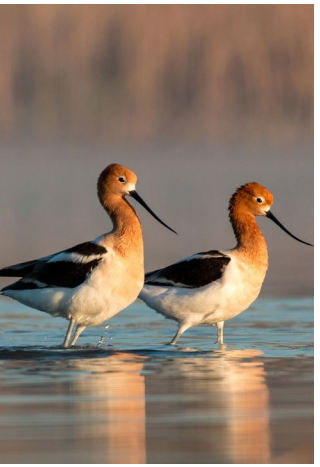
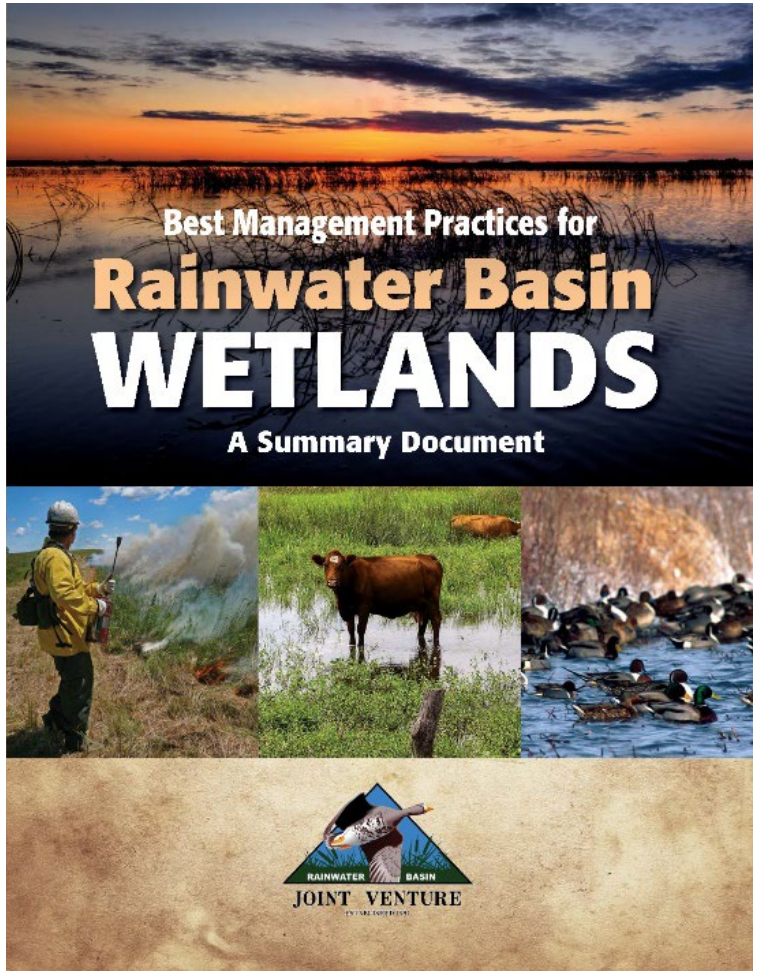
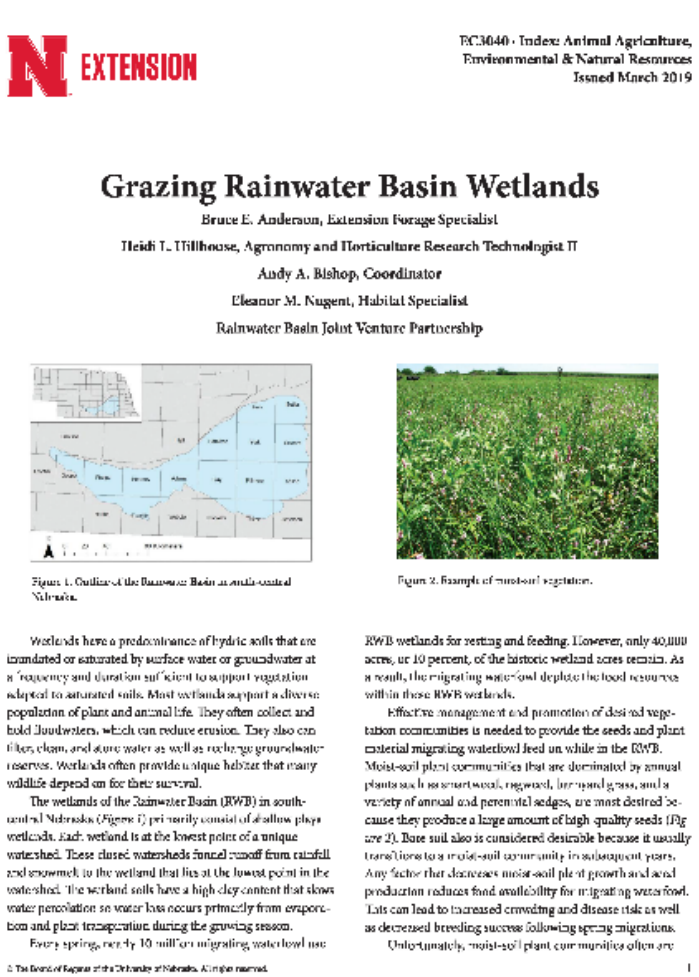


Nebraska Playa Wetland Restoration Guide

RWBJV Technical Committee

RAINWATER BASIN JOINT VENTURE





EXTENSION

EC3040 · Index: Animal Agriculture, Environmental & Natural Resources
Issued March 2019

Grazing Rainwater Basin Wetlands

Bruce E. Anderson, Extension Forage Specialist
Heidi L. Hillhouse, Agronomy and Horticulture Research Technologist II
Andy A. Bishop, Coordinator
Eleanor M. Nugent, Habitat Specialist
Rainwater Basin Joint Venture Partnership

Figure 1. Outline of the Rainwater Basin in south-central Nebraska.

Figure 2. Example of moist-soil vegetation.

Wetlands have a predominance of hydric soils that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support vegetation adapted to saturated soils. Most wetlands support a diverse population of plant and animal life. They often collect and hold floodwaters, which can reduce erosion. They also can filter, clean, and store water as well as recharge groundwater reserves. Wetlands often provide unique habitat that many wildlife depend on for their survival.

The wetlands of the Rainwater Basin (RWB) in south-central Nebraska (Figure 1) primarily consist of shallow playa wetlands. Each wetland is at the lowest point of a unique watershed. These closed watersheds funnel runoff from rainfall and snowmelt to the wetland that lies at the lowest point in the watershed. The wetland soils have a high clay content that slows water percolation so water loss occurs primarily from evaporation and plant transpiration during the growing season.

Every spring, nearly 10 million migrating waterfowl use RWB wetlands for resting and feeding. However, only 40,000 acres, or 10 percent, of the historic wetland acres remain. As a result, the migrating waterfowl deplete the food resources within these RWB wetlands.

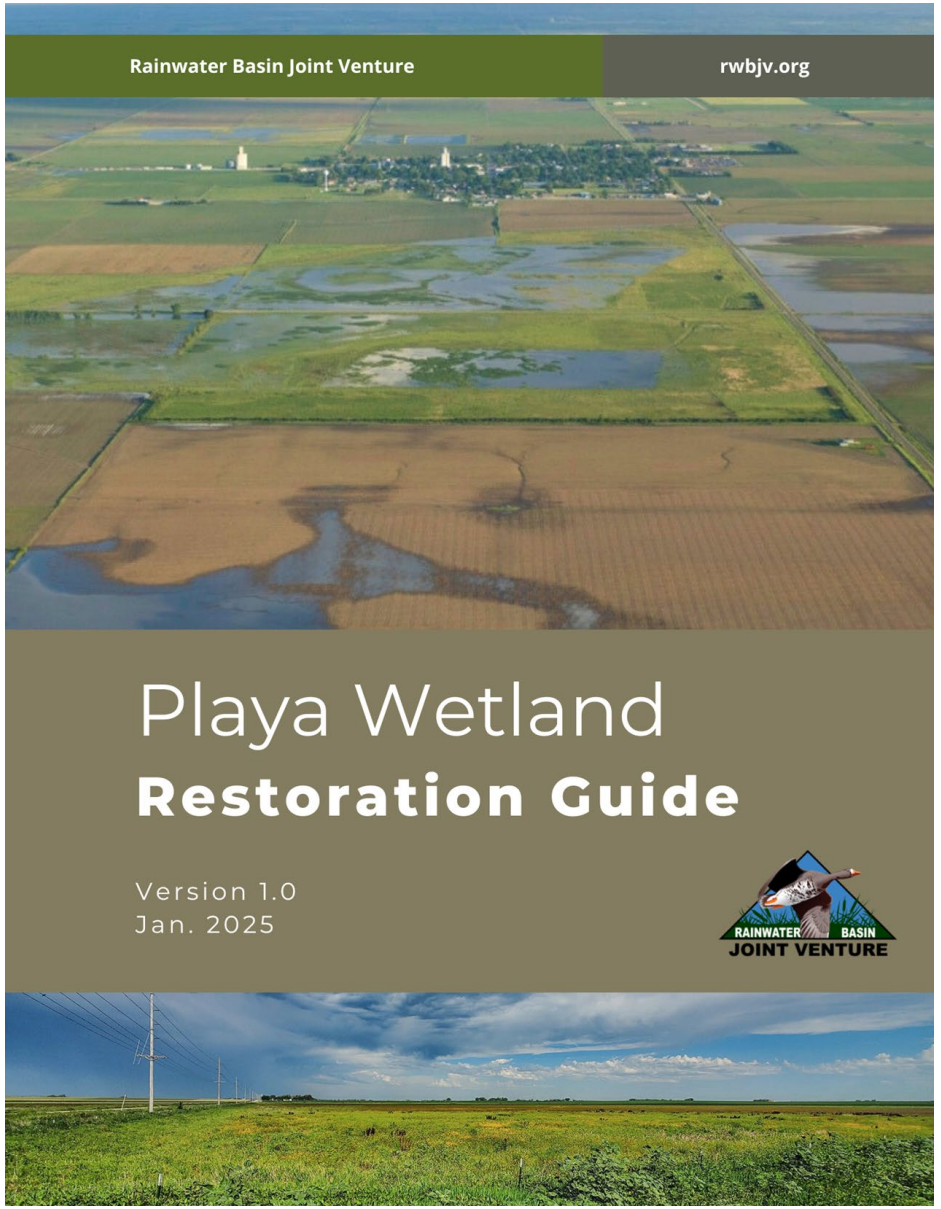
Effective management and promotion of desired vegetation communities is needed to provide the seeds and plant material migrating waterfowl feed on while in the RWB. Moist-soil plant communities that are dominated by annual plants such as smartweed, ragweed, barnyardgrass, and a variety of annual and perennial sedges, are most desired because they produce a large amount of high-quality seeds (Fig ure 2). Bare soil also is considered desirable because it usually transitions to a moist-soil community in subsequent years. Any factor that decreases moist-soil plant growth and seed production reduces food availability for migrating waterfowl. This can lead to increased crowding and disease risk as well as decreased breeding success following spring migrations.

Unfortunately, moist-soil plant communities often are

Background

- Restoration philosophy, level of planning, and resource inventories to guide playa restoration have adapted and changed over the last 30 years
- Over 55% of Nebraska conservation staff have been in the field for less than 5-years
- The RWBJV partnership has lost nearly 250 years of institutional knowledge in six retirements (2020 - 2023)

"… a comprehensive resource document for the Nebraska conservation community that should empower current and future employees to build on past approaches, address potentially limiting factors, and improve conservation delivery efficiency and outcomes."



At A Glance

Executive Summary

Playa Wetland Restoration Overview

Restoration Planning Scenario

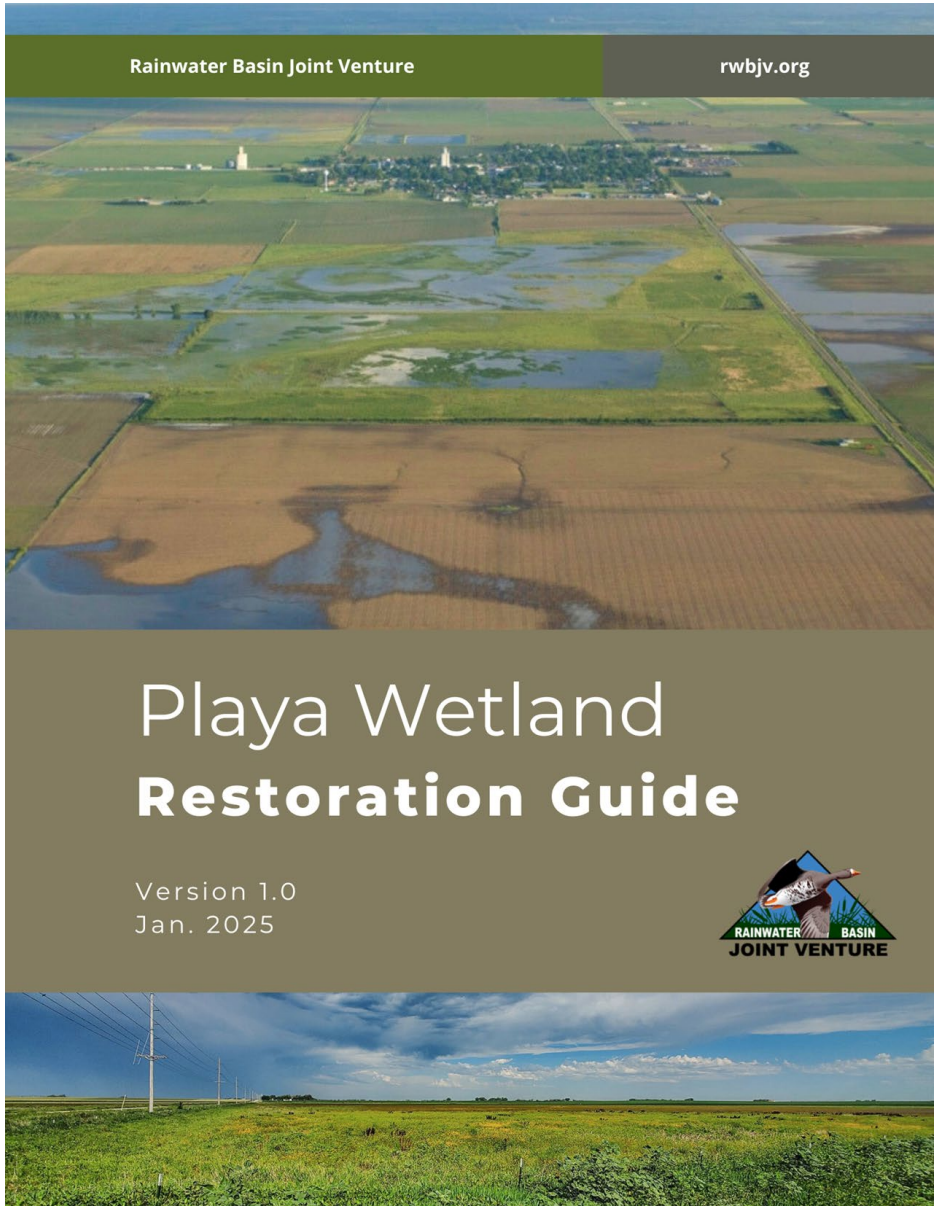
App A. Partners, Programs, and Policies

App B. Sediment ID Procedure for Resource Soil Scientists

App C. Historical Estimates of Depth to Bt Layer

App D. Pit Fill Calculator

App E. GIS Method for Estimating Sediment Removal Volume



Acknowledgements

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- Casey Latta
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- Ken Oathout
- Dan Shurtliff
- Carlos Villarreal
- Dan Whitehead

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- **Ted LaGrange**
- **Scott Luedke**

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- **Jennifer Swanson**

Rainwater Basin Joint Venture
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- Roger Grosse
- Shaikh Sadiqur Rahman
- **Brad Thornton**

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- Jaron Andrews
- Jeff Drahota
- Steve Fairbairn
- **Brad Krohn**
- **Kirk Schroeder**

U.S. Forest Service
- **Greg Wright**

Playa Wetland Restoration Overview

- Rainwater Basin Joint Venture
- Playa wetlands
  - Ecological importance
  - Conversion & loss
- Restoration accomplishments & opportunities
- Philosophy, guidance & resources
  - Lessons learned
  - Science and tools
  - Ecological targets

Restoration Planning Scenario

<u>Wetland under single ownership and single land use</u>

- Off-site wetland extent and condition assessment resources
- On-site wetland extent and condition assessment
- Restoration plan
- Management plan

RAINWATER BASIN JOINT VENTURE

App. A: Partners, Programs, and Policies

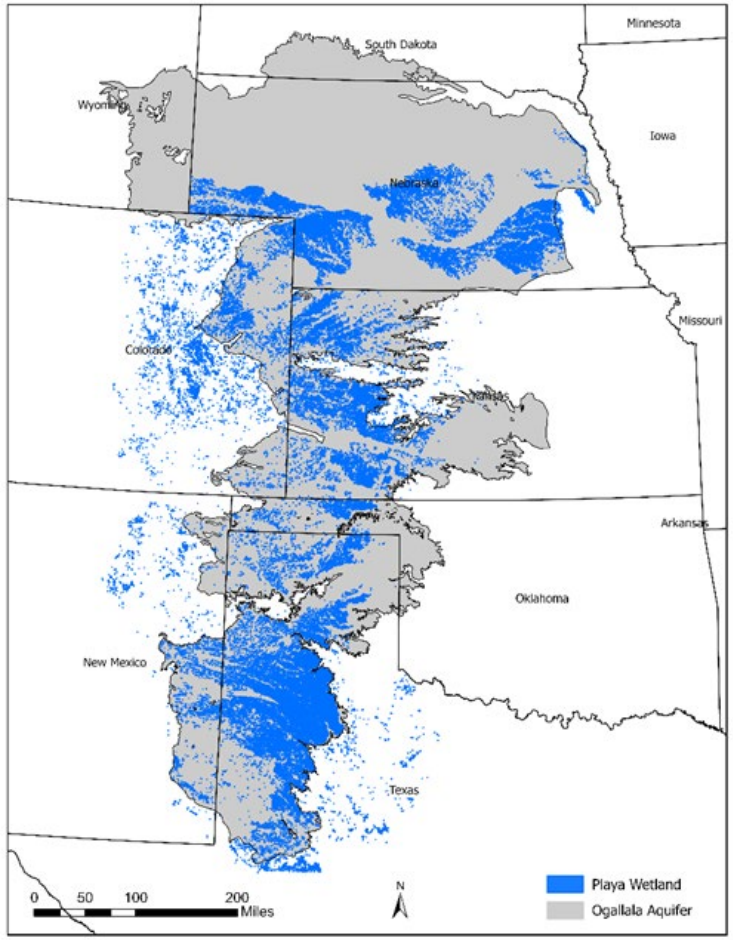
Rainwater Basin Joint Venture Technical Committee, 2024

- Regulatory Considerations
  - Federal & State policy
- Partner Missions & Objectives
- Summary of Programs & Implementation Considerations
- Program & Funding Support

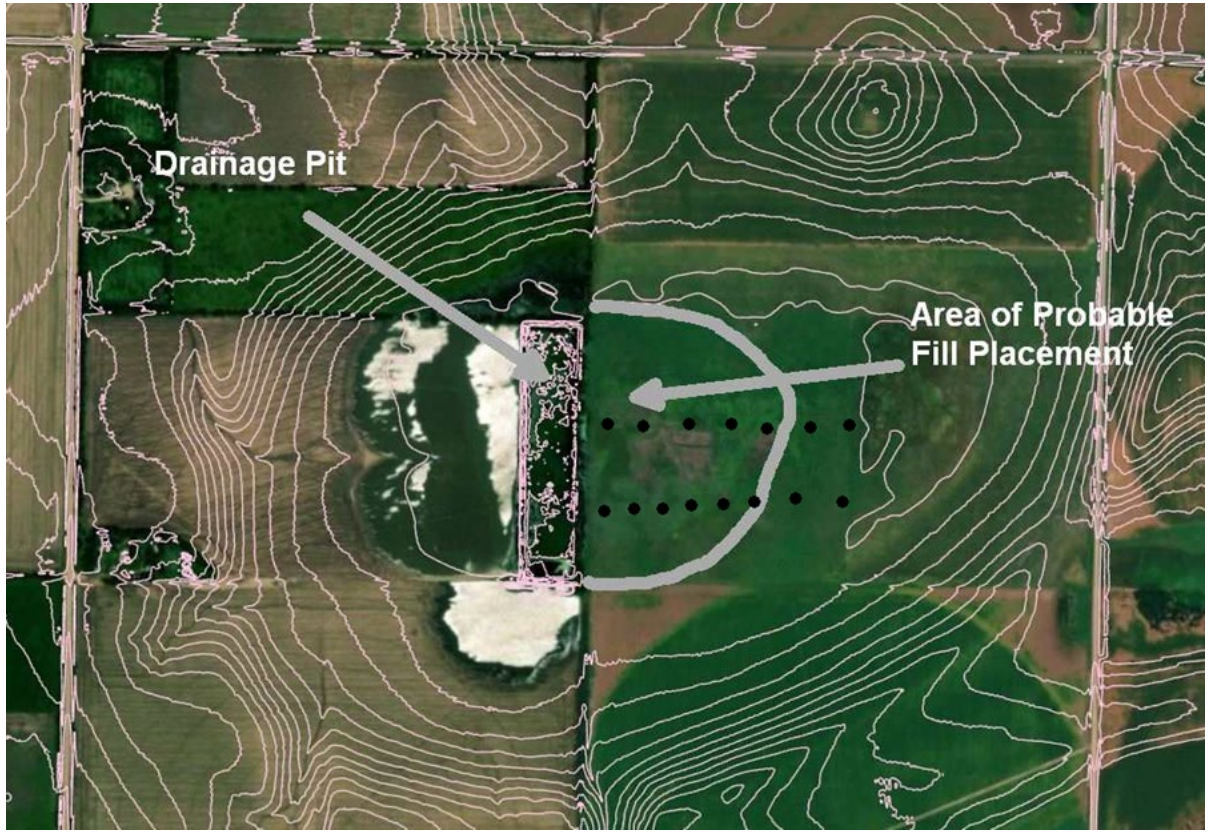
App. B: Sediment ID on Playa or Basin Wetland Restoration Projects for Resource Soil Scientists

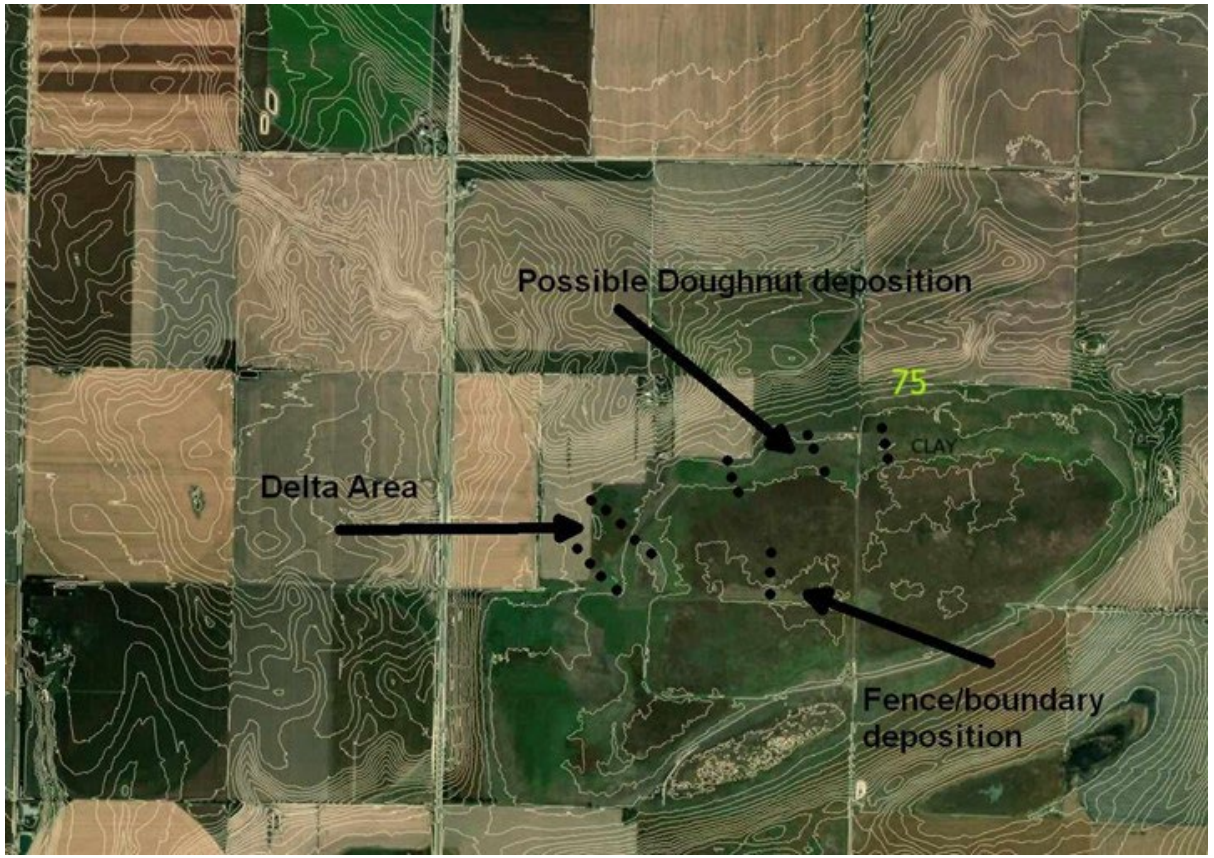
Patrick Cowsert, R.S.S. and Neil Dominy MLRA S.S.O.L, 2010
Revised by Patrick Cowsert, Casey Latta, and Chuck Markley, 2024

- Terminology
  - E.g., soil, sediment, fill
- Playa Wetlands
  - Distribution
  - Soils
  - Hydrology
- Hydrologic Manipulations
- Sediment Identification Procedure



App. B: Sediment ID on Playa or Basin Wetland Restoration Projects for Resource Soil Scientists





App. C: Historical Estimates of Depth to Bt Layer by Playa Wetland Complex

Dan Shurtliff, Assistant Nebraska Soil Scientist, Dan Whitehead, and other authors from LaGrange et al. 2011
Revised by Carlos Villarreal, State Soil Scientist & Tyler Durre, Resource Soil Scientist, 2024

- Based on LaGrange et al. (2011)
- Historical estimates from observations that occurred in range/grass/pasture landuse
- Two additional columns:
  1. Low depth range
  2. High depth range
- Organized by complex & soil category

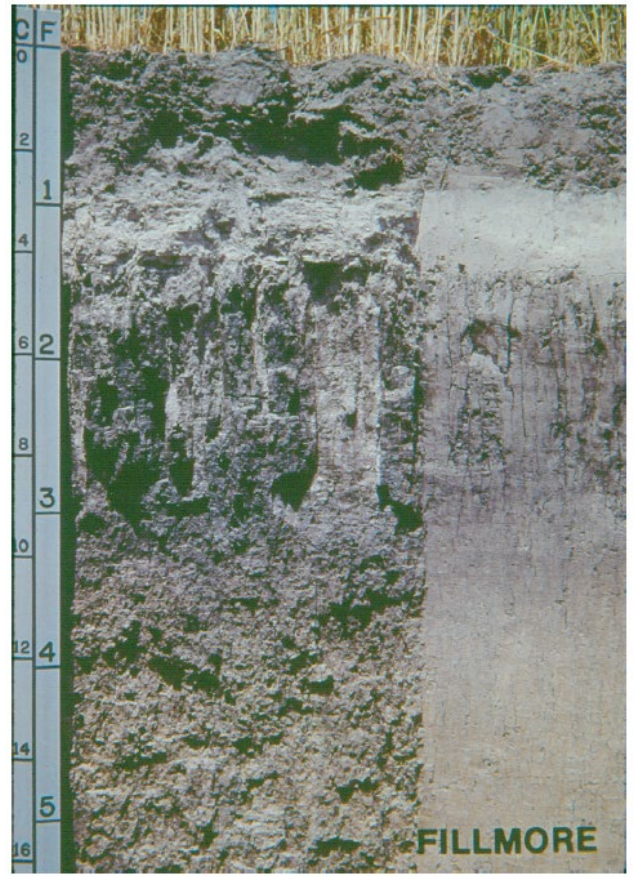


Figure 8. *Profile of Fillmore Silt Loam. Scale is in feet.*
Source: Andy Aandhal

App. C: Historical Estimates of Depth to Bt Layer by Playa Wetland Complex

Rainwater Basin All Sites

County	Year printed	Playa Complex Region	Soil Name	Depth to Claypan	Low Depth	High Depth	Average Depth	Land Use	Notes
Adams	1923	Rainwater Basin	Scott silt loam	1 to 12 inches	1	12	6.5	pasture and waste	"gray layer " (E horizon) described
Butler	1929	Rainwater Basin	Scott Silt Loam	5 to 11 inches	5	11	8	pasture, hayland and waste	A: 3 to 6 inches thick; E: 2 to 5 inches thick
Clay	1927	Rainwater Basin	Scott Silt Loam	8 to 12 inches	8	12	10	pasture and hayland-some waste	"gray layer " (E horizon) described
Fillmore	1918	Rainwater Basin	Scott silty clay loam	1 to 4 inches	1	4	2.5	35 percent drained and cultivated ; the rest is pasture and hayland	No "gray layer" (E horizon) described
Fillmore	1918	Rainwater Basin	Scott Silt Loam	7 to 25 inches	7	25	16	20 percent under cultivation	"gray layer " (E horizon) described
Gosper	1934	Rainwater Basin	Scott Silt Loam	4 to 10 inches	4	10	7	waste, pasture	"gray layer " (E horizon) described
Hall	1916	Rainwater Basin	Scott silt loam	6 to 12 inches	6	12	9	hay and pasture	"gray layer " (E horizon) described
Hamilton	1927	Rainwater Basin	Scott silty clay loam	6 to 14 inches	6	14	10	pasture and hayland	"topsoil closely resembles Fillmore"
Harlan	1930	Rainwater Basin	Scott silty clay loam	5 to 6 inches	5	6	5.5	pasture, waste	"gray layer " (E horizon) described
Kearney	1927	Rainwater Basin	Scott silt loam	10 to 12 inches	10	12	11	Pasture; smaller depressions may be cropped with surrounding soils.	some clay surfaces in western part of county; where this occurs the gray layer is very thin and the hardpan is at

App. D: Pit Fill Calculator

Nate Garrett, NRCS Area Engineer, 2012
Revised by Parker Belgum, NRCS Central Area Engineer and Ken Oathout, NRCS Field Engineer, 2025

- Irrigation reuse pits in the Rainwater Basin
  1. Concentrate water for reuse
  2. Reduce wetland function
- Engineering specs and guidance
  - Compaction ratios
  - (Over)fill volume
  - Borrow area volume

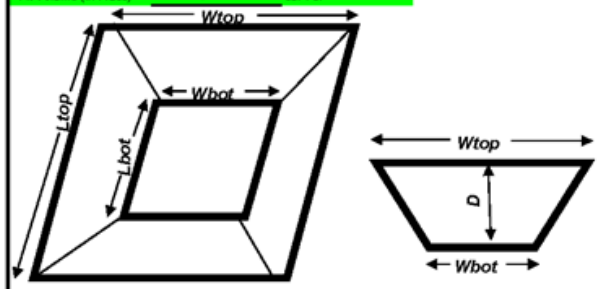
Pit Fill Calculator

Wbot Bottom Width (ft)	Lbot Bottom Length (ft)	Wtop Top Width (ft)	Ltop Top Length (ft)	D Depth (ft)
40	160	120	200	8

B = 6,400.0 sq. ft (Bottom Area)
M = 14,400.0 sq. ft (Median Area)
T = 24,000.0 sq. ft (Top Area)

(Where Volume of Pit = (d/6)(B+T+4M)/27 in cu. yd.)

Pit Volume (In Place) = 4,345.7 cu. Yd.



PLAN VIEW DIMENSIONS

PROFILE DIMENSIONS

Borrow Area

BORROW AREA LOCATION: INCLUDE PLAN MAP WITH LOCATION

Wbot Bottom Width (ft)	Lbot Bottom Length (ft)	Wtop Top Width (ft)	Ltop Top Length (ft)	D Depth (ft)
400	400	450	450	1
		Compaction Ratio (typically 1.2-1.3):	1.25	
		Stripping Depth:	0.3	

B = 160,000.0 sq. ft (Bottom Area)
M = 180,625.0 sq. ft (Median Area)
T = 202,500.0 sq. ft (Top Area)

(Where Volume of Pit = (d/6)(B+T+4M)/27 in cu. yd.)

Borrow Required = 5,432.1 cu. Yd.
Borrow Volume = 6,697.5 cu. Yd.

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITIES	AS-BUILT
Mobilization & Demobilization		Lump Sum	
Site Preparation			
- Stripping **	CY-P	2250	
- Tree removal burn and bury **	AC-P	2	
Removal of Water **	MG	3951	
Earth-fill			
- Pit Fill *	CY-P	5,430	
- Stripping **	CY-P	2250	
Seeding (Practice Stnd 645)	AC-P	4	

* Payments will be based off of these planned quantities. Earth-fill quantities are figured using 25% shrinkage

** Item is for bid purposes only. Payment for these items is subsidiary to pit earth fill.

MG = 1,000 Gal. CY-P = Cu Yds Planned. AC-P = Acres Planned.

I certify that the quantities shown as "as-built" are accurate and reflect actual field mearsurements. I certify that this project was installed according to approved plans and meet NRCS Standards.

Name: _____ Date: _____

PRACTICES

- [x] 657 - Wetland Restoration Pit Fills
- [ ] 644 - Wetland Wildlife Habitat Management Pit Fills
- [ ] 645 - Upland Wildlife Habitat Management

SPECIFICATIONS

- [x] NE-1. SITE PREPARATION & STRUCTURE REMOVAL
- [x] NE-11. REMOVAL OF WATER
- [x] NE-21. EXCAVATION
- [x] NE-23. EARTH FILL

PROJECT LOCATION

Site Location is approximately....

Legal: SW4 S16-T18-R12W
County: HALL COUNTY, NEBRASKA

CONSTRUCTION NOTES

1) The CONTRACTOR will inspect the construction area for the presence of utility facilities both surface and subsurface, and will notify the Nebraska One Call System (http://www.ne-diggers.com) before construction activities begin. The contractor will use extra safety precautions when working near or around pipelines, power lines, power poles, underground cables, or other utility installations. DIGGERS HOTLINE: 1-800-331-5666

2) The CONTRACTOR shall remove all signs of temporary construction facilities, such as work areas, stockpiles of excess material, and other vestiges of construction prior to final acceptance of the work. The disturbed areas shall be graded and filled as specified. Any off-site damage attributable to the CONTRACTOR's conduct of the work shall be repaired at no additional cost to the OWNER.

3) Exact limits of the excavation and fill will be staked by the NRCS before construction begins.

4) The CONTRACTOR shall remove the vegetation and debris from the excavation areas prior to movement of the material.

5) Following the completion of excavation activities the CONTRACTOR shall deep rip chisel or equivalent and plane level or equivalent, the excavation area. The finished earthfill placement area shall be 1 foot or greater below original ground grade.

6) Compaction requirements on the earthfill areas shall be CLASS C or equivalent to that each lift shall be completely covered at least once by the wheel tracks of loaded, rubber tired, hauling equipment. Load is defined as the struck load, or larger.

7) Trees and brush within the work limits will be removed, burned and disposed of in the approximate area. Exact location of the work limits will be staked by the NRCS before construction begins.

8) The CONTRACTOR shall remove all old metal, trash, and cheimical containers off site to a approved landfill as required by law.

9) The CONTRACTOR will dewater the re-use pits and channel areas as needed to perform the required construction activities. Prior to earthfill, the CONTRACTOR must be able to cross thawed pit foundation with loaded equipment. The CONTRACTOR is responsible for obtaining all permissions and permits to discharge the water outside the construction limits. All temporary detained water must be released after construction is complete.

NRCS

COVER SHEET
FARMER XYZ PIT FILL
HALL COUNTY, NEBRASKA

This project is job class: III
(Utilize Job Class criteria for NPS 657)

Designed:		Date:	Sheet #: 1
Checked:		Date:	Total Sheets: 2
Approved:		Date:	

RAINWATER BASIN JOINT VENTURE

App. E: GIS Method for Estimating Sediment Removal Volume

Jeff Drahota, USFWS Wildlife Biologist, Rainwater Basin Wetland Management District & Jaron Andrews, USFWS Hydrologist, Mountain Prairie Region, Division of Water Resources, 2024

- Data collection
  - Basin topography
  - Depth to Bt-horizon
- GIS data processing
- Estimate volume of excavation material

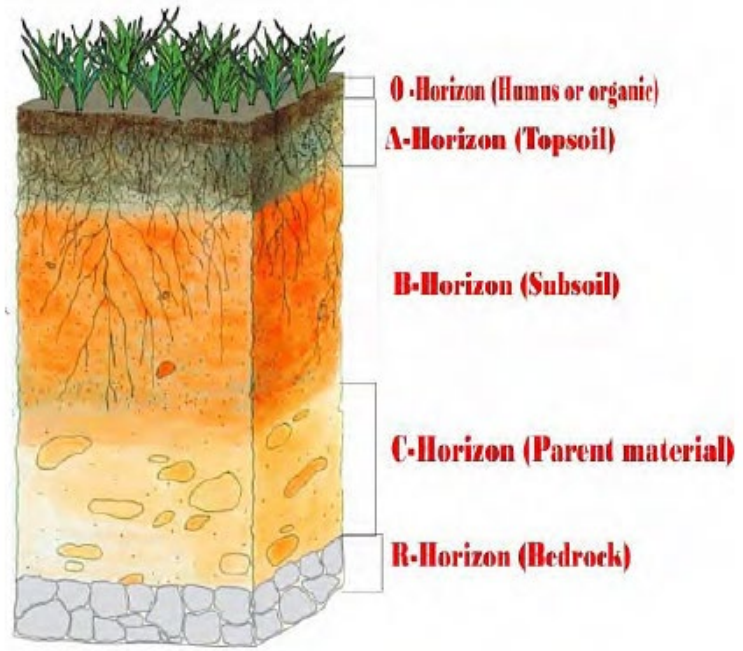
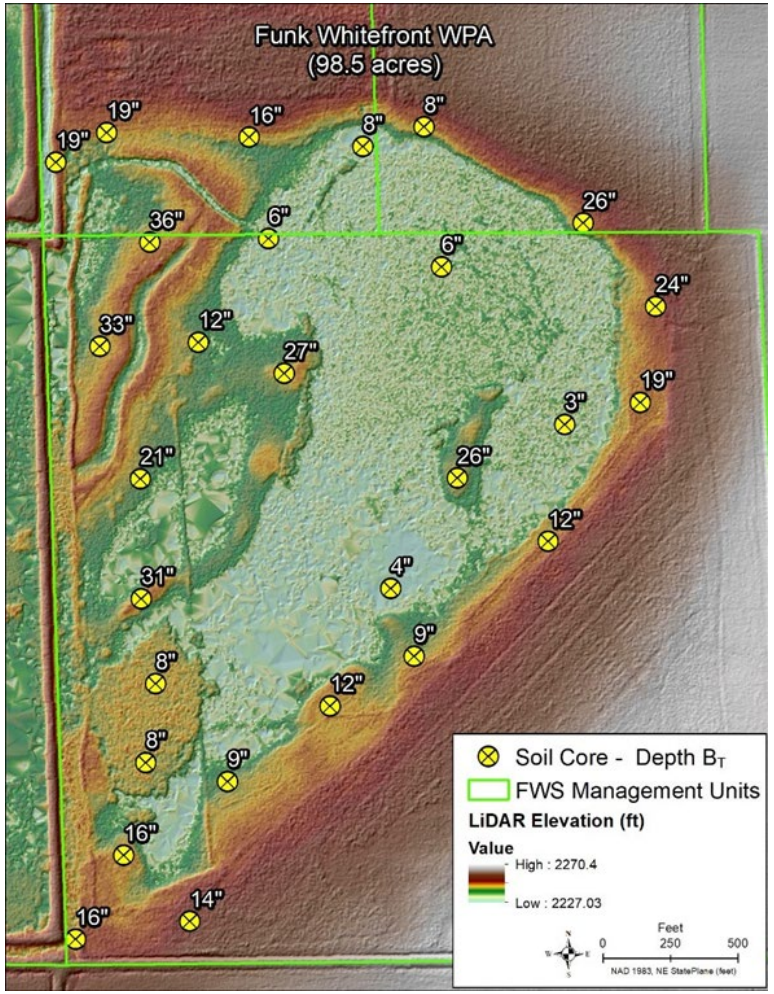
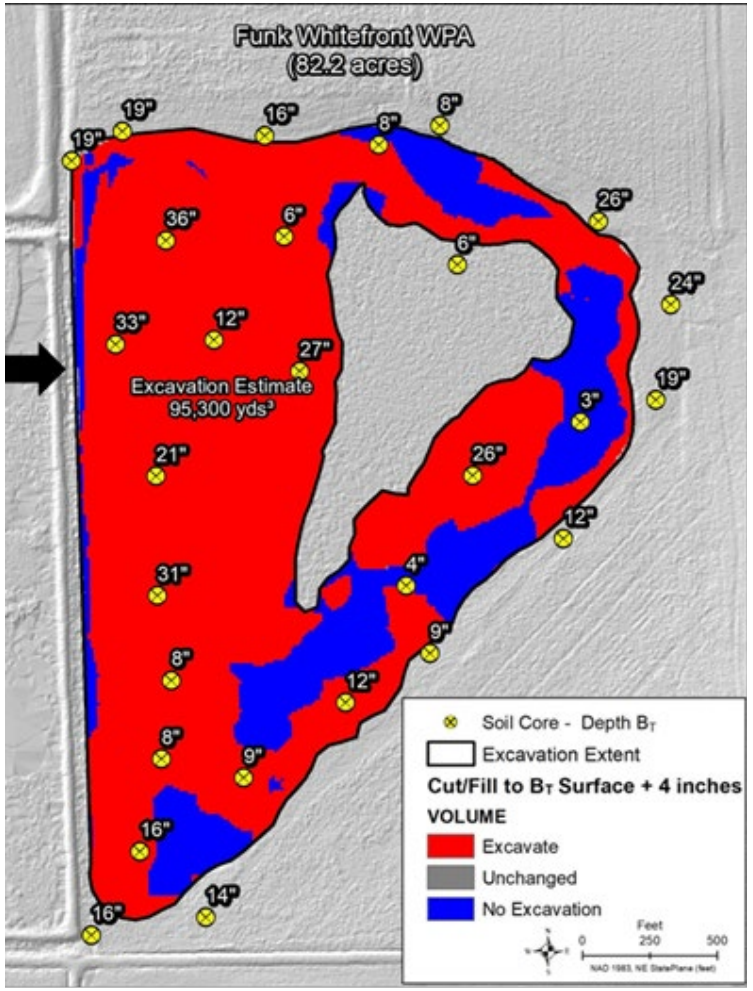


Figure 1 An idealized soil profile indicating the various soil horizons and layers. Soil core sampling should identify the depth to subsoil (B-horizon) when evaluating areas for wetland enhancement/restoration (by R. Brown 2020).

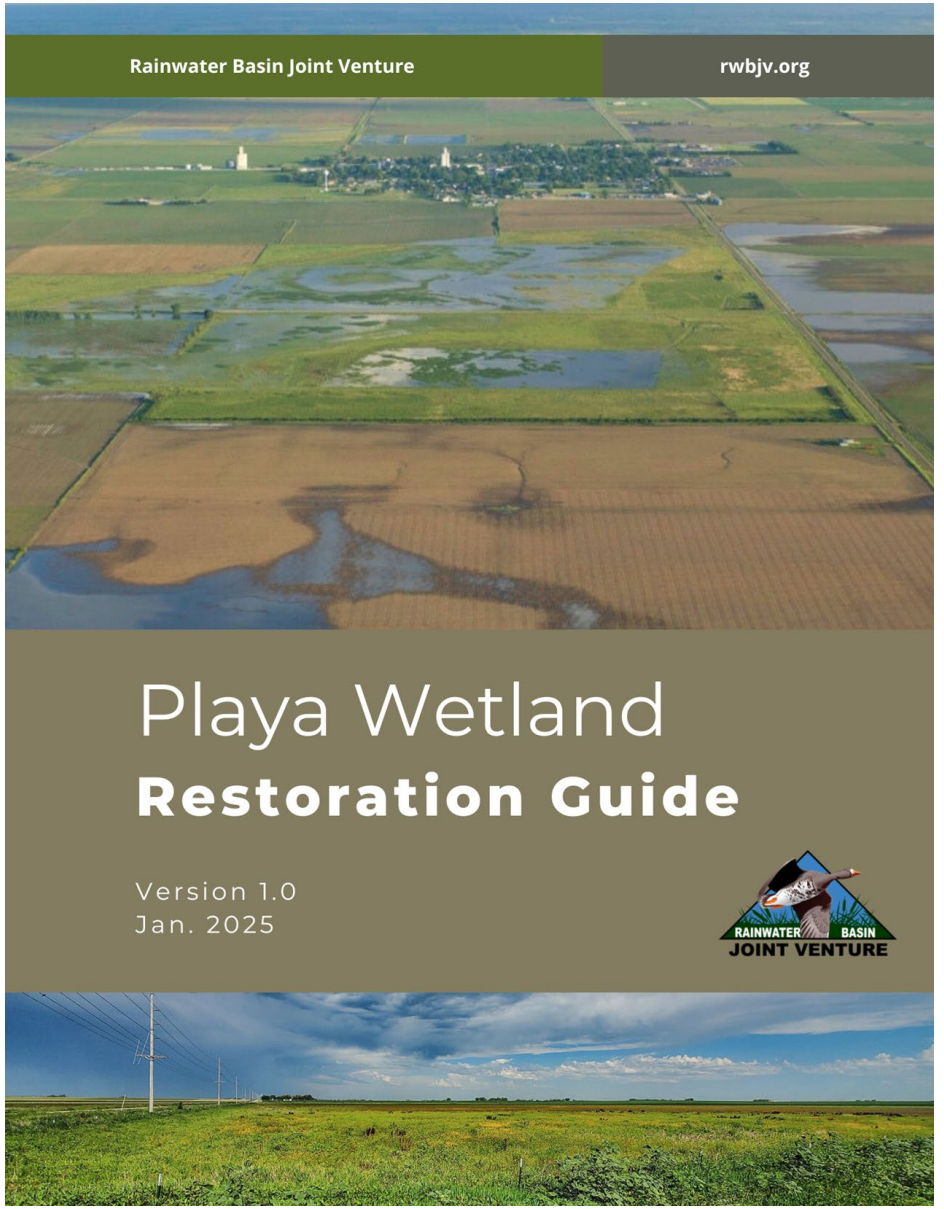
App. E: GIS Method for Estimating Sediment Removal Volume





Next Steps

- ‘Living document’
  - Updated with new guidance, resources, and scenarios
- Version 1.xx
  - Final draft review by Technical Committee
  - Used as placeholder in regional conversations
- Version 2.0
  - Sent to workgroups for feedback
  - Added topics
    - Split-ownership scenarios



Thank you!

Brad Thornton
Science Coordinator
bthornton4@unl.edu

rwbjv.org