristics (choose a representative location within survey segment)

Downstream Bank	Height (OHWM to top of bank)	Slope above OHWM Break	Vegetation (use 6-letter code) Trees	Shrubs	Herbs	Noxious Weeds
Left	1.5 ft	☐Gentle (0-10%) ☒Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Typha angustifolia, Rumex crispus	
Right	0.5 ft	☒Gentle (0-10%) ☐Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Typha angustifolia	

Site Drawings (show dimensions; match OHWM characteristics)



WESTECH Watercourse Survey Form

Flow Regime (must add to 100%)			Aquatic Habitat			
Riffle	Run	Pool	Boulders	Logs/Debris	Undercut Banks	Structures
%	60 %	40 %	%	%	%	%

Culvert present? ☒ Yes ☐ No If present, culvert diameter: Bridge Structure upstream

Hydrogeomorphic Classification (choose one) (see definitions on Page 2, Box B)

☒ Riverine ☐ Depressional ☐ Slope ☐ Mineral soil flats ☐ Lacustrine fringe

Cowardin Classification (see definitions, Box C)

System (select one)	Sub-system (select one)	Class (select one)	Special Modifiers (select all that apply)	Cowardin Code:
☒ Riverine	☒ Lower Perennial (R2) ☐ Upper Perennial (R3) ☐ Intermittent (R4) ☐ Ephemeral (R6) ☐ Tidal (R1) ☐ Unknown Perennial (R5)	☐ Rock bottom (RB) ☒ Unconsolidated Bottom (UB) ☐ Aquatic Bed (AB) ☐ Rocky Shore (RS) ☐ Unconsolidated Shore (US) ☐ Streambed (SB) ☐ Open water (OW)	☐ Beaver (b) ☐ Partly drained/ditched (d) ☐ Farmed (f) ☐ Diked/Impounded (h) ☐ Managed (m) ☐ Artificial substrate(r) ☐ Spoil (s) ☐ Excavated (x)	PEM1F Cowardin Code: System Letter + Subsystem # + Class Letter + Subclass # Ex: headwater perennial stream with rocky substrate = R3RB2
☐ Lacustrine	☐ Limnetic (L1) ☐ Littoral (L2)			

A. Ordinary High Water Mark (OHWM) Definition

That line on the shore established by the fluctuations of water and indicated by physical characteristics such as:

- a clear, natural line impressed on the bank;
- a slope break;
- shelving;
- a sediment/debris change;
- changes in soil character;
- a vegetation change;
- presence of litter/debris; or
- destruction of terrestrial vegetation.

OHWM is the extent of water in the majority of years, not in response to extraordinary events.

B. Hydrogeomorphic Classification

Riverine: Wetlands whose water source is overbank flow from a channel. Example: wetlands adjacent to streams and rivers.

Depressional: Wetlands whose water source is return flow from groundwater and/or surface flow into a closed basin. Example: prairie potholes.

Slope: Wetlands whose water source is return flow from groundwater. Example: spring, seep, or fen.

Mineral Soil Flats: Wetlands whose water source is precipitation. Example: saline flat.

Lacustrine fringe: Wetlands whose water source is overbank flow from a lake. Example: marsh surrounding a lake.

C. Cowardin Classification

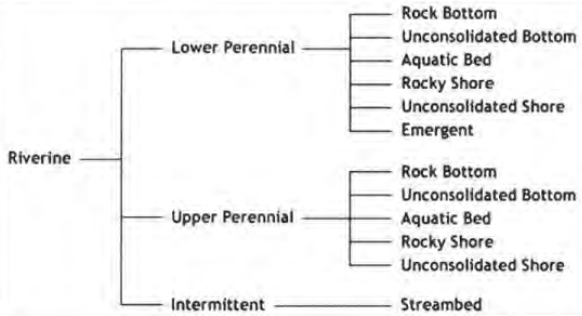
Situated in a channel; water, when present, usually flowing.	**Riverine**
Area < 20 acres; no wave formed or bedrock shoreline feature present **AND** water < 2 m deep.	**Palustrine (Open Water)**
Area < 20 acres; with wave formed or bedrock shoreline feature present **OR** water > 2 m deep.	**Lacustrine**
Area ≥ 20 acres.	

Lower Perennial (R2): Typically has low gradients and slow water velocity, substrates consist of sand and mud, and well-developed floodplains.

Upper Perennial (R3): Typically has steep gradients and fast water velocity, substrates consist of rock, cobbles, or gravel with sand, and absent or poorly-developed floodplains.

Intermittent (R4): Surface water flowing during a portion of the year (e.g., when the groundwater table is seasonally elevated or when seasonal snowpack melts). May have isolated pools form in channel when there is no water flow.

Ephemeral (R6): Surface water flowing or pooling only in direct response to precipitation (e.g., rain or snowfall). A snowfall event is distinguished from melting snowpack that is continuous, such as for weeks or months at a time.



Common RIVERINE Subclasses (Substrate) for Cowardin Code:

R2 = **UB** – 1=Cobble-Gravel, 2=Sand, 3=Mud, 4=Organic;
AB – 1=Algal, 2=Aquatic Moss, 3=Rooted Vascular, 4=Floating Vascular;
EM – 2=Nonpersistent.

R3 = **RB** – 1=Bedrock, 2=Rubble; **UB, AB, & EM** as above.

R4 = **SB only** – 1=Bedrock, 2=Rubble, 3=Cobble-Gravel, 4=Sand, 5=Mud, 6=Organic, 7=Vegetated.

R6 = Ephemeral (no subclass).

UB: substrate is ≥ 25% mud, silt, or other fine particles.
RB: substrate is ≥ 75% stones, boulders, or bedrock
AB: vegetation growing on or below the water surface for most of the growing season.

Site 3 - Pearl Creek

Photo 1: Facing East from West Project Limit (Upstream)

Photo 2: Facing West from West Project Limit (Downstream)

Site 3 - Pearl Creek

Photo 3: Facing Northwest from Central Project Limit (Ahead)

Photo 4: Facing East from Central Project Limit (Upstream)

Site 3 - Pearl Creek

Photo 5: Facing Southeast from Central Project Limit (Behind)

Photo 6: Facing West from Central Project Limit (Downstream)

Site 3 - Pearl Creek

Photo 7: Facing East from East Project Limit (Upstream)

Photo 8: Facing West from East Project Limit (Downstream)

Site 3 - Pearl Creek

Photo 9: Facing Northeast at Upstream Structure

Photo 10: Facing Southwest from Structure

WESTECH Watercourse Survey Form

Project: South Fork Pearl Creek
Date: 6-13-2022 County: Kingsbury
Crew: K. Johnson/R. Wetzel State: South Dakota

Site ID: Site 4
Waterbody Name: South Fork Pearl Creek
Waterbody Type: ☒ Stream ☐ Ditch ☐ Canal ☐ Swale

Photos (photographer initials-photo#)

Linear Project	Other Photos
Ahead: Photo 3	Photo 13: Upstream Culvert
Behind: Photo 5	Photo 14: Culverts
Upstream: Photo's 1, 4, 7, 9, 11	
Downstream: Photo's 2, 6, 8, 10, 12	

Comments (notes on fish habitat, erosion, livestock impacts, etc.)

- No fish observed, fish habitat low, Flows South.
- Standing water in stream that is completely vegetated through bottom.
- Drietsely vegetated wetland fringe to toe of sloped uplands.
- Evidence of current grazing.
- Dugout upstream and structure downstream at 199th St.

Ordinary High Water Mark (OHWM) Criteria (check all that apply) (see definition on Page 2, Box A)

☒ Slope break ☐ Sediment/debris change ☒ Vegetation change ☐ Other (describe in comments) ☐ None (swale)

OHWM Characteristics (average within survey segment)

Width: 20 ft Depth: 0.15 ft (OHWM to channel bottom) Stream Gradient: 0 %

Conditions at time of survey:

☐ Dry ☒ Standing Water ☒ Flowing
☐ Other:

Substrate Composition (choose a representative location within survey segment)

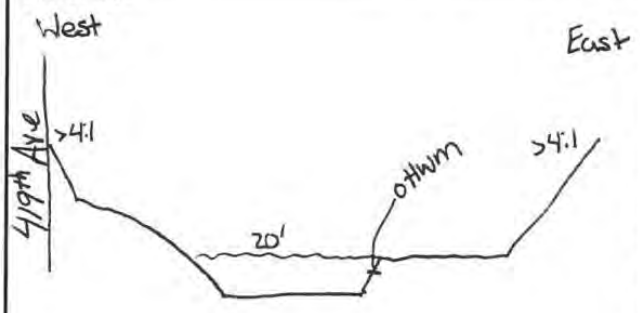
Relative to OHWM	Clay/silt	Sand	Gravel (<3" dia.)	Cobbles (3-10" dia.)	Boulders (>10" dia.)	Visible developed soil horizons?
Above	100 %	%	%	%	%	☒ Yes ☐ No
Below	100 %	%	%	%	%	☒ Yes ☐ No

Bank Characteristics (choose a representative location within survey segment)

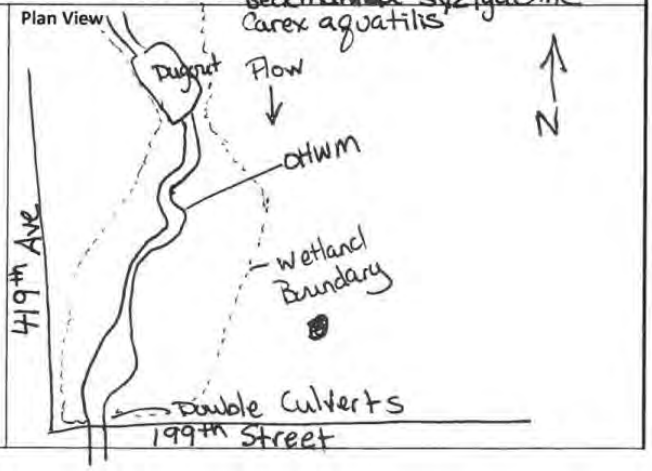
Downstream Bank	Height (OHWM to top of bank)	Slope above OHWM Break	Vegetation (use 6-letter code) Trees	Shrubs	Herbs	Noxious Weeds
Left	0.5 ft	☐ Gentle (0-10%) ☐ Moderate (10-50%) ☐ Steep (50+%) ☐ Vertical			Typha angustifolia Phalaris arundinacea Eleocharis acicularis	
Right	0.25 ft	☐ Gentle (0-10%) ☐ Moderate (10-50%) ☐ Steep (50+%) ☐ Vertical			Rumex crispus Phalaris arundinacea Eleocharis acicularis Mentha arvensis Shoenoplectus pungens Typha angustifolia Persicaria lapathifolia Beckmannia syzigachne Carex aquatilis	

Site Drawings (show dimensions; match OHWM characteristics)

Cross Section



Plan View



WESTECH Watercourse Survey Form

Flow Regime (must add to 100%)			Aquatic Habitat -None-			
Riffle	Run	Pool	Boulders	Logs/Debris	Undercut Banks	Structures
%	%	100 %	%	%	%	%

Culvert present? ☒ Yes ☐ No If present, culvert diameter: Culvert downstream

Hydrogeomorphic Classification (choose one) (see definitions on Page 2, Box B)

☒ Riverine ☐ Depressional ☐ Slope ☐ Mineral soil flats ☐ Lacustrine fringe

Cowardin Classification (see definitions, Box C)

System (select one)	Sub-system (select one)	Class (select one)	Special Modifiers (select all that apply)	Cowardin Code:
☒ Riverine	☐ Lower Perennial (R2) ☐ Upper Perennial (R3) ☒ Intermittent (R4) ☐ Ephemeral (R6) ☐ Tidal (R1) ☐ Unknown Perennial (R5)	☐ Rock bottom (RB) ☒ Unconsolidated Bottom (UB) ☐ Aquatic Bed (AB) ☐ Rocky Shore (RS) ☐ Unconsolidated Shore (US) ☐ Streambed (SB) ☐ Open water (OW)	☐ Beaver (b) ☐ Partly drained/ditched (d) ☐ Farmed (f) ☐ Diked/Impounded (h) ☐ Managed (m) ☐ Artificial substrate(r) ☐ Spoil (s) ☐ Excavated (x)	PEM1C Cowardin Code: System Letter + Subsystem # + Class Letter + Subclass # Ex: headwater perennial stream with rocky substrate = R3RB2
☐ Lacustrine	☐ Limnetic (L1) ☐ Littoral (L2)			

A. Ordinary High Water Mark (OHWM) Definition

That line on the shore established by the fluctuations of water and indicated by physical characteristics such as:

- a clear, natural line impressed on the bank;
- a slope break;
- shelving;
- a sediment/debris change;
- changes in soil character;
- a vegetation change;
- presence of litter/debris; or
- destruction of terrestrial vegetation.

OHWM is the extent of water in the majority of years, not in response to extraordinary events.

B. Hydrogeomorphic Classification

Riverine: Wetlands whose water source is overbank flow from a channel. Example: wetlands adjacent to streams and rivers.

Depressional: Wetlands whose water source is return flow from groundwater and/or surface flow into a closed basin. Example: prairie potholes.

Slope: Wetlands whose water source is return flow from groundwater. Example: spring, seep, or fen.

Mineral Soil Flats: Wetlands whose water source is precipitation. Example: saline flat.

Lacustrine fringe: Wetlands whose water source is overbank flow from a lake. Example: marsh surrounding a lake.

C. Cowardin Classification

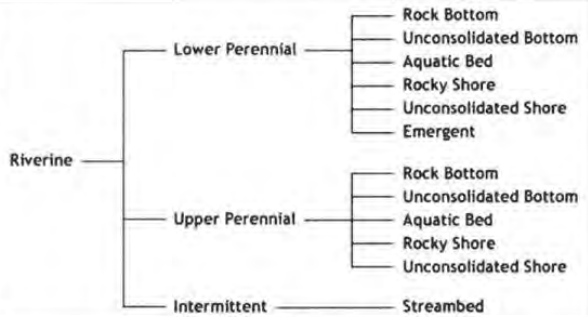
Situated in a channel; water, when present, usually flowing.	**Riverine**
Area < 20 acres; no wave formed or bedrock shoreline feature present **AND** water < 2 m deep.	**Palustrine (Open Water)**
Area < 20 acres; with wave formed or bedrock shoreline feature present **OR** water > 2 m deep.	**Lacustrine**
Area ≥ 20 acres.	

Lower Perennial (R2): Typically has low gradients and slow water velocity, substrates consist of sand and mud, and well-developed floodplains.

Upper Perennial (R3): Typically has steep gradients and fast water velocity, substrates consist of rock, cobbles, or gravel with sand, and absent or poorly-developed floodplains.

Intermittent (R4): Surface water flowing during a portion of the year (e.g., when the groundwater table is seasonally elevated or when seasonal snowpack melts). May have isolated pools form in channel when there is no water flow.

Ephemeral (R6): Surface water flowing or pooling only in direct response to precipitation (e.g., rain or snowfall). A snowfall event is distinguished from melting snowpack that is continuous, such as for weeks or months at a time.



Common RIVERINE Subclasses (Substrate) for Cowardin Code:

R2 = **UB** – 1=Cobble-Gravel, 2=Sand, 3=Mud, 4=Organic;
AB – 1=Algal, 2=Aquatic Moss, 3=Rooted Vascular, 4=Floating Vascular;
EM – 2=Nonpersistent.

R3 = **RB** – 1=Bedrock, 2=Rubble; **UB, AB, & EM** as above.

R4 = **SB only** – 1=Bedrock, 2=Rubble, 3=Cobble-Gravel, 4=Sand, 5=Mud, 6=Organic, 7=Vegetated.

R6 = Ephemeral (no subclass).

UB: substrate is ≥ 25% mud, silt, or other fine particles.
RB: substrate is ≥ 75% stones, boulders, or bedrock
AB: vegetation growing on or below the water surface for most of the growing season.

Site 4 – South Fork Pearl Creek

Photo 1: Facing Northeast from South Project Limit of South Parcel (Upstream)

Photo 2: Facing Southwest from South Project Limit of South Parcel (Downstream)

Site 4 – South Fork Pearl Creek

Photo 3: Facing Northwest from Central Project Limits of South Parcel (Ahead)

Photo 4: Facing Northeast from Central Project Limit of South Parcel (Upstream)

Site 4 – South Fork Pearl Creek

Photo 5: Facing Southeast from Central Project Limit of South Parcel (Behind)

Photo 6: Facing Southwest from Central Project Limit of South Parcel (Downstream)

Site 4 – South Fork Pearl Creek

Photo 7: Facing Northeast from North Project Limit of South Parcel (Upstream)

Photo 8: Facing Southwest from North Project Limit of South Parcel (Downstream)

Site 4 – South Fork Pearl Creek

Photo 9: Facing Northwest from South Project Limit of North Parcel (Upstream)

Photo 10: Facing Southeast from South Project Limit of North Parcel (Downstream)

Site 4 – South Fork Pearl Creek

Photo 11: Facing Northeast from North Project Limit of North Parcel (Upstream)

Photo 12: Facing Southwest from North Project Limit of North Parcel (Downstream)

Site 4 – South Fork Pearl Creek

Photo 13: Facing Northeast Upstream from Culverts on 199th Street

Photo 14: Facing Southeast Downstream towards Culverts on 199th Street

WESTECH Watercourse Survey Form

Project: West Fork Vermillion River
Date: 6-13-2022 County: Kingsbury
Crew: K. Johnson/R. Wetzel State: South Dakota

Site ID: Site 5
Waterbody Name: West Fork Vermillion River
Waterbody Type: ☐ Stream ☐ Ditch ☐ Canal ☐ Swale

Photos (photographer initials-photo#)

Linear Project	Other Photos
Ahead: Photo 3	
Behind: Photo 5	
Upstream: Photo's 1, 4, 7	
Downstream: Photo's 2, 6, 8	

Comments (notes on fish habitat, erosion, livestock impacts, etc.)

- No fish observed, Fish habitat poor, Flows South.
- standing water through bottom and wetlands,
- Vegetated through entire bottom.
- No OHWM or defined channel.
- Evidence of past grazing
- Dugout present upstream
- Along same Corridor of Texas gas pipeline

Ordinary High Water Mark (OHWM) Criteria (check all that apply) (see definition on Page 2, Box A)

☐ Slope break ☐ Sediment/debris change ☐ Vegetation change ☐ Other (describe in comments) ☒ None (swale)

OHWM Characteristics (average within survey segment)

Width: 2 ft Depth: 0.10 ft (OHWM to channel bottom) Stream Gradient: 0 %

Conditions at time of survey:

☐ Dry ☒ Standing Water ☐ Flowing
☐ Other:

Substrate Composition (choose a representative location within survey segment)

Relative to OHWM	Clay/silt	Sand	Gravel (<3" dia.)	Cobbles (3-10" dia.)	Boulders (>10" dia.)	Visible developed soil horizons?
Above	%	%	%	%	%	☐Yes ☐No
Below	%	%	%	%	%	☐Yes ☐No

No OHWM, No Defined Stream, Braided Flow

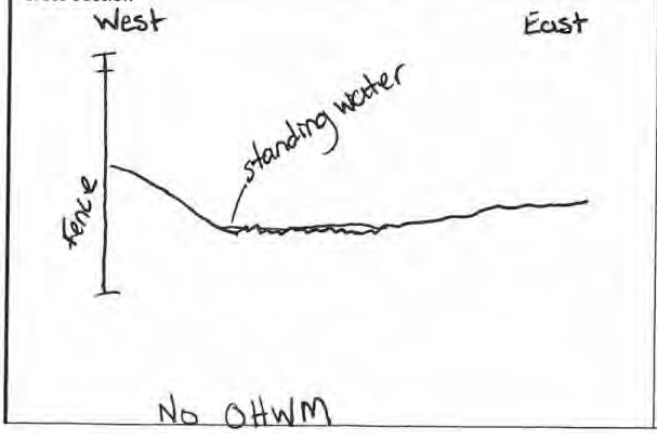
Bank Characteristics (choose a representative location within survey segment)

~~Downstream~~ Bank	Height (OHWM to top of bank)	Slope above OHWM Break	Vegetation (use 6-letter code) Trees	Shrubs	Herbs	Noxious Weeds
Left	No Bank ft	☒Gentle (0-10%) ☐Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Phalaris arundinacea	
Right	No Bank ft	☒Gentle (0-10%) ☐Moderate (10-50%) ☐Steep (50+%) ☐Vertical			Phleum pratense	

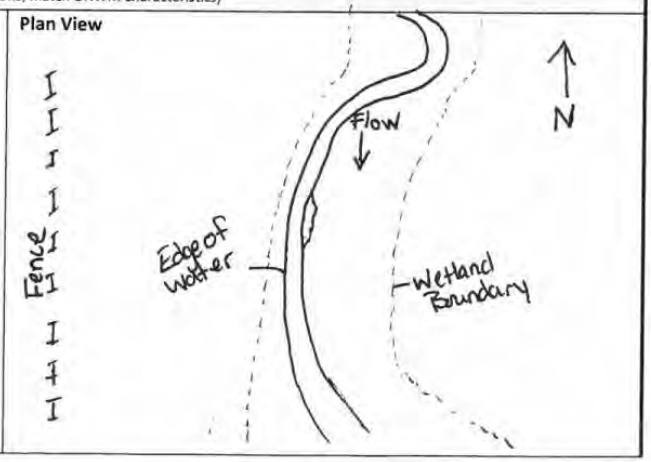
Wetland Fringe

Site Drawings (show dimensions; match OHWM characteristics)

Cross Section



Plan View



WESTECH Watercourse Survey Form

Flow Regime (must add to 100%)			Aquatic Habitat – None			
Riffle	Run	Pool	Boulders	Logs/Debris	Undercut Banks	Structures
%	100 %	%	%	%	%	%

Culvert present? ☐ Yes ☒ No If present, culvert diameter: _____

Hydrogeomorphic Classification (choose one) (see definitions on Page 2, Box B)

☐ Riverine ☐ Depressional ☒ Slope ☐ Mineral soil flats ☐ Lacustrine fringe

Cowardin Classification (see definitions, Box C)

System (select one)	Sub-system (select one)	Class (select one)	Special Modifiers (select all that apply)	Cowardin Code:
☐ Riverine	☐ Lower Perennial (R2) ☐ Upper Perennial (R3) ☐ Intermittent (R4) ☒ Ephemeral (R6) ☐ Tidal (R1) ☐ Unknown Perennial (R5)	☐ Rock bottom (RB) ☒ Unconsolidated Bottom (UB) ☐ Aquatic Bed (AB) ☐ Rocky Shore (RS) ☐ Unconsolidated Shore (US) ☐ Streambed (SB) ☐ Open water (OW)	☐ Beaver (b) ☐ Partly drained/ditched (d) ☐ Farmed (f) ☐ Diked/Impounded (h) ☐ Managed (m) ☐ Artificial substrate(r) ☐ Spoil (s) ☐ Excavated (x)	PEMIC Cowardin Code: System Letter + Subsystem # + Class Letter + Subclass # Ex: headwater perennial stream with rocky substrate = R3RB2
☐ Lacustrine	☐ Limnetic (L1) ☐ Littoral (L2)			

A. Ordinary High Water Mark (OHWM) Definition

That line on the shore established by the fluctuations of water and indicated by physical characteristics such as:

- a clear, natural line impressed on the bank;
- a slope break;
- shelving;
- a sediment/debris change;
- changes in soil character;
- a vegetation change;
- presence of litter/debris; or
- destruction of terrestrial vegetation.

OHWM is the extent of water in the majority of years, not in response to extraordinary events.

B. Hydrogeomorphic Classification

Riverine: Wetlands whose water source is overbank flow from a channel. Example: wetlands adjacent to streams and rivers.

Depressional: Wetlands whose water source is return flow from groundwater and/or surface flow into a closed basin. Example: prairie potholes.

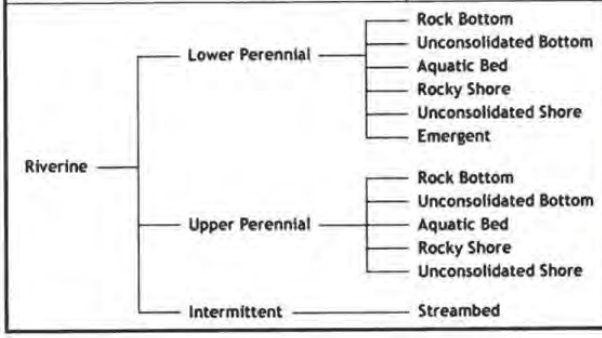
Slope: Wetlands whose water source is return flow from groundwater. Example: spring, seep, or fen.

Mineral Soil Flats: Wetlands whose water source is precipitation. Example: saline flat.

Lacustrine fringe: Wetlands whose water source is overbank flow from a lake. Example: marsh surrounding a lake.

C. Cowardin Classification

Situated in a channel; water, when present, usually flowing.	**Riverine**	**Lower Perennial (R2):** Typically has low gradients and slow water velocity, substrates consist of sand and mud, and well-developed floodplains.
Area < 20 acres; no wave formed or bedrock shoreline feature present **AND** water < 2 m deep.	**Palustrine (Open Water)**	**Upper Perennial (R3):** Typically has steep gradients and fast water velocity, substrates consist of rock, cobbles, or gravel with sand, and absent or poorly-developed floodplains.
Area < 20 acres; with wave formed or bedrock shoreline feature present **OR** water > 2 m deep.	**Lacustrine**	**Intermittent (R4):** Surface water flowing during a portion of the year (e.g., when the groundwater table is seasonally elevated or when seasonal snowpack melts). May have isolated pools form in channel when there is no water flow.
Area ≥ 20 acres.		**Ephemeral (R6):** Surface water flowing or pooling only in direct response to precipitation (e.g., rain or snowfall). A snowfall event is distinguished from melting snowpack that is continuous, such as for weeks or months at a time.



Common RIVERINE Subclasses (Substrate) for Cowardin Code:

R2 = **UB** – 1=Cobble-Gravel, 2=Sand, 3=Mud, 4=Organic;
AB – 1=Algal, 2=Aquatic Moss, 3=Rooted Vascular, 4=Floating Vascular;
EM – 2=Nonpersistent.

R3 = **RB** – 1=Bedrock, 2=Rubble; **UB, AB, & EM** as above.

R4 = **SB only** – 1=Bedrock, 2=Rubble, 3=Cobble-Gravel, 4=Sand, 5=Mud, 6=Organic, 7=Vegetated.

R6 = Ephemeral (no subclass).

UB: substrate is ≥ 25% mud, silt, or other fine particles.
RB: substrate is ≥ 75% stones, boulders, or bedrock
AB: vegetation growing on or below the water surface for most of the growing season.

Site 5 – West Fork Vermillion River

Photo 1: Facing Northeast from South Project Limit (Upstream)

Photo 2: Facing South from South Project Limit (Downstream)

Site 5 – West Fork Vermillion River

Photo 3: Facing Northwest from Central Project Limit (Ahead)

Photo 4: Facing Northeast from Central Project Limit (Upstream)

Site 5 – West Fork Vermillion River

Photo 5: Facing Southeast from Central Project Limit (Behind)

Photo 6: Facing Southwest from Central Project Limit (Downstream)

Site 5 – West Fork Vermillion River

Photo 7: Facing Northeast from North Project Limit (Upstream)

Photo 8: Facing Southwest from North Project Limit (Downstream)

Appendix C –
2022, 2023, and 2024 Western Prairie Fringed Orchid Survey Forms Midwest Carbon Express Project: South Dakota

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert (2016) Date: 7/12/2022	Site ID: No_hab_SD_WPFO_019
Grazing: ☐None ☐Light ☒ Moderate ☐Heavy		Tract #s: SD-CL-208-081.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing land		
Photo #s: JA5308-5309		State: South Dakota County: Clark
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		SOLCAN	TYPANG		
POAPRA		CIRARV			
AGRSTO		ARTABS			
SPAPEC		TEUCAN			
PHAARU		CARVUL			
ELEPAL		MENARV			
		POLAMP			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):
Mostly non-native grassland – the upland prairie has been sprayed for forbs. Area transitions into a herbaceous wetland in the middle of the tract; wetland fringe has better diversity of species, wetland center is dominated by cattails. Area has been grazed. Unsuitable for WPFO due to domination by introduced perennial grasses.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert (2016) Date: 7/12/2022	Site ID: No_hab_SD_WPFO_018
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-KI-0331.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Pastureland		
Photo #s: JA5310		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		GRISQU		CARNUT	
POAPRA		CIRARV			

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Poor, non-native grassland dominated by introduced perennial grasses. Few forbs, mostly weedy species. Dominance by smooth brome and Kentucky bluegrass make this area unsuitable habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert (2016) Date: 7/12/2022	Site ID: No_hab_SD_WPFO_2016
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-KI-0269.000 SD-KI-0270.000 SD-KI-0271.000 State: South Dakota County: Kingsbury
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known):		
Photo #s: JA5312-5315		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		VERFAS			
POAPRA		CIRARV			
SPAPEC		ANECAN			
AGRSTO					
HORJUB					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Non-native grassland, dominated by smooth brome and Kentucky bluegrass. Prairie wetland potholes present but almost no forbs. Road ditches are weedier with Canada thistle, trace amounts of ANECAN.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert Date: 7/12/2022	Site ID: No_hab_SD_WPFO_017
Grazing: ☐None ☐Light ☒ Moderate ☐Heavy		Tract #s: SD-KI-0273.100 SD-KI-0273.000
Target Species: ☐Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing land		State: South Dakota County: Kingsbury
Photo #s: JA5311		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		TYPANG		CARNUT	
POAPRA					
HORJUB					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Poor, non-native grassland dominated by smooth brome and Kentucky bluegrass. Very few forbs with the exception of musk thistle. Wetland dominated by TYPANG/HORJUB.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert (2016) Date: 7/12/2022	Site ID: No_hab_SD_WPFO_015
Grazing: ☐None ☐Light ☒ Moderate ☐Heavy		Tract #s: SD-MN-0238.180 SD-MN-0238.160 (west half only)
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing land		
Photo #s: JA5316-5317		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☐Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		GRISQU			
POAPRA					
HORJUB					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Non-native pasture/rangeland. Very few forbs. Actively grazed.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert Date: 7/12/2022	Site ID: No_hab_SD_WPFO_014

Grazing: ☐None ☒Light ☒ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Grazing land and cropland

Photo #s: JA5317 - 5326

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☒Cultivated ☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-MN-0233.120
SD-MN-0233.130
SD-MN-0238.100
SD-MN-0238.110
SD-MN-0238.120
SD-MN-0238.130
SD-MN-0238.140
SD-MN-0238.150
SD-MN-0238.160

State: South Dakota
County: Miner

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE					
POAPRA					
PHAARU					

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

Land east of tract 0238.120 is non-native grassland that is dominated by smooth brome. Reed canary grass is more common in low-lying areas. Area has been grazed. Domination by introduced perennial grasses make this area unsuitable for WPFO.

Land west of tract 0238.120 is mostly cultivated cropland that is currently planted with soybeans. Conversion of prairie to cropland and repeated disturbance make this area unsuitable habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert (2016) Date: 7/12/2022	Site ID: No_hab_SD_WPFO_013
Grazing: ☐None ☐Light ☐ Moderate ☒Heavy		Tract #s: SD-MN-0229.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing land		
Photo #s: JA5343		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Obliterated by overgrazing, vegetation was too overgrazed to identify.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: A. Admiraal, L. Gunther, C. Grummert Date: 7/12/2022 and 7/13/2022	Site ID: No_hab_SD_WPFO_012

Grazing: ☒None ☐Light ☐ Moderate ☒Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Grazing (west side)

Photo #s: LG1490-1494 (east side), AA001-002 (west side)

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-LA-0198.000 (east side)

SD-LA-0199.000 (denied)
SD-LA-0200.000 (denied)
SD-LA-0201.000 (landlocked)
SD-LA-0202.000 (denied)

SD-LA-0203.000 (west side)

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		CONARV			
POAPRA					
AGRCRI					
SPAPEC					
HORJUB					

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

East side (right photograph):

Non-native grassland with low grass and forb diversity. Some areas have severe domination by smooth brome. No grazing. Unsuitable as WPFO habitat due to dominance of smooth brome and other introduced perennial grasses. Hillsides closer to denied tracts have more native grasses and forbs present, but their upland landscape position lacks suitable hydrology to support orchids.

West side (left photograph):

Tract is dominated by introduced perennial grasses and is currently heavily grazed on lower terraces. Stream banks are mostly unvegetated because of intense grazing, and minimal native perennial vegetation was observed. Though proximity to the East Fork Vermillion River may provide favorable hydrology and the landscape position is typical, current land use has severely degraded this grassland.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: L. Gunther, A. Admiraal Date: 7/12/2022	Site ID: No_hab_SD_WPFO_011
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LA-0182.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known):		
Photo #s: LG1488-1489		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE		CIRARV			
POAPRA		MEDSAT			
		SONARV			
		SYMLAN			
		APOCAN			
		ASCSYR			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

Non-native grassland with low grass and forb diversity. Unsuitable as WPFO habitat due to dominance of smooth brome and other introduced perennial grasses.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: L. Gunther, A. Admiraal Date: 7/12/2022	Site ID: No_hab_SD_WPFO_010
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LA-0174.000 SD-LA-0173.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known):		
Photo #s: LG1486-1487		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☒Mixed Grassland ☐Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
PHAARU		CIRARV		HELANN	
BROINE					
SPAPEC					
AGRSTO					
HORJUB					

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):
Mixed grassland dominated by introduced perennial grasses (reed canary grass and smooth brome). Narrow ditch (~2-3ft wide but incised) cuts through the habitat parcel – ditch fringe has more mesic qualities and native grasses. However, overall site is not suitable WPFO habitat due to domination by introduced perennial grasses.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: L. Gunther, A. Admiraal Date: 7/12/2022	Site ID: H2019LA002_WPFO
Grazing: ☐None ☒Light ☒ Moderate ☐Heavy		Tract #s: SD-LA-0164.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing land		
Photo #s: LG1480-1485		State: South Dakota County: Lake
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☒Wet Meadow ☐Wetland ☒Mixed Grassland ☐Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☐Unsuitable ☒Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES		PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
CARVUL	BROINE	STAPAL			
ELEPAL	PHLPRA	LYOAME			
POAPRA	SCHPUN	VERHAS			
PANVIR	HORJUB				
NASVIR	AGRTRA				
KOEMAC					

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):
Dominant/common species listed for the wet meadow swale.
Marginal suitable habitat in wet meadow swale with more native species. Area is grazed and poor quality overall. Low forb abundance and diversity.
Unsuitable WPFO habitat on upper terraces to hillsides. Mixed grassland dominated by BROINE and POAPRA.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: L. Gunther, A. Admiraal Date: 7/12/2022	Site ID: No_hab_SD_WPFO_009
Grazing: ☐None ☒Light ☐ Moderate ☐Heavy		Tract #s: SD-LA-206-034.200 (near North Buffalo Creek)
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing		
Photo #s: LG1478-1479		
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE					
POAPRA					
AGRINT					
PHLPRA					
PHAARU					
JUNDUD					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Grazing land dominated by introduced grasses. Small swale is wetter with PHAARU and JUNDUD. Low forb diversity/presence. Unsuitable for WPFO due to domination by introduced perennial grasses.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: L. Gunther, A. Admiraal (2019) Date: 7/12/2022	Site ID: H2019LA001_WPFO
Grazing: ☐None ☒Light ☒ Moderate ☐Heavy		Tract #s: SD-LA-206-029.000 SD-LA-206-029.110 SD-LA-206-031.200
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Grazing land (029.110), Hayland (031.200)		
Photo #s: LG1469-1477		
Habitat Type: ☐Tallgrass Prairie ☒Mesic Meadow ☐Wet Meadow ☐Wetland ☒Mixed Grassland ☐Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☐Unsuitable ☒Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES		PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA	HORJUB	SOLCAN	CIRARV	CARNUT	
BROINE		LYCASP	PLAMAJ		
AGRSTO		SYMLAN			
CARPRA		TRIHYB			
SCHPUN		ANECAN			
POACOM		LOBSPI			
CARBRE		RUDHIR			
PASSMI		VIOPRA			
ELEPAL		GLYLEP			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):
Poor WPFO habitat. Recently hayed tract (031.200) has greater forb diversity than grazed tracts. Groundwater-fed meadows. Areas of heavy grazing noted along stream and many introduced grasses dominant. PHAARU abundant on neighboring tracts which are currently denied. Management needs include control of non-native grasses and modification of haying cycle to allow for native forb reproduction.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: L. Gunther, A. Admiraal (2019) Date: 7/12/2022	Site ID: H2019MI001_WPFO

Grazing: ☐None ☒Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)

☐ Small White Lady Slipper (SWLS)

Land Use (if known): Grazing land

Photo #s: LG1460-1468

Habitat Type: ☐Tallgrass Prairie ☒Mesic Meadow ☐Wet Meadow ☒Wetland ☐Mixed Grassland ☐Non-native Grassland ☐Cultivated ☒Other: Wet Mesic Native Prairie

Habitat Quality: ☐Unsuitable ☐Poor ☒Fair ☐Good ☐Excellent

Tract #s:

SD-MI-0138.000
SD-MI-0137.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
PHAARU	HORJUB	LYCASP			
SPAPEC		LYCAMER			
AGRSTO		ASCINC			
CAREX sp.		VERHAS			
LEEORY					
SCIATR					
ELEPAL					
BECSYZ					
PHLPRA					

WPFO or SWLS Observed:

☒ NO

☐ YES

NOTES (Mgmt, context, mapping, etc):

Only SD-MI-0138.000 provides suitable habitat. Habitat lies within low quality native prairie along West Branch Skunk Creek. Habitat reaches lower slopes which are also groundwater fed, and it extends along the creek to the east and west. A shallow water marsh dominated by SCHACU, ELEPAL, and SPAPEC borders the habitat. Management needs include control of non-native grasses and CIRARV in surrounding native prairie (dominant grasses: BROINE, NASVIR, POACOM, SCHSCO).

Fair WPFO habitat.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: D. Hagen Date: 7/6/2022	Site ID: **No_hab_SD_WPFO_007**
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-MI-0094.200 (*Denied, assessed from road*)
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Cropland		
Photo #s:		State: South Dakota
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☒Cultivated ☐Other:		County: Minnehaha
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS/TREES
ZEAMAY					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Cultivated cropland – currently planted with corn. No habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: D. Hagen Date: 7/6/2022	Site ID: **No_hab_SD_WPFO_008**
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-MI-0098.110 SD-MI-0098.111 (Pending) SD-MI-0102.101 SD-MI-0102.102
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known):		
Photo #s: DH704-705		State: South Dakota County: Minnehaha
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS/TREES
BROINE					
POAPRA					
PHLPRA					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Non-native grassland dominated by introduced perennial grasses. No habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: A. Admiraal, L. Gunther Date: 7/11/2022	Site ID: **No_hab_SD_WPFO_006**
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LI-104-209.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Hayland		
Photo #s: LG1456-1459		State: South Dakota County: Lincoln
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS/TREES
BROINE		MEDSAT			
POAPRA		ASCSYR			
PHAARU		CONARV			
		CIRARV			
		TYPANG			

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Non-native grass hayland. Swale/ditch is mostly dominated by reed canary grass. Few forbs, disturbed. No habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: A. Admiraal, L. Gunther Date: 7/11/2022	Site ID: **No_hab_SD_WPFO_005**
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LI-104-207.000 SD-LI-104-208.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Cropland		
Photo #s: N/A		State: South Dakota County: Lincoln
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☒Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS/TREES
PHAARU				GLYMAX	
BROINE					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Cultivated cropland – currently planted with soybeans. No habitat for WPFO. Swale appears to be dominated by non-native grasses such as BROINE and PHAARU.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: A. Admiraal, L. Gunther Date: 7/13/2022	Site ID: **No_hab_SD_WPFO_004**
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LI-104-198.000 SD-LI-104-202.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Cropland		
Photo #s: AA003		State: South Dakota County: Lincoln
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☒Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS/TREES
ZEAMAY					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): Cultivated cropland – currently planted with corn. No habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: A. Admiraal, C. Grummert (2019) Date: 7/13/2022	Site ID: **No_hab_SD_WPFO_003**
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LI-104-189.000 SD-LI-104-188.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☐ Small White Lady Slipper (SWLS)		
Land Use (if known): Cropland		
Photo #s: AA004, 006		State: South Dakota County: Lincoln
Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☒Mixed Grassland ☐Non-native Grassland ☒Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS/TREES
PHAARU	ZEAMAY				POPDEL
SPAPEC					FRAPEN
BROINE					GLETRI

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

West tract is cultivated corn, though small areas where soil was too wet to plant were dominated by annual grasses and smartweeds.

East tract had been cropped or disturbed in previous years. It has been recolonized by perennial grasses as well as several tree species that have reached shrub size.

Neither tract is suitable WPFO habitat because of disturbance.

No habitat for WPFO.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt and C. Grummert (2016) Date: 7/11/2022	Site ID: **No_hab_SD_WPFO_002**

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Cropland

Photo #s: JA5306-5307

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☒Cultivated ☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:
SD-LI-104-187.000
SD-LI-104-186.000
SD-LI-104-183.000
SD-LI-104-182.000
SD-LI-104-181.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

Cultivated crop field.

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C Grummert Date: 7/11/2022	Site ID: No_hab_SD_WPFO&LS_001
Grazing: ☒None ☐Light ☐ Moderate ☐Heavy		Tract #s: SD-LI-104-151.000
Target Species: ☒Western Prairie Fringed Orchid (WPFO) ☒ Lined Snake (LS)		
Land Use (if known):		
Photo #s: JA5305		
Habitat Type: ☐Tallgrass Prairie ☒Mesic Meadow ☐Wet Meadow ☒Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated ☐Other:		
Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
SPAPEC				HELGRO	SAMCAN
PHAARU					
TYPANG					
BROINE					
POAPRA					

WPFO or SWLS Observed: ☒ NO ☐ YES	NOTES (Mgmt, context, mapping, etc): WPFO habitat survey; plant species observed are listed above. Narrow incised creek bottom and banks. Dense TYPANG in outer meander areas with PHAARU and SPAPEC along banks with HELGRO and SAMCAN. Very dense and tall vegetation with few forbs. Vegetation community quickly/abruptly shifts from crop to BROINE/POAPRA to wetland. Not suitable for WPFO.

Site ID: H2024GR001_WPFO

Target Species: ☐ Small White Lady Slipper (SWLS) ☑ Western Prairie Fringed Orchid (WPFO)

Project name Midwest Carbon Express

Completed by NE NHP staff

EO ID _____ Source Feature ID _____ Reference Code _____

NEBRASKA NATURAL HERITAGE PROGRAM
ECOLOGICAL COMMUNITY SURVEY FORM

SURVEY INFORMATION

Form last rev. 5/2014

Survey date 2024 - 07 - 09 (Y/M/D) Surveyor(s), principal surveyor listed first: A. Admiraal, E. Henry

Additional survey work needed? Y N Why? If Yes: Determine based on final project route; future monitoring may be necessary due to orchid bloom cycle. If No: Not suitable habitat for orchids

IDENTIFICATION

Community name N/A - Surveying potential habitat for SWLS/WPFO

Classification problems? Y N if Y, explain _____

Photo/slide taken? Y N Where has photo/slide been deposited? WESTECH Environmental Photo Repository (e-filed). Photo #: AA812-815, AA828-829

LOCATION

Survey site: Tract: SD-GR-514-072.000 County: Grant, SD

Elevation (range if applicable): _____ m ft

T/R/S/ ¼ ¼ sec and/or directions to site Please refer to WESTECH GIS dataset for the legal description.

GPS Coordinates: Latitude: 45.094923 N Longitude: 96.754336 W Accuracy of the coordinates: ~2 m ft

GPS unit type: Internal GPS on cellular device/tablet

What coordinate system, map units, and datum are the above x/y coordinates in (select one)?

Geographic (lat/long), WGS 1984 | UTM (meters) Zone 13, NAD 1983 | UTM (meters) Zone 15, NAD 1983

Geographic (lat/long), NAD 1983 | UTM (meters) Zone 14, NAD 1983 | Other _____

Landowner: Private Landowner comments: N/A

Managed Area Name N/A

Is the observed area known to be located within some feature(s) identifiable from an aerial photo (e.g., clump of trees, hay field, lake, road, trail)? Y N If so, identify feature Please refer to WESTECH GIS dataset for parcel boundaries and landmarks.

GENERAL HABITAT DESCRIPTION

Short description of the area where the element is located (physical setting and, when known, land use and natural communities in surrounding area).

Brood areas with a mix of native and non-native plants, saturated with little standing water, surrounded by low hill of moderately grazed grassland.

SIZE OF ELEMENT OCCURRENCE

Size is a quantitative measure of the area of an occurrence. Rank: A B C D ?

Area of occupancy : 3,608 m² hectares km² ft² acres miles² Type of measurement: Precise Estimate

Observed length: 30 m km ft miles Type of measurement: Precise Estimate

Indicate whether there is confidence that the observed area represents the full extent of occupied area for the community at that location. Y N ? Y = confident full extent is known; N = confident full extent is not known; ? = uncertain

Site ID: H2024GR001_WPFO

CONDITION

Condition is an integrated measure of the quality of biotic and abiotic factors, structures and processes within the observed area, and the degree to which they affect the continued existence of the occurrence. Components of condition for communities are: 1) development/maturity, 2) ecological processes, 3) species composition and biological structure, 4) abiotic physical/chemical factors.

Rank: A B C D ?

Condition rank comments: Hydrology suitable in swales across a wide area. Mix of native and non-native species surrounded by moderate quality range. Some noxious weeds at margins and dominant non-native species. Current grazing pressure is light.

Dominant Species (in parentheses behind species include estimate of canopy coverage and **D** for dominants, **C** for common)

Tree canopy N/A

Subcanopy N/A

Tall shrub N/A

Short shrub N/A

Herbaceous SPAPEC (D), Polygonum sp. (C), ELYTRA (C), CARBRE, CARPRA (C), ELECOM (D), SYMLAN, HELPAU, STAHIS, BOLAT, VERHAS, ANECAN, POLAMP, VERFAS, LYCAME, HORJUB, ALOCAR, CARVUL

Rare species

Exotic species TRIPRA, POAPRA (D), AGRSTO (C), ALOARU, CIRARV, TRIREP, EUPESU, BROINE (C), POAPRA (D), PHLPRA (C)

Ecological processes and abiotic physical/chemical factors

Current land use Pasture

Soil type: Parent material: Calcareous till

Slope 0-2 Aspect All MOISTURE: hydric (inundated) wet-mesic (saturated) mesic (moist) dry-mesic xeric (dry)

TOPOGRAPHIC POSITION: crest upper slope mid slope lower slope bottom

LANDSCAPE CONTEXT

An integrated measure of the quality of biotic and abiotic factors, structures and processes surrounding the observed area, and the degree to which they may affect the continued existence of the community at that location. Rank: A B C D ?

Describe the landscape surrounding the habitat of the occurrence (e.g. land cover, connectivity/fragmentation, condition of habitat).

Surrounded by moderately diverse, lightly to moderately grazed grassland. Hydrologic condition seemed stable and protected by grassland. Tract is bordered by cultivated fields on the north.

Comment on evidence of disturbance (past and current) and alteration of ecological processes in the area surrounding the observation.

Leafy spurge present in several patches, sometimes directly bordering suitable habitat, and non-native grass species are dominant.

EOrank (size + condition + landscape context)(see instructions): A B C D ? Eorank date: 7/9/2024 (Y/M/D)

EOrank summary comments Good forb diversity and mix of native and introduced grasses. Hydrology is suitable.

MISCELLANEOUS

Management, research and protection needs for the element at this site (e.g. burning, control exotics, study effects of grazing, protect entire wetland): Control invasives, limit bloom-time grazing, conserve upland habitat quality. Limit pesticide use.

Miscellaneous comments: This site ID includes suitable habitat in swales in current and proposed project corridors, which we suspect ~~are hydrologically connected. The part of the swale occurring in the proposed corridor is of lower quality.~~

Site ID: H2024GR001_WPFO

Site Photograph: AA812

Site Photograph: AA813

Site ID: H2024GR001_WPFO

Site Photograph: AA814

Site Photograph: AA815

Site ID: H2024GR001_WPFO

Site Photograph: AA828

Site Photograph: AA829

Site ID: H2024GR002_WPFO

Target Species: ☐ Small White Lady Slipper (SWLS) ☑ Western Prairie Fringed Orchid (WPFO)

Project name Midwest Carbon Express

Completed by NE NHP staff

EO ID _____ Source Feature ID _____ Reference Code _____

NEBRASKA NATURAL HERITAGE PROGRAM
ECOLOGICAL COMMUNITY SURVEY FORM

SURVEY INFORMATION

Form last rev. 5/2014

Survey date 2024 - 07 - 09 (Y/M/D) Surveyor(s), principal surveyor listed first: A. Admiraal, E. Henry

Additional survey work needed? Y N Why? If Yes: Determine based on final project route; future monitoring may be necessary due to orchid bloom cycle. If No: Not suitable habitat for orchids

IDENTIFICATION

Community name N/A - Surveying potential habitat for SWLS/WPFO

Classification problems? Y N if Y, explain _____

Photo/slide taken? Y N Where has photo/slide been deposited? WESTECH Environmental Photo Repository (e-filed). Photo #: AA816-829

LOCATION

Survey site: Tract: SD-GR-514-072.000 County: Grant, SD

Elevation (range if applicable): _____ m ft

T/R/S/ ¼ ¼ sec and/or directions to site Please refer to WESTECH GIS dataset for the legal description.

GPS Coordinates: Latitude: 45.093772 N Longitude: 96.758853 W Accuracy of the coordinates: ~2 m ft

GPS unit type: Internal GPS on cellular device/tablet

What coordinate system, map units, and datum are the above x/y coordinates in (select one)?

Geographic (lat/long), WGS 1984 | UTM (meters) Zone 13, NAD 1983 | UTM (meters) Zone 15, NAD 1983

Geographic (lat/long), NAD 1983 | UTM (meters) Zone 14, NAD 1983 | Other _____

Landowner: Private Landowner comments: N/A

Managed Area Name N/A

Is the observed area known to be located within some feature(s) identifiable from an aerial photo (e.g., clump of trees, hay field, lake, road, trail)? Y N If so, identify feature Please refer to WESTECH GIS dataset for parcel boundaries and landmarks.

GENERAL HABITAT DESCRIPTION

Short description of the area where the element is located (physical setting and, when known, land use and natural communities in surrounding area).

Wet meadow and shallow stream bordered by low hills, mix of moderately grazed grassland and patches of bare ground with emerging weeds. North of railroad and wooded fenceline. This habitat enters and exits the corridor and proposed corridor in several locations on the southwest corner of this tract.

SIZE OF ELEMENT OCCURRENCE

Size is a quantitative measure of the area of an occurrence. Rank: A B C D ?

Area of occupancy : _____ m^2 hectares km^2 ft^2 acres $miles^2$ Type of measurement: Precise Estimate

Observed length: 614 m km ft miles Type of measurement: Precise Estimate

Indicate whether there is confidence that the observed area represents the full extent of occupied area for the community at that location. Y N ? Y = confident full extent is known; N = confident full extent is not known; ? = uncertain

Site ID: H2024GR002_WPFO

CONDITION

Condition is an integrated measure of the quality of biotic and abiotic factors, structures and processes within the observed area, and the degree to which they affect the continued existence of the occurrence. Components of condition for communities are: 1) development/maturity, 2) ecological processes, 3) species composition and biological structure, 4) abiotic physical/chemical factors.

Rank: A **B** C D ?
Condition rank comments: Suitable hydrology in broad swale. Native species are dominant, though fewer forbs are abundant.

Dominant Species (in parentheses behind species include estimate of canopy coverage and **D** for dominants, **C** for common)

Tree canopy N/A

Subcanopy N/A

Tall shrub N/A

Short shrub N/A

Herbaceous CALSTR (C), MENARV, PHAARU (C), VERFAS, Carex sp., Viola sp., CARPRA (D), CARGRA, CARVUL (C), ELEPAL (D), SPAPEC (D), CARBIC, ELYTRA (C), SCIATR, HORJUB, SYMLAN, LYCAME, BIDVUL, STAHIS, VERHAS, SOLCAN (C), GLYLEP (C)

Rare species Spiraea alba (BONAP's North American Plant Atlas - reference)

Exotic species POAPRA (D), BROINE (C), PHLPRA (C), AGRSTO (C)

Ecological processes and abiotic physical/chemical factors

Consistent groundwater flow maintains this wet/sedge meadow plant community and prevents some noxious weeds from becoming established.

Current land use Pasture

Soil type: _____ Parent material: Calcareous till

Slope 0-2 Aspect All MOISTURE: **hydric (inundated)** **wet-mesic (saturated)** mesic (moist) dry-mesic xeric (dry)

TOPOGRAPHIC POSITION: crest upper slope mid slope lower slope **bottom**

LANDSCAPE CONTEXT

An integrated measure of the quality of biotic and abiotic factors, structures and processes surrounding the observed area, and the degree to which they may affect the continued existence of the community at that location. Rank: A **B** C D ?

Describe the landscape surrounding the habitat of the occurrence (e.g. land cover, connectivity/fragmentation, condition of habitat).

Surrounding hills are a mix of very weedy (pigweed, purslane, crabgrass) and high quality native grassland (ECHANG, ACHMIL), grazing pressure variable, patchy. Cultivated fields lie to the north of the tract.

Comment on evidence of disturbance (past and current) and alteration of ecological processes in the area surrounding the observation.

Bare ground with emerging weeds in southwest area, moderate grazing on other hillslopes.

EOrank (size + condition + landscape context)(see instructions): A **B** C D ? Eorank date: 7/9/2024 (Y/M/D)

EOrank summary comments Native grasses and sedges dominant but fewer forbs. Hydrology appears stable and current grazing pressure is light.

MISCELLANEOUS

Management, research and protection needs for the element at this site (e.g. burning, control exotics, study effects of grazing, protect entire wetland): Prevent spread of weeds, avoid grazing during WPFO blooming period, conserve upland habitat quality. Limit pesticide use.

Miscellaneous comments: This site ID includes suitable habitat in swales, in current and proposed project corridors, which we believe are hydrologically connected.

Site ID: H2024GR002_WPFO

Site Photograph: AA816

Site Photograph: AA817

Site ID: H2024GR002_WPFO

Site Photograph: AA818

Site Photograph: AA819

Site ID: H2024GR002_WPFO

Site Photograph: AA820

Site Photograph: AA821

Site ID: H2024GR002_WPFO

Site Photograph: AA822

Site Photograph: AA823

Site ID: H2024GR002_WPFO

Site Photograph: AA824

Site Photograph: AA825

Site ID: H2024GR002_WPFO

Site Photograph: AA826

Site Photograph: AA827

Site ID: H2024GR002_WPFO

Site Photograph: AA828

Site Photograph: AA829

Site ID: H2024GR003_WPFO

Target Species: ☐ Small White Lady Slipper (SWLS) ☑ Western Prairie Fringed Orchid (WPFO)

Project name Midwest Carbon Express

Completed by NE NHP staff

EO ID _____ Source Feature ID _____ Reference Code _____

NEBRASKA NATURAL HERITAGE PROGRAM
ECOLOGICAL COMMUNITY SURVEY FORM

SURVEY INFORMATION

Form last rev. 5/2014

Survey date 2024 - 07 - 09 (Y/M/D) Surveyor(s), principal surveyor listed first: A. Admiraal, E. Henry

Additional survey work needed? Y N Why? If Yes: Determine based on final project route; future monitoring may be necessary due to orchid bloom cycle. If No: Not suitable habitat for orchids

IDENTIFICATION

Community name N/A - Surveying potential habitat for SWLS/WPFO

Classification problems? Y N if Y, explain _____

Photo/slide taken? Y N Where has photo/slide been deposited? WESTECH Environmental Photo Repository (e-filed). Photo #: AA832-835

LOCATION

Survey site: Tract: SD-GR-514-072.000 County: Grant, SD

Elevation (range if applicable): _____ m ft

T/R/S/ ¼ ¼ sec and/or directions to site Please refer to WESTECH GIS dataset for the legal description.

GPS Coordinates: Latitude: 45.098812 N Longitude: 96.752446 W Accuracy of the coordinates: ~2 m ft

GPS unit type: Internal GPS on cellular device/tablet

What coordinate system, map units, and datum are the above x/y coordinates in (select one)?

Geographic (lat/long), WGS 1984 | UTM (meters) Zone 13, NAD 1983 | UTM (meters) Zone 15, NAD 1983

Geographic (lat/long), NAD 1983 | UTM (meters) Zone 14, NAD 1983 | Other _____

Landowner: Private Landowner comments: N/A

Managed Area Name N/A

Is the observed area known to be located within some feature(s) identifiable from an aerial photo (e.g., clump of trees, hay field, lake, road, trail)? Y N If so, identify feature Please refer to WESTECH GIS dataset for parcel boundaries and landmarks.

GENERAL HABITAT DESCRIPTION

Short description of the area where the element is located (physical setting and, when known, land use and natural communities in surrounding area).

Cordgrass meadow along small stream, adjacent to lightly grazed pasture, south of cultivated field.

SIZE OF ELEMENT OCCURRENCE

Size is a quantitative measure of the area of an occurrence. Rank: A B C D ?

Area of occupancy : 1120 m² hectares km² ft² acres miles² Type of measurement: Precise Estimate

Observed length: 50 m km ft miles Type of measurement: Precise Estimate

Indicate whether there is confidence that the observed area represents the full extent of occupied area for the community at that location. Y N ? Y = confident full extent is known; N = confident full extent is not known; ? = uncertain

Site ID: H2024GR003_WPFO

CONDITION

Condition is an integrated measure of the quality of biotic and abiotic factors, structures and processes within the observed area, and the degree to which they affect the continued existence of the occurrence. Components of condition for communities are: 1) development/maturity, 2) ecological processes, 3) species composition and biological structure, 4) abiotic physical/chemical factors.

Rank: A B C D ?
Condition rank comments: Cordgrass dominant, though few forbs present. Suitable hydrology in meadow adjacent to stream.

Dominant Species (in parentheses behind species include estimate of canopy coverage and **D** for dominants, **C** for common)

Tree canopy N/A

Subcanopy N/A

Tall shrub N/A

Short shrub N/A

Herbaceous CALSTR (C), VERFAS, Carex sp., SPHOBT, SCIATR, SPAPEC (C), CARVUL (C), ELYCAN, LYSCIL, CARPRA (D), VERHAS (C), ELYTRA, HORJUB (C), SOLCAN (C)

Rare species

Exotic species POAPRA (D), BROINE (C), AGRSTO

Ecological processes and abiotic physical/chemical factors

Consistent ground- and surface-water flow maintain this wet meadow plant community and prevents some noxious weeds from becoming established.

Current land use Pasture

Soil type: Parent material: Calcareous till

Slope 0-2 Aspect All MOISTURE: hydric (inundated) wet-mesic (saturated) mesic (moist) dry-mesic xeric (dry)

TOPOGRAPHIC POSITION: crest upper slope mid slope lower slope bottom

LANDSCAPE CONTEXT

An integrated measure of the quality of biotic and abiotic factors, structures and processes surrounding the observed area, and the degree to which they may affect the continued existence of the community at that location. Rank: A B C D ?
Describe the landscape surrounding the habitat of the occurrence (e.g. land cover, connectivity/fragmentation, condition of habitat).
Cultivated field to north. Gentle hillslopes surrounding wet meadow, lightly grazed grassland.

Comment on evidence of disturbance (past and current) and alteration of ecological processes in the area surrounding the observation.
Noxious weeds and introduced species at fenceline with cultivated field. Little evidence of erosion, stream incision, or heavy grazing.

EOrank (size + condition + landscape context)(see instructions): A B C D ? Eorank date: 7/9/2024 (Y/M/D)
EOrank summary comments Most suitable between hillslope and stream for hydrology. Few forbs present. Less affected by non-native species. Small area.

MISCELLANEOUS

Management, research and protection needs for the element at this site (e.g. burning, control exotics, study effects of grazing, protect entire wetland): Prevent invasion by weeds in cultivated margin. Graze lightly to provide gaps for forb growth, avoid grazing in WPFO bloom period.

Miscellaneous comments:

Site ID: H2024GR003_WPFO

Site Photograph: AA832

Site Photograph: AA833

Site ID: H2024GR003_WPFO

Site Photograph: AA834

Site Photograph: AA835

Site ID: H2024GR004_WPFO

Target Species: ☐ Small White Lady Slipper (SWLS) ☑ Western Prairie Fringed Orchid (WPFO)

Project name Midwest Carbon Express

Completed by NE NHP staff

EO ID _____ Source Feature ID _____ Reference Code _____

NEBRASKA NATURAL HERITAGE PROGRAM
ECOLOGICAL COMMUNITY SURVEY FORM

SURVEY INFORMATION

Form last rev. 5/2014

Survey date 2024 - 07 - 09 (Y/M/D) Surveyor(s), principal surveyor listed first: A. Admiraal, E. Henry

Additional survey work needed? Y N Why? If Yes: Determine based on final project route; future monitoring may be necessary due to orchid bloom cycle. If No: Not suitable habitat for orchids

IDENTIFICATION

Community name N/A - Surveying potential habitat for SWLS/WPFO

Classification problems? Y N if Y, explain _____

Photo/slide taken? Y N Where has photo/slide been deposited? WESTECH Environmental Photo Repository (e-filed). Photo #: AA848-851, AA854-857, AA864-865

LOCATION

Survey site: Tract: SD-GR-514-083.000 County: Grant, SD

Elevation (range if applicable): _____ m ft

T/R/S/ ¼ ¼ sec and/or directions to site Please refer to WESTECH GIS dataset for the legal description.

GPS Coordinates: Latitude: 45.072342 N Longitude: 96.824556 W Accuracy of the coordinates: ~2 m ft

GPS unit type: Internal GPS on cellular device/tablet

What coordinate system, map units, and datum are the above x/y coordinates in (select one)?

Geographic (lat/long), WGS 1984 | UTM (meters) Zone 13, NAD 1983 | UTM (meters) Zone 15, NAD 1983

Geographic (lat/long), NAD 1983 | UTM (meters) Zone 14, NAD 1983 | Other _____

Landowner: Private Landowner comments: N/A

Managed Area Name N/A

Is the observed area known to be located within some feature(s) identifiable from an aerial photo (e.g., clump of trees, hay field, lake, road, trail)? Y N If so, identify feature Please refer to WESTECH GIS dataset for parcel boundaries and landmarks.

GENERAL HABITAT DESCRIPTION

Short description of the area where the element is located (physical setting and, when known, land use and natural communities in surrounding area).

Wet cordgrass meadow located in broad valley. Slopes and parts of the meadow have been planted with timothy, alfalfa, and alsike clover and are cut for hay. West end of the tract is native tallgrass prairie likely used for pasture.

SIZE OF ELEMENT OCCURRENCE

Size is a quantitative measure of the area of an occurrence. Rank: A B C D ?

Area of occupancy : 27,000 m² hectares km² ft² acres miles² Type of measurement: Precise Estimate

Observed length: 709 m km ft miles Type of measurement: Precise Estimate

Indicate whether there is confidence that the observed area represents the full extent of occupied area for the community at that location. Y N ? Y = confident full extent is known; N = confident full extent is not known; ? = uncertain

Site ID: H2024GR004_WPFO

CONDITION

Condition is an integrated measure of the quality of biotic and abiotic factors, structures and processes within the observed area, and the degree to which they affect the continued existence of the occurrence. Components of condition for communities are: 1) development/maturity, 2) ecological processes, 3) species composition and biological structure, 4) abiotic physical/chemical factors.

Rank: A **B** C D ?

Condition rank comments: Large area with suitable hydrology. Non-native plants common, likely overseeded at one point. Species diversity was fair, better where grazed.

Dominant Species (in parentheses behind species include estimate of canopy coverage and **D** for dominants, **C** for common)

Tree canopy N/A

Subcanopy N/A

Tall shrub N/A

Short shrub N/A

Herbaceous VERHAS, CARPRA (D), PHAARU (D), ELEPAL (D), SCIATR, LOBSPI, SISCAM, POTANS (C), HORJUB, GLYLEP, SPAPEC, ANECYL, SYMLAN, EQUARV, CALSTR, APOCAN (C), TYPLAT

Rare species

Exotic species SONARV (C), MELOFF (C), PHLPRA (C), BROINE (D), ELYHIS (D), AGRSTO (D), TRIHYB (C), POAPRA (C)

Ecological processes and abiotic physical/chemical factors

A consistent groundwater source maintains suitable hydrology in this low-lying meadow. Parts of this site are likely hayed when conditions are dry.

Current land use Hay Meadow

Soil type: Parent material: Calcareous till

Slope 0-2 Aspect All MOISTURE: **hydric (inundated)** **wet-mesic (saturated)** mesic (moist) dry-mesic xeric (dry)

TOPOGRAPHIC POSITION: crest upper slope mid slope lower slope **bottom**

LANDSCAPE CONTEXT

An integrated measure of the quality of biotic and abiotic factors, structures and processes surrounding the observed area, and the degree to which they may affect the continued existence of the community at that location. Rank: A B C D ?

Describe the landscape surrounding the habitat of the occurrence (e.g. land cover, connectivity/fragmentation, condition of habitat).

Western section surrounded by disturbed native grassland, eastern section surrounded by non-native hay meadow. A county road borders the east side.

Comment on evidence of disturbance (past and current) and alteration of ecological processes in the area surrounding the observation.

May have been overseeded with red clover, wild alfalfa, redtop.

EOrank (size + condition + landscape context)(see instructions): A B **C** D ? Eorank date: 7/9/2024 (Y/M/D)

EOrank summary comments Hydrology suitable. Non-native species dominant, some native assemblage species present. This area is relatively large.

MISCELLANEOUS

Management, research and protection needs for the element at this site (e.g. burning, control exotics, study effects of grazing, protect entire wetland): Control of introduced species needed. Delay haying until the WPFO has dispersed seed. Limit pesticide use.

Miscellaneous comments:

Site ID: H2024GR004_WPFO

Site Photograph: AA848

Site Photograph: AA849

Site ID: H2024GR004_WPFO

Site Photograph: AA850

Site Photograph: AA851

Site ID: H2024GR004_WPFO

Site Photograph: AA854

Site Photograph: AA855

Site ID: H2024GR004_WPFO

Site Photograph: AA856

Site Photograph: AA857

Site ID: H2024GR004_WPFO

Site Photograph: AA864

Site Photograph: AA865

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR001_WPFO

Grazing: ☐None ☒Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Pasture

Photo #s: AA807-AA811, AA830-AA831

Habitat Type: ☒Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow
☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☐Cultivated
☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-071.000
SD-GR-514-071.200

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE*		AMBPSI*	EUPESU	ACMAME	AMOCAN (C)
POAPRA*		GRISQU	ARTABS		ROSARK (C)
POACOM*		RATCOL			SYMOCC (C)
HESCOM (C)		ACHMIL			
NASVIR (C)		ARTLUD (C)			
KOEMAC		PEDARGO			
PANVIR		DALPUR			
DICOLI		ECHANG			
		VERSTR (C)			
		SOLCAN (C)			
		VERBAL			
		ERISTR			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):
*= Dominant
(C)= Common

Upland tallgrass prairie vegetation on well-drained soils on slopes and hilltops. Also included are narrow and drier swales between hills. These areas do not have suitable hydrology that supports the plant community in which WPFO would be found.

AA807:

AA808:

AA809:

AA810:

AA811:

AA830:

AA831:

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR002_WPFO

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Cultivated Soybeans

Photo #s: AA836

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☒Cultivated ☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-075.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
				GLYMAX*	

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):
*= Dominant

Site is cultivated field, planted to soybeans. No habitat for WPFO is present.

AA836:

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR003_WPFO

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Pasture

Photo #s: AA837-838, AA839-840

Habitat Type: ☒Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow
☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☐Cultivated
☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-075.000
SD-GR-514-076.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BOUCUR		RATCOL (C)	ARTABS (C)		SYMOCC (C)
POACOM*		ARTLUD			ROSARK
BOUGRA		ACHMIL (C)			
BROINE*		DELVIR			
KOEMAC		AMBPSI*			
POAPRA*		ECHANG			
SCHSCO		DALPUR			
HESCOM (C)		ASCVER			
NASVIR (C)		GRISQU (C)			
		ANECYL			
		VERSTR (C)			
		SOLCAN (C)			
		LITOCC (C)			

WPFO or SWLS Observed:
☒ NO
☒ YES

NOTES (Mgmt, context, mapping, etc):

*= Dominant
(C)= Common

Low to moderate quality upland tallgrass prairie on hillslopes and hilltops. Soils are well-drained and do not support a plant community or hydrology typical of WPFO habitat.

AA837:

AA838:

AA839:

AA840:

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR004_WPFO

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known):

Photo #s: AA841-844

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow
☒Wetland ☐Mixed Grassland ☐Non-native Grassland ☐Cultivated
☐Other:

Habitat Quality: ☐Unsuitable ☒Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-076.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
POAPRA*		SOLGIG (C)	SYMPRA		AMOFRU
SPAPEC*		HELHEL (C)			
BOUCUR		ZIZAUR			
BROINE*		LOPSPI			
		ANECYL			
		ASCINC			
		SYMLAN			
		CICMAC			
		LYSCIL			
		SOLCAN*			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

*= Dominant
(C)= Common

Intermittent stream that has a channel 2-3 feet deep. Surrounding meadow has diverse forbs but is dominated by invasive bluegrasses and smooth brome. The stream channel is too wet to provide suitable habitat for the WPFO. The surrounding meadow is drier than is typical for the WPFO but may provide poor quality habitat.

AA841:

AA842:

AA843:

AA844:

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR005_WPFO

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Pasture

Photo #s: AA845-846

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow
☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated
☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-076.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
ELYHIS*		TRIPRA (C)		MELOFF	
POACOM*		TAROFF		MELALB	
POAPRA*		SOLRIG			
BROINE*		MEDLUP			
HORJUB		TRIREP (C)			
		VERBAL			
		SYMERI			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

*= Dominant
(C)= Common

Low quality non-native grassland (possibly native, but interseeded for hay or forage?). Dominated by non-native grasses and clover. Some areas of saturated soil occur but these are very low quality and do not provide habitat for WPFO.

AA845:

AA846:

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR006

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Pasture

Photo #s: AA852 E, AA853 W, AA858-861

Habitat Type: ☒Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow
☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☐Cultivated
☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-083.000
SD-GR-514-084.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE*		PEDARG			AMOCAN
PHLPRA		ARISTR			ROSARK
HESCOM (C)		DALPUR			
ANDGER*		LITOCC			
POACOM*		ACHMIL			
KOEMAC		VERSTR			
		CALINV			

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

*= Dominant
(C)= Common

Low quality native grassland dominated by non-native grasses; fen forbs. Well-drained, rocky soils occur on hilltops and slopes and do not provide habitat for WPFO.

AA852:

AA853:

AA858:

AA859:

AA860:

AA861:

ORCHID VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: 3114 A. Admiraal, E. Henry Date: 7/9/2024	Site ID: X2024GR007

Grazing: ☒None ☐Light ☐ Moderate ☐Heavy

Target Species: ☒Western Prairie Fringed Orchid (WPFO)
☐ Small White Lady Slipper (SWLS)

Land Use (if known): Hay meadow

Photo #s: AA862-863, AA847

Habitat Type: ☐Tallgrass Prairie ☐Mesic Meadow ☐Wet Meadow
☐Wetland ☐Mixed Grassland ☒Non-native Grassland ☐Cultivated
☐Other:

Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent

Tract #s:

SD-GR-514-083.000

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
BROINE*		MEDSAT*			
PHLPRA*		TRIHYB*			
HESCOM		ERISTR			
NASVIR					

WPFO or SWLS Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

*= Dominant
(C)= Common

This area is actively managed as a hay meadow. It occurs on well-drained slopes and does not provide suitable habitat for WPFO.

AA862:

AA863:

AA847:

Appendix D –
2022 Lined Snake Survey Forms Midwest Carbon Express Project: South Dakota

LINED SNAKE VEGETATION INVENTORY FORM

Project: Midwest Carbon Express	Crew: J. Allewalt, C. Grummert Date: 7/11/2022	Site ID: No_hab_SD_LinedSnake_001
Tract #s: SD-LI-104-151.000	Grazing: ☒None ☐Light ☐ Moderate ☐Heavy	Habitat Quality: ☒Unsuitable ☐Poor ☐Fair ☐Good ☐Excellent
Target Species: ☒Lined Snake		
Land Use (if known): Waterway		
Photo #s: JA5305 (*see page 2*)		
Habitat Type: ☐Tallgrass Prairie ☒Mesic Meadow ☐Wet Meadow ☐Wetland ☐Mixed Grassland ☐Non-native Grassland ☐Cultivated ☒ Riparian ☐Other:		

CLASS/SPECIES

DOMINANT SPECIES BY MORPHOLOGICAL CLASS

PERENNIAL GRASSES	ANNUAL GRASSES	PERENNIAL FORBS		ANNUAL/BIENNAL FORBS	SHRUBS
SPAPEC				HELGRO	SAMCAN
PHAARU					
TYPANG					
BROINE					
POAPRA					

Lined Snake Observed:
☒ NO
☐ YES

NOTES (Mgmt, context, mapping, etc):

Not suitable for Lined Snake due to lack of remnant prairie. Site has been disturbed and invaded by reed canary grass. Narrow-leaved cattail is also dominant within the meander wetland areas.

Narrow incised creek bottom and banks. Dense TYPANG in outer meander areas with PHAARU and SPAPEC along banks with HELGRO and SAMCAN. Very dense and tall vegetation with few forbs. Vegetation community quickly/abruptly shifts from cropland to introduced perennial grasses (smooth brome and Kentucky bluegrass) to wetland.

Site Photograph: