Colorado Siteworks Inc
25599 Co Rd 4
Hudson, CO 80642

September 28, 2022

Re: Work Plan, Docket No. CWA-07-2022-0103

To whom it may concern:

Pursuant to the United States Environmental Protection Agency's ("EPA") Findings of Violation and Order for Compliance in the matter of Tom Villegas and Amy Villegas, Respondents, Docket No. CWA-07-2022-0103, Colorado Siteworks, Inc. ("Colorado Siteworks") submits the following Work Plan for EPA's review and approval.

This Work Plan references several exhibits, which are attached hereto and incorporated herein by reference. These exhibits are:

- Exhibit "A" – July 11, 2022 Letter from EPA to the Villegas with May 18, 2022 Inspection Report
- Exhibit "B" – MILCO Environmental Services, Inc. Wetland Delineation, Data Forms, and Photo Log
- Exhibit "C" – Natural Resources Conservation Service Herbaceous Vegetation Establishment Guidance Document 2020

Upon EPA approval, the activities described in this Work Plan will be performed by Colorado Siteworks. Colorado Siteworks estimates that it would take approximately four (4) days to complete, work would be performed on weekends, and work would be completed within ten (10) weeks. Spoils would be seeded with little bluestem and brome grass and would be seeded consistent with the Natural Resource Conservation Service Herbaceous Vegetation Establishment Guidance Document 2020, Exhibit "C".

Colorado Siteworks will take the following actions as described for each area below:

A. Stream Crossings.

Colorado Siteworks will remove the culverts depicted in Photos 58 and 62 of Exhibit "A." These culverts are depicted as "Crossing 3" and what appears to be an unlabeled crossing in the Impacts Map, Exhibit "A," p. 9.

Colorado Siteworks will not remove the remaining culvert crossings depicted in Exhibit "A." These crossings are exempt from regulation under 33 U.S.C. § 1344(f).

B. Southeast Side of Property.

Colorado Siteworks will remove 1.5 feet of dirt from "Crossing #3" to 237 feet north, an area comprising .251 acres, for a total excavation of 600 cubic yards. Spoils will be placed in the upland area depicted in Photo 59 of Exhibit "A" and reseeded as described above.

Colorado Siteworks will also remove the duck blind depicted in Photo 9 of Exhibit "A."

C. North Side of Property.

The berm depicted in Photo 40 of Exhibit "A" is located in an upland area per the MILCO Environmental Services, Inc. Wetland Delineation. *Compare* Exhibit "A, p. 20 *with* Exhibit "B," p. 1. No action will be taken with respect to this berm.

D. Southwest Side of Property.

Colorado Siteworks will remove 1.5 feet of dirt northeast of "Crossing 2," an area comprising .074 acres, for a total excavation of 25 cubic yards. Spoils will be placed in the upland area to the east in between crossing "A3" and "Crossing 2" depicted in Exhibit "A," p. 9, and reseeded as described above.

Colorado Siteworks will remove the small spoil pile southeast of "Crossing 2," for a total excavation of 15 cubic yards. Spoils will be placed in the upland area to the east in between crossing "A3" and "Crossing 2" depicted in Exhibit "A," p. 9, and reseeded as described above.

The spoils from Crossing "A3" on the north side of the slough were placed in an upland area per the MILCO Environmental Services, Inc. Wetland Delineation. Exhibit "B," p.1. No action will be taken with respect to these spoils.

E. Tree Piles

All tree piles were placed in upland areas. No action will be taken with respect to these tree piles.

Sincerely,

Tom Villegas, President
tom@coloradositeworks.com

Enclosures

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

July 11, 2022

Amy and Tom Villegas
25599 WCR 4
Hudson, Colorado 80652

Re: Villegas CWA 404 Compliance Inspection

Dear Ms. And Mr. Villegas:

On May 18, 2022, a representative of the U.S. Environmental Protection Agency inspected your facility.The inspection was conducted under the authority of Section 404 of the Clean Water Act. A copy of the inspection report is enclosed for your information.

The EPA is presently reviewing the findings of the report to determine your facility's compliance with the applicable statutes, permits, or regulations. If it is determined that violations exist, the EPA reservesall rights it may have to take appropriate enforcement action.

If there are any questions regarding this report, please contact me at Bruno.jodi@epa.gov or (913) 551-7810.

Sincerely,

Jodi Bruno

Jodi Bruno, Chief
Water Branch
Enforcement and Compliance Assurance Division

Attachments

cc: ndeq.epainspections@nebraska.gov

Clean Water Act Section 404: Site Visit/Case Development

United States Environmental Protection Agency

For inspections authorized pursuant to Clean Water Act sections 308 and 404 (33 U.S.C. §§ 1318 and 1344)

This report includes only factual information gained by documentation, onsite observations, and/or onsite interviews.

Inspector Name(s)	Delia Garcia, Ph.D.	Time In	9:30 AM	Start Date	May 18, 2022
		Time Out	12:18 PM	End Date	May 18, 2022
Inspector's Organization	U.S. Environmental Protection Agency, Region 7				
Organization Requesting Inspection (if different)					
Inspection Type	Evaluation	Inspection Status	Original		
Site Name	Villegas				
Site Address*	S 13, T 12N, R 28W				
City*	Brady	County*	Lincoln	State* NE	Zip Code* 69123
Mailing Address*	25599 WCR 4				
City*	Hudson	County*	Weld	State* CO	Zip Code* 80642
Latitude*	41.008047	Longitude*	-100.453985		
Estimated Size of Site (acres)	85	Is there a home on the site?	☐ Yes	☒ No	
Inspector Signature		Date			
Supervisor Signature		Date			

Clean Water Act Section 404: Site Visit/Case Development

United States Environmental Protection Agency

For inspections authorized pursuant to Clean Water Act sections 308 and 404 (33 U.S.C. §§ 1318 and 1344)

Site Name	Villegas	Start Date	May 18, 2022
		End Date	May 18, 2022
Inspection Purpose	Initial site visit		

Opening Conference

☒ Presentation of Inspector Credentials

Name and Title (Use N/A if owner/operator not available to join the inspection)

N/A

☒ Opening Conference

Name of person authorizing access if applicable

Tom Villegas through his attorney Stephen Mossman

Notes from Opening Conference

No opening conference took place since Mr. Villegas was unable to be at the site during the inspection.

☒ Access Issues if Any

Describe

Was initially told that Mr. Villegas would be meeting us at the site at 9:00 am on May 18, 2022. When Mr. Simmons and I arrived at the site nobody was present. After waiting for approximately half an hour I called Natasha Goss (assigned EPA Attorney) and asked that she check with Mr. Villega's attorney (Stephen Mossman) to see if Mr. Villegas would be joining us. Mr. Mossman indicated that Mr. Villegas would not be able to join us for the inspection but that we could proceed without him.

Inspection Observations and Sample Collection

Site Owner/Site Operator/Responsible Party (Name, title and contact information)

Amy and Tom Villegas, (Site Owner and Site Operator) 25599 WCR 4, Hudson, Colorado 80642 (303) 349-6213

Additional Persons Present at Inspection

Keith Simmons, Project Manager, U.S. Army Corps of Engineers, Omaha District

General Site Characteristics (layout of property, etc.)

The site is located approximately 4.5 miles southwest of Brady, Nebraska and is located south of Interstate 80. Landcover at the site consisted primarily of wooded and emergent wetlands and unnamed tributaries to the Platte River. The site consists of approximately 85 acres bordered on the North by wetlands and the Platte River, on the East and West by wetlands, and on the South by cropland (see Attachment 1)

Purpose and Need for Discharge of Dredged and/or Fill Material

During my initial phone conversation with Mr. Villegas he stated that he was trying to eradicate Phragmites australis (an invasive plant species) from the wetlands.

Site Overview (Past inspections, site description, permits, etc.)

Prior to the inspection, I reviewed the materials provided by the U.S. Army Corps of Engineers, Omaha District (COE) which included a summary and photos of their site visit on May 18, 2021. The COE has not issued any Clean Water Act 404 permits for the work that was conducted on the site and I am unaware of any other regulatory permits.

Clean Water Act Section 404: Site Visit/Case Development

United States Environmental Protection Agency

For inspections authorized pursuant to Clean Water Act sections 308 and 404 (33 U.S.C. §§ 1318 and 1344)

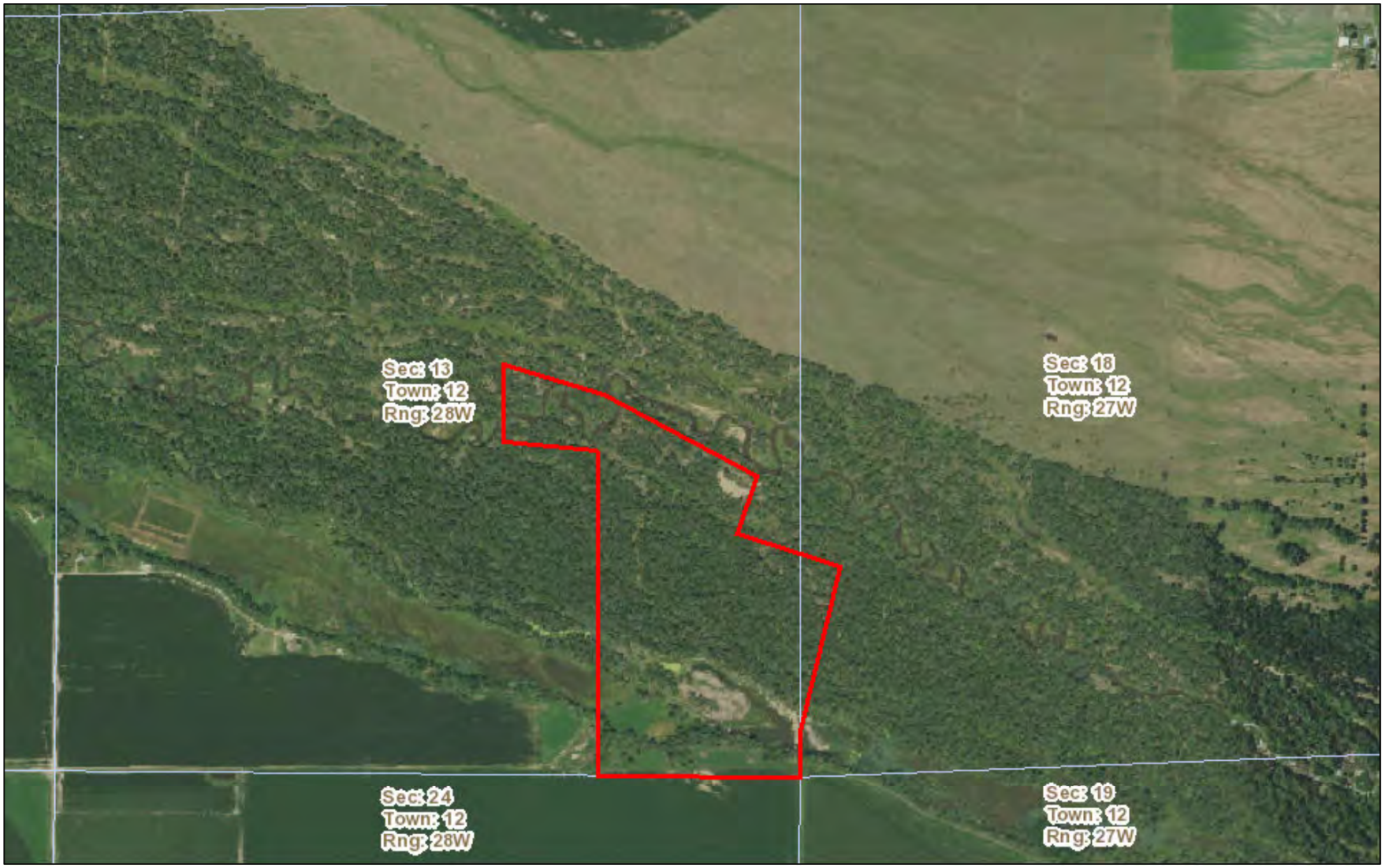
Site Name	Villegas	Start Date	May 18, 2022
		End Date	May 18, 2022

Scope of Inspection (Areas inspected or not inspected)

We started our observations on the southwest portion of the site and generally walked in a northernly direction on the western path/road. I stopped to document road crossings, excavated areas, tree piles, and /or filled areas. We continued our observations until we reached the northern boundary of the property adjacent to the Platter River. There I made note of an area in which two channels/ponds were created by excavation within the wetlands and of a large cleared area. We then utilized the eastern/path road to generally head south. Any additional impacts that we came across were documented.

I recorded the location of the larger tree piles that we came across but there were numerous smaller tree piles that I did not document.

Villegas
Lincoln County, NE
Site Outline



June 29, 2022

Sections

DISCLAIMER: This map is not intended for conveyances, nor is it a legal survey. The information is presented on a best-efforts basis, and should not be relied upon for making financial, survey, legal or other commitments.

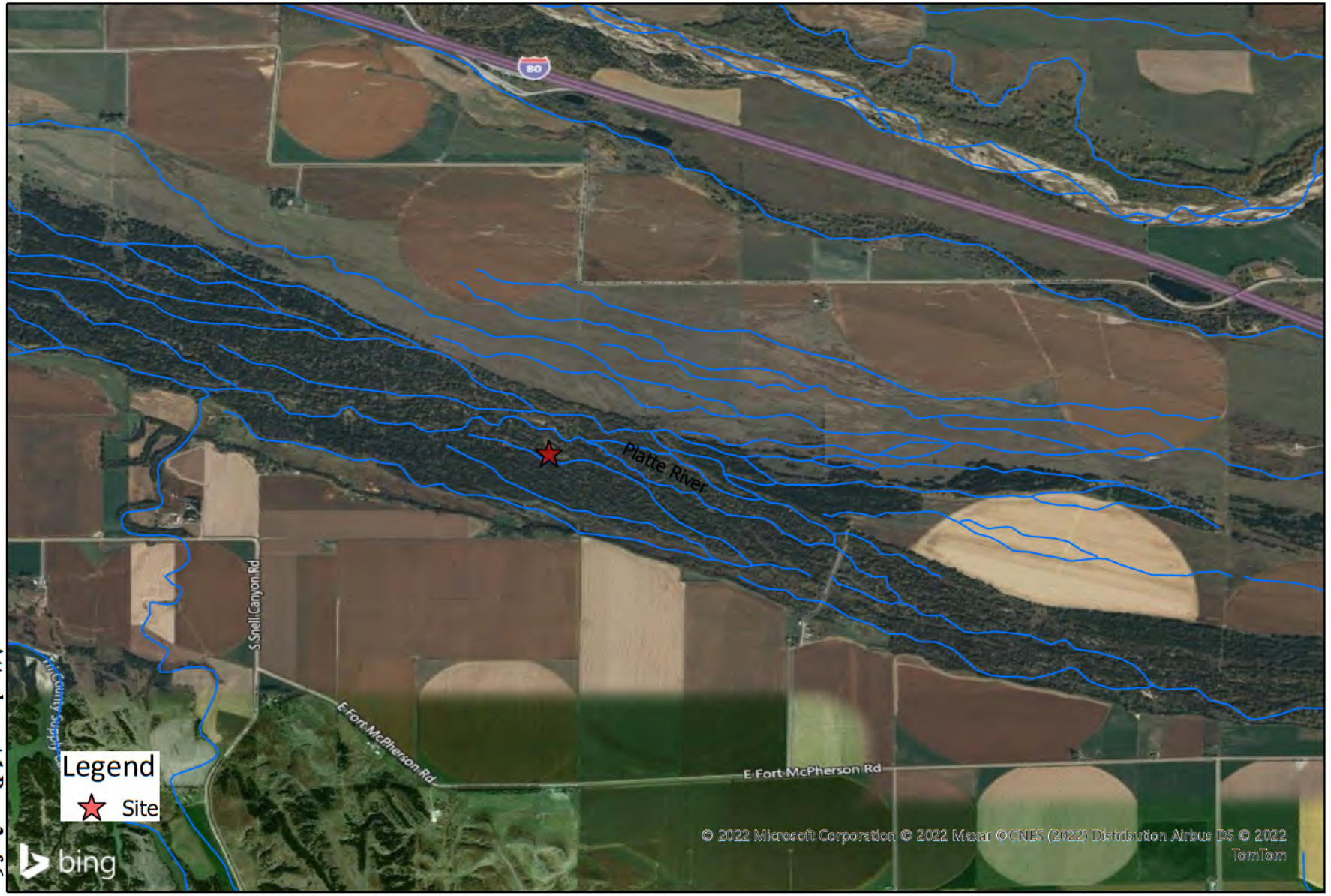
1:15,453

0 0.125 0.25 0.5 mi

0 0.2 0.4 0.8 km

Lincoln County
gWorks.

Villegas
Lincoln County, NE
Location Map



EPA United States Environmental Protection Agency

0 0.72 1.45 Miles

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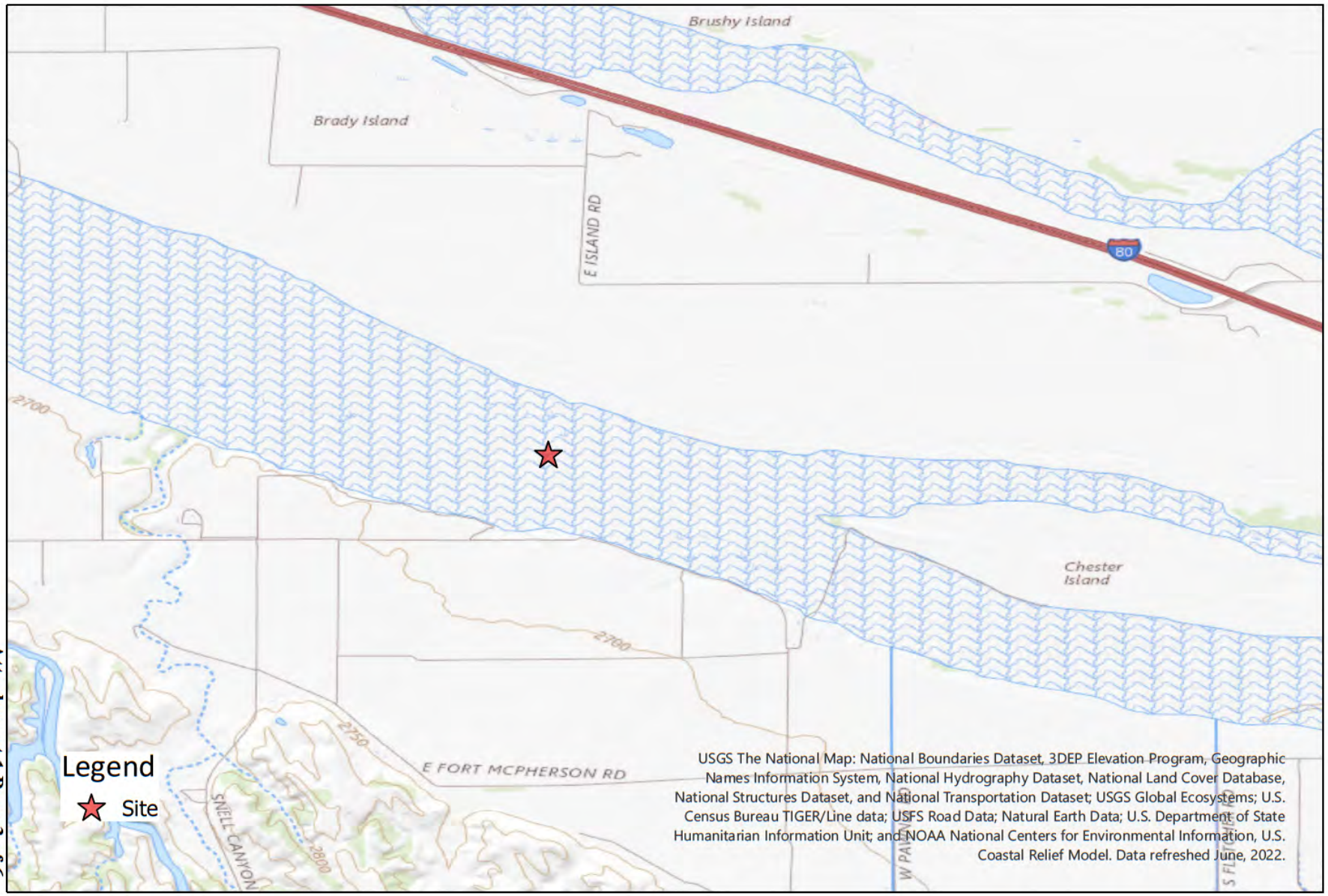
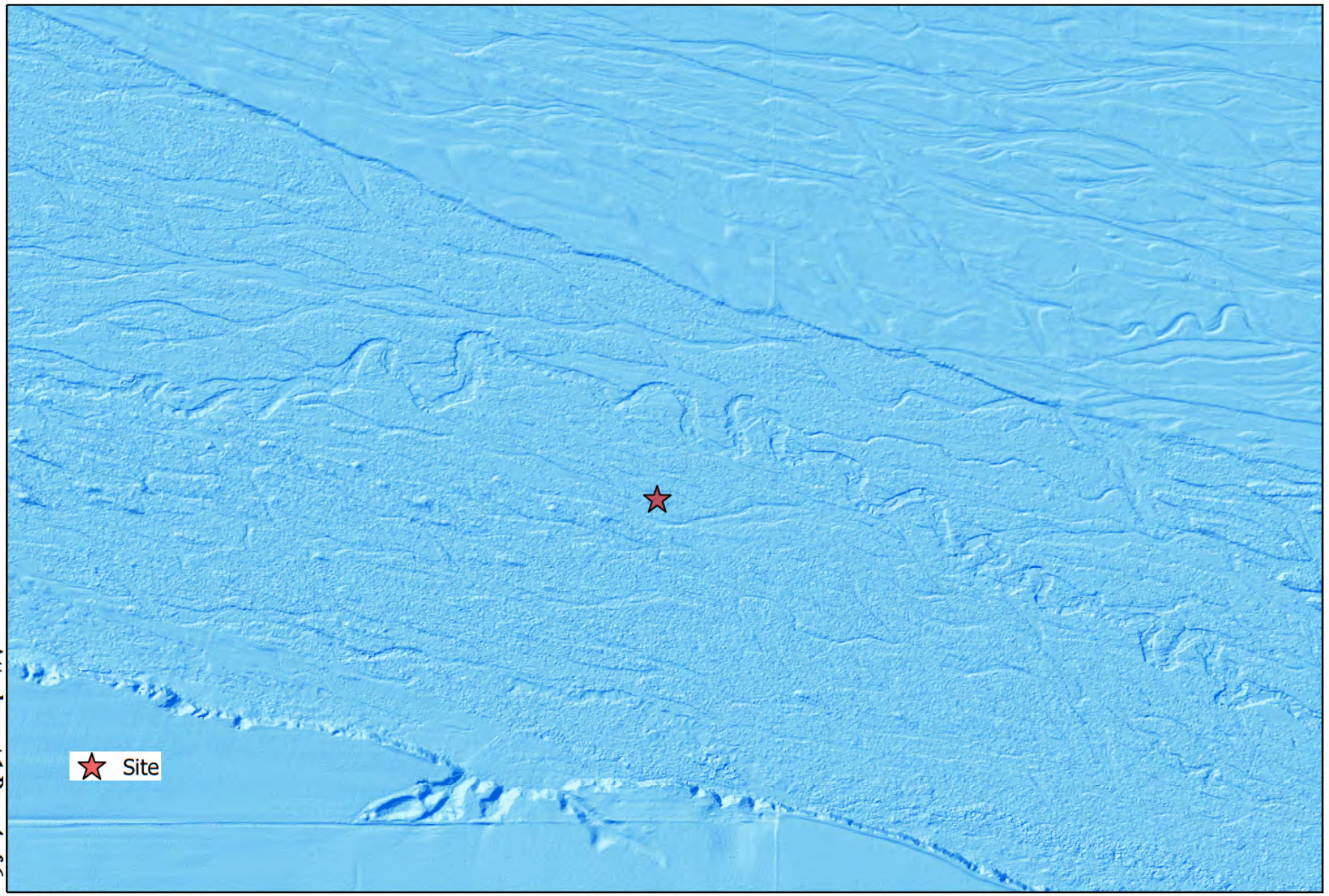
Villegas
Lincoln County,
USGS Topo Map

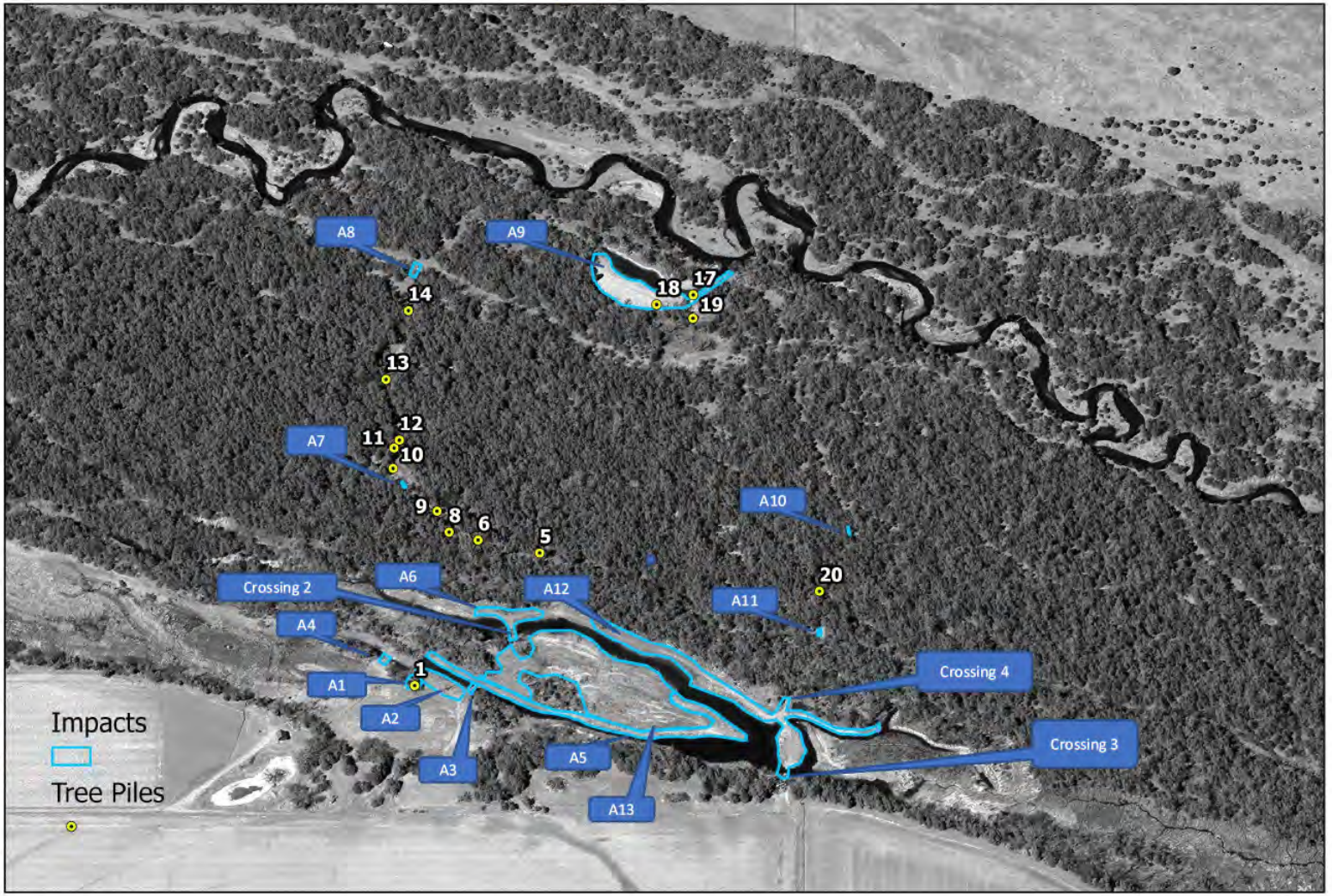


Villegas
Lincoln County, NE
LIDAR Map



Villegas
Lincoln County, NE

Impacts Map



EPA United States Environmental Protection Agency

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Villegas
Lincoln County, NE
GPS Locations

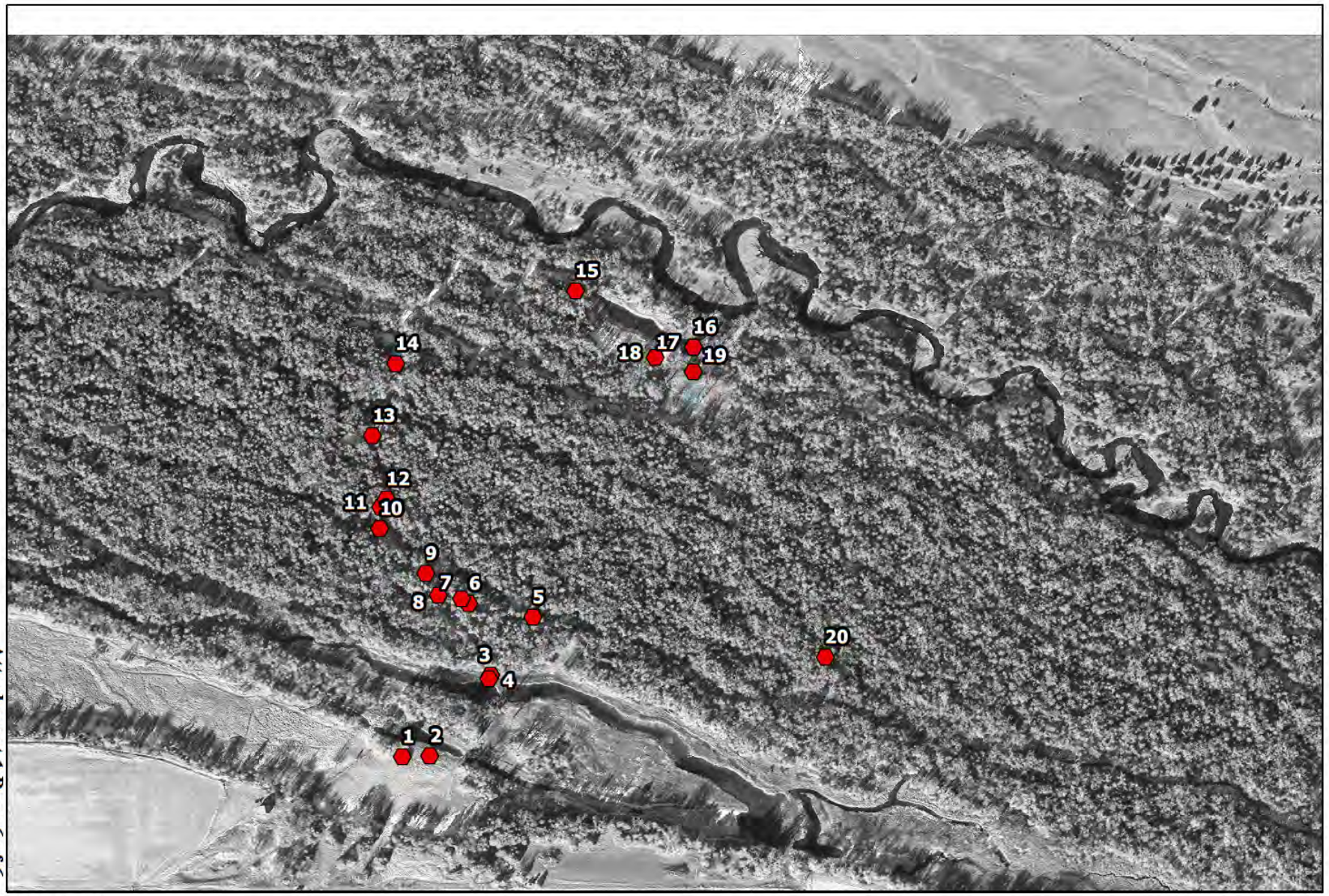


PHOTO AND VIDEO LOG DOCUMENTATION LIST
CHAIN OF CUSTODY DOCUMENT

VILLEGAS
LINCOLN COUNTY, NE
MAY 18, 2022

Facility Name / County: Villegas, Lincoln County, NE
Facility ID# N/A
Date: May 18, 2022
Approximate Time Taken (Military Time): Between 0943 – 1210 hours.
Photographer / Videographer: Photos and videos were taken by Delia Garcia, Ph.D.
Type of Camera: Nikon, Coolpix W300 #: 30010053
Digital Recording Media: Sony SD 32GB Card
All digital photos & video were copied by: Delia Garcia, Ph.D. on May 19, 2022
All digital photos & video were copied to: CD-R
Original copy is stored in: CD-R. Digital photos were downloaded to CD-R by Delia Garcia, Ph.D.

Taken by:	Date	Approximate Time (mil)	File Name	Photo/Video Number	Description
D. Garcia	05/18/22	0943	DSCN012.JPG	1	Soil core sample, hydric soil present.
D. Garcia	05/18/22	0951	DSCN013.JPG	2	Frog within channel (bottom center third of photograph).
D. Garcia	05/18/22	0954	DSCN014.JPG	3	Facing berm created from sidecasted material that was excavated from channel.
D. Garcia	05/18/22	0954	DSCN015.JPG	4	Large pile of cleared trees.
D. Garcia	05/18/22	0955	DSCN0016.JPG	5	Facing northeast at stream crossing (A3).
D. Garcia	05/18/22	0957	DSCN0017.JPG	6	Looking at channel within berm in Photo 3. This area was approximately 6 feet wide and discharged into excavated tributary just north of it.
D. Garcia	05/18/22	1000	DSCN0018.JPG	7	Looking at another stream crossing (A4) located to the west of crossing 1
D. Garcia	05/18/22	1002	DSCN0019.JPG	8	Looking at stream channel just west of crossing in Photo 7. There were some minnows present within this channel but photograph did not capture them.
D. Garcia	05/18/22	1003	DSCN0020.JPG	9	Looking at excavated stream channel near stream crossing A3.

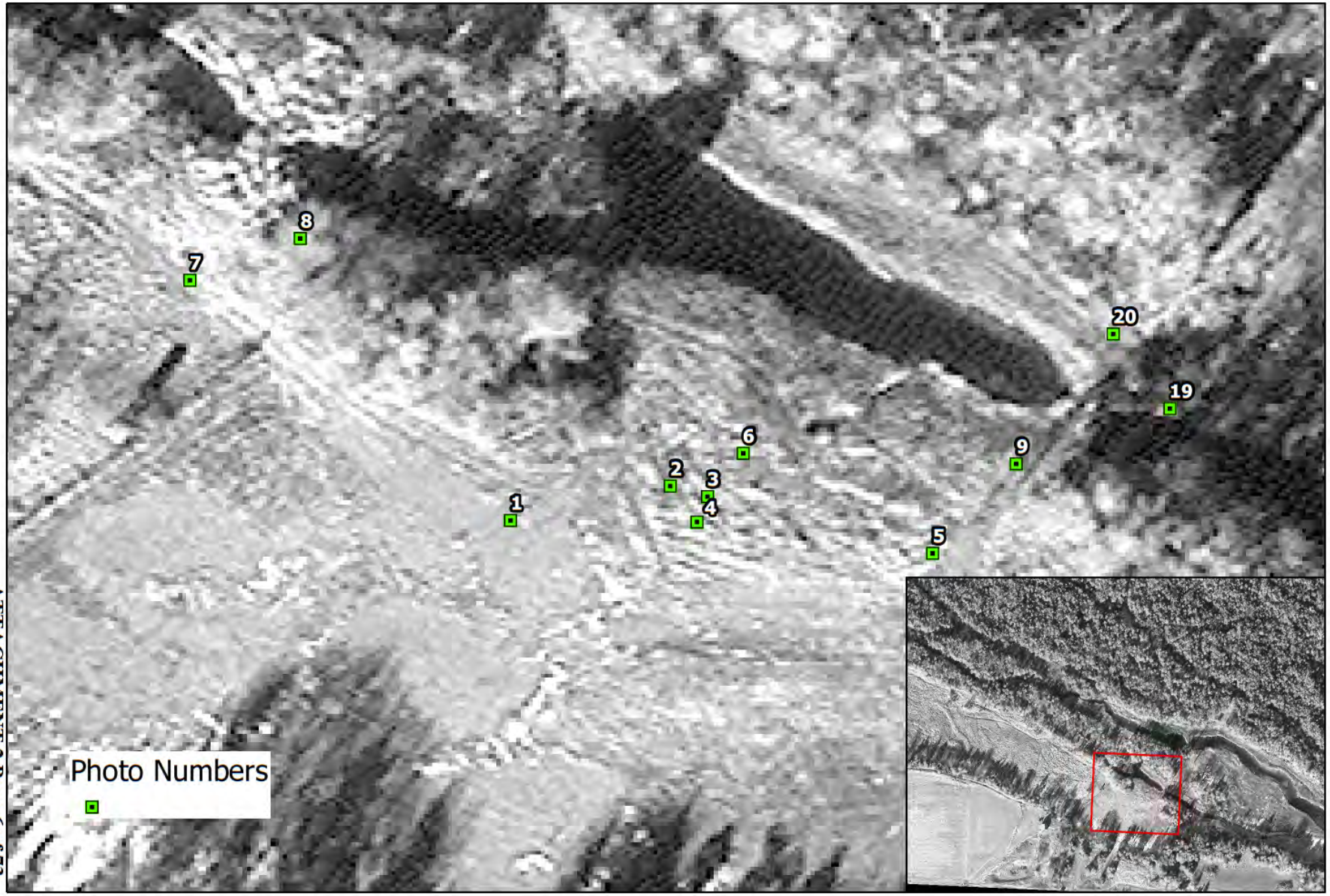
D. Garcia	05/18/22	1013	DSCN0021.JPG	10	Near the edge of the berm, looking at one of the cleared areas.
D. Garcia	05/18/22	1014	DSCN0022.JPG	11	Looking straight down at edge of berm crated from sidecasted excavated material.
D. Garcia	05/18/22	1014	DSCN0023.JPG	12	Looking at stream channel that was excavated and expanded to create more of a pond.
D. Garcia	05/18/22	1015	DSCN0024.JPG	13	Taken from same location as Photo 12 but facing the other direction.
D. Garcia	05/18/22	1017	DSCN0025.JPG	14	Looking at stream crossing 4.
D. Garcia	05/18/22	1017	DSCN0026.JPG	15	Looking at waterfowl blind (metal/white looking object towards center of photograph) in - between stream crossings 3 and 4.
D. Garcia	05/18/22	1017	DSCN0027.JPG	16	Looking at stream crossing 3.
D. Garcia	05/18/22	1022	DSCN0028.JPG	17	Looking down at silt and algae within excavated stream channel.
D. Garcia	05/18/22	1022	DSCN0029.JPG	18	Same as photo 18, just slightly different angle.
D. Garcia	05/18/22	1024	DSCN0030.JPG	19	Looking at culvert in stream crossing (A3).
D. Garcia	05/18/22	1027	DSCN0031.JPG	20	Soil core sample, hydric soil present.
D. Garcia	05/18/22	1035	DSCN0032.JPG	21	Pile of cleared trees.
D. Garcia	05/18/22	1039	DSCN0033.JPG	22	Stream crossing 2.
D. Garcia	05/18/22	1039	DSCN0034.JPG	23	Looking at excavated stream channel on which stream crossing 2 was built.
D. Garcia	05/18/22	1039	DSCN0035.JPG	24	Looking at excavated stream channel, opposite view from that shown on Photo 23.
D. Garcia	05/18/22	1042	DSCN0036.JPG	25	Pile of cleared trees.
D. Garcia	05/18/22	1043	DSCN0037.JPG	26	Another pile of cleared trees.

D. Garcia	05/18/22	1045	DSCN0038.JPG	27	Soil core sample, hydric soil present.
D. Garcia	05/18/22	1047	DSCN0039.JPG	28	Pile of cleared trees.
D. Garcia	05/18/22	1047	DSCN0040.JPG	29	Pile of cleared trees.
D. Garcia	05/18/22	1048	DSCN0041.JPG	30	Pile of cleared trees.
D. Garcia	05/18/22	1049	DSCN0042.JPG	31	Stream crossing (A7)
D. Garcia	05/18/22	1053	DSCN0043.JPG	32	Pile of cleared trees.
D. Garcia	05/18/22	1053	DSCN0044.JPG	33	Coyote scat.
D. Garcia	05/18/22	1054	DSCN0045.JPG	34	Pile of cleared trees.
D. Garcia	05/18/22	1056	DSCN0046.JPG	35	Pile of cleared trees.
D. Garcia	05/18/22	1058	DSCN0047.JPG	36	Pile of cleared trees.
D. Garcia	05/18/22	1059	DSCN0048.JPG	37	Soil core sample, hydric soil present.
D. Garcia	05/18/22	1103	DSCN0049.JPG	38	Stream crossing (A8)
D. Garcia	05/18/22	1109	DSCN0050.JPG	39	Soil core sample, hydric soil present.
D. Garcia	05/18/22	1113	DSCN0051.JPG	40	Looking at berm that was created from side casting of sediment that was excavated to create channel, and the excavated channel.
D. Garcia	05/18/22	1115	DSCN0052.MP4	41	Short video trying to capture school of fish present, but video was too short.
D. Garcia	05/18/22	1117	DSCN0053.MP4	42	Video same location as previous video. Showing fish swimming within the channel.
D. Garcia	05/18/22	1118	DSCN0054.JPG	43	Looking at culvert that connects excavated channels to the Platte River.

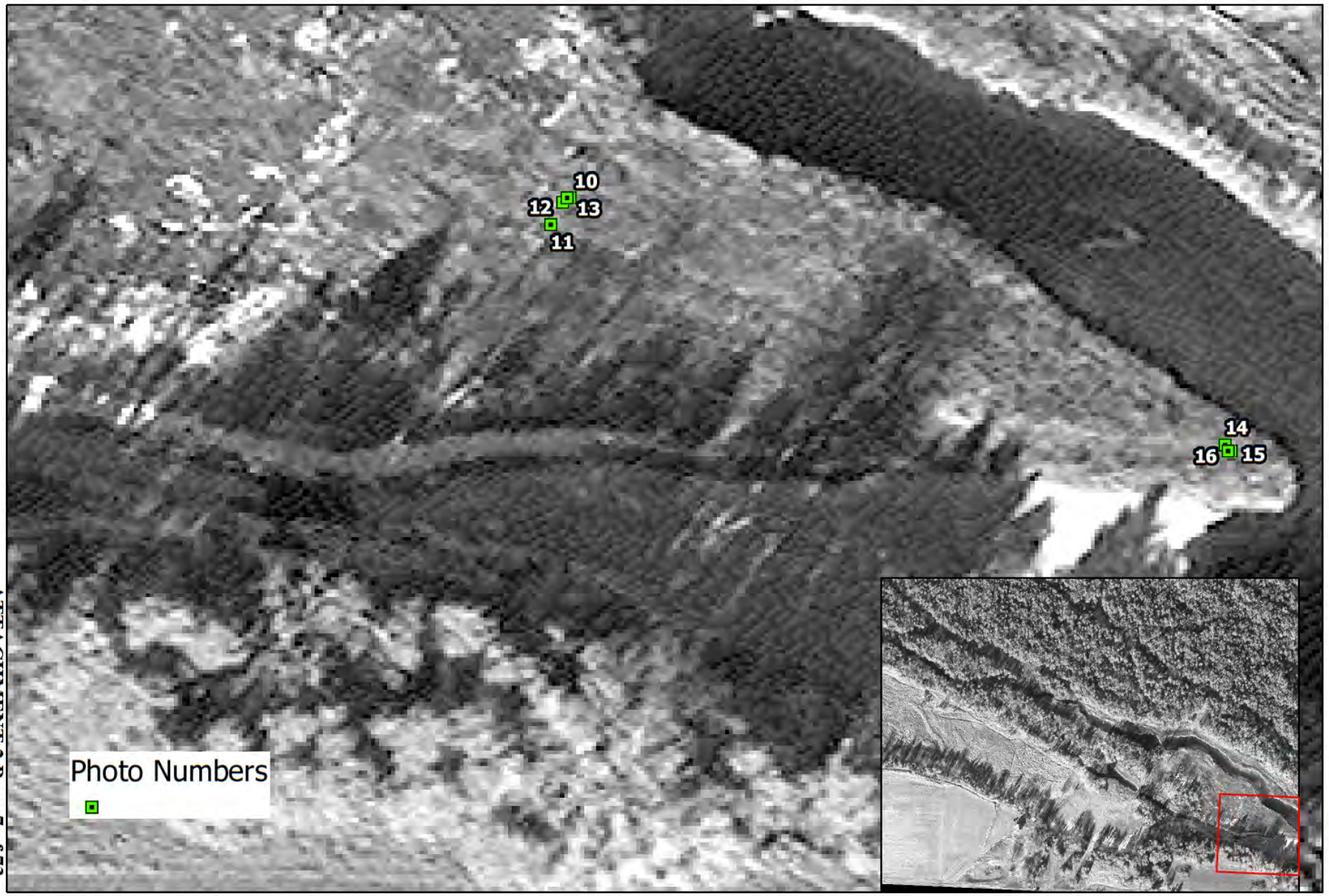
D. Garcia	05/18/22	1120	DSCN0055.JPG	44	Culvert from Photo 43 that connects excavated channel to Platte River.
D. Garcia	05/18/22	1121	DSCN0056.JPG	45	Same culvert as the one in Photos 43 and 44, this end is on the excavated channel.
D. Garcia	05/18/22	1122	DSCN0057.JPG	46	Looking at excavated channel that connects to the Platte River.
D. Garcia	05/18/22	1123	DSCN0058.JPG	47	Two piles of cleared trees along the banks of the excavated channel.
D. Garcia	05/18/22	1127	DSCN0059.MP4	48	Video that shows multiple tree piles near the northern boundary of the site.
D. Garcia	05/18/22	1132	DSCN0060.JPG	49	Pile of cleared trees.
D. Garcia	05/18/22	1140	DSCN0061.JPG	50	Stream crossing (A10)
D. Garcia	05/18/22	1142	DSCN0062.JPG	51	Pile of cleared trees.
D. Garcia	05/18/22	1143	DSCN0063.JPG	52	Borrow area, potentially used as fill material for stream crossing A11.
D. Garcia	05/18/22	1144	DSCN0064.JPG	53	Stream crossing A11
D. Garcia	05/18/22	1146	DSCN0065.JPG	54	Stream channel over which stream crossing A11 was built.
D. Garcia	05/18/22	1146	DSCN0066.JPG	55	Other side of stream channel in Photo 54.
D. Garcia	05/18/22	1153	DSCN0067.JPG	56	Note all sediment/silt deposits in excavated/expanded stream channel.
D. Garcia	05/18/22	1157	DSCN0068.JPG	57	Close view of waterfowl blind from Photo 15.
D. Garcia	05/18/22	1158	DSCN0069.JPG	58	Culverts in stream crossing 3, note the amount of erosion that has taken place.
D. Garcia	05/18/22	1159	DSCN0070.JPG	59	Cut in uplands, might have used material to build stream crossings and berms.
D. Garcia	05/18/22	1200	DSCN0071.JPG	60	Looking at excavated stream channel.

D. Garcia	05/18/22	1201	DSCN0072.JPG	61	Looking at excavated stream channel.
D. Garcia	05/18/22	1202	DSCN0073.JPG	62	Looking at excavated stream channel.
D. Garcia	05/18/22	1204	DSCN0074.JPG	63	Looking at excavated stream channel. Standing on top of fill material but not as extensive as in other locations (in terms of depth).
D. Garcia	05/18/22	1210	DSCN0075.JPG	64	Close view of erosion taking place between the two culverts in stream crossing 3. Same area as Photo 58.

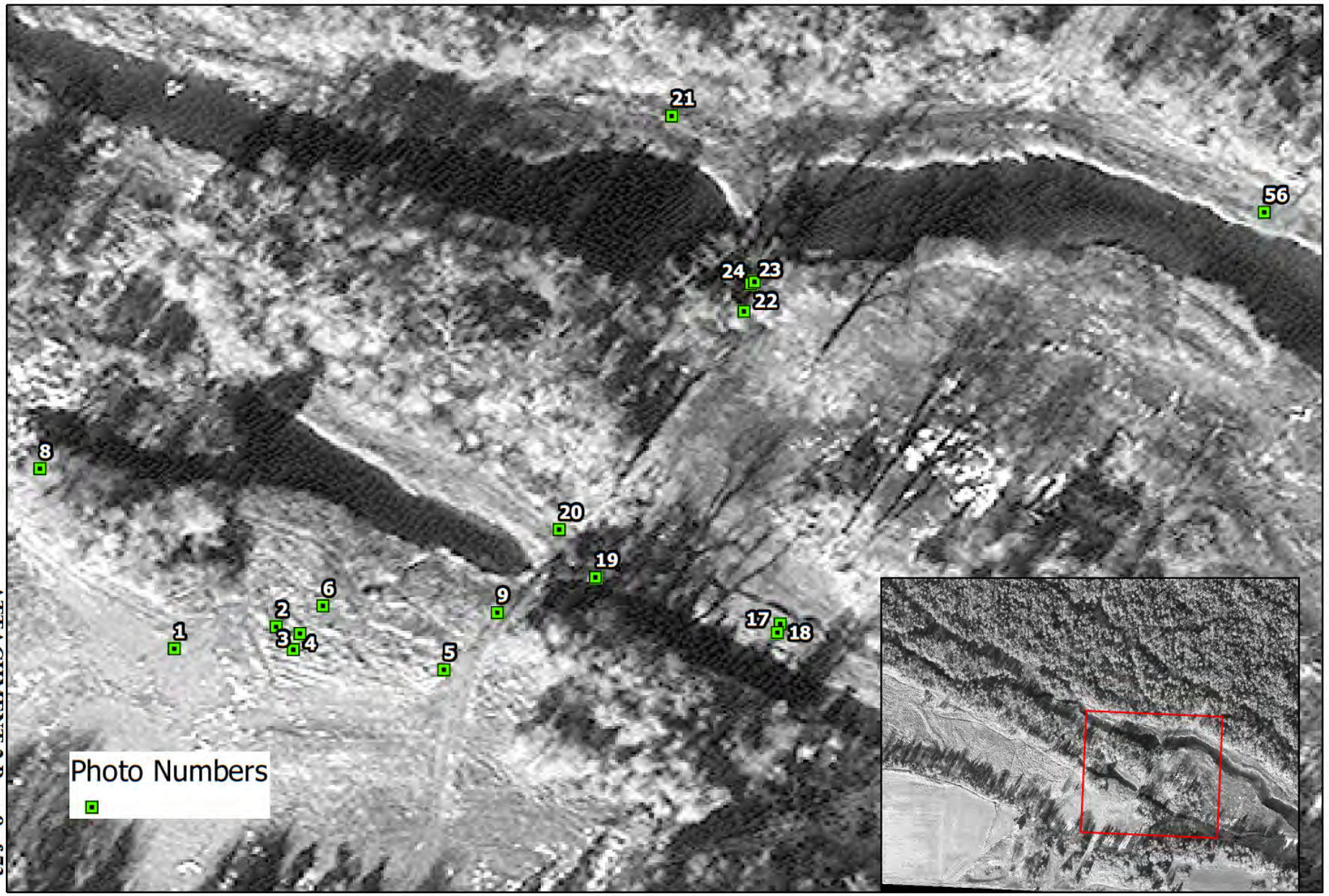
Villegas
Lincoln County, NE
Photo Locations



Villegas
Lincoln County, NE
Photo Locations



Villegas
Lincoln County, NE
Photo Locations



EPA United States Environmental Protection Agency

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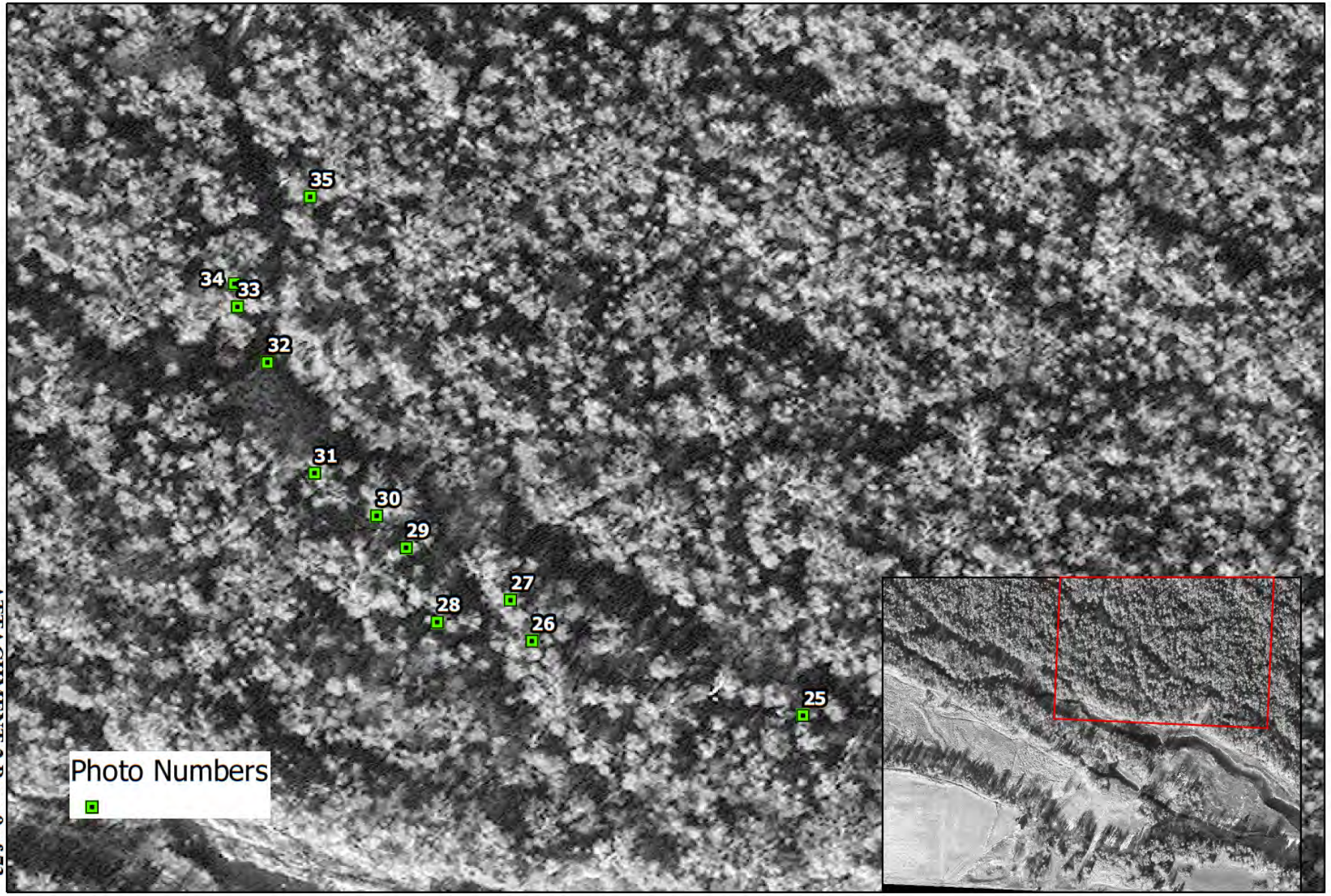
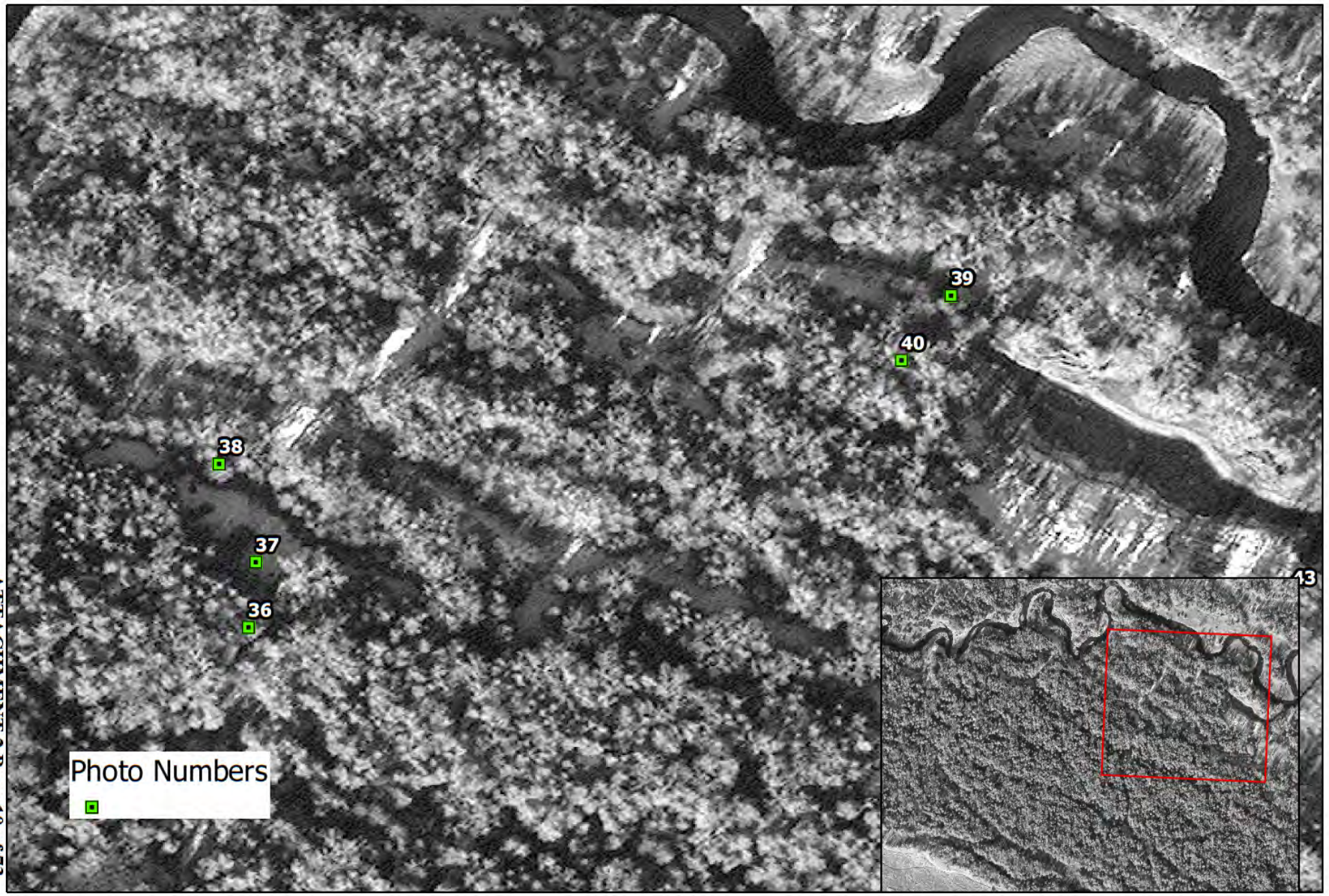
Villegas
Lincoln County, NE
Photo Locations



Villegas
Lincoln County, NE
Photo Locations



EPA United States Environmental Protection Agency

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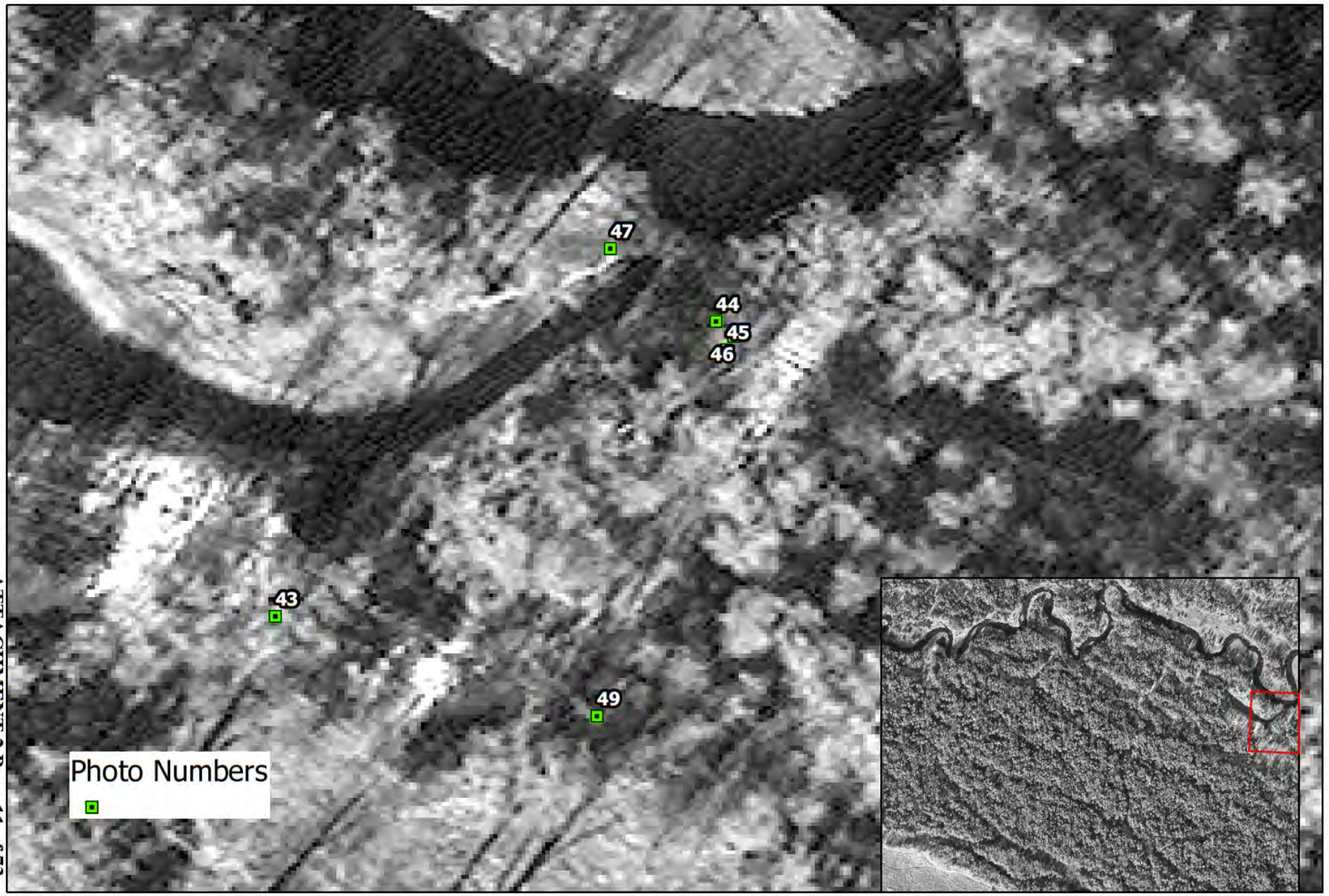
Villegas
Lincoln County, NE
Photo Locations



Villegas
Lincoln County, NE
Photo Locations

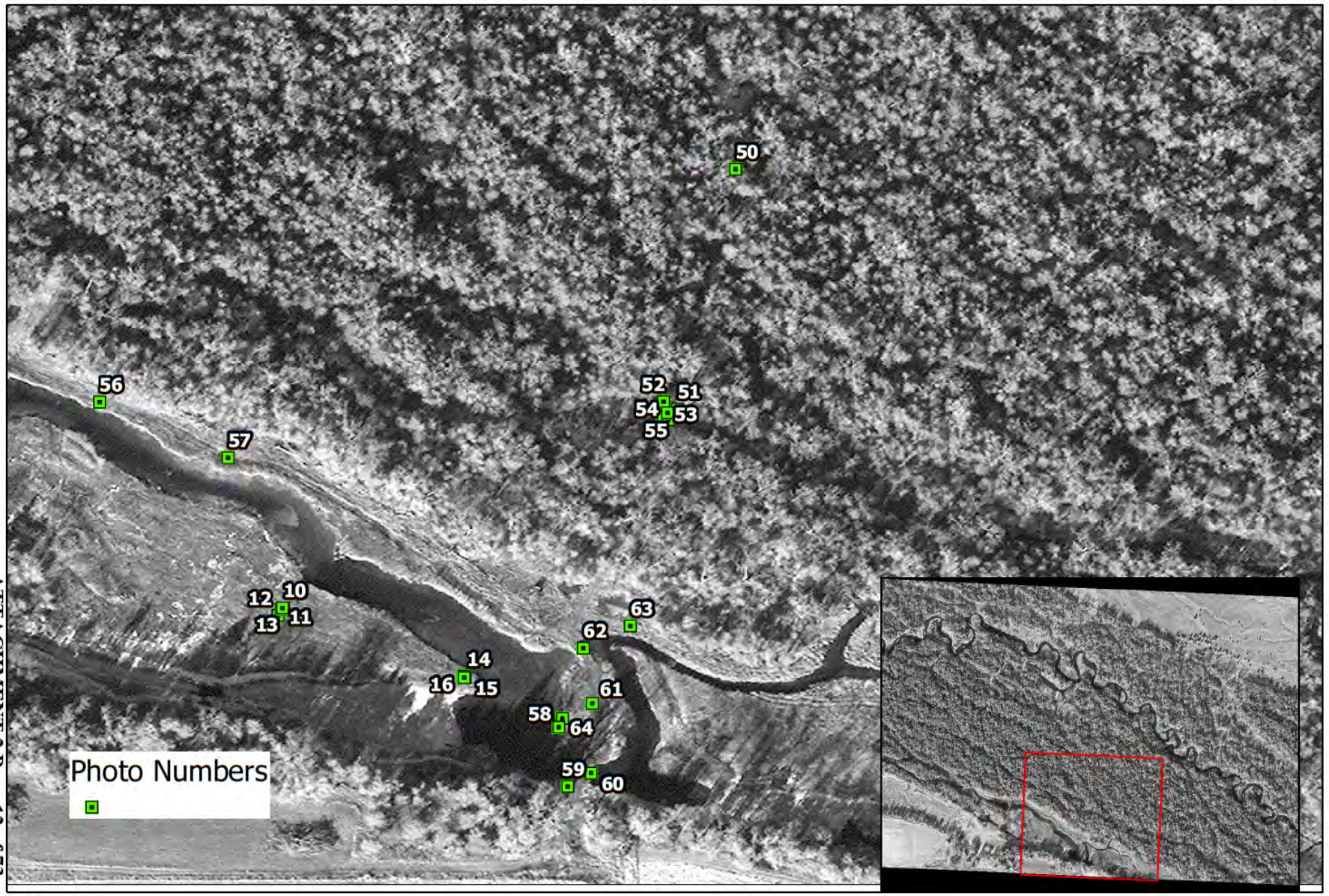


Photo 1

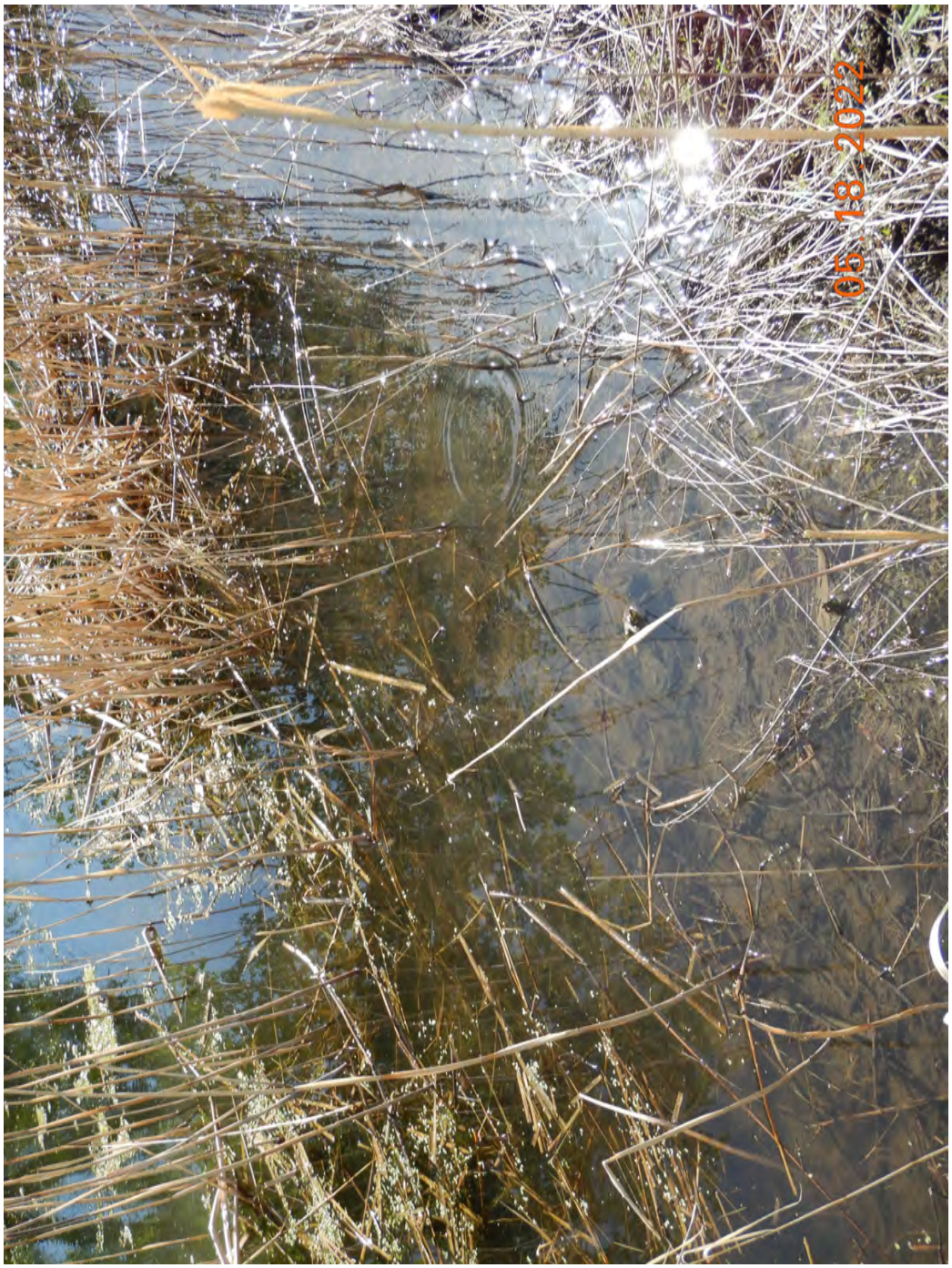


Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photo 20

Photo 21

Photo 22

Photo 23

Photo 24

Photo 25

Photo 26

Photo 27

Photo 28

Photo 29

Photo 30

Photo 31

Photo 32

Photo 33

Photo 34

Photo 35

Photo 36

Photo 37

Photo 38

Photo 39

Photo 40

Photo 43

Photo 44

Photo 45

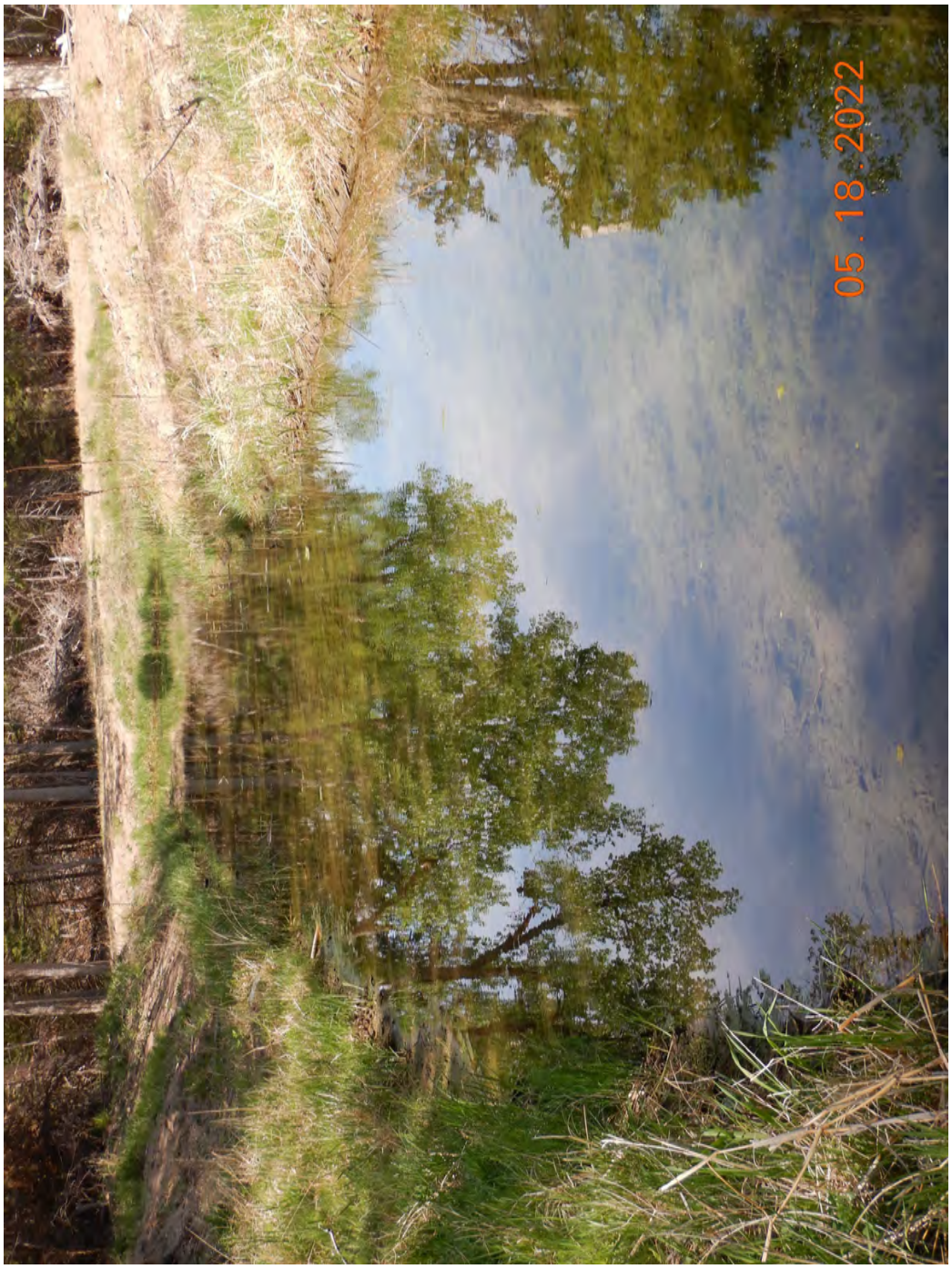


Photo 46

Photo 47

Photo 49

Photo 50

Photo 51

Photo 52

Photo 53

Photo 54

Photo 55

Photo 56

Photo 57

Photo 58

Photo 59

Photo 60

Photo 61

Photo 62

Photo 63

Photo 64

Area	Impact Description	Acres
A1	Tree pile, note this is the same as tree pile noted by number 1	0.044
A2	Berm formed from sidecast excavated material	0.181
A3	Crossing	0.013
A4	Crossing	0.018
A5	Berm formed from sidecast excavated material	0.739
A6	Berm formed from sidecast excavated material and crossing	0.194
A7	Crossing	0.003
A8	Crossing	0.023
A9	Piled sidecast material and clearing	0.626
A10	Crossing	0.002
A11	Crossing	0.005
A12	Berm formed from sidecast excavated material and crossing	1.088
A13	Fill material from clearing	2.528
1	Tree pile- see A1	
5	Tree pile 30 x 20 feet	0.014
6	Tree pile 30 x 20 feet	0.014
8	Tree pile 20 x 30 feet	0.014
9	Tree pile 30 x 30 feet	0.021
10	Tree pile 30 x 20 feet	0.014
11	Tree pile 30 x 15 feet	0.01
12	Tree pile 40 x 20 feet	0.018
13	Tree pile 60 x 30 feet	0.041
14	Tree pile 60 x 20 feet	0.028
17	Tree pile 30 x 20 feet	0.014
18	8 tree piles 30 x 20 feet each	0.112
19	Tree pile 30 x 20 feet	0.014
20	Tree pile 15 x 30 feet	0.01
Total Acres		**5.788**
Wetland Acres		**5.697**
Stream Acres		**0.091**
Linear Feet Stream		**240**

Site Name	Villegas	Start Date	May 18, 2022
		End Date	May 18, 2022

Environmental Conditions (e.g., wind, rain, smoke, dust, temperature, snow)

Upon our arrival it was sunny with clear skies and the temperature was approximately 66 degrees Fahrenheit.

Field Work Conducted

Once we confirmed that we could proceed with our inspection we headed towards the stream crossings on the southwest area of the site. We stopped to take our first soil core sample(GPS 1) in an area south of the southern stream channels (GPS Locations Map in Attachment 1). We utilized the Munsell Soil-Color Charts to characterize colors of the soil profile and confirmed the presence of hydric soils. A tree pile was located just north of the first soil sample location (area A1 and tree location 1), it was approximately 0.044 acres (see Impact Map in Attachment 1). I then proceeded to walk around the perimeter of a berm (area A2) to measure its size (Photo 3 in Attachment 2). Located just northeast of that berm was the first stream crossing (A3) we came upon (Photo 5 in Attachment 2). Just southwest of that crossing we came upon a second crossing (A4) which I photographed (Photo 7 Attachment 2). That crossing is difficult to make out on the photograph due to vegetation overgrowth but it is clearly visible on aerial maps. I did observe fish within the stream channel on the east side of this crossing (stream channel in Photo 8 in Attachment 2). Mr. Simmons informed me that they were mosquitofish (*Gambusia affinis*). We also saw white tailed deer (*Odocoileus virginianus*) in the area.

After documenting the A4 crossings we walked back to crossing A3 and walked around the elevated area formed by sidecasted sediment from the stream channel excavation (Area A5 in Impact Map in Attachment 1). We walked around and made observations of an area that had been cleared of vegetation, of the elevated area, and of the excavated stream channel (Photos 10-12 in Attachment 2). From the eastern edge of the wetland we could see stream crossing 3 (captured within A12) and the waterfowl blind that was placed in it (see Photos 14-16 in Attachment 2). As we made our way back towards stream crossing A3 I stopped to document the silt and algae present within the southern stream channel (Photos 17-18 in Attachment 2).

Just north of the A3 crossing we took another soil core sample (Photo 20 Attachment 2, GPS number 3 in GPS Locations map in Attachment 1). The area was dominated by green ash trees (*Fraxinus pennsylvanica*) , cottonwood trees (*Populus deltoides*) and willows (*Salix sp.*). We confirmed that the soil in this area was also hydric. From there we continued walking north and stopped to document the stream crossing number 2 (captured within area A6) (Photo 22 in Attachment 2), and another tree pile (Photo 21 in Attachment 2).

We continued walking in a northwestern direction along the cleared path/road and stopped to document multiple tree piles (locations of all tree piles are documented in the Impact Map of Attachment 1). A third soil sample core was taken along this path (GPS number 7 in GPS Locations Map in Attachment 1, Photo 27 in Attachment 2). We confirmed that the soil was hydric. As we continued our walk towards the northern boundary of the property we documented two additional stream crossings (A7 and A8). Just south of the A8 crossing we took a soil core sample and confirmed presence of hydric soils (Photo 37 Attachment 2, and GPS number 14 in GPS Locations Map in Attachment 1).

Once we reached the northern boundary of the property we took a soil core sample just west of the excavated channels and the cleared area (Photo 39 Attachment 2, GPS number 15 in GPS Locations Map in Attachment 1). The soil was confirmed to be hydric at this location. The area here had been planted with fescue.

We then proceeded to walk around the area which had been cleared of vegetation and upon which excavated material was deposited as the channels/ponds were excavated (A9). The culvert that connected the excavated area with the Platte River was located below a fenced line (see Photos 43-45 in Attachment 2). I also documented many piles of trees in the vicinity of this area (see Impact Map in Attachment 1).

Once we had completed our observations in the area, we headed south along the cleared path/road. We came across two additional road crossings A10 and A11 (Photos 50 and 53 in Attachment 2). We also came across an an area (Photo 52 Attachment 2, GPS

Site Name	Villegas	Start Date	May 18, 2022
		End Date	May 18, 2022

number 20 in GPS Locations Map in Attachment 1) which had been excavated and was located between the A10 and A11 stream crossings. It appeared as though it had served as a borrow area for the material that was utilized for one of those crossings.

We continued walking south and stopped once we reached the northern stream channel on the south side of the site. I saw and heard Red-winged blackbirds (*Agelaius phoeniceus*) in this area, and saw Asian carp (*Cyprinus carpio*) within the channel . I also saw a considerable amount of silt deposits in the excavated and expanded stream channel (Photo 56 in Attachment 2). A large area has been cleared of vegetation and graded (A13). I walked around both stream crossings (crossings 3 and 4) and the berm that was created just north of the excavated channel (all combined counted as A12). A waterfowl hunting blind was placed in between those two stream crossings (Photo 57 in Attachment 2). A considerable amount of erosion had occurred between the two culverts in crossing 3 (Photos 58 and 64 in Attachment 2). I also noticed that additional fill material had been placed on the north side of the excavated channels in this area but it was not as extensive (see Photo 63 in Attachment 2). As we walked across the two stream crossings we noticed a large area just south of the crossings that might have served as a borrow area for the fill material utilized in the crossings (Photo 59 in Attachment 2)

Closing Conference

Documents Received and/or Requested During the Inspection

N/A

Compliance Assistance Provided (If any)

N/A

Observations Relayed to Site Owner/Operator

N/A

Actions Taken by Owner/Operator During the Inspection (If any)

N/A

Potential Issues of Concern Including Regulatory Citations

Section 301(a) of the CWA, 33 U.S.C. 1311(a), prohibits the discharge of pollutants except in compliance with, inter alia, Section 404 of the CWA, 33 U.S.C. 1344. Section 404 of the CWA, 33 U.S.C. 1344, specifically requires a person to obtain a permit from the Secretary of the Army acting through the Chief of Engineers, commonly referred to as the United States Army Corps of Engineers, for any discharge of "dredged or fill material" into the "navigable waters" of the United States. The Villegas did not apply for or receive a Section 404 permit prior to the placement of fill within regulated waters. The discharge of fill material into the wetlands, unnamed tributaries to the Platte River, and the Platte River was done without authorization.

Total minimum impacts are as follows (see Additional Notes Section below):

Wetland Acres: 5.697
Stream Acres: 0.091
Total Acres: 5.788
Linear Feet of Stream Impacted: 240

Clean Water Act Section 404: Site Visit/Case Development

United States Environmental Protection Agency

For inspections authorized pursuant to Clean Water Act sections 308 and 404 (33 U.S.C. §§ 1318 and 1344)

Site Name	Villegas	Start Date	May 18, 2022
		End Date	May 18, 2022

See Attachment 3 for a detailed description of impacted areas.

Attachments*

☒ Maps and Sketches

☒ Photographs (including location) and Photo Log

☒ Other (SSIP, Wetlands Delineation Forms, etc.)

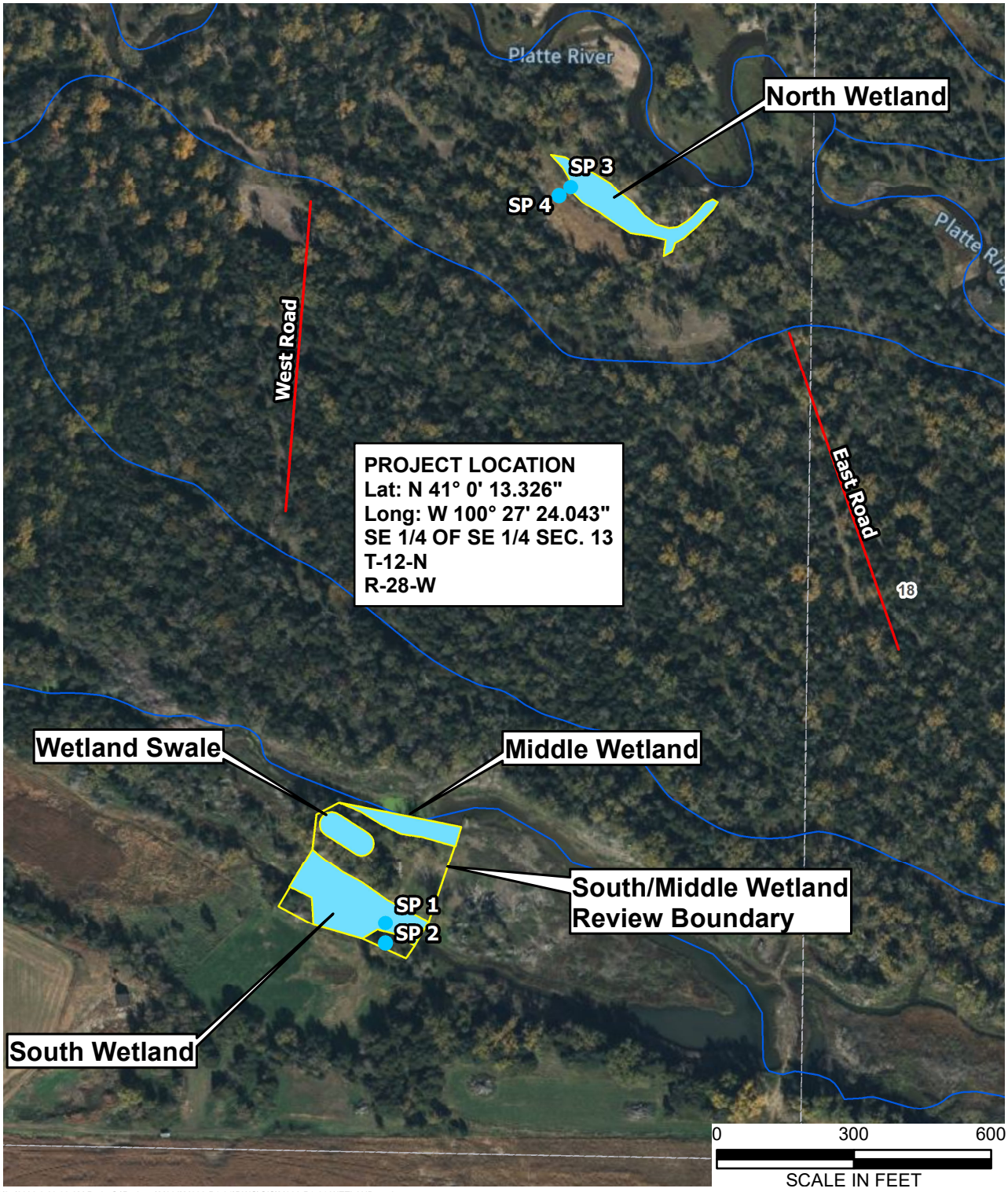
Attachment 1: Maps (6 pages)
Attachment 2: May 18, 2022 Photo Log and Photographs (73 pages)
Attachment 3: Impact Description Table (1 page)

Additional Notes

Impact calculations were estimated through a combination of on the ground measurements and aerial imagery interpretation. On the ground measurements were conservative given that due to the terrain I stayed approximately 1-2 feet away from the stream or excavated channels for safety purposes. There were also multiple smaller piles of trees located throughout the area that were not included in the impact calculations but are unauthorized fill material. There were also areas in which fill material had been placed, but it was spread and the elevation differences were not as obvious.

R 28 W

T 12 N



9/27/2022 9:23:08 AM Path: O:\Projects\M306\M306-P1-01\DWG\GIS\M306-P1-01 WETLAND.mxd

9/27/2022

Prepared By:

MILCO
Environmental Services, Inc.
1111 Central Avenue
Kearney, NE 68847
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Fax: 308-234-1146
Email: info@milcoinc.com

N
W E
S

LEGEND

- Sample Location
- Wetland Delineation

Note:

1. Aerial Photography acquired from: ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP

Tom Villegas
Wetland Delineation

Project M306-P1-01
Lincoln County, Nebraska

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Tom Villegas Wetland Delineation City/County: Brady/Lincoln Sampling Date: 9/2/22

Applicant/Owner: Tom Villegas State: NE Sampling Point: 1

Investigator(s): Keith Tillotson, Eric Paulicek Section, Township, Range: Section 13, T12N, R28W

Landform (hillslope, terrace, etc.): wetland bed Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR): H Lat: 41.035533 Long: 100.456284 Datum: WGS 84

Soil Map Unit Name: Fluvaquents, frequently flooded (9900) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: South tract severe Drought (D2). Palustrine, Emergent, Semipermanently Flooded wetland (PEMF) (Cowardin classification). Floodplain Depression (Nebraska wetland Subclass). Excavated linear wetland resulting in increased surface water depth and soil mounds within wetlands.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Typha spp.	60	✓	OBL
2. Cyperus spp.	2		FACW
3. Echinochloa crus-galli	9		FAC
4. Bidens cernua	5		OBL
5. Sagittaria spp.	1		OBL
6.			
7.			
8.			
9.			
10.			
	69 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 31

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Photo 1 N

SOIL

Sampling Point: /

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks: No pit dug due to saturation to surface. Soils assumed hydric based on dominance of hydrophytic species and wetland hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No _____ Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Tom Villegas Wetland Delineation City/County: Brady/Lincoln Sampling Date: 9/2/22

Applicant/Owner: Tom Villegas State: NE Sampling Point: 2

Investigator(s): KT, EP Section, Township, Range: Section 13, T12N, R28W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 0-3

Subregion (LRR): H Lat: 41.003412 Long: 100.456282 Datum: WGS84

Soil Map Unit Name: Fluvaquents, frequently flooded (9900) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks: South tract. Severe drought (D2). Upland outpoint to SP 1.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juniperus virginiana	50	✓	UPL
2. Populus deltoides	25	✓	FAC
3. Ulmus americana	20		FAC
4. Ulmus rubra	20		FACU
	115	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. Bromus inermis	5		UPL
2. Carex spp.	80	✓	FACW
3. Poa pratensis	5		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 10

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species 80	x 2 =	160
FAC species 45	x 3 =	135
FACU species 25	x 4 =	100
UPL species 55	x 5 =	275
Column Totals: 205 (A)		670 (B)

Prevalence Index = B/A = 3.27

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: Photo 2-NE. Tree canopies overlap. Carex couldn't be identified to species due to absence of seeds. The indicator status of FACW is based on best professional judgment.

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks: No pit dug. Soils assumed hydric based on dominance of non-hydrophytic species and landscape position.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Tom Villegas Wetland Delineation City/County: Brady/Lincoln Sampling Date: 9/2/22

Applicant/Owner: Tom Villegas State: NE Sampling Point: 3

Investigator(s): KT, EP Section, Township, Range: Section 13, T12N, R28W

Landform (hillslope, terrace, etc.): wetland edge Local relief (concave, convex, none): concave Slope (%): 0-3

Subregion (LRR): H Lat: 41.007972 Long: 100.454917 Datum: WGS 84

Soil Map Unit Name: Gothenburg soils, frequently flooded (8495) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✓

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks: Severe Drought (D2). Excavated pond. Palustrine, Emergent, Semipermanently flooded (PEMF). Floodplain depression. Pond is linear and excavation appears to approximately follow a relict river channel.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 25'x3')			
1. Eleocharis erythropoda	50	✓	OBL
2. Carex spp.	20	✓	OBL
3. Typha spp.	1		OBL
4. Ambrosia artemisiifolia	1		FACU
5. Triglochin maritima	1		OBL
6. Polypogon monspeliensis	2		FACW
7. Cirsus americana	1		OBL
8. Eleocharis spp.	1		OBL
9. Taberndemontani			
10.			
	77 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 23

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: Photo 3 NW

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2	10YR4/2	100					medium sand	
2-5	10YR4/1	100					medium sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks: Too saturated to color below 5".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 7

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Tom Villegas Wetland Delineation City/County: Brady / Lincoln Sampling Date: 9/12/22

Applicant/Owner: Tom Villegas State: NE Sampling Point: 4

Investigator(s): KT, EP Section, Township, Range: Section 13, T12N, R28W

Landform (hillslope, terrace, etc.): pond slope Local relief (concave, convex, none): Convex Slope (%): 0-5

Subregion (LRR): H Lat: 41-00-28.5 Long: 100-27-18.0 Datum: WGS 84

Soil Map Unit Name: Gothenburg soils, frequently flooded (8495) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✓ (If no, explain in Remarks.)

Are Vegetation ✓, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✓

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks: Outpoint to SP 3 Severe Drought (D2), Mature cottonwood, red cedar forest has been removed and replaced with herbaceous species.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Conyza canadensis	1		UPL
2. Hesperostipa spp.	50	✓	UPL
3. Sirsium arvense	20	✓	FACU
4. Panicum capillare	25	✓	FAC
5. Setaria viridis	1		UPL
6.			
7.			
8.			
9.			
10.			
	97 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 3

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: Photo 4 N. Hesperostipa spp. identified with some uncertainty due to lack of seed heads which are typically present at this time of year. The area was formerly dominated by eastern red cedar (UPL) and cottonwood (FAC) and would also result in "no hydrophytic vegetation present".

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR F)**
- ___ 1 cm Muck (A9) **(LRR F, G, H)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR I, J)**
- ___ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ___ Dark Surface (S7) **(LRR G)**
- ___ High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks: No pit dug, Soils assumed non-hydric based on a dominance of non-hydrophytic species and landscape position.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

	
Photo 1: SP-1, indicated by spade, viewing north.	Photo 2: SP-2, indicated by spade, viewing northeast.
	
Photo 3: SP-3, indicated by spade, viewing northwest.	Photo 4: SP-4, indicated by spade, viewing north.

NATURAL RESOURCES CONSERVATION SERVICE

HERBACEOUS VEGETATION ESTABLISHMENT GUIDANCE DOCUMENT 2020

This guidance pertains to the following Nebraska FOTG Practice Standards:

322 – Channel Bank Vegetation*****
327 – Conservation Cover
332 – Contour Buffer Strips
342 – Critical Area Planting*
589C – Cross Wind Trap Strips
647 – Early Successional Habitat Development/Mgt
386 – Field Border
393 – Filter Strip
394 – Fire Break
412 – Grassed Waterway*
603 – Herbaceous Wind Barriers
582 – Open Channel
512 – Pasture and Hay Planting
550 – Range Planting
643 – Restoration and Management of Declining Habitats
391 – Riparian Forest Buffer (low maintenance seedings)
390 – Riparian Herbaceous Cover
580 – Streambank and Shoreline Protection
395 – Stream Habitat Improvement and Management
612 – Tree/Shrub Establishment (low maintenance seedings)
645 – Upland Wildlife Habitat Management
635 – Wastewater Treatment Strip
658 – Wetland Creation
659 – Wetland Enhancement
644 – Wetland Wildlife Habitat Management
380 – Windbreak/Shelterbelt Establishment (low maintenance seedings)

*Critical area plantings for grassed waterways, channel bank vegetation, structures, and other critical areas subject to erosion have additional requirements such as mulching or other erosion control measures (refer to 342 NE GD Critical Area Planting Guidance Document). There may also be allowances for seeding outside of the normal seeding date when it is not practical to seed at the preferred time. Refer to Mulching Section 7 and Seeding Dates Section 9 for details.

Contents of Herbaceous Vegetation Design Procedures:

1. Grass Seeding Specifications

a). 000 NE IR Herbaceous Vegetation Seeding Design Worksheet (NE-CPA-8) will be completed in its entirety as follows:

- Details of seedbed preparation, weed control, grass seeding equipment and a map or sketch of the area to be seeded must be completed for every job. Cover crop establishment, mulching and fertilizer sections must be completed when appropriate as described in this document.
- Additional Specifications
    1. When chemical weed control is recommended, product labels, pages from the current University of Nebraska-Lincoln Extension, Guide to Weed, Disease, and Insect Management in Nebraska or guidance from chemical companies will be attached to the grass seeding job sheet as appropriate.
    2. Detailed step by step procedures will be provided for complicated grass seeding jobs such as chemically killed sod for items such as residue management, growth stage, herbicide timing/rate, and other details.
    3. All other items in this design guide (Sections 2-18) will be addressed as appropriate and detailed and attached to seeding implementation requirements provided to the client (Copies of this document or sections of it may be provided as needed).

- "Practice Certification" must be completed and signed by the client. Specific performance items and/or components listed in the practice certification section should be documented as completed with specific components, acres and completion dates listed.
- Page 2 (and 3 if needed) of the Herbaceous Vegetation Seeding Design Worksheet (NE-CPA-8) must be completed in its entirety including the list of grasses and varieties and certification status, the list of fobs and scientific names, pls pounds/acre needed, and total PLS required. The seed dealer will provide documentation for seed provided: variety (grasses), purity and germination of the seed, seedlot number, bulk pounds sold, and county/state of origin.
- Refer FOTG Section II, Statewide Soil and Site Interpretations, Pastureland and Hayland Interpretations, "Grass and Forb Seed Source Requirements" and Section 12 of this document "Pure Live Seed Calculations" for more detailed guidance on completing the grass seeding job sheet.

2. Soil Fertility and pH (at seeding time)

a. General Requirements

- Soil test prior to planting following University of Nebraska procedures for the number of samples, depth and other requirements.
- If Soil tests results for pH, alkalinity, and salinity cannot be adjusted with amendments adequately, species/varieties adapted to these conditions will be adjusted appropriately.

b. Grasses

- Nitrogen fertilizer is not recommended at planting time, because of the increased potential for weed competition.
- If soil tests are low or very low for nutrients other than nitrogen, nutrients broadcasted prior to seeding or band-applied by the drill at planting may be beneficial to seedlings.
- Follow University of Nebraska-Lincoln Extension recommendations as listed in Certified Perennial Grass Varieties Recommended for Nebraska (EC120). This publication can be found at: https://extensionpubs.unl.edu/. Search for "perennial grasses" or "EC120".

c. Legumes

- Lime is the most important soil amendment for legumes, especially if pH of the surface is below 6.2.
- When phosphorus levels are low or very low (15 ppm or less for Bray P1 or Melich tests, and 10 ppm or less for Olsen-P test), P broadcasted prior to grass seeding, or band-applied by the grass drill at planting will be beneficial to seedling vigor.
- Zinc/Sulfur fertilizer may benefit legumes on eroded sites, sandy sites and when soil organic matter is less than 1 percent.
- Follow University of Nebraska-Lincoln Extension recommendations which can be found at https://extensionpubs.unl.edu/. Search for "legume establishment' at the Publications home page.

3. Existing Cover Conditions (acceptable cover conditions at planting time)

a. Row Crop Stubble

- Weed free row crop stubble such as corn, sorghum, soybean crop or summer annual forage stubble are the best cover type to seed into.
    1. Low residue crops such as soybeans, corn silage, edible beans, sunflowers, must provide adequate cover to protect the seedlings and to protect soil from wind and water erosion or a cover crop will be planted.
    2. Residue must be evenly spread and not be in windrows.
    3. Burn down herbicides will be used prior, or immediately after planting if significant weed pressure or volunteer crop is present (refer to weed control section).

b. Chemically Killed Sod (pasture/hayland renovations)

- Sod must be killed the season prior to planting grasses.
- Appropriate residue management, re-growth of grasses (growth stage), active ingredient(s), timing and rate of herbicide application
    1. Refer to the herbicide label and current guide for weed management for guidelines on the correct growth stage, number of treatments, herbicides/additives, rate, timing, method of application and other details.
    2. Sod should be hayed, and adequate re-growth allowed prior to spraying.
    3. Refer to Section 5 “Seedbed Preparation” for more guidelines on residue management necessary prior to seeding.
- Sod must be monitored to ensure it has been killed prior to planting grasses and additional treatments applied as necessary prior to emergence of planted grasses.
- Planting Roundup Ready Crops or a summer annual cover crop into chemically killed sod the season prior to planting grass is recommended over seeding grass directly into sod. Planting Roundup Ready Crops allows for multiple treatments of grass sod with Roundup to ensure that sod is effectively killed.
    1. For guidelines on renovating pastures with Glyphosate Tolerant Soybeans, refer to Nebraska Range and Pasture Technical Note 14.
- If desirable grass species are present, burn down herbicides must be applied when desirable grasses are dormant and undesirable grasses are actively growing.
    1. For warm season grasses this is typically in the spring of the year or in the fall if grasses are dormant and undesirable grasses (i.e. bromegrass, bluegrass) are actively growing.
    2. Contact your local or state specialist or chemical company representative for specific guidelines to avoid killing desirable species.

c. Small Grain Stubble

- Allelopathic effects from small grain stubble phytotoxins may be present in small grain fields.
    1. Phytotoxins from mature small grain are more of a problem in Western Nebraska as rainfall decreases, and during drought years, but are less of a problem when fields are irrigated or in above normal rainfall years.

2. Rye stubble contains phytotoxins (benzoxazinones) and wheat stubble contains phytotoxins (dimzboa) that can potentially cause problems with grass establishment. Oats exhibits the least amount of allelopathic effect of the small grains.

3. When forage is the primary purpose for seeding use the following guidance;

   (a) A summer annual cover crop shall be planted on all dryland fields in Vegetative Zones I, II and III.

   (b) A cover crop is recommended, but not required for the following:

      (i) If small grain stubble is removed and weeds are killed with a burn down herbicide on dryland fields in Vegetative Zone IV or irrigated small grain fields across the state.

4. When wildlife is the primary purpose (early successional habitat) use the following guidance:

   (a) A cover crop is recommended but not required when small grain stubble is baled off, and a burn down herbicide is utilized to eliminate all weeds and unwanted vegetation (all Vegetative Zones).

   (b) By not planting a cover crop, the client should agree and understand that it will take several years longer for herbaceous cover to establish.

4. Seedbed Preparation

a. Weed Control (prior to or at planting time)

- The presence or absence of weed populations, especially noxious weeds, will impact the success of grass establishment. Seeding on fields with significant weed populations will be delayed until weeds are controlled.
- Each field shall be evaluated for weed pressure prior to planting and during the growing season prior to planting. If weeds are present, they shall be controlled prior to seeding by utilizing an appropriate burn down herbicide.
- If excessive weed pressure is expected to occur after planting grass, a cover crop will be planted, or an appropriate pre-emergent and/or post emergent herbicide applied. Refer to the current year “Guide to Weed, Disease, and Insect Management in Nebraska, EC130” which can be found at: https://extensionpubs.unl.edu/. From this page search for: "EC130”.

b. Herbicide Carryover

- When planning a seeding, the previous two years of herbicide application should be considered. Any potential carryover problems should be addressed by delaying seeding, establishing a cover crop, and/or changing species to be planted.
- Refer to product labels for guidance on how long to wait before planting grasses or legumes; or do a field bioassay. Field bioassays can also be done by collecting a representative soil samples from the soil surface layer, which is likely to contain herbicides, then planting grasses/legumes into flowerpots and allowing adequate time after germination to ensure the seedlings are not damaged from herbicide carryover. Legumes are especially vulnerable to herbicide carryover.

c. Seedbed Preparation Methods

- No-Till Seedbeds

1. Seed directly into existing cover (i.e. crop stubble, chemically killed sod)

- Weeds or volunteer crops that are present will be controlled with burn down herbicide(s) in accordance with product label directions and current recommendations from "Guide to Weed, Disease, and Insect Management in Nebraska, EC130" which can be found at: https://extensionpubs.unl.edu/. From this page search for: "EC130".

1. Excessive residue will be removed using one or more of the following methods if grass seeding equipment that can properly place seed is not available.

(a) Prescribed burning can be used to reduce excessive plant residue that may inhibit drilling. If used in conjunction with burndown herbicides, timing of the burn is critical to allow for adequate re-growth of vegetation to adequately kill sod. Refer to the Prescribed Burning Standard and Specification (338) for further guidance.

(b) Mechanical removal (i.e. haying) of vegetation may be needed if residue is excessive (refer to cover crop 340 standard and Section 5 Summer Annual Cover Crops for guidance on ideal cover crop heights for irrigated and dryland plantings).

- Tilled Seedbed Methods

1. Guidelines

(a) **Tillage should be limited to light tillage and not be used unless absolutely necessary**. Examples are as follows:

(i) To level ridges in row crop fields that are too rough and cause problems with a light tillage operation.

(ii) Seeding equipment will not work with heavy residue

(iii) On non-erodible soils where irrigated grass/legumes are going to be planted under irrigation by center pivot.

(b) Tillage must be timed to achieve desired weed control, moisture conservation, and leave adequate residue on the soil surface for erosion control.

(c) Tillage methods that leave a fluffy seedbed will require firming with a roller or other packing method. A firm seedbed will ensure that the seed will contact soil moisture uniformly, facilitates seeding emergence, and provides a medium that does not restrict or allow roots to become dry. **Seedbeds shall be firm enough so that footprints are hardly visible**.

5. Summer Annual Cover Crops

a. A summer annual cover crop can be planted during the growing season prior to seeding grasses to provide cover to reduce evaporation, maintain cool soil temperatures, smother or reduce weeds, trap snow, protect seedlings from extreme climatic conditions and/or control wind and water erosion.

b. When planting a cover crop refer to the Cover Crop Standard and Specification (340) for further guidance and seeding rates. Other requirements are as follows:

- Plant a summer annual cover crop from one of the following: grain sorghum, sudangrass, sorghum-sudan, forage sorghum, millet, or cane.

- Ideal cover crop height is 12-18” for dryland plantings and a 3” cover crop height for irrigated pasture plantings.
    1. Taller cover crops such as sudangrass, sorghum sudan or cane will need to be harvested to achieve these heights.
        (a) Re-growth will need to be accounted for to achieve desired heights
        (b) If taller cover crops cannot be harvested utilize a shorter cover crop such as grain sorghum or pearl millet.
- If volunteer crops are a concern (i.e. sorghum), plant early enough in the summer to allow for adequate growth, but late enough to ensure that viable seed does not mature. Utilize one or more of the following strategies:
    1. Select late maturing varieties
    2. Utilize varieties that produce sterile seed
    3. Plant after July 1, but prior to August 1.
    4. Clip or harvest the crop prior to seed maturing
    5. Spray the crop with a burn down herbicide prior to seed maturing
- Small grain cover crops will not be used (i.e. oats, wheat, triticale, barley, rye).

6. Companion Crops

a. A companion cover crop of oats may be planted along with cool season grasses/legume plantings in the spring, or with spring, fall irrigated cool season grass/legume or for critical area plantings when additional erosion control is necessary.

b. If used, oats will be harvested and removed prior to maturity. Companion crops compete with seedlings for light, moisture, and soil nutrients.

c. Companion crops are not recommended with warm season grass plantings.

d. Perennial ryegrass “Linn” Variety may be used as a companion crop for critical area plantings when additional erosion control is needed in lieu of oats.

7. Mulching

a. Mulching is required on all grassed waterways, channel banks, and other concentrated flow areas that do not have other appropriate erosion control measures (side dikes, cover crops, companion crops, or other approved erosion control measures).

b. Mulching, cover crops, companion crops, or a combination of these is required on structures subject to erosion when cover is not likely to establish fast enough to control erosion.

c. Mulching shall be placed immediately after seeding according to guidance in the Mulching 484 Practice Standard.

8. Species/Variety Selection

a. Refer to the appropriate FOTG practice standard for guidance on species selection.

b. Refer to Ecological Site Description or Forage Suitability Groups as appropriate and 550-Range Planting and 512-Forage and Biomass Planting Guidance Documents.

- Refer to Section II of the FOTG for guidance on soil and site limitations on species selection.

- Refer to Certified Perennial Grass Varieties Recommended for Nebraska (EC120) for appropriate varieties. This publication can be found at: https://extensionpubs.unl.edu/. Search for "perennial grasses" or "EC120".

c. Refer to Section 12 "Pure Live Seed Calculations" Table 2 for species, pure live seeding rates and MLRA adaptation.

- Table 2-Pure Live Seeding Rates and MLRA Adaptability provides a list of potential species to select from in addition to those found in the FOTG practice standard.
- Species selected from Table 2 must meet the requirements of the applicable FOTG practice standard.

9. Seeding Dates:

a. Seeding dates are based on climatic records, research, and experience; they represent optimum periods for grass and legume establishment. These dates should provide for adequate development of adventitious roots prior to stressful periods, such as hot, dry summers and cold, open winters. The following table shows recommended seeding dates. Seeding dates may be adjusted up to1 week after these planting dates when soil moisture and climatic conditions are favorable.

Season of Planting	Vegetative Zones	[1]Seeding Dates
Cool Season Grasses and Legumes (Irrigated or dryland)		
Optimum Seeding Time (Fall is best if summer annual weed pressure is expected)	ALL	August 20-September 1 or March 1 – April 15
Late Fall (Dormant) – Early Spring Soil temperatures below 50° F		Dryland: November 15 – April 30 Irrigated: November 15 – May 15
Early Fall	I, II	August 1 – September 15
	III, IV	August 10 – September 30
Predominately Warm Season Grasses and Forbs		
Optimum Seeding Time	ALL	April 1 – May 20
Late Fall– Early Spring (Dormant Seeding – soil temp <50° F)		November 1 – May 31
Warm-Cool Season Mix or Warm Season-Legume Mix		
Optimum Seeding Time	ALL	March 1 – May 10
Late Fall (Dormant) –Spring (Dormant Seeding – soil temp <50° F)		November 15 – May 15

[1]Critical area plantings on structures may not be possible during the appropriate seeding date range. In most cases seeding will need to occur immediately after construction is completed. Critical area plantings in concentrated
flow areas such as grassed waterways and channel bank vegetation seedings shall be done no more than two weeks outside of the timeframes listed above.

10. Seed Requirements:

a. All seed must meet all federal seed laws and the requirements of Nebraska State Seed Laws and Regulations. Information on State seed law is available on-line at the Nebraska Department of Agriculture state program webpage.

b. All seed must meet requirements from the FOTG Section II – Pastureland and Hayland Interpretations "Grass and Forb Seed Source Requirements". This includes but is not limited to purity and germination tests by a certified seed lab, mileage and other requirements for uncertified seed, grass variety restrictions and other items listed.

c. Use certified seed when available. If certified varieties of perennial grasses are not available, it is permissible to use common/native ecotype seed originating from the same general locality of the planting site. Refer to Certified Perennial Grass Varieties Recommended for Nebraska (EC120). This publication can be found at: https://extensionpubs.unl.edu/. Search for "perennial grasses" or "EC120".

d. Legume seed shall be inoculated according to the directions on the inoculant's container just prior to seeding. Use the correct inoculant's (culture) for each legume species.

11. Seeding Rates

a. Seeding rates will vary depending on the purpose and seeding method according to guidance in the applicable conservation practice standard.

b. All seeding rates/mixtures will be based on pure live seed (PLS).

- PLS can be calculated from the information on the seed tag.
- PLS is derived by multiplying percent pure seed by percent germination (plus percent hard seed, if present) and dividing by 100.
- Refer to Section 12, "Pure Live Seed Calculations" for guidance.

c. A 5% tolerance in seeding rates is allowed.

12. Pure Live Seed Calculations:

a. SEED DISTRIBUTION

Most seeding rates are listed in pounds of pure live seed (PLS) per acre. The best method of determining PLS planted is to count the number of seeds per foot of drill row or per square foot while the machine is in operation. The formulas and examples for calculating pure live seed (PLS) seeding rates, total PLS per sq. ft., and PLS per sq. ft. for a given species are as follows:

$$\frac{\text{PLS per sq. ft.}}{\text{PLS per sq. ft. at 1 pound per acre}} = \text{Seeding rate in PLS lbs. per acre}$$

Example: Smooth bromegrass from Table 2

$$\frac{30 \text{ pls/ft}^2}{3.1 \text{ PLS seeds/ft}^2 \text{ at 1 lb./acre}} = 9.7 \text{ PLS lbs/acre}$$

$$\frac{\text{Seeds per lb.}}{43{,}560 \text{ sq. ft. per acre}} = \text{Seeds per sq. ft/PLS lb. of seed}$$

Example: Smooth bromegrass from Table 2

$$\frac{136{,}000 \text{ seeds/lb.}}{43{,}560 \text{ sq. ft/acre}} = 3.1 \text{ PLS seeds per sq. ft at 1 PLS lb./acre}$$

Table 1: Pure Live Seeds (PLS) per Foot of Row at Various Seeding Rates and Drill Row Spacing				
Drill Row Spacing:	6"	8"	10"	12"
20 PLS per square foot	10 seeds/ft	13 seeds/ft	17 seeds/ft	20 seeds/ft
30 PLS per square foot	15 seeds/ft	20 seeds/ft	25 seeds/ft	30 seeds/ft
60 PLS per square foot	30 seeds/ft	40 seeds/ft	50 seeds/ft	60 seeds/ft

Table 2 Instructions

Table 2 data was developed with published information shown in the reference section. This data will be used to provide seeding specifications for all seeding practices. When a variety of plant materials are known to greatly differ from seeds per pound listed, the seeding rate can be recalculated. For example, debearded seed will have more seeds per pound than listed in Table 2. Many of the native forbs listed are not commercially available.

b. Customizing Seeding Mixtures

PLS seeding rates for mixtures can be developed for a specific seeding rate. Seeding rates will depend on an individual practice standard. For example: range plantings are seeded at a rate of 20 pls/ft^2, native forbs are typically added to native grass plantings at 2 pls/ft^2, dryland pasture plantings are 30 pls/ft^2,

Critical area plantings may be as high as 120 pls/ft^2. These seeding rates can be developed by multiplying the percentage desired (in decimals) times the seeding rate in lb./ac for each species in a mixture. Seeding rates for mixtures of native forbs should be calculated to the hundreds of lbs/ac, and grass and introduced forbs to tenths of lbs/ac.

An automated spreadsheet to customize seeding mixtures and determine seeding rate is included in Nebraska Herbaceous Perennial Seeding Design Worksheet which is located in Section IV the Nebraska field office technical guide.

Formula: Percentage (in decimals) X Seeding Rate (lb./ac from Table 2) = PLS lbs/ac of each species in mixture (refer to example below):

Example Seed Mixture Calculations

Range Seeding (20 pls/ft^2)			Pasture Seeding (30 pls/ft^2)			Native Forb Seeding (2 pls/ft^2)		
Big Bluestem	0.20 x 5.3	= 1.1 lb/ac	Smooth brome	0.4 x 9.6	= 3.8 lb/ac	American Vetch	0.25 x 3.56	= 0.89 lb/ac
Indiangrass	0.15 x 5.0	= 0.8 lb/ac	Orchardgrass	0.40 x 2.0	= 0.8 lb/ac	Illinois bundleflower	0.25 x 1.45	= 0.36 lb/ac
Little Bluestem	0.25 x 3.4	= 0.9 lb/ac	Alfalfa	0.2 x 6.5	= 1.3 lb/ac	Purple Cone Flower	0.25 x 0.75	= 0.18 lb/ac
Sideoats grama	0.20 x 4.6	=0.9 lb/ac				Roundhead lespedeza	0.25 x 0.58	= 0.15 lb/ac
Switchgrass	0.20 x 2.2	=0.4 lb/ac						

13: Table 2: Pure Live Seeding Rates and MLRA Adaptation

NATIVE GRASSES

Refer to UNL Cooperative Extension Circular "Certified Perennial Grass Varieties – Recommended for Nebraska" for appropriate varieties

Common Name	Scientific Name	Family	Seeds / PLS lb.	PLS / ft^2 at 1 lb/ac	Seed Source Information	Bloom Period	COC	MLRA Adaptability
Alkali Sacaton	*Sporobolus airoides*	Poaceae	1,750,000	40.17	USDA Plants		5	60A, 63B, 64, 67A, 72, 106
Bicknell's Sedge	*Carex bicknellii*	Cyperaceae	272,000	6.24	Prairie Moon Nursery		6	65, 71, 75, 102C, 106, 107B
Big Bluestem	*Andropogon gerardii*	Poaceae	144,240	3.31	USDA Plants		5	All
Blowout Grass	*Redfieldia flexuosa*	Poaceae					6	60A, 63B, 64, 65, 66, 67A, 72
Blue Grama	*Bouteloua gracilis*	Poaceae	724,400	16.63	USDA Plants		4	All
Bluebunch Wheatgrass	*Pseudoroegneria spicata*	Poaceae	125,680	2.89	USDA Plants		7	60A, 64, 67A
Bluejoint Reedgrass	*Calamagrostis canadensis*	Poaceae	3,837,472	88.10	USDA Plants		6	All
Bottle-brush Sedge	*Carex hystericina*	Cyperaceae	480,000	11.02	Prairie Moon Nursery		5	All
Buffalograss	*Bouteloua dactyloides*	Poaceae	50,000	1.15	USDA Plants		2	All, except not 65
Canada Wildrye	*Elymus canadensis*	Poaceae	115,000	2.64	Legacy from 550 DP		5	All (does not do well in 72, 73W)
Eastern Gamagrass	*Tripsacum dactyloides*	Poaceae	7,200	0.17	USDA Plants		7	73E, 75, 106, 102C, 107B
Fox Sedge	*Carex vulpinoidea*	Cyperaceae	1,297,000	29.78	USDA Plants		4	All, except not 60A, 64, 67A
Foxtail Barley	*Hordeum jubatum*	Poaceae	192,000	4.41	Prairie Moon Nursery		1	All
Green Needlegrass	*Nassella viridula*	Poaceae	167,840	3.85	USDA Plants		4	60A, 63B, 64, 65, 66, 67A, 72, 73
Hairy Grama	*Bouteloua hirsuta*	Poaceae	800,000	18.37	USDA Plants		6	All
Heavy Sedge	*Carex gravida*	Cyperaceae	192,000	4.41	Prairie Moon Nursery		4	All except not in 60A, 64, 65, 67A
Indian Ricegrass	*Achnatherum hymenoides*	Poaceae	161,920	3.72	USDA Plants		4	60A, 64, 65W, 67A, 72, 73W
Indiangrass	*Sorghastrum nutans*	Poaceae	174,720	4.01	USDA Plants		5	All
Inland Rush	*Juncus interior*	Juncaceae	44,800,000	1028.47	Prairie Moon Nursery		4	All
Junegrass	*Koeleria macrantha*	Poaceae	2,315,000	53.15	USDA Plants		6	All
Little Bluestem	*Schizachyrium scoparium*	Poaceae	240,670	5.53	USDA Plants		4	All
Needleandthread	*Hesperostipa comata*	Poaceae	115,000	2.64	USDA Plants		6	All except not 75, 106, 107B
Porcupinegrass	*Hesperostipa spartea*	Poaceae	150,000	3.44	USDA Plants		6	63B, 65, 66, 71, 75, 102C, 106, 107B
Prairie Cordgrass	*Spartina pectinata*	Poaceae	638,863	14.67	USDA Plants		5	All
Prairie Dropseed	*Sporobolus heterolepis*	Poaceae	1,200,000	27.55	USDA Plants		7	66, 75, 102C, 106, 107B

Prairie Sandreed	*Calamovilfa longifolia*	Poaceae	274,000	6.29	USDA Plants		5	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75
Purple Lovegrass	*Eragrostis spectabilis*	Poaceae	1,059,100	24.31	USDA Plants		3	65, 66, 71, 72, 73, 75, 102C, 106, 107B
Redtop (purple top)	*Tridens flavus*	Poaceae	7,200	0.17	USDA Plants		2	73, 75, 102C, 106, 107B
Rough (Tall) Dropseed	*Sporobolus compositus*	Poaceae	759,362	17.43	USDA Plants		3	All
Saltgrass	*Distichlis spicata*	Poaceae	519,000	11.91	USDA Plants		3	All
Sand Bluestem	*Andropogon hallii*	Poaceae	96,640	2.22	USDA Plants		5	All
Sand Bluestem (Champ)	*Andropogon hallii var. Champ*	Poaceae	165,000	3.79	Legacy from 550 DP		5	All
Sand Dropseed	*Sporobolus cryptandrus*	Poaceae	5,600,080	128.56	USDA Plants		2	All
Sand Lovegrass	*Eragrostis trichodes*	Poaceae	1,625,680	37.32	USDA Plants		5	All
Schweinitz's Flatsedge	*Cyperus schweinitzii*	Cyperaceae	368,000	8.45	IA NRCS seed calculator		4	All
Scribner Panicum (Rosettegrass)	*Dichanthelium oligosanthes var. scribnerianum*	Poaceae	144,000	3.31	Prairie Moon Nursery		4	All
Shortbeak Sedge	*Carex brevior*	Cyperaceae	464,000	10.65	Prairie Moon Nursery		4	All
Sideoats Grama	*Bouteloua curtipendula*	Poaceae	159,200	3.65	USDA Plants		5	All
Sixweeks-fescue	*Vulpia octoflora*	Poaceae	965,000	22.15	Granite Seed		3	All
Slender Wheatgrass	*Elymus trachycaulus*	Poaceae	135,000	3.10	USDA Plants		5	All
Switchgrass	*Panicum virgatum*	Poaceae	259,000	5.95	USDA Plants		4	All
Thickspike Wheatgrass	*Elymus lanceolatus*	Poaceae	153,000	3.51	USDA Plants		5	60A, 64, 65W, 67A, 72, 73W
Virginia Wildrye	*Elymus virginicus*	Poaceae	100,000	2.30	USDA Plants		4	63B, 65E, 66, 71, 73E, 75, 102C, 106, 107
Wedge Grass	*Sphenopholis obtusata*	Poaceae	200,000	4.59	USDA Plants		5	All
Western Wheatgrass	*Pascopyrum smithii*	Poaceae	113,840	2.61	USDA Plants		3	All
Yellow Sand Paspalum	*Paspalum setaceum*	Poaceae	705,304	16.19	USDA Plants		2	63B, 65, 66, 71, 72, 73, 75, 102C, 106, 107B
Yellowfruit Sedge	*Carex annectans*	Cyperaceae	1,440,000	33.06	Prairie Moon Nursery		7	65, 71, 75, 102C, 106, 107B

INTRODUCED COOL SEASON GRASSES Refer to UNL Cooperative Extension Circular "Certified Perennial Grass Varieties – Recommended for Nebraska" for appropriate varieties								
Common Name	**Scientific Name**	**Family**	**Seeds / PLS lb.**	**PLS / ft² at 1 lb/ac**	**Seed Source Information**	**Bloom Period**	**COC**	**MLRA Adaptability** **See Forage Suitability Groups for Appropriate Sites**
Creeping Foxtail	*Alopecurus arundinaceus*	Poaceae	784,064	18.00	USDA Plants			All
Crested Wheatgrass	*Agropyron cristatum*	Poaceae	311,200	7.14	USDA Plants			60A, 64, 65, 67A, 71, 72, 73, 75
Intermediate Wheatgrass	*Thinopyrum intermedium*	Poaceae	88,000	2.02	USDA Plants			All
Meadow Bromegrass	*Bromus biebersteinii*	Poaceae	86,875	1.99	USDA Plants			All
Orchardgrass	*Dactylis glomerata*	Poaceae	427,200	9.81	USDA Plants			All
Perennial Ryegrass	*Lolium perenne*	Poaceae	240,400	5.52	USDA Plants			Al
Pubescent Wheatgrass	*Thinopyrum intermedium spp barbulatum*	Poaceae	100,000	2.30	Granite Seed			All
Russian Wildrye	*Psathyrostachys juncea*	Poaceae	162,600	3.73	USDA Plants			60A, 63B, 64, 65, 66, 67A
Smooth Bromegrass	*Bromus inermis*	Poaceae	142,880	3.28	USDA Plants			All
Tall Fescue	*Schedonorus arundinaceus*	Poaceae	227,000	5.21	USDA Plants			All
Tall Wheatgrass	*Thinopyrum ponticum*	Poaceae	80,080	1.84	USDA Plants			All
Timothy	*Phelum pratense*	Poaceae	1,163,200	26.70	USDA Plants			
Wheatgrass hybrid	*Elymus hoffmannii var. Newhy*	Poaceae	134,000	3.08	PMC Tech Note			All

NATIVE FORBS AND SHRUBS								
Common Name	**Scientific Name**	**Family**	**Seeds / PLS lb.**	**PLS / ft² at 1 lb/ac**	**Seed Source Information**	**Bloom Period**	**COC**	**MLRA Adaptability**
Alleghney Monkey Flower	*Mimulus ringens*	Scrophulariaceae	36,800,000	844.81	Prairie Moon Nursery	Middle	6	63B, 65 66, 67A, 71, 73, 75, 102C, 106, 107B
American Germander	*Teucrium canadense*	Lamiaceae	320,000	7.35	Prairie Moon Nursery	Middle	4	All
American Vetch	*Vicia americana*	Fabaceae	32,833	0.75	USDA Plants	Early	6	All
Arkansas rose	*Rosa arkansana*	Rosaceae	40,000	0.92	Prairie Moon Nursery	Early	4	All
Aromatic Aster	*Symphyotrichum oblongifolium*	Asteraceae	816,000	18.73	Prairie Moon Nursery	Late	5	63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Arrow-leaf Aster	*Symphyotrichum cordifolium*	*Asteraceae*	2,000,000	45.91	USDA Plants	Late	5	107B
Azure Aster	*Symphyotrichum oolentangiense*	Asteraceae	1,280,000	29.38	Prairie Moon Nursery	Late	7	106, 107B
Blackeyed Susan	*Rudbeckia hirta*	Asteraceae	1,575,760	36.17	USDA Plants	Middle	4	All
Blanketflower	*Gaillardia aristata*	Asteraceae	186,436	4.28	USDA Plants	Early		60A, 63B, 64, 67A
Blue Flax	*Linum perenne*	Linaceae	293,000	6.73	Stock Seed	Early		60A, 63B, 64, 67A, 71, 75, 102C, 106
Blue Lobelia	Lobelia siphillitica	Campanulaceae	8,000,000	183.65	Prairie Moon Nursery	Late	6	63B, 65 66, 67A, 71, 73, 75, 102C, 106, 107B
Blue Sage	Salvia azurea var. grandiflora	Lamiaceae	300,000	6.89	USDA Plants	Middle	6	All
Blue Vervain	Verbena hastata	Verbenaceae	1488000	34.16	Prairie Moon Nursery	Middle	4	All
Boneset	Eupatorium perfoliatum	Asteraceae	2,560,000	58.77	Prairie Moon Nursery	Middle	5	All
Bracted Spiderwort	Tradescantia bracteata	Commelinaceae	160,000	3.67	Prairie Moon Nursery	Early	5	63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Brown-eyed Susan	Rudbeckia trilobata	Asteraceae	688,000	15.79	Prairie Moon Nursery	Middle		107B
Bush Morning-Glory	Ipomoea leptophylla	Convulvulaceae	4,000	0.09	USDA Plants	Middle	5	106, 107B
Bushy Seedbox	Ludwigia alternifolia	Onagraceae	20,800,000	477.50	Prairie Moon Nursery	Late	7	All
Butterfly Milkweed	Asclepias tuberosa	Apocynaceae	70,000	1.61	USDA Plants	Middle	6	60A, 63B, 64, 67A
Calamus	Acorus calamus	Acoraceae	498,454	11.44	USDA Plants	Middle		60A, 63B, 64, 67A, 71, 75, 102C, 106
Canada goldenrod	Solidago canadensis	Asteraceae	4,600,000	105.60	USDA Plants	Late	2	All
Canada Milkvetch	Astragalus canadensis	Fabaceae	270,500	6.21	USDA Plants	Middle	5	All
Canada Tick-Cllover	Desmodium canadense	Fabaceae	72,500	1.66	USDA Plants	Middle	5	All
Candle Anemone	Anemone cylindrica	Ranunculaceae	416,000	9.55	Tallgrass Prairie Center	Middle	4	63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Cardinal Flower	Lobelia cardinalis	Campanulaceae	11,292,758	11,292,758	USDA Plants	Late	6	107B
Carolina Anemone	Anemone caroliniana	Ranunculaceae				Early	7	106, 107B
Catnip Giant-Hyssop	Agastache nepetoides	Lamiaceae	1,480,000	1,480,000	NY PMC	Middle	5	All
Clammy Ground-cherry	Physalis heterophylla	Solanaceae				Middle	4	60A, 63B, 64, 67A

Clasping Coneflower	Dracopis amplexicaulis	Asteraceae	1,600,000	1,600,000	USDA Plants	Middle		60A, 63B, 64, 67A, 71, 75, 102C, 106
Cobaea Penstmon	Penstemon cobaea	Scrophulariaceae	192,000	192,000	Prairie Moon Nursery	Early	6	63B, 65 66, 67A, 71, 73, 75, 102C, 106, 107B
Common Agalinis	Agalinis tenuifolia	Scrophulariaceae	12,800,000	12,800,000	Prairie Moon Nursery	Late	5	All
Common Evening Primrose	Oenothera biennis	Onagraceae	1,376,000	1,376,000	USDA Plants	Middle	1	All
Common Golden Alexander	Zizia aurea	Apocynaceae	176,000	176,000	Prairie Moon Nursery	Early	6	All
Common Milkweed	Asclepias syriaca	Apocynaceae	64,000	64,000	Prairie Moon Nursery	Middle	1	63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Common Ragweed	Ambrosia artemisiifolia	Asteraceae	55,000	55,000	Ernst Conservation Seeds	Middle	0	107B
Common Sunflower	Helianthus annuus	Asteraceae	46,919	46,919	USDA Plants	Late	0	106, 107B
Compass-plant	Silphium laciniatum	Asteraceae	18,400	18,400	Prairie Moon Nursery	Middle	5	All
Culver's Root	Veronicastrum virginicum	Scrophulariaceae	12,800,000	12,800,000	Prairie Moon Nursery	Middle	9	60A, 63B, 64, 67A
Cup-plant	Silphium perfoliatum	Asteraceae	22,400	22,400	Prairie Moon Nursery	Middle	4	60A, 63B, 64, 67A, 71, 75, 102C, 106
Curlycup Gumweed	Grindelia squarrosa	Asteraceae	400,000	400,000	USDA Plants	Middle	4	63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Cutleaf Coneflower	Rudbeckia laciniata	Asteraceae	252,222	252,222	USDA Plants	Middle	4	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75, 102C
Cutleaf Ironplant	Machaeranthera pinnatifida	Asteraceae	1,225,800	1,225,800	2014 Pheasants Forever Seed Test	Early	2	60A, 63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Daisy Fleabane	Erigeron strigosus	Asteraceae	250,000	250,000	USDA Plants	Early	4	60A, 63B, 66, 71, 72, 73, 75, 102C, 106
Dakota Mock Vervain	Glandularia bipinnatifida	Verbenaceae	450,000	450,000	Texas DOT	Middle	4	63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Devil's Beggar-Ticks	*Bidens frondosa*	Asteraceae	195,300	195,300	USDA Plants	Late	1	All
Dotted Gayfeather	*Liatris punctata*	Asteraceae	63,000	63,000	USDA Plants	Middle	5	All
Downy Blue Violet	*Viola sororia*	Violaceae	368,000	368,000	Prairie Moon Nursery	Early	3	All
Downy Gentian	*Gentiana puberulenta*	Gentianaceae	6,960,000	6,960,000	Prairie Moon Nursery	Late	7	65, 66, 75, 102C, 106, 107B
Downy Goldenrod	*Solidago petiolaris*	Asteraceae				Late	6	71, 75, 106, 107B
Dwarf Indian-Paintbrush	*Castilleja sessiliflora*	Scrophulariaceae	1,540,000	1,540,000	USDA Plants	Early	6	60A, 63B, 64, 66, 67A, 72, 73, 102C
False Boneset	*Brickellia eupatorioides var. corymbulosa*	Asteraceae	512,000	512,000	Prairie Moon Nursery	Middle	4	All
False Sunflower	*Heliopsis helianthoides*	Asteraceae	125,735	125,735	USDA Plants	Middle	4	63B, 64, 65, 66, 67A, 71, 73, 75, 102C, 106, 107B
Field Mint	*Mentha arvensis*	Lamiaceae	4,800,000	4,800,000	Prairie Moon Nursery	Middle	4	All
Field Pussytoes	*Antennaria neglecta*	Asteraceae	6,600,000	6,600,000	USDA Plants	Early	3	63B, 65, 66, 71, 75, 102C, 106, 107B
Field Snake-Cotton	*Froelichia floridana*	Amaranthaceae	115,200	115,200	Prairie Moon Nursery	Middle	4	63B, 65, 66, 71, 72, 102C 107B
Finger Coreopsis	*Coreopsis palmata*	Asteraceae	160,000	160,000	Prairie Moon Nursery	Middle	8	102C, 106, 107B

Flat-top Goldentop	*Euthamia graminifolia*	Asteraceae	5,600,000	5,600,000	USDA Plants	Late		60A, 64, 65, 67A, 106, 107B
Flodman's Thistle	*Cirsium flodmanii*	Asteraceae				Middle	4	60A, 63B, 64, 65, 66, 67A, 71, 75, 102C, 106, 107B
Flowering Spurge	*Euphorbia corollata*	Euphorbiaceae	128,000	128,000	Prairie Moon Nursery	Middle	3	102C, 106, 107B
Four-point Evening Primrose	*Oenothera rhombipetala*	Onagraceae	1,600,000	36.73	Prairie Moon Nursery	Middle	2	63B, 64, 65, 66, 72, 73, 75, 102C
Fourwing Saltbush	*Atriplex canescens*	Chenopodiaceae	44,203	1.01	USDA Plants	Middle	5	60A, 67A
Fragrant Cudweed	*Pseudognaphalium obtusifolium*	Asteraceae	8,000,000	183.65	Prairie Moon Nursery	Late	3	71, 72, 73, 75, 102C, 106, 107B
Fringed Pucoon	*Lithospermum incisum*	Boraginaceae	24,000	0.55	Prairie Legacy	Early	5	All
Fringed Sagewort	*Artemisia frigida*	Asteraceae	4,536,000	104.13	USDA Plants	Late	6	60A, 63B, 64, 65, 66, 67A, 72, 102C
Fringe-leaf Wild-petunia	*Ruellia humilis*	Acanthaceae	150,000	3.44	USDA Plants	Middle	4	75, 106, 107B
Goat's-Beard	*Tragopogon dubius*	Asteraceae	28,000	0.64	USDA Plants	Early		All
Goldenaster	*Heterotheca villosa*	Asteraceae	336,500	7.72	USDA Plants	Middle	4	60A, 63B, 64, 65, 66, 71, 72, 73, 102C
Goldentop	*Euthamia gymnospermoides*	Asteraceae	6,080,000	139.58	Prairie Moon Nursery	Late	4	All
Gray Goldenrod	*Solidago nemoralis*	Asteraceae	1,008,000	23.14	USDA Plants	Late	4	All except not 72
Grayhead Prairie Coneflower	*Ratibida pinnata*	Asteraceae	427,500	9.81	USDA Plants	Late	4	106, 107B
Green Milkweed	*Asclepias viridiflora*	Apocynaceae	57,600	1.32	Prairie Moon Nursery	Middle	6	All
Grooved Flax	*Linum sulcatum*	Linaceae	672,000	15.43	Prairie Moon Nursery	Middle	6	63B, 65, 66, 71, 75, 102C, 106, 107B
Ground-Plum	*Astragalus crassicarpus*	Fabaceae	83,200	1.91	Prairie Moon Nursery	Early	7	All except not 72
Hairy Aster	*Symphyotrichum pilosum*	*Asteraceae*	2,240,000	51.42	Prairie Moon Nursery	Late	0	75, 106, 107B
Hairy Four-o'clock	*Mirabilis hirsuta*	Nyctaginaceae	105,700	2.43		Middle	5	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C
Hairy Hawkweed	*Hieracium longipilum*	Asteraceae	1,120,000	25.71	Prairie Moon Nursery	Middle	6	75, 106, 107B
Hairy Sunflower	*Helianthus mollis*	Asteraceae	112,000	2.57	USDA Plants	Late		71, 75, 102C, 106, 107B
Hare's-Foot Dalea	*Dalea leporina*	Fabaceae	150,000	3.44	USDA PMC Plant Chat-Bismarck Fall 2014	Middle	3	63B, 65, 67A, 71, 73, 102C, 106, 107B
Heath Aster	*Symphyotrichum ericoides*	Asteraceae	3,200,000	73.46	Prairie Moon Nursery	Late	3	All
Hemp Dogbane	*Apocynum cannabinum*	Apocynaceae	500,000	11.48	USDA Plants	Middle	2	All
Hoary Pucoon	*Lithospermum canescens*	Boraginaceae	161,024	3.70	IA NRCS seed calculator	Early	5	102C, 106, 107B
Hoary Tick-Clover	*Desmodium canescens*	Fabaceae				Middle	5	71, 75, 102C, 106, 107B
Hoary Vervain	*Verbena stricta*	Verbenaceae	448000	10.28	Prairie Moon Nursery	Middle	2	All
Horse Mint	*Monarda punctata*	Lamiaceae	1,440,000	33.06	Prairie Moon Nursery	Middle		102C

Illinois Bundleflower	*Desmanthus illinoensis*	Fabaceae	85,000	1.95	USDA Plants	Middle	5	63B, 65, 66, 67A, 71, 72, 73, 75, 102C, 106, 107B
Illinois Tick-Cllover	*Desmodium illinoense*	Fabaceae	88,000	2.02	USDA Plants	Middle	6	71, 75, 102C, 106, 107B
Indian Blanketflower	*Gaillardia pulchella*	Asteraceae	238,144	5.47	USDA Plants	Middle	5	73
Indian Breadroot	*Pediomelum esculentum*	Fabaceae	17,600	0.40	Prairie Moon Nursery	Early	7	All
Ironweed	*Vernonia fasciculata*	Asteraceae	384,000	8.82	Prairie Moon Nursery	Middle	4	65, 66, 67A, 71, 75
Jerusalem Artichoke	*Helianthus tuberosus*	Asteraceae	75,666	1.74	USDA Plants	Late	4	63B, 64, 65, 66, 67A, 71, 73, 75, 102C, 106, 107B
Lacy Phacelia	*Phacelia tanacetifolia*	Hydrophyllaceae	244,944	5.62	USDA Plants	Early		60A, 64, 65, 67A, 72
Lanceleaf Gayfeather	*Liatris lancifolia*	Asteraceae	294,848	6.77	USDA Plants	Late	8	64, 65, 66, 67A, 71, 72, 73, 75, 102C, 106, 107B
Lance-Leaf Tickseed	*Coreopsis lanceolata*	Asteraceae	221,000	5.07	USDA Plants	Middle		63B, 66, 71, 75, 102C, 106, 107B
Large Beardtongue	Penstemon grandiflorus	Scrophulariaceae	224,000	5.14	Prairie Moon Nursery	Early	5	All
Large Flowered Gaura	*Oenothera filiformis*	Onagraceae	32,000	0.73	Prairie Moon Nursery	Late	3	71, 75, 106, 107B
Late or Giant Goldenrod	*Solidago gigantea*	Asteraceae	700,000	16.07	USDA Plants	Late	3	All
Lavendar Giant-Hyssop	*Agastache foeniculum*	Lamiaceae	1,440,000	33.06	NY PMC	Late	9	60A, 64
Leadplant	*Amorpha canescens*	Fabaceae	195,360	4.48	USDA Plants	Middle	6	All except not 60A
Lemon Beebalm	*Monarda citriodora*	Lamiaceae	820,000	18.82	Granite Seed	Middle		73, 102C, 106
Long bract Wild Indigo	*Baptisia bracteata var. leucophaea*	Fabaceae	22,400	0.51	Prairie Moon Nursery	Early	5	106, 107B
Marbleseed	*Onosmodium bejariense*	Boraginaceae	24,000	0.55	Prairie Moon Nursery	Middle	4	60A, 63B, 64, 65, 66, 71, 75, 102C, 106, 107B
Maximilian's Sunflower	*Helianthus maximiliani*	Asteraceae	196,360	4.51	USDA Plants	Late	4	All
Meadow Anemone	*Anemone canadensis*	Ranunculaceae	128,000	2.94	Prairie Moon Nursery	Early	4	63B, 66, 71, 75, 102C, 106, 107B
Missouri Evening Primrose	*Oenothera macrocarpa ssp. macrocarpa*	Onagraceae	75,200	1.73	Prairie Moon Nursery	Early	7	73, 75, 106
Narrowleaf Beardtongue	*Penstemon angustifolius*	Scrophulariaceae	313,000	7.19	USDA Plants	Early	6	60A, 63B, 64, 65, 66, 67A, 71, 72, 75, 102C
Narrow-leaf Milkweed	*Asclepias stenophylla*	Apocynaceae	80,000	1.84	Prairie Legacy	Middle	6	60A, 63B, 65, 66, 71, 72, 73, 75, 102C, 106, 107B
Narrow-Leaf Purple Coneflower	*Echinacea angustifolia*	Asteraceae	128,000	2.94	USDA Plants	Middle	5	All
New England Aster	*Symphyotrichum novae-angliae*	Asteraceae	1,100,000	25.25	USDA Plants	Late	4	65, 66, 71, 102C, 106, 107B
New Jersey Tea	*Ceanothus americanus*	Rhamnaceae	112,000	2.57	USDA Plants	Early	6	106, 107B
Nine-Anther Dalea	*Dalea ennendra*	Fabaceae				Middle	7	60A, 63B, 64, 67A, 71, 72, 73, 75, 107B

Nodding Onion	*Allium cernuum*	Liliaceae	121,600	2.79	Prairie Moon Nursery	Middle	8	60A, 64
Obedience Plant	*Physostegia virginiana ssp. virginiana*	Lamiaceae	176,000	4.04	Prairie Moon Nursery	Middle	7	65, 66, 71, 75, 102C, 106, 107B
Pale Indian-Plantain	*Arnoglossum atriplicifolium*	Asteraceae	96,000	2.20	Prairie Moon Nursery	Middle	6	75, 102C, 106, 107B
Pale Purple Coneflower	*Echinacea pallida*	Asteraceae	106,000	2.43	USDA Plants	Middle	7	106, 107B
Panicled Aster	*Symphyotricum lanceolatum*	Asteraceae	2,496,000	57.30	Prairie Moon Nursery	Late	2	All
Pasque Flower	*Pulsatilla patens ssp. multifida*	Ranunculaceae	288,000	6.61	Prairie Moon Nursery	Early	6	60A, 63B, 64, 67A, 102C
Pink Poppy Mallow	*Callirhoe alcaeoides*	Malvaceae	89,476	2.05		Early	5	71, 75, 106, 107B
Plains Beebalm	*Monarda pectinata*	Lamiaceae	1,300,000	29.84	Western Native Seed	Middle	4	60A, 64, 65, 66, 67A, 72, 73
Plains Coreopsis	*Coreopsis tinctoria*	Asteraceae	3,222,222	73.97	USDA Plants	Middle	1	63B, 65, 66, 67A, 71, 72, 73, 75, 102C, 106, 107B
Plains Evening Primrose	*Calylophus serrulatus*	Onagraceae	400,000	9.18	Prairie Legacy	Middle	5	All
Plains false Indigo	*Baptisia australis*	Fabaceae	24,000	0.55	Prairie Moon Nursery	Early		75, 106
Plains Sunflower	*Helianthus petiolaris*	Asteraceae	120,000	2.75	Western Native Seed	Middle	1	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C
Platte Lupine	*Lupinus plattensis*	Fabaceae	22,000	0.51	Western Native Seed	Early	4	60A, 63B, 64, 67A
Platte River Milkvetch	*Astragalus plattensis*	Fabaceae				Early	7	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75, 102C
Platte Thistle	*Cirsium canescens*	Asteraceae				Early	4	60a, 63B, 64, 65, 66, 71, 72, 73, 75, 102C
Prairie Alumroot	*Heuchera richardsonii*	Saxifragaceae	11,200,000	257.12	USDA Plants	Early	7	63B, 64, 65, 66, 102C, 106, 107B
Prairie Blue-eyed-grass	*Sisyrinchium campestre*	Iridaceae	720,000	16.53	Prairie Moon Nursery	Early	5	63B, 65, 66, 71, 75, 102C, 106, 107B
Prairie Coneflower	*Ratibida columnifera*	Asteraceae	737,104	16.92	USDA Plants	Middle	4	All
Prairie Dandelion	*Nothocalais cuspidata*	Asteraceae	128,000	2.94	Prairie Legacy	Early	6	All
Prairie Flax	*Linum lewisii var. lewisii*	Linaceae				Early	7	60A, 64
Prairie Gentian	*Eustoma exaltatum ssp. russellianum*	Gentianaceae	2,240,000	51.42	2014 Pheasants Forever Seed Test	Middle	4	60A, 64, 65, 67A, 72, 75, 102C, 106
Prairie Goldenrod	*Solidago missouriensis*	Asteraceae	1,998,238	45.87	USDA Plants	Middle	5	All
Prairie indian-Plantain	*Arnoglossum plantagineum*	Asteraceae	75,200	1.73	Prairie Moon Nursery	Middle	6	75, 102C, 106, 107B
Prairie Larkspur	*Delphinium carolinianum ssp. virescens*	Ranunculaceae	960,000	22.04	Prairie Moon Nursery	Early	6	All
Prairie Onion	*Allium textile*	Liliaceae				Early	6	60A, 64, 65, 67A, 72, 73
Prairie Phlox	Phlox pilosa ssp. fulgida	Polemoniaceae	304,000	6.98	Prairie Moon Nursery	Early	8	102C, 106, 107B
Prairie Ragwort	*Packera plattensis*	Asteraceae	1,600,000	36.73	Prairie Moon Nursery	Middle	7	65, 66, 71, 75, 102C, 106, 107B

Prairie Redroot (Jersey tea)	*Ceanothus herbaceus*	Rhamnaceae	160,000	3.67	Prairie Moon Nursery	Early	6	65, 66, 71, 75, 102C, 106, 107B
Prairie Trefoil	Lotus unifoliolatus	Fabaceae	75,750	1.74	S&S Seeds	Early	3	60A, 63B, 64, 65, 66, 67A, 71, 75, 102C, 106, 107B
Prairie Violet	*Viola pedatifida*	Violaceae	448,000	10.28	Prairie Moon Nursery	Early	6	60A, 63B, 64, 65, 66, 71, 75, 102C, 106, 107B
Prairie-parsley	*Polytaenia nuttallii*	Apiaceae				Early	8	75, 106, 107B
Prickly Poppy	*Argemone polyanthemos*	Papavaraceae	9,000	0.21	USDA Plants	Middle	1	102C, 106
Purple Coneflower	*Echinacea purpurea*	Asteraceae	115,665	2.66	USDA Plants	Early		106
Purple Locoweed	*Oxytropis lambertii*	Fabaceae	192,000	4.41	Prairie Moon Nursery	Early	6	All except not 106
Purple Poppy Mallow	*Callirhoe involucrata*	Malvaceae	33,600	0.77	Prairie Moon Nursery	Middle	2	All
Purple Prairie Clover	*Dalea purpurea*	Fabaceae	300,000	6.89	USDA Plants	Middle	6	All
Purplestem Beggar-Ticks	*Bidens connata*	Asteraceae	130,000	2.98	USDA Plants	Late	3	63B, 66, 71, 75, 102C, 106, 107B
Rattlesnake-Master	*Eryngium yuccifolium*	Apiaceae	177,700	4.08	USDA Plants	Middle	8	75, 106, 107B
Rattlesnake-root	*Prenanthes aspera*	Asteraceae	224,000	5.14	Prairie Moon Nursery	Late	7	66, 71, 75, 102C, 106, 107B
Rayless Greenthread	Thelesperma megapotamicum	Asteraceae	232,618	5.34	2014 Pheasants Forever Seed Test	Middle	4	60A, 64, 65, 67A, 72, 73
Rocky Mountain Bee Plant	*Cleome serrulata*	Capparaceae	64,000	1.47	USDA Plants	Middle	0	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C
Rosinweed	*Silphium integrifolium*	Asteraceae	19,200	0.44	Prairie Moon Nursery	Middle	4	71, 75, 102C, 106, 107B
Rough Agalinis	*Agalinis aspera*	Scrophulariaceae	1,600,000	36.73	Prairie Moon Nursery	Late	10	63B, 65, 66, 71, 73, 75, 102C, 106, 107B
Rough Gayfeather	*Liatris aspera*	Asteraceae	131,000	3.01	NRCS Planting Guide	Late	6	63B, 66, 71, 75, 102C, 106, 107B
Roundhead Bush-clover	*Lespedeza capitata*	Fabaceae	174,000	3.99	USDA Plants	Middle	5	63B, 66, 71, 75, 102C, 106, 107B
Round-Head Prairie Clover	*Dalea multiflora*	Fabaceae				Early	7	106, 107B
Rubber Rabbitbrush	*Ericameria nauseosa*	Asteraceae	693,000	15.91	Prairie Moon Nursery	Middle	3	60A, 64, 67A
Sand Milkweed	*Asclepias arenaria*	Apocynaceae	32,000	0.73	Prairie Moon Nursery	Middle	5	63B, 65, 66, 67A, 71, 72, 73, 102C
Sand Lily	*Mentzelia nuda*	Loasaceae			Prairie Moon Nursery	Middle	4	60A, 63B, 64, 65, 67A, 72, 73, 102C
Sawtooth Sunflower	*Helianthus grosseserratus*	Asteraceae	630,000	14.46	USDA Plants	Late	4	66, 71, 75, 102C, 106, 107B
Scaly Blazingstar	*Liatris squarrosa*	Asteraceae	112,000	2.57	Prairie Moon Nursery	Middle	5	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C
Scarlet Bee Blossom	*Oenothera suffrutescens*	Onagraceae	22,400	0.51	Prairie Moon Nursery	Middle	4	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C, 107B
Scarlet Globemallow	*Sphaeralcea coccinea*	Malvaceae	500,000	11.48	USDA Plants	Early	4	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C
Scorpion-weed	*Phacelia hastata*	Hydrophyllaceae	153,000	3.51	USDA Plants	Early	7	60A, 64, 67A

Sensitive Briar	*Mimosa nuttallii*	Fabaceae	32,000	0.73	Prairie Moon Nursery	Middle	6	63B, 71, 73, 75, 102C, 106, 107B
Showy Milkweed	*Asclepias speciosa*	Apocynaceae	72,000	1.65	USDA Plants	Middle	1	60A, 63B, 65, 66, 71, 72, 73
Showy Partridgepea	*Chamaecrista fasciculata*	Fabaceae	65,000	1.49	USDA Plants	Middle	1	65, 66, 71, 75, 102C, 106, 107B
Showy-Wand Goldenrod	*Solidago speciosa*	Asteraceae	1,520,000	34.89	Prairie Moon Nursery	Late	7	63B, 64, 65, 66, 75, 102C, 106, 107B
Silky Aster	*Symphyotrichum sericeum*	Asteraceae	416,000	9.55	Prairie Moon Nursery	Late	7	75, 102C, 106, 107B
Silky Prairie Clover	*Dalea villosa*	Fabaceae	253,500	5.82	USDA Plants	Middle	5	63B, 64, 65, 66, 67A, 71, 72, 73, 75, 102C, 106
Silvery Lupine	*Lupinus argenteus*	Fabaceae	126,000	2.89	USDA Plants	Middle	5	60A, 64, 67A
Skelatonweed	*Lygodesmia juncea*	Asteraceae				Middle	4	All
Sleepy Catchfly	*Silene antirrhina*	Caryophyllaceae	160,000	3.67	USGS	Early	2	64, 65, 66, 71, 75, 102C, 106, 107B
Slender Beardtongue	*Penstemon gracilis*	Scrophulariaceae	9,600,000	220.39	Prairie Moon Nursery	Middle	6	60A, 63B, 64, 65, 66, 71, 75, 102C, 106
Slender-flowered Scurfpea	*Psoralidium tenuiflorum*	Fabaceae	16,000	0.37	Prairie Moon Nursery	Early	5	All except not 102C
Slender-leaf Mountain-mint	*Pycanthemum tenuifolium*	Lamiaceae	6,000,000	137.74	USDA Plants	Middle	7	75, 106
Small Lupine	*Lupinus pusillus*	Fabaceae	26,000	0.60	Western Native Seed	Early	4	60A, 64, 67A, 72, 73
Smooth Blue Aster	*Symphyotrichum laeve*	Asteraceae	1,014,000	23.28	USDA Plants	Late	5	60A, 63B, 64, 65, 66, 102C, 106, 107B
Sneezeweed	Helenium autumnale	Asteraceae	2,080,000	47.75	Prairie Moon Nursery	Late	6	65, 66, 67A, 71, 72, 73, 102C, 106, 107B
Snow-on-the-Mountain	*Euphorbia marginata*	Euphorbiaceae	30,400	0.70	Prairie Moon Nursery	Middle	0	All
Soft Goldenrod	*Solidago mollis*	Asteraceae	9,265,326	212.70	Legacy 550DP	Late	4	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75, 102C
Southern Blue Flag	*Iris virginica var. shrevei*	Iridaceae	16,000	0.37	Prairie Moon Nursery	Middle	8	106, 107B
Spider milkweed	*Asclepias viridis*	Apocynaceae	68,800	1.58	Prairie Moon Nursery	Early	4	75, 106, 107B
Spotted Joe-Pye Weed	*Eutrochium maculatum*	Asteraceae	1,520,000	34.89	Prairie Moon Nursery	Late	6	63B, 64, 65, 66, 67A, 71, 73, 75, 107B
Spreading Dogbane	*Apocynum androsaemifolium*	Apocynaceae	334,117	7.67	Research paper	Early	6	60A, 63B, 64, 66, 67A, 106, 107B
Stiff Flax	*Linum rigidum*	Linaceae	531,500	12.20	Oregon NRCS	Early	5	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 102C
Stiff Goldenrod	*Oligoneuron rigidum*	Asteraceae	1,009,000	23.16	USDA Plants	Late	3	All except not 72
Stiff Greenthread	*Thelesperma filifolium*	Asteraceae	198,000	4.55	2014 Pheasants Forever Seed Test	Early	3	60A, 64, 65, 67A, 72, 73
Stiff Sunflower	*Helianthus pauciflorus*	Asteraceae	85,000	1.95	USDA Plants	Late	5	63B, 64, 65, 66, 67A, 71, 75, 102C, 106, 107B

Strict Blue-Eyed-Grass	*Sisyrinchium montanum*	Iridaceae				Early	5	60A, 63B, 64, 65, 66, 67A, 71, 72, 102C, 107B
Sullivant's Milkweed	*Asclepias sullivantii*	Apocynaceae	72,000	1.65	Prairie Moon Nursery	Middle	7	71, 75, 102C, 106, 107B
Swamp Milkweed	*Asclepias incarnata*	Apocynaceae	153,761	3.53	USDA Plants	Middle	4	All
Sweet Black-eyed Susan	*Rudbeckia subtomentosa*	Asteraceae	688,000	15.79	Prairie Moon Nursery	Middle		Not native to Nebraska
Sweet Sand Verbena	*Abronia fragrans*	Nyctaginaceae	72,000	1.65	Western Native Seed	Middle	3	60A, 64, 65, 67A, 72
Sweetflag	*Acorus americanus*	Acoraceae	105,600	2.42	Prairie Moon Nursery	Middle	8	65, 71, 75, 102C, 106, 107B
Tall Boneset	*Eupatorium altissimum*	Asteraceae	2,560,000	58.77	Prairie Moon Nursery	Late	3	75, 102C, 106, 107B
Tall Cinquefoil	*Potentilla arguta*	Rosaceae	3,680,000	84.48	Prairie Moon Nursery	Middle	6	60A, 63B, 64, 65, 66, 67A, 71, 75, 102C, 106, 107B
Tall Spiderwort	*Tradescantia ohiensis*	Commelinaceae	128,000	2.94	Prairie Moon Nursery	Early	4	75, 102C, 106, 107B
Tall Thistle	*Cirsium altissimum*	Asteraceae	76,800	1.76	Prairie Moon Nursery	Late	1	63B, 66, 71, 72, 73, 75, 102C, 106, 107B
Tall Tickseed	*Coreopsis tripterus*	Asteraceae	224,000	5.14	Prairie Moon Nursery	Middle		Not native to Nebraska
Tall White Penstemon	*Penstemon digitalis*	Scrophulariaceae	400,000	9.18	USDA Plants	Early		102C, 106, 107B
Tansy-aster	*Machaeranthera tanacetifolia*	Asteraceae	408,240	9.37	USDA Plants	Middle	1	60A, 64, 67A, 72, 73
Ten-petal Stickleaf	*Mentzelia decapetala*	Loasaceae	328,500	7.54	USDA Plants	Middle	5	60A, 63B, 64, 66, 67A, 71, 72, 73, 75
ThickspikeGayfeather	*Liatris pycnostachya*	Asteraceae	120,000	2.75	USDA Plants	Middle	7	75, 106, 107B
Thimbleweed	*Anemone virginiana*	Ranunculaceae	448,000	10.28	Prairie Moon Nursery	Middle	6	60A, 102C, 106, 107B
Tube Penstemon	*Penstemon tubaeflorus*	Scrophulariaceae	1,280,000	29.38	Prairie Moon Nursery	Middle	6	107B
Velvetweed	*Oenothera curtiflora*	Onagraceae	64,812	1.49	2014 Pheasants Forever Seed Test	Middle	1	All
Virginia Ground-cherry	*Physalis virginiana*	Solanaceae				Middle	6	All
Virginia Mountain-mint	*Pycnanthemum virginianum*	Lamiaceae	3,520,000	80.81	Prairie Moon Nursery	Middle	6	63B, 65, 66, 71, 75, 102C, 106, 107B
Water Smartweed	*Polygonum punctatum*	Polygonaceae	125,000	2.87	USDA Plants	Middle	4	63B, 65, 66, 71, 72, 73, 75, 102C, 106, 107B
Wavy-leaf Thistle	*Cirsium undulatum*	Asteraceae				Middle	4	All but not 102C
Western Heath Aster	*Symphyotrichum falcatum ssp. commutatum*	Asteraceae	5,044,444	115.80	2014 Pheasants Forever Seed Test	Late	4	60A, 64, 65, 67A, 71, 72, 73
Western Ironweed	*Vernonia baldwinii*	Asteraceae	384,000	8.82	Prairie Moon Nursery	Middle	3	65, 66, 71, 72, 73, 75, 102C, 106. 107B
Western Ragweed	*Ambrosia psilostachya*	Asteraceae				Middle	1	All
Western Spiderwort	*Tradescantia occidentalis*	Commelinaceae	144,000	3.31	Prairie Moon Nursery	Early	5	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75, 102C
Western Wallflower	*Erysimum asperum*	Brassicaceae	373,000	8.56	NRCS Oregon Tech Note 21	Early	4	60A, 63B, 64, 65, 66, 67A, 71, 72, 73

Western Wild Rose	*Rosa woodsii*	Rosaceae	50,967	1.17	USDA Plants	Early	4	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75
White Beardtongue	*Penstemon albidus*	Scrophulariaceae	192,000	4.41	Prairie Legacy	Early	6	60A, 63B, 64, 65, 66, 67A, 71, 72, 73, 75, 102C
White false Indigo	*Baptisia alba var. macrophylla*	Fabaceae	27,200	0.62	Prairie Moon Nursery	Early	6	106, 107B
White Prairie Aster	*Symphyotrichum falcatum ssp. falcatum*	Asteraceae	496,000	11.39	Legacy Information 550DP	Late	4	60A, 64, 67A
White Prairie Clover	*Dalea candida*	Fabaceae	278,000	6.38	USDA Plants	Middle	6	All
White Sagewort	*Artemisia ludoviciana*	Asteraceae	4,048,000	92.93	USDA Plants	Late	4	All
White Snakeroot	*Ageratina altissima*	Asteraceae	2,400,000	55.10	Prairie Moon Nursery	Late	4	65, 66, 71, 75, 102C, 106, 107B
White Vervain	*Vernonia urticifolia*	Verbenaceae	752000	17.26	Prairie Moon Nursery	Middle	3	60A, 63B, 64, 65, 66, 71, 73, 75, 102C, 106, 107B
Whorled Milkweed	*Asclepias verticillata*	Apocynaceae	176,000	4.04	Prairie Moon Nursery	Middle	3	64, 65, 66, 71, 73, 75, 102C, 106, 107B
Wild Bergamot	*Monarda fistulosa*	Lamiaceae	1,272,500	29.21	USDA Plants	Middle	4	All
Wild Four-o'clock	*Mirabillis nyctaginea*	Nyctaginaceae	56,000	1.29	Prairie Moon Nursery	Early	1	All except not 72
Wild Licorice	*Glycyrrhiza lepidota*	Fabaceae	52,688	1.21	USDA Plants	Early	4	All except not 63B
Wild Onion	*Allium canadense*	Liliaceae	137,600	3.16	Prairie Moon Nursery	Early	5	65, 71, 75, 102C, 106, 107B
Wild Indigo	*Amorpha fruticosa*	Fabaceae	77,000	1.77	USDA Plants	Early	5	All except not 67A
Willowleaf Aster	*Symphyotrichum praealtum var. nebraskense*	Asteraceae	2,080,000	47.75	Prairie Moon Nursery	Late	5	65,66, 71, 73, 75, 102C, 106, 107B
Wingstem	*Verbesina alternifolia*	Asteraceae	144000	3.31	Prairie Moon Nursery	Late	4	75
Winterfat	*Krascheninnikovia lanata*	Chenopodiaceae	110,729	2.54	USDA Plants	Middle	5	60A, 64, 72
Woolly Locoweed	*Astragalus mollisimus*	Fabaceae	140,000	3.21	USDA Plants	Early	3	60A, 64, 67A, 72, 73
Woolly Plantain	*Plantago patagonica*	Plantaginaceae	600,000	13.77	USDA Plants	Early	1	All
Yarrow	*Achillea millefolium*	Asteraceae	2,852,012	65.47	USDA PlantsOUR	Early	2	All
Yucca	*Yucca glauca*	Agavaceae	24,850	0.57	USDA Plants	Middle	4	60A, 63B, 64, 65, 67A, 71, 72, 73
Southern Wild Senna	*Senna marlandica*	Fabaceae	20,500	0.47	USDA Plants	Middle	5	75 106, 107B

INTRODUCED FORBS FOR PASTURE PLANTINGS								
Common Name	**Scientific Name**	**Family**	**Seeds / PLS lb.**	**PLS / ft2 at 1 lb/ac**	**Seed Source Information**	**Bloom Period**		**MLRA Adaptability**
Alfalfa	*Medicago sativa*	Fabaceae	226,800	5.21		Early		All
Crimson clover	*Trifolium incarnatum*	Fabaceae	776000	17.81	USDA Plants	Early		106, 107B
Sainfoin	*Onobrychis viciifolia*	Fabaceae	30240	0.69	USDA Plants	Early		60A, 64, 67A, 72, 73
Strawberry clover	*Trifolium fragiferum*	Fabaceae	299371	6.87	USDA Plants	Early		64, 67A, 65W, 72
Salad Burnet	*Onobrychis viciifolia*	Rosaceae	48745	1.12	USDA Plants	Early		60A, 64, 67A, 72
Alsike clover	*Trifolium hybridum*	Fabaceae	680400	15.62	USDA Plants	Middle		63B, 65, 66, 73, 75, 102C, 106, ,107B
Bird's-foot trefoil	*Lotus corniculatus*	Fabaceae	369840	8.49	USDA Plants	Middle		63B, 65E, 66, 71, 73, 75, 102C, 106, ,107B (drier MLRAs under irrigation or subirrigated sites).
Yellow Sweet Clover	*Melilotus officinalis*	Fabaceae	260,000	5.97	Legacy Information 550DP	Middle		All
White Sweet Clover	*Melilotus officinalis*	Fabaceae	260,000	5.97	Legacy Information 550DP	Middle		All
White clover	*Trifolium repens*	Fabaceae	711867	16.34	USDA Plants	Middle		All
Cicer milkvetch	*Astragalus cicer*	Fabaceae	122,560	2.81	USDA Plants	Late		60A, 64, 67A, 65W, 72
Red Clover	*Trifolium pratense*	Fabaceae	272160	6.25	USDA Plants	Late		All

WARM SEASON COVER CROPS AND COMPANION CROPS FOR GRASS SEEDINGS – use varieties appropriate to the site and area of the state (annual cover only)				
Common Name	**Seeds / PLS lb.**	**PLS Seeds / FT2 @ 1 lb. / ac**	**Pounds / Bushel**	
Foxtail millet	213,000	4.89	50	
Hybrid forage sudan	55,000	1.26	40	
Oats	19,400	0.45	32	
Pearl millet	88,000	2.02	48	
Perennial ryegrass	240,400	5.52	24	
Proso millet	81,648	1.87	54	
Sorghum	28,000	0.64	56	
Sudan grass	55,000	1.26	28	
Foxtail millet	213,000	4.89	50	
Hybrid forage sudan	55,000	1.26	40	

14. Seeding Depth:

a. Proper seeding depth is extremely important in successfully establishing grass and forbs from seed. Grasses, forbs, and shrubs need to be seeded at a shallow depth, as light plays a key role in the germination especially in many native species. Optimum grass seeding depths are as follows for the following soil types:

i. Loams, Silty Clay Loams, and Silty Clays – ¼" to ½" deep.

ii. Loamy Sands, Sandy Loams, and Sands – ½" to 1" deep.

15. Seeding Equipment:

a. General Requirements for Grass Seeding Equipment that will handle planting all types of grasses are as follows:

i. The best type of seeding equipment is a grass drill equipped to accurately meter seed from the seed box(s), provide seed flow without plugging, and plant seed at desired depth with good seed-to-soil contact. Refer to the requirements of grass drills for more information.

ii. Slower seeding speeds should be used for fluffy or rough-coated seed species. Three to five miles per hour should be the seeding speed for most types of grass drills. Seeding speeds in excess of six miles per hour may result in uneven or inconsistent grass and legume stands.

iii. A carrier can be used to facilitate seeding at lower rates. Carriers include vermiculite, cracked corn or rolled oats which are added to the mixture.

iv. Graphite can be used to help feed fluffy seed through drills.

v. Refer to Table 3 and Table 4, and requirements for specific equipment types listed below, to determine the appropriate seeding equipment to utilize.

Table 3: Compatibility of Drill Type with Grass Seed Types
NR = Not Recommended

Drill Type and Grass Seed Type	Legumes, Switchgrass or other small slick seed	Chaffy native seed with awns	Wheatgrasses, Bromegrass and other similar clean, smooth seed	Trashy seed	All Seed Types in a Mixture
Grassland Drills* without picker wheels or agitators	X	NR	X	NR	NR
Grassland Drills* with picker wheels and agitators	X	X	X	X	X
Standard Small Grain Drill* with small seed box	X	NR	X	NR	NR
*Grassland and standard drills must have depth control devices as described below and separate seed boxes for various types of grass/forbs.					

Table 4: Compatibility of Drill Types with Cover Crops
NR = Not Recommended

Drill and Cover Type	Row Crop Heavy Cover (post-harvest)	Row Crop Minimal Cover* (post-harvest)	Cover Crop (18 inches or less in height)	Cover Crop (heavy cover > 18 inches)	Chemically killed sod	Tilled Seedbed (>50% ground cover)	Tilled Seedbed (<50% ground cover)
No-Till Grass Drill w/ no-till attachments	X	X	X	X	X	X	X
Grass Drill with double disk openers only	NR	X	X	NR	NR	X	X
Standard Small Grain Drill with small seed box	NR	X	NR	NR	NR	X	X
Brillion or Trillion Seeder	NR	NR	NR	NR	NR	NR	X
Broadcast Seeder with packing and/or incorporation device	NR	NR	NR	NR	NR	X	X

*Note minimal cover includes soybean stubble or low residue dryland cropland

b. Requirements for grassland drills:

i. Grass drills are specifically designed and equipped to properly meter and place various grass and/or forb seed and have the following design characteristics.

ii. Grass drills are specifically designed and equipped to properly meter and place various grass and/or forb seed and have the following design characteristics.

1. Separate seed boxes are required to handle the three main types of grass/forb seed commonly planted.

   (a) These include the relatively clean, smooth seed characteristic of many cool-season grasses;
   (b) Chaffy or awned seed, characteristic of may warm-season grasses (i.e. blue grama, bluestems, and Indiangrass);
   (c) Fine smooth seed, characteristic of legume or grasses such as switchgrass, sand lovegrass, or tall fescue.

   (d) Seed boxes having the capability of seeding chaffy or awned grasses are needed, only if such species are planned in the seeding mixture; likewise, fine-seed or legume seed boxes are needed, only if such species are to be seeded.

2. Agitators or similar mechanisms are necessary when chaffy or trashy seed will be planted to prevent bridging in the drill box and ensure a constant flow of seed at the desired rate with uniform mixing of the species in the mixture.

3. Feeder mechanism (picker wheels, fluted feed, etc.) that ensure uniform of all types of grass seed either separately or in a mixture.

4. Oversized feeder tubes (2" minimum inner diameter) that allow constant flow of chaffy or trashy type seed from boxes to placement point (if such seed is used). Feeder tubes must be placed in front of the packer wheels to allow for proper seed-soil contact.
5. Proper depth control:
   (a) Individually mounted, adjustable, spring loaded, double-disc furrow openers with depth control bands behind each opener, or rear depth seeding depth control adjustment behind each double disk opener that provide positive seed placement at a consistent and desired planting depth over varying degrees of seedbed firmness and residue cover. Refer to section 13 for depth control requirements.
6. Press/packer wheels that provide adequate covering and firming of soil over and around the seed for necessary seed/soil contact after proper seed placement. They should be mounted individually on each furrow opener or independently to follow behind each opener. Press/packer wheels are not intended to firm an already tilled/fluffy seedbed. A relatively firm seedbed must exist before the drilling operation begins.
7. Grass drills must be equipped with coulters for no-till planting into sod or heavy residue cover (i.e. 5/16" fluted, ¾" wavy, 5/8" fluted) ahead of the double disk openers. Wider fluted coulters are more suitable for heavy crop residue and narrower 5/16" coulters for sod plantings

c. Requirements for Standard Small Grain Drills

i. Free-flowing grass seed (i.e., wheat grasses) and small slick seed (i.e. Switchgrass, legumes) are the only types of grass/forb seed that can be planted with this type of drill.

ii. Chaffy or awned seeds (i.e. bluestems, Indiangrass, and Blue grama) shall not be planted with this type of drill.

iii. Proper seeding depth

1. Individually mounted, adjustable, spring loaded, double-disc furrow openers with depth control bands behind each opener, or rear depth seeding depth control adjustment behind each double disk opener that provide positive seed placement at a consistent and desired planting depth over varying degrees of seedbed firmness and residue cover. Refer to section 13 for depth control requirements.
2. Improper seeding depth is a major factor that affects seeding success when using a small grain drill.
3. While drilling periodic inspections should be done to check seeding depth especially when seeding across different soil types or field conditions.
4. It is extremely important to have a firm seedbed when using a grain drill to ensure proper seed soil contact.

- Seeding Mixtures (different sizes/types of seeds)

1. Checking the drill frequently and hand mixing the seed is essential to achieve a properly blended seed mix and to ensure that seeds of different sizes are seeded evenly across the field. Most small grain drills do not have agitation devices and a grass drill shall be used if there are significant differences in seed size/type.
2. Periodic feeder mechanism adjustments are usually necessary to ensure proper seeding rates.

3. A separate legume box is necessary for seeding small seeded species. (i.e. Switchgrass, hard fescue, clovers, and alfalfa) along with wheat grasses or Smooth bromegrass.
4. Feeder tubes must be placed in front of the packer wheels to allow for proper seed-soil contact.

d. Requirements for Brillion and Trillion Seeders

i. These seeders drop seed on the soil surface between cultipacker rollers. This type of seeding will place seed on the soil surface or very shallow (less than ¼ inch), depending on the seedbed conditions.

ii. Small slick seeds such as legumes, Switchgrass, or other small slick seeds are the only types of seed that can be planted with this equipment.

iii. A tilled/clean seedbed or a row crop seedbed with significant open ground with a smooth, firmly packed clean surface is required.

iv. This method of seeding is not acceptable unless erosion and weed control are adequate (note pre-emergent herbicide or mulch may be necessary to control weeds).

e. Requirements for Broadcast Seeders

i. Seed distribution will vary based on seed texture and density with heavier seeds being flung further than lightweight fluffy, chaffy seed.

ii. This type of seeding equipment may only be used for critical area plantings, or when slope, site/soil conditions, and/or size of area to be seeded make it unpractical to use drills. An exception to this requirement is when early successional habitat is desired (i.e. certain prairie restoration plantings, and early successional habitat plantings).

iii. All plantings will have a tilled seedbed (minimal residual cover with a smooth, firmly packed clean surface) and an operation which incorporates the seed into the soil at the proper depth (i.e. covering operation using a drag harrow, cultipacker, roller packer, or other suitable implement to cover and press the seed into the soil surface).

iv. This method of seeding is not acceptable unless erosion and weed control are adequate (note pre-emergent herbicide or mulch may be necessary to control weeds).

v. Double the rate of seeding when broadcasting is used.

f. Requirements for Hydroseeding

- Seed shall be applied prior to mulch, fertilizer and lime, unless mulch is not applied, in which case, fertilizer and lime shall be applied prior to hydroseeding.
- When required, mulch can be applied with this method by itself or in combination with fertilizer immediately after seed has been applied.
- Limit application of mulch to 150 pounds per 100 gallons of water.
- Double the rate of seeding when hydroseeding is used.

16. Drill Calibration:

a. Grass or small grain drills may be calibrated using the following methods. Bulk Weight Method:

i. Raise the drill's drive wheel and measure its circumference in **feet**. Next, measure the distance between seed spouts or disc openers. Use Table 5 to determine the number of revolutions (R) to turn the drive wheel for the row spacing and wheel circumference in feet (C) for your drill. If you have different row spacing than listed in this table refer to your operations manual provided by equipment manufacturer for calibration guidance.

ii. Some manufacturers offer a calibration crank or other calibration method that makes it unnecessary to turn the drive wheel and measure its circumference (contact the manufacture for more information).

Table 5: Determination of Seeding Rate Using the Bulk Weight Method

Row Spacing in Inches	Number of Seed Spouts to Use	Turns of Drive Wheel
6	4	96/C = R*
7	4	82/C = R
8	3	96/C = R
10	3	77/C = R
12	2	96/C = R
*C=wheel circumference; R=revolutions of drive wheel.		

- Place enough seed in the box to cover spouts from which you will collect seed. Turn the drive wheel until all spouts are feeding. Place a container under the correct number of seed spouts (as determined from the Table A) and turn the drive wheel the number of revolutions previously determined. Weigh the sample in grams. Multiply this weight by 0.5. The result is the pounds per acre at that setting. Make adjustments in the drill setting and continue trials until the desired seeding rate is obtained.
- Remember seeding rates determined by this method are in terms of bulk seed. You need to convert your seeding rate from pure live seed per acre to bulk seed per acre when using this calibration method.
- Example:

  Row spacing = 7 inches
  Number of seed spouts = 4
  Circumference of drive wheel = 6.8 ft

  Revolutions of drive wheel (R) = 82/C R = 82/6.8 = 12 revolutions
  Bulk seeding rate is 15.1 lbs/ac. The drill is properly set when the 4 seed spouts yield 30 grams of seed after 12 revolutions of the drive wheel.

  30 grams x 0.5 = 15 lbs/ac

b. Seeds Per Row Foot Method:

i. This method of determining the amount of seed being distributed by the seeding equipment is to count the number of seeds per foot of drill row while the machine is in operation. Fill the drill with seed, make setting, and drive equipment over a hard ground surface or canvas. Count the number of seeds per foot of row and adjust until proper seeding rate is attained. Use Table B to determine the linear foot of row necessary to equal one square foot planted.

Table 6: Linear Foot Drill Calibration	
Row Spacing in Inches	Linear Foot of Row to Equal One Square Foot
6	2.0 feet
7	1.8 feet
7.5	1.65 feet
8	1.5 feet
10	1.2 feet
12	1.0 foot

ii. To determine the proper number of seeds per foot of drill row for a specific seeding mixture; you will first need to calculate the bulk seeding rate for each species in the mix. From Table 1, calculate the number of seeds per square foot (ft^2) for each pound seeded (seeds per pound divided by 43,560 ft^2/acre). Multiply the number of seeds per square foot for each pound seeded by the bulk seeding rate for each species. Total the resulting numbers to determine the number of seeds per square foot for the mixture.

iii. Example: If you want to calibrate a drill for a mixture of 4.5 lbs. PLS/ac green needlegrass (80% purity and 70% germination) and 4.0 lbs. PLS/ac western wheatgrass (92% purity and 85% germination), we would calculate the bulk seeding rate for each species. Bulk seeding rate would be 8lbs./ac for the green needlegrass and 5.1 lbs./ac for the western wheatgrass. Assuming one pound of green needlegrass seed contains 181,000 or 4.2 seeds/ft^2 for each pound seeded (181,000/43,560 ft^2/acre). Western wheatgrass has 110,000 seeds per pound or about:

2.5 seeds/ft^2 for each pound seeded.

8 lbs/ac x 4.2 seeds/ft^2/lb. = 33.6 seeds/ft^2

5.1 lbs/ac x 2.5 seeds/ft^2/lb. = 12.7 seeds/ft^2

The total seeds per square foot for the mix would be 46. If the drill we are calibrating has 7 inch row spacing, the drill calibration would be 46 seeds per 1.8 feet of row length.

17. Management and Protection during Establishment:

a. Grazing

i. Do not graze until stand is fully established and a minimum of one full growing season.

ii. If an adequate stand has not established during the first growing season, or if seedlings do not have well-developed root systems as evidenced by the presence of adventitious roots above the sown seed, then grazing deferment should be extended through the second growing season.

iii. Grazing during the deferment period, or "flash grazing" for weed control will be handled on a case-by-case basis provided no damage will be done to the seeded species (refer to requirements for flash grazing below).

b. Weed Control

i. General Requirements

1. During the establishment period, excessive amounts of competitive weeds will be controlled. In many cases weed control is not necessary especially if early successional habitat is desired.
2. Control weeds that compete with seedlings for sunlight and/or moisture during the growing season of the species planted.
3. The first weed control operation will be needed as recommended or prior to weed seed maturity.
4. Repeated weed control operations may be needed. Competitive weeds can be controlled mechanically, chemically, with a combination of these methods or with prescribed burning once grasses have a well-established root system. In a few rare cases flash grazing may be appropriate.

ii. Mechanical

1. Broadleaf - When broadleaf weeds threaten a seeding establishment because of severe shading, they should be mowed or shredded or sprayed. Mowing or shredding is generally the most effective prior to July 1 and should be discontinued by mid-August. The height of mowing or shredding must be above the height of the seeded grasses. For most grass plantings 10-12 inches is ideal.
2. Annual Grasses – Do not shred or mow unless severe shading occurs. Shredding or mowing may cause annual grasses to stool out causing more competition to the seeded grasses. If mowing or shredding is done ensure that more leaves are cut from the weedy grasses than from the seeded grasses. Mowing or shredding should be discontinued in late July to early August.
3. If vegetation is too heavy and smothering of grass seedlings may occur consider haying or removing residue or use of equipment that chops residue into fine pieces.

iii. Chemical

- To control competitive weeds with herbicides, use the appropriate herbicide(s) applied according to product label. Refer to the current year "Guide to Weed, Disease, and Insect Management in Nebraska, EC130" which can be found at: https://extensionpubs.unl.edu/. From this page search for: "EC130".
    1. The best control will be obtained when weeds are in the early stages of growth. Precautions should be taken to ensure that grass or legume seedlings are not injured by the selected herbicide(s).
- Prescribed Burning

1. Prescribed burning can be utilized after the first growing season.
   (a) Desirable grasses must have a well-established root system to avoid damage.
2. Refer to Prescribed burning standard 338 for guidance on utilizing this practice for weed control in grass/forb plantings.

- Flash Grazing
  1. Grazing treatments for weed control should specify the timing and duration of the grazing period.
  2. Requires short term use of livestock to reduce competition from undesirable plants by grazing them.
  3. Flash grazing will be used as a last resort for weed control and is not recommended over other weed control methods.
  4. Use flash grazing until the height and time of grazing reaches the point of 15% defoliation or less of seeded plants.
  5. Length of grazing period, number of animals, and soil condition should be considered before flash grazing.
  6. When utilizing this option contact your local Range/Forage Management Specialist for guidance.
- Noxious weed Control
  1. All noxious weeds must be controlled in accordance with State law
  2. Contact your local county officials for local guidance.
- Guidance for Weed control for early successional habitat
  1. Only those rare instances that excessive weed competition will prevent establishment of seeded species will weed control measures be required.
  2. Weeds threatening stand establishment will be controlled by mowing and/or spraying with labeled herbicides (herbicides must not compromise the desired plant composition).
  3. Mowing should not be conducted beyond the first full growing season after seeding.

c. Insect Control

- Insects such as grasshoppers can be a threat to new grass/forb seedlings.
  1. Contact professional agronomists, range specialists, University of Nebraska-Lincoln Extension specialists, or Chemical Company representatives for determination of insect thresholds, existing/potential seedling damage and recommendations on control of specific insects affecting seeded species.

Caution: When using any insecticides read and follow the manufacturer's label recommendations. Read and follow all directions and precautions on the label.

18. Guidelines for Stand Evaluation:

a. To determine adequacy of stands and to determine if reseeding or reinforcement seeding is required, use the following guidelines:

i. It should be recognized that environmental factors, such as climate, insects, soils, and fertility affect time required for establishment of stands. Timeliness of precipitation, drought, extreme temperatures, severe winds, or late soil thaw can delay seedling emergence and/or development.

ii. Seedling emergence should be relatively uniform over the area. The density of established plants required for an adequate stand will depend upon the planned purpose of the seeding and practice requirements.

iii. If specific practice guidelines are not available, stand counts should indicate a density of at least 3 to 5 seedlings per square foot of area. If at least 3 of the seedlings are rhizomatous species, the lower limit of 3 seedlings per square foot is adequate. The upper limit of 5 seedlings per square foot is necessary when all are bunch-type species or a mixture of rhizomatous and bunch-type species.

iv. The adequacy of a stand will be based on density of established plants and stage of morphological development needed to ensure survival. To be considered established, a grass plant must have a well-developed adventitious root system and should exhibit signs of tillering or rhizome development. An alfalfa plant must have a well-developed taproot with secondary and tertiary roots and a well-developed crown set below the soil surface and/or branch rhizomes.

v. Preliminary stand evaluation can be made 4 to 8 weeks after germination; evaluate for progress and management problems (i.e. weeds, insects, etc.) - not for final establishment.

vi. All stands must go through at least one winter before making final stand evaluation.

vii. Stands resulting from late fall (dormant) or spring seedings must go through the first growing season and subsequent winter; evaluation for final establishment can be made any time during the second growing season.

viii. Stands resulting from late summer seeding cannot be evaluated for final establishment until the end of subsequent, full growing season.

ix. Most stands will require 2 growing seasons to become established; warm-season species may require 3 growing seasons for establishment.

b. Stand counts may either be done using a 1-square foot frame or the row count method. If a frame count is used, all plants rooted within the frame should be counted. If the row count method is used, 2 side-by-side rows should be counted, the length to be determined by the row spacing. A 6-inch row spacing would require the observer to count all plants in 2 rows for a length of 12 inches; a 7-inch row spacing would require a 10.3-inch length of 2 rows; and an 8-inch row spacing would require a 9-inch length.

i. A predetermined number of steps should be taken diagonal or perpendicular to the drill rows and the frame dropped at the toe of the foot on the final step. The frame should be dropped in a consistent alignment to the drill rows. The same procedure would be used when making a row count. Instead of dropping the frame at the toe of the foot, this point would then mark the beginning of the row count.

ii. The number of samples required depends on factors such as stand uniformity and the number of species to be counted. Generally, a minimum of 10 counts (or frames) per 10 acres or less of field size would result in a representative sample. End rows, turn around areas or other areas that may have been double seeded should be avoided. Ten counts per 10 acres of field size should only be used as a starting point. For example, a 70 to 80 acre pasture planting with a uniform stand may be sampled accurately using 40 counts or less. Whatever the situation, enough counts must be taken so that a representative sample is obtained.

iii. NE-CPA-8A, Grass/Legume Stand Evaluation jobsheet, may be used to document the stand counts.

iv. If evaluation reveals a marginal stand, consideration should be given to allowing a second growing season for establishment. Seedings that contain a high percentage of "hard seed" are more likely to produce new seedlings during the second growing season.

v. The alternative of a partial reinforcement seeding, in lieu of the full seeding rate, should be considered during the evaluations.

vi. "Spot" seeding weak areas may be a logical alternative in the case of spotty or intermittent stands, in lieu of whole field reseeding. Grazing deferment should follow spot seedings.

19. Support References

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