Upper Little Salt Creek Saline Wetlands Plan

Executive Summary

Nebraska's eastern saline wetland complex is one of the most endangered wetland ecosystems in the state. Within the upper portion of Little Salt Creek watershed in northern Lancaster County, there are approximately 270 acres of saline wetlands on 950 acres of public land. Public lands are comprised of six individual properties within two contiguous groups, owned by the Lower Platte South NRD (LPSNRD), Nebraska Game and Park Commission (NGPC), and Pheasants Forever. The properties are: Helmuth Marsh (Pheasants Forever), Little Salt Creek Wildlife Management Area (WMA)-Noble Tract (NGPC), Little Salt Creek WMA (NGPC), Little Salt Fork Marsh (LPSNRD), Little Salt Creek West WMA (NGPC) and Little Salt Springs (LPSNRD). These properties contain a range of high quality to degraded saline wetlands as well as native prairie uplands and freshwater wetlands. Regionally unique and endangered plants and insects as well as resident and migratory wildlife inhabit the area. In addition to valuable habitat, these wetlands provide educational and research opportunities within close proximity to the City of Lincoln. Ongoing threats to saline wetlands include invasive plant species, sedimentation, land and agricultural development, water pollution, stream degradation and local water table declines. Ongoing land and resource management and future wetland rehabilitation projects are vital to the survival of this unique ecosystem.

BACKGROUND AND HISTORY

Nebraska's eastern saline wetlands played a key role in the City of Lincoln's history and are part of the city's legacy. In the 1850's, salt mining companies employed all 30 residents for gathering salt in what was then called Lancaster. Technological advances changed the salt mining operations and the salt mines were abandoned around Lincoln. But the city of Lincoln had been established as the new territorial capital in large part because of the ill-fated salt mining.

SALINE WETLAND SCIENCE AND RESEARCH

Saline wetlands are formed through the seasonal wetting and drying of saline groundwater discharge in floodplain depressions and swales of the tributaries to Salt Creek in Lancaster and Saunders counties. The source of salt lies in a deep limestone formation that is a remnant of the inland sea across the Great Plains (Gosselin et al. 2003). Saline groundwa-

ter travels over regional pathways and rises to the surface via conduits not completely understood. Saline groundwater outlets include seeps, springs, and contributions to stream baseflows.

Wetlands are defined by their vegetative, soil and hydrological characteristics. In saline wetlands, the characteristics are defined by halophytic ("salt loving") vegetation, salt infused floodplain soils, , and saline groundwater discharge. Saline soils are created by the seasonal wetting and drying of saline groundwater discharge. A wide range of soil salinity concentrations exists throughout the Salt Creek watershed. A limited number of halophytes have evolved to tolerate saline soils resulting in a lack of vegetation diversity that defines these saline wetlands. Saline groundwater moves over large regional flow paths from a Pennsylvanian Era limestone formation and discharges in Lancaster and Saunders counties.

In the early 1900's, an amateur naturalist named Frank Shoemaker began taking photographs in the saline wetlands. His work marked the beginning of over 100 years of scientific research and observation. Numerous research papers were written over the years. In 1987, James Ducey reported on the biological features of saline wetlands and was arguably the first to identify threats and ongoing degradation due to Lincoln's development expansion and channelization of Salt Creek and its tributaries around Lincoln.

In 1991, an interagency team of individuals from NGPC, U.S. Army Corps of Engineers, Nebraska Dept. of Environmental Quality (NDEQ), U.S. Fish and Wildlife Service and Environmental Protection Agency initiated the saline wetland characterization study. This team determined the study boundary, established criteria for characterization, and conducted wetland site assessments during the growing seasons in 1992 and 1993. This study established baseline criteria for Nebraska Eastern saline wetlands. But a dedicated program to address the conservation of saline wetlands did not exist.

PARTNERSHIP FORMATION

To address saline wetland conservation and associated community needs, the Saline Wetlands Conservation Partnership (SWCP) was formed in 2003. The SWCP's full share partners include the City of Lincoln, Lower Platte South NRD, Nebraska Game and Parks Commission, Lancaster County and The Nature Conservancy. Ten comprehensive strategies and five landscape objectives were developed in the SWCP's Implementation Plan. Since 2003, the SWCP has addressed all of the comprehensive strategies and landscape objectives.

saline wetlands conservation partnership

"No net loss of saline wetlands and their associated functions with a long-term gain in sustaining wetland functions through the restoration of hydrology, prescribed wetland management, and watershed protection."

- Primary Goal of SWCP Implementation Plan

GOALS AND OBJECTIVES OF PLANNING DOCUMENT

Moving into the second decade of implementation, the SWCP initiated a planning project for the Upper Little Salt Creek watershed. Based on feedback and direction from members of the SWCP, the following goals and objectives were identified in the early phases of the planning process:

1. Identify planning area boundary and land management, rehabilitation and conservation goals for planning area. The SWCP identified six public properties to focus on in the upper portion of the Little Salt Creek watershed. Step 1 of the planning project was to identify a planning area boundary including a core area that includes these properties and known saline wetlands, a buffer area that focuses on protection of adjacent saline wetlands, and the upper Little Salt Creek Watershed.

2. Collect field and spatial data to evaluate existing conditions and prioritize projects. To evaluate existing conditions of the saline wetlands within the planning boundary, field level and spatial data were collected. These datasets comprise watershed resources, detailed vegetation surveys, ground-level information from land managers, and historic land management information.

3. Evaluate techniques used in saline wetland rehabilitation. Saline wetland rehabilitation and stream restoration projects were conducted over the past 20 years in the Little Salt Creek watershed prior to SWCP inception. The wide variety of rehabiltation techniques were evaluated as part of the this project to determine successful applications and also instances where rehabilitation measures could be improved.

4. Assist Saline Wetlands Conservation Partnership with future decision making for the planning area. The SWCP is moving into the second decade of conservation work. This plan will engage the SWCP in a process of thinking about the area's future and provide a basis for future planning and project development.

PLANNING AREA BOUNDARY

The first step in the planning process was to determine the planning area boundary. Subwatershed boundaries within the Little Salt Creek watershed were mapped with the six property boundaries. The planning area boundary was split into three groups using subwatersheds based on the following protocol. The planning area boundary map is included in Figure ES-1.

Saline Wetland Preservation and Rehabilitation Area

This is the core planning area. These subwatersheds overlap the six publicly owned properties or contain saline wetlands. Wetland improvement and land management projects are focused in this area.

Saline Wetland Buffer Area

This area includes subwatersheds with an open waterway that connects to a core planning area. Land in this buffer area should be monitored for land management projects that might include conservation buffers, sediment traps, and invasive species management.

Saline Wetland Watershed Protection Area

This area includes the remainder of land within the Little Salt Creek watershed that drains to the core planning area. Land in the protection area should be monitored for land use changes, conservation practices and impacts local groundwater recharge.

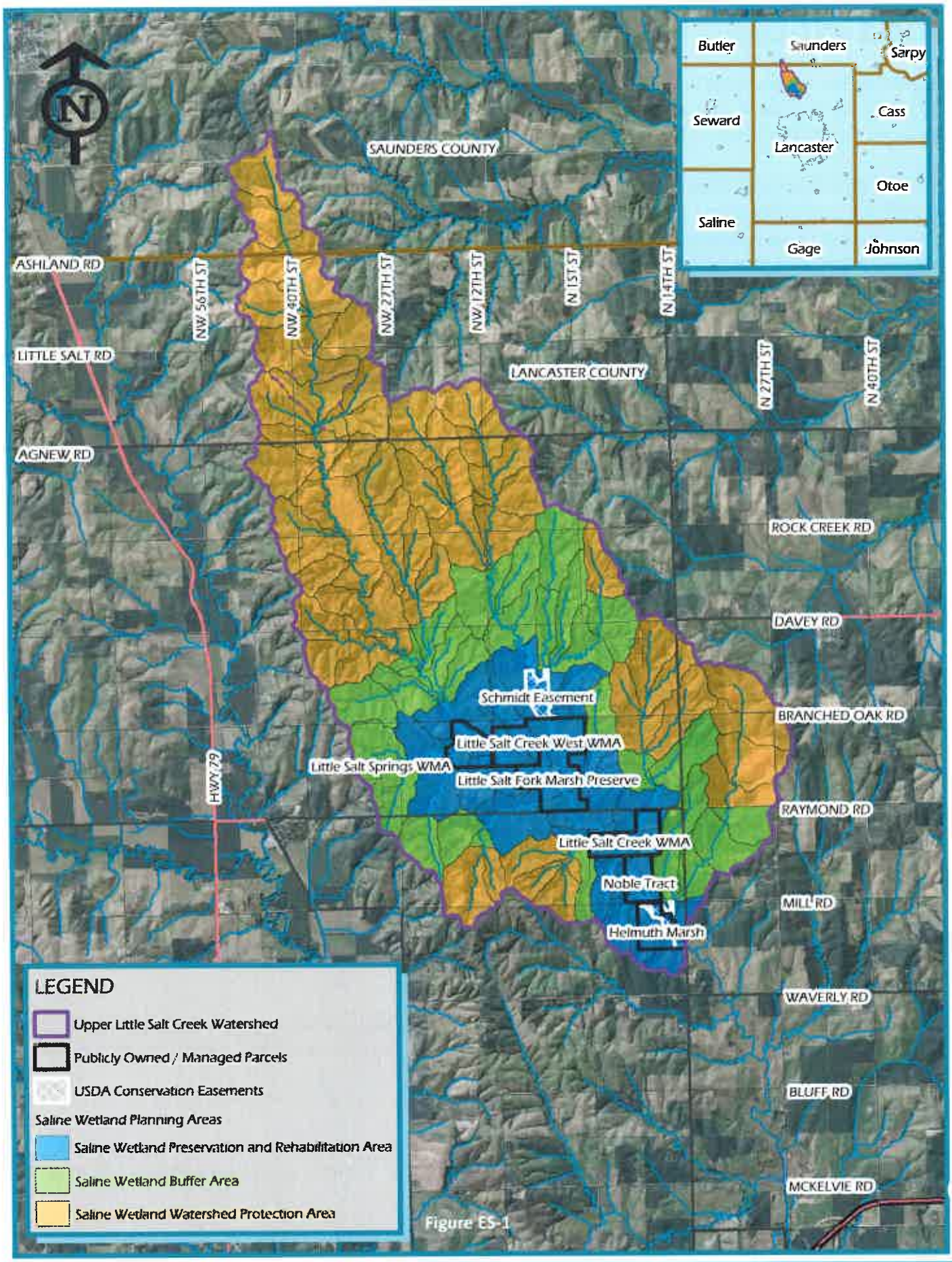

Butler
Saunders
Sarpy
Seward
Cass
Lancaster
Otoe
Saline
Gage
Johnson
SAUNDERS COUNTY
LANCASTER COUNTY
ASHLAND RD
LITTLE SALT RD
AGNEW RD
ROCK CREEK RD
DAVEY RD
BRANCHED OAK RD
RAYMOND RD
MILL RD
WAVERLY RD
BLUFF RD
MCKELVIE RD
NW 56TH ST
NW 40TH ST
NW 27TH ST
NW 12TH ST
N 1ST ST
N 14TH ST
N 27TH ST
N 40TH ST
HWY 79
Schmidt Easement
Little Salt Creek West WMA
Little Salt Springs WMA
Little Salt Fork Marsh Preserve
Little Salt Creek WMA
Noble Tract
Helmuth Marsh
LEGEND
Upper Little Salt Creek Watershed
Publicly Owned / Managed Parcels
USDA Conservation Easements
Saline Wetland Planning Areas
Saline Wetland Preservation and Rehabilitation Area
Saline Wetland Buffer Area
Saline Wetland Watershed Protection Area

Figure ES-1

DATA INPUTS - RESOURCES BASEMAP

Geographic information systems (GIS) data were created to identify property resources, saline wetland condition, and stream condition. Public land manager input was collected to delineate saline wetland features, land management techniques and other site resources. These data supplemented available spatial datasets for saline wetlands, critical habitat, NDEQ programs, utilites, etc. See Figure ES-2 for a resources basemap of planning, utilities, and resources for the core planning area.

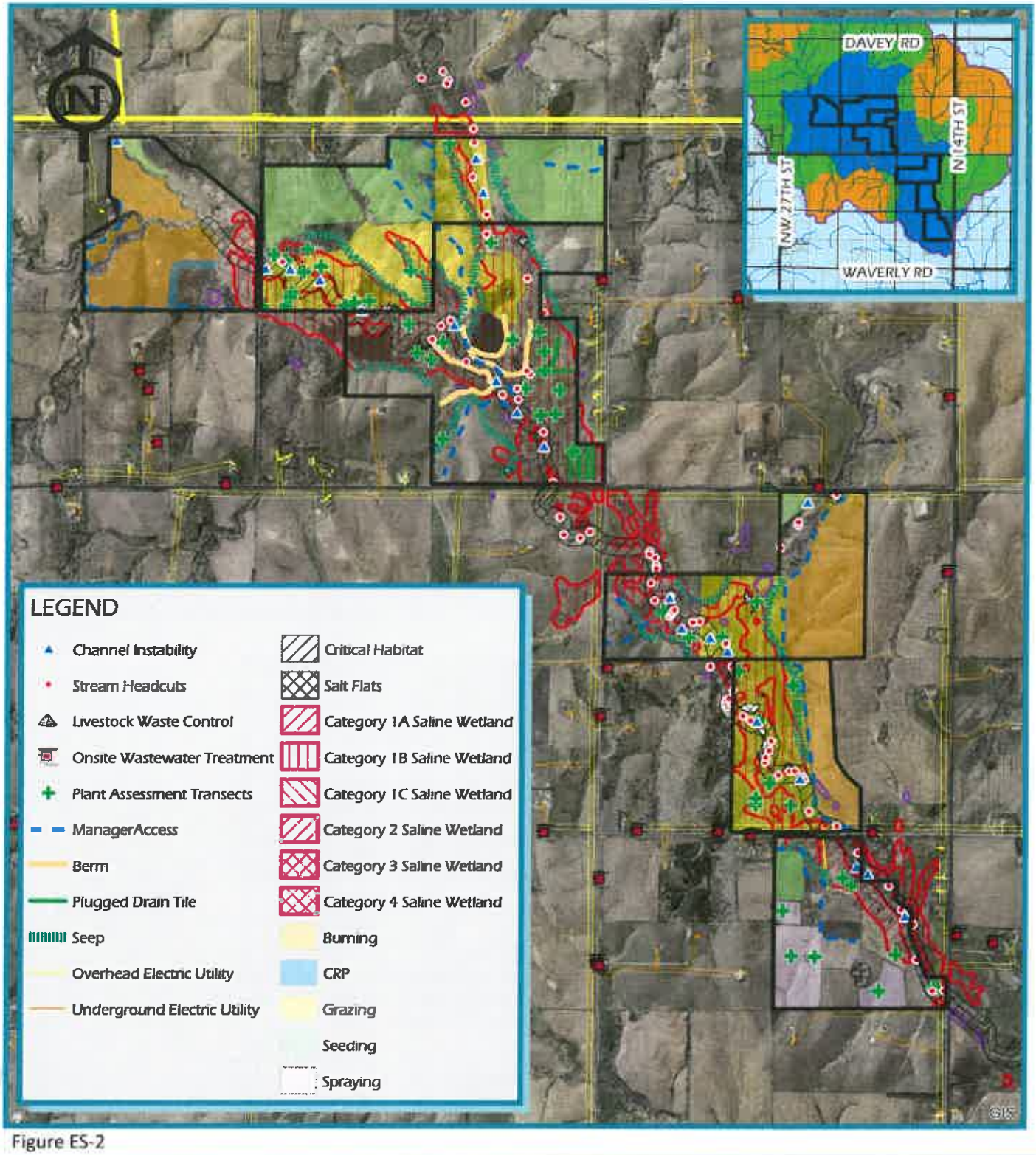


Figure ES-2

DATA INPUTS - VEGETATION FIELD SURVEYS

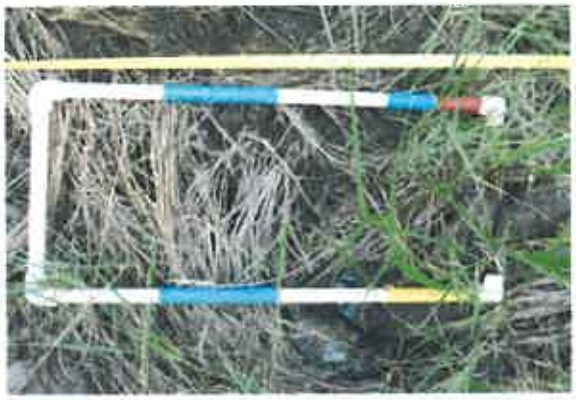
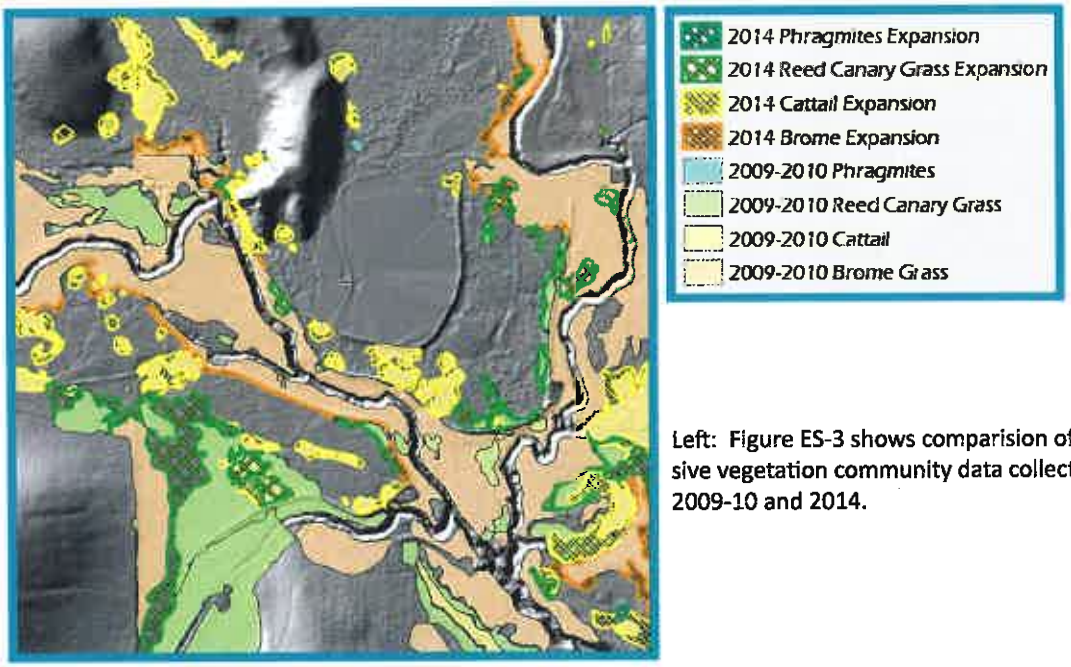


Photo of Canopy Cover (Daubenmire Method) Microplot (Photo Credit: Kay Kottas)

At the field level, project team botanists conducted a transect-based plant assessment and community mapping effort in the fall of 2013 and during the spring/summer of 2014 to define baseline botanical resources of the planning area. Plant assessment data was collected over 51 transects throughout planning area (See Figure ES-2 for locations). Vegetation surveys conducted by the SWCP in 2009 and 2010 were reinvestigated in 2014 to identify changes and spread of invasive species (see Figure ES-3).

Two distinct types of data were gathered. Community boundaries were delineated with GPS to map the dominant native and invasive communities of these sites and to establish baseline definitions of the various community types as they now exist. In addition, detailed vegetation plot sampling was performed in areas where mechanical/physical or hydrologic modifications or management practices might be implemented at a later date to improve conditions at these wetlands. Comparing these data with future data can assess potential changes in community structure, boundaries or species dominance as a result of management efforts.

Project botanist in foxtail barley at Little Salt Creek WMA.



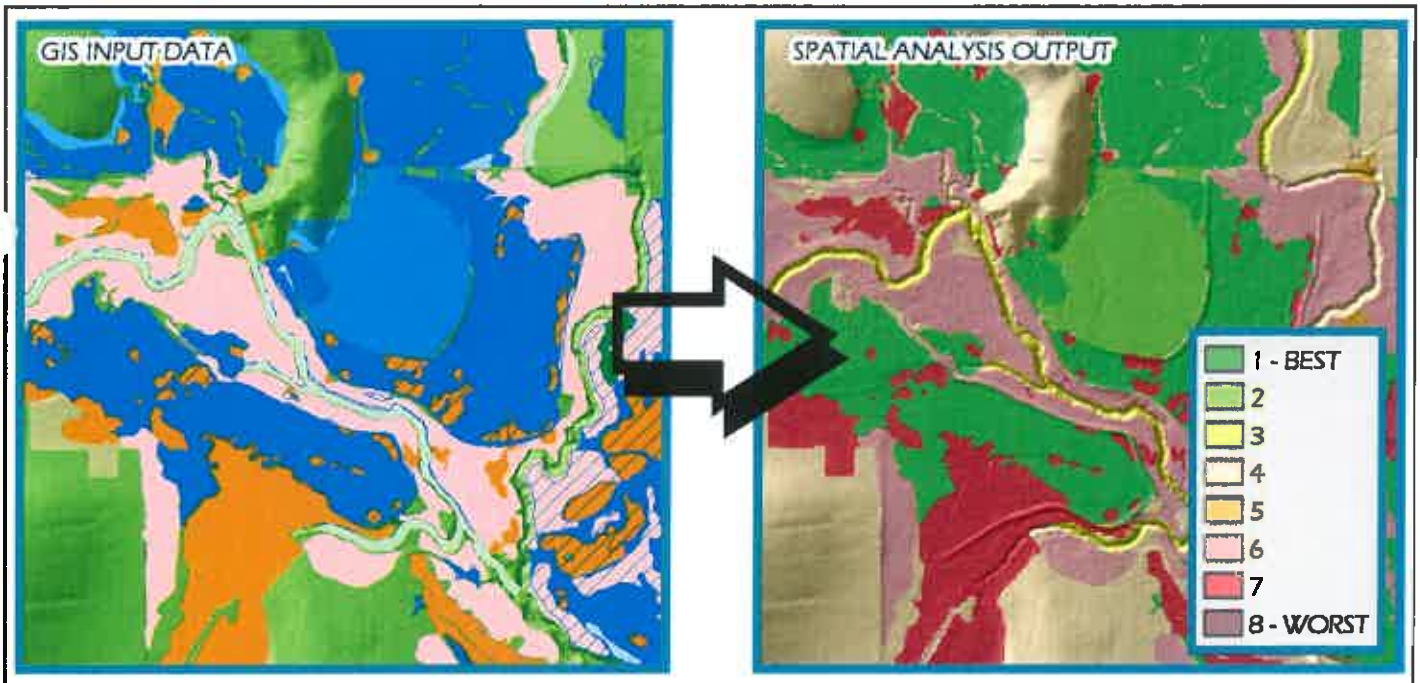
Left: Figure ES-3 shows comparision of invasive vegetation community data collected in 2009-10 and 2014.

DATA INPUTS - SPATIAL ANALYSIS

At the desktop level, a unique spatial analysis methodology was employed with available GIS datasets for vegetation, soils and hydrology resources. The analysis generated saline wetland condition ratings and rehabilitation strategies on a 10ft x 10ft grid throughout the planning area.

Vegetation

Vegetative cover conducive to saline wetlands was analyzed using site surveys and land cover databases. Vegetation surveys on public properties were conducted in 2009 and 2010 by the SWCP. This survey identified the extents of vegetation communities and individual species. The remaining watershed was evaluated using the 2010 land cover database generated by the National Agricultural Statistical Service (NASS). As shown in Figure ES-4, a rating of "1-best" through "8-worst" were assigned and based on the presence of vegetation types related to saline wetland condition. Existing saline communities were given the best rating "1". Vegetation types that provide either diversity to saline wetlands or have the greater potential for conversion were rated "2" through "5". Invasive species and areas with a lower potential for conversion to saline wetlands were given the worst ratings "6" through "8". An example of the vegetation resource coverages are shown in Figure ES-4.



Vegetation Input Data - Spatial Analysis Rating (Indicated by Presence of GIS Resources within Grid Cell)

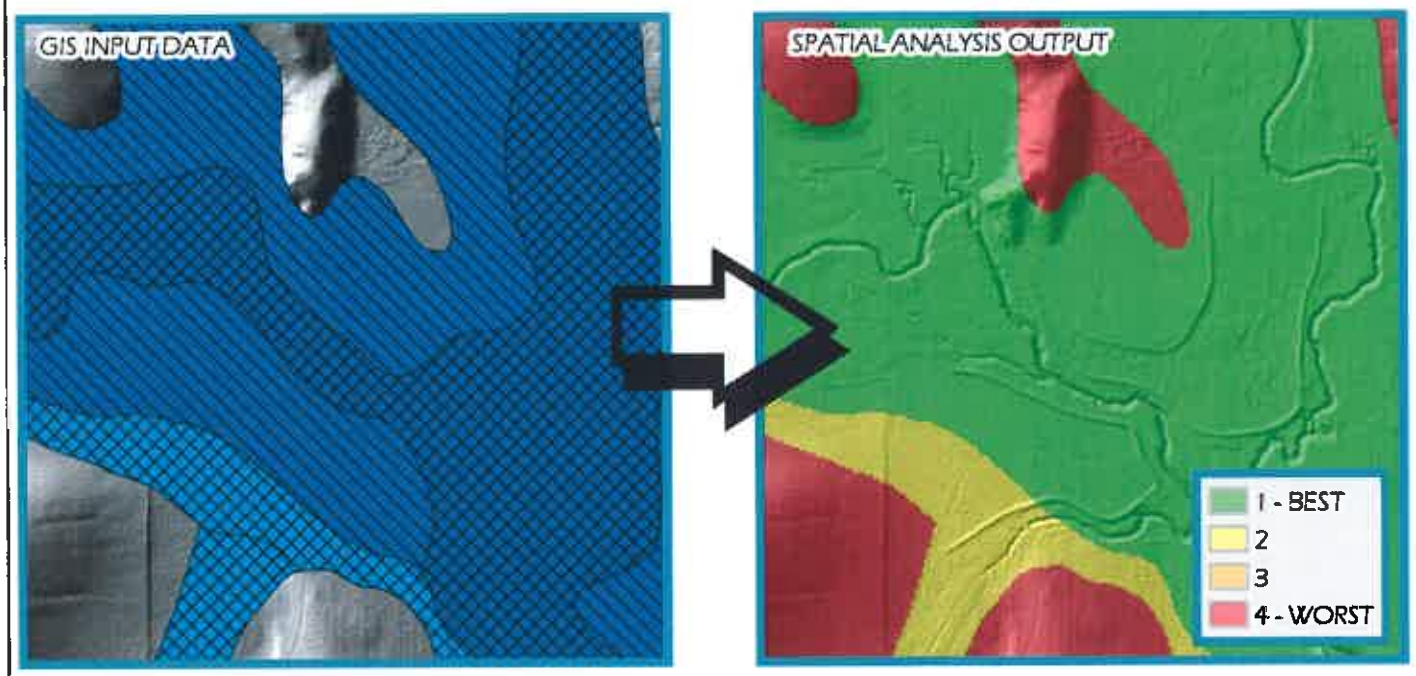
WORST — BEST

- Saline Wetland, Salt Flat, Seep, Wetland* (Rating = 1)
- Prairie Cordgrass, Barnyard Grass, Open Water*, Freshwater Wetland (Rating = 2)
- Stream (Rating = 3)
- Prairie Species, Pasture/Grass* (Rating = 4)
- Riparian Species, Forest* (Rating = 5)
- Brome (Rating = 6)
- Phragmites, Reedcanary Grass, Cattail, Cropland* (Rating = 7)
- Developed* (Rating = 8)

Figure ES-4

Soils

Soil properties conducive to saline wetlands were evaluated through Soil Survey Geographic Database (SSURGO) attributes. The chart shown in Figure ES-5 assigns a rating of "1-best" through "4-worst" based on the presence of given attributes. Soil series associated with salinity and hydric soils were the primary attributes assessed. Geomorphic description, wetland soil rating, and drainage class were considered concurrently to assess the potential for saline wetland conditions or rehabilitation. An example of the GIS data inputs and soils analysis outputs are shown in Figure ES-5.



Soil Input Data - Spatial Analysis Rating (Indicated by Presence of GIS Resources within Grid Cell)

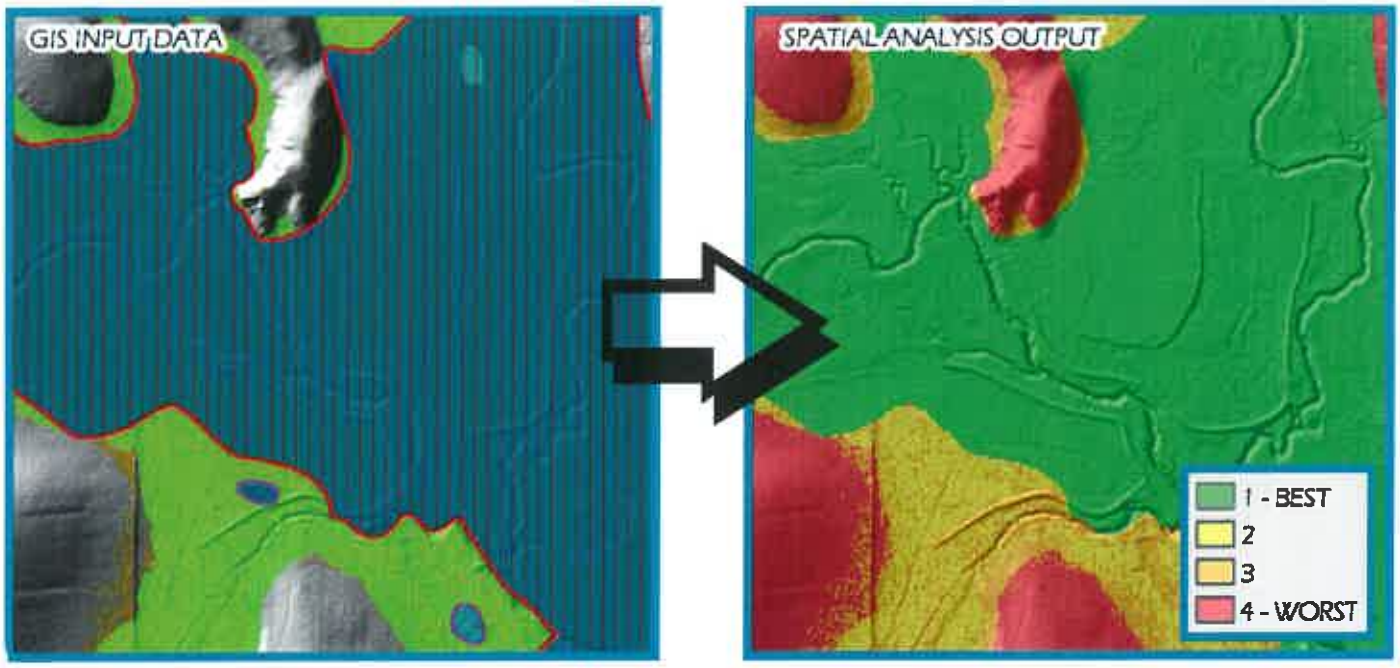
BEST → WORST

- Salmo or Lamo Soil Series (Rating = 1)
- Hydric Soil (Rating = 2)
- Soil Geomorphology - Floodplain / Stream Terraces / Depressions:
  - Good Wetland Soil Rating and/or Poor Drainage Class (Rating = 2)
  - Poor Wetland Soil Rating and Good Drainage Class (Rating = 3)
- Soil Geomorphology - Drainageways and Swales:
  - Good Wetland Soil Rating and Poor Drainage Class (Rating = 2)
  - Good Wetland Soil Rating or Poor Drainage Class (Rating = 3)
  - Poor Wetland Soil Rating and Good Drainage Class (Rating = 4)
- Soil Geomorphology - Uplands (Rating = 4)

Figure ES-5

Hydrology

Watershed hydrology conducive to saline wetland function was evaluated using GIS datasets. Primary data resources included mapping data obtained from the SWCP and the U.S. Fish and Wildlife Service. Secondary data resources included floodplain boundaries, land slope, and depth to water table, which were considered concurrently. The chart shown in Figure ES-6 was developed to assign a rating of "1-best" through "4-worst" based on the presence of hydrologic features.



Hydrology Input Data - Spatial Analysis Rating (Indicated by Presence of GIS Resources within Grid Cell)

BEST → WORST

- Saline Wetland Category 1 or 3 (Rating = 1)
- Saline Wetland Category 2 or 4 and/or NWI Freshwater Wetland (Rating = 2)
- NWI Lake, Pond, or Stream (Rating = 3)
- Within 100-Year FEMA Floodplain:
  - Shallow Water Table and Average Land Slope < 3% (Rating = 2)
  - Unknown Water Table and/or Average Land Slope > 3% (Rating = 3)
- Outside 100-Year FEMA Floodplain:
  - Shallow Water Table and Average Land Slope < 3% (Rating = 3)
  - Unknown Water Table and/or Average Land Slope > 3% (Rating = 4)

Figure ES-6

Stream Condition

An assessment conducted for the Little Salt Creek Watershed Master Plan (LPSNRD 2009) was expanded to include minor drainages in the core planning area. A spatial analysis of stream conditions was conducted and focused on saline wetland rehabilitation and restoration. This analysis included identification of knick points and head cuts in Little Salt Creek within the publicly owned parcels that are adjacent to saline wetlands and evaluation of channel stability in minor tributaries within the planning area.

DATA OUTPUTS - WETLAND CONDITION

Vegetation, soils and hydrology input ratings were combined using a matrix approach to generate an overall saline wetland condition rating. At each grid point a rating based on a scale of 1 to 8 was determined with 1 representing best condition and 8 representing poorest condition. An example figure of the wetland condition map is shown in Figure ES-7. Also shown are the results of the stream condition assessment.

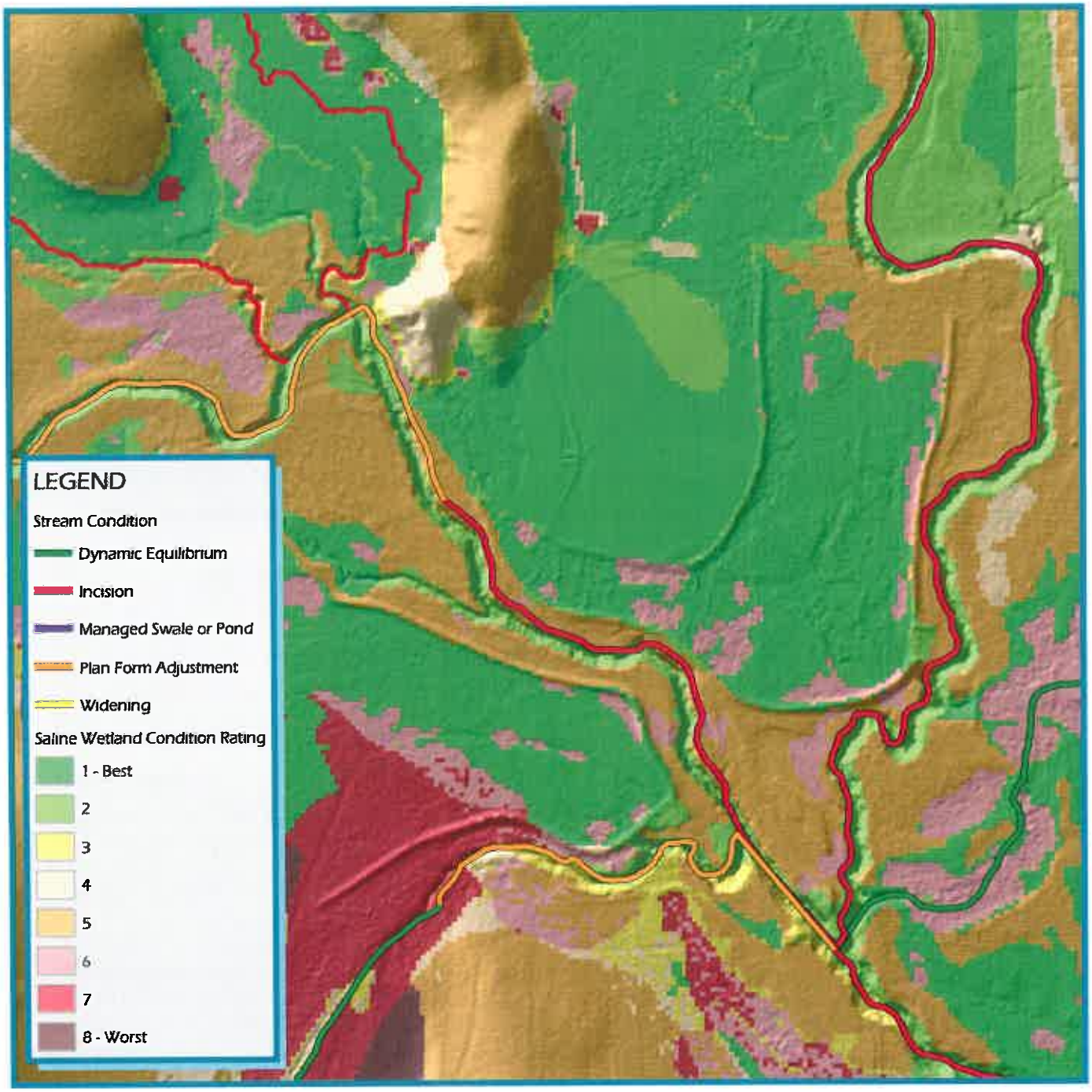


Figure ES-7

DATA OUTPUTS - WETLAND REHABILITATION RATING

Rehabilitation strategies were also developed for the 2009-10 vegetation data and applied using a similar matrix process as the condition rating. Multiple strategies exist for many of the rehabilitation groups. For these groups, selection of a strategy is dependent on the hydrology and soils ratings for a given vegetation type. For instance, pastures located on Salmo Soils or in a mapped wetland would be designated as "Convert to Saline or Freshwater Wetland". Similarly, pastures located on floodplain type soils or hydrology would be designated for a "Conservation Buffer", while pastures located in uplands would be designated for "Watershed Conservation". An example of the analysis results is shown in Figure ES-8. Also shown are results of the 2014 vegetation community for invasive species.

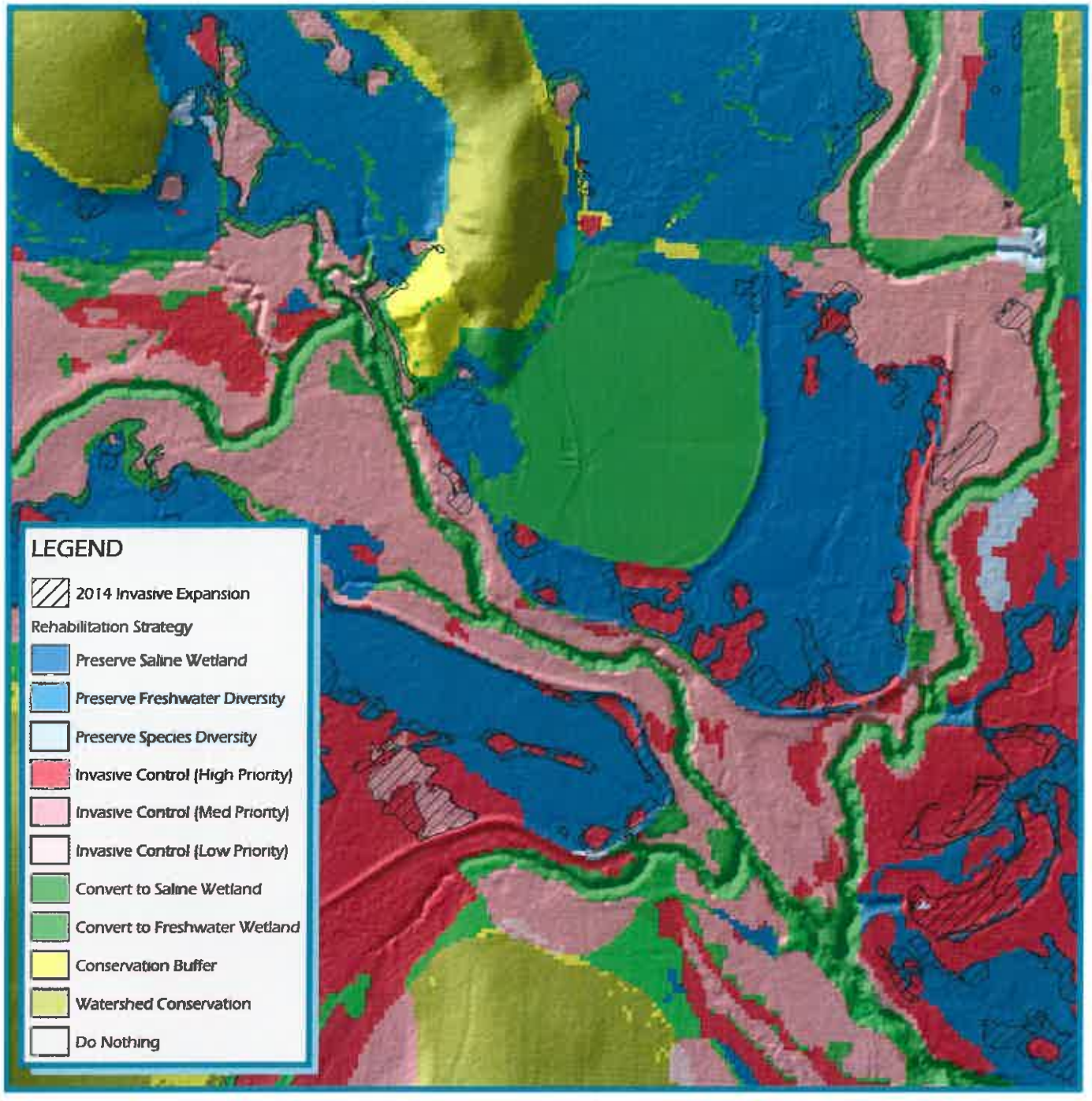


Figure ES-8

PLAN OUTPUTS - Saline Wetland Improvement Projects (SWIPs)

Based on results of the spatial analysis, vegetation field surveys, stream condition and knowledge of site conditions, members of the planning project Core Team prioritized saline wetland improvement projects. These SWIPs (saline wetland improvement projects) were identified and prioritized with an implementation timeline. SWIPs are similar in concept to capital improvement projects and consist of land management and rehabilitation projects. SWIPs have been identified at the following public properties: Helmuth Marsh, Little Salt Creek WMA-Noble Tract, Little Salt Creek WMA (LSCWMA), Little Salt Fork Marsh (LS Fork Marsh), Little Salt Creek West WMA, and Little Salt Springs. At the detailed planning level by property, SWIPs were prioritized with a rating or 1 (highest), 2 or 3. Table ES-1 presents different SWIP project types identified by property and planning level budget information. A map of SWIPs identified in the core planning is included as Figure ES-9.

Table ES-1

Structural Projects	Unit Cost Range	Helmuth	LSC-WMA Noble	LSC-WMA	LS Fork Marsh	LSC West WMA	LS Springs
Armor Bank	$5,000 - $15,000				X		
Armor Head Cut	$5,000 - $15,000	X	X	X	X		
Repair Berms / Stream Terrace	$8,000 - $20,000		X	X	X		
Channel Realignment	$40,000 - $100,000						X
Conservation Buffer	$2,000 - $40,000		X		X	X	X
Instream Grade Control	$25,000 - $60,000	X	X		X		
Sediment Trap	$14,000 - $68,000			X	X	X	X
Stream Crossing	$26,000 - $50,000			X			
Streamside Saline Habitat Shelf	$4,000 - $40,000	X		X	X	X	
Water Level Control Structure	$15,000 - $50,000	X			X		
Land Management Projects	***Units***						
Brome Control	acres	6	11		9	2	
Cattail Control	acres	5	5	5	14	2	8
Reed Canary Control	acres	17	3	7	6	1	
Cedar Removal Sites	each			2			
Monitoring Projects	each	2				2	
Future Studies	each	1	1	3			2
Planning Level Budget*		$150,000	$200,000	$100,000	$200,000	$100,000	$150,000

*Planning level budgets are based on construction costs and do not include permitting, design or construction administration.

Saline Wetland Improvement Projects (SWIPs)

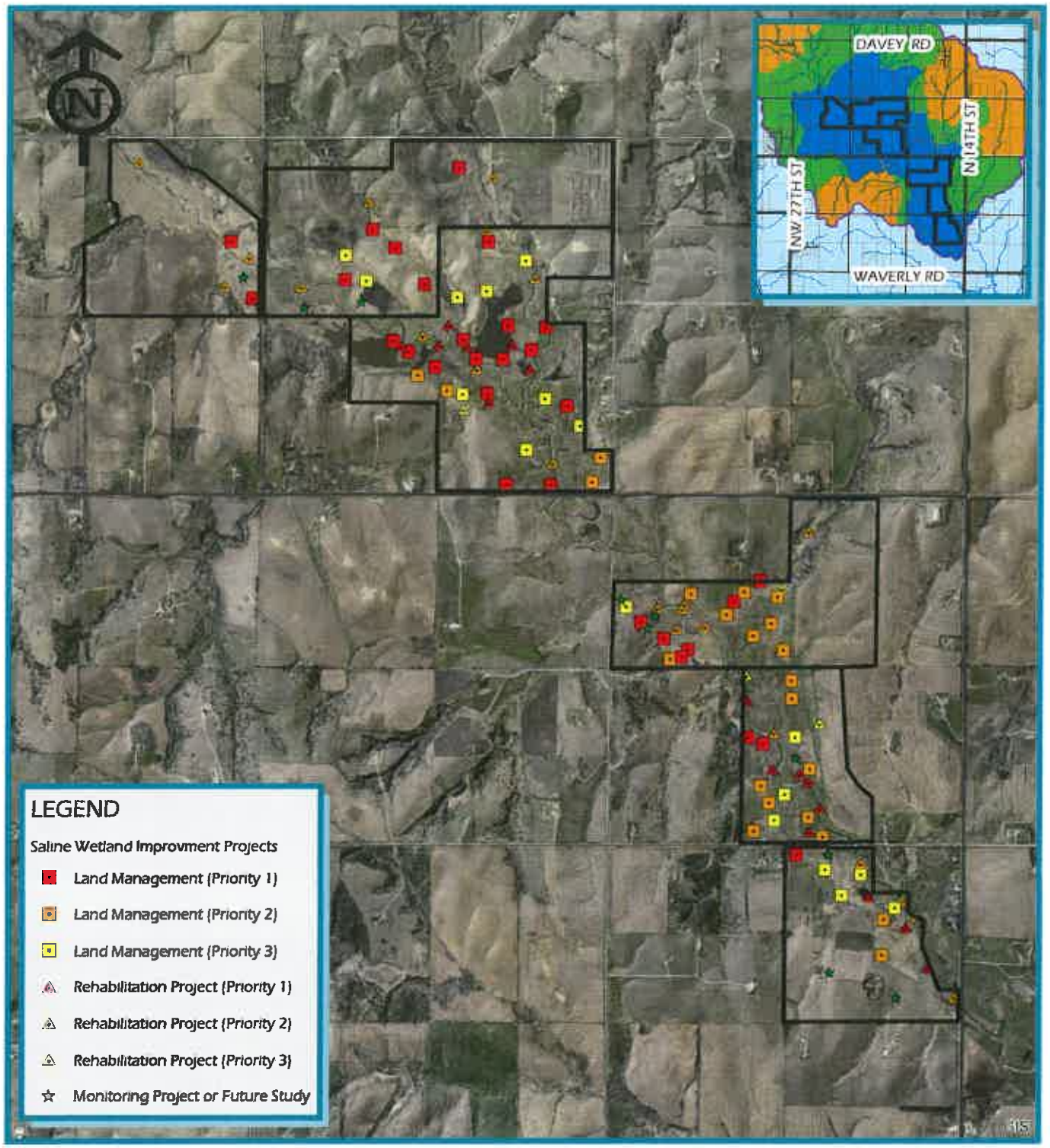


Figure ES-9

PLANNING AREA PROPERTIES

Unless noted, all photographs in this document are the property of The Flatwater Group, Inc.