CITY OF LINCOLN
NEBRASKA

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"Making Lincoln a Better Place to Live"

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LINCOLN
The Community of Opportunity

MEMORANDUM

DATE: March 15, 2012

TO: Lincoln City Council, Lower Platte South Natural Resources District Board of Directors, The Nebraska Game and Parks Commission, The Nature Conservancy, and Lancaster County Board of Commissioners

FROM: Tom Malmstrom
Natural Resources Coordinator
Parks and Recreation Department
Saline Wetlands Conservation Partnership

RE: Saline Wetlands Conservation Partnership – 2011 Progress Report

On behalf of the Saline Wetlands Conservation Partnership (SWCP) I want to make you aware of the activities, which occurred in 2011. The SWCP was initiated in 2003 and continues to progress. The City of Lincoln has been awarded three Nebraska Environmental Trust Fund (NETF) grants for the eastern saline wetlands. The grants were received in 2002, 2005, and 2008. The City of Lincoln received a $1,200,000 grant over a three year period in 2008. The grant period was extended and will terminate on June 30, 2012. These grants have been used for land acquisition and restoration purposes and provide matching funds for other grant opportunities. An article in the Nebraska Environmental Trust 2011 Annual Report about the grant project is included in this report.

Efforts of the SWCP are to protect, restore, and manage the rare and unique saline wetland habitat. The Partnership continues to utilize the "Implementation Plan for the Conservation of Nebraska's Eastern Saline Wetlands (2003)," for guidance in efforts to conserve the saline wetlands. Since its inception, partners have purchased nearly 1,200 acres of saline wetlands and other associated upland habitat, initiated educational activities, participated in saline wetland restoration projects, and provided for operation and maintenance of these areas. One restoration project completed in 2007, at Frank Shoemaker Marsh was featured in the November/December 2011 publication of Land and Water. The article is attached.

Illustration 1 identifies saline wetland properties, which have been acquired through fee-title acquisitions or conservation easements since the 1980's.

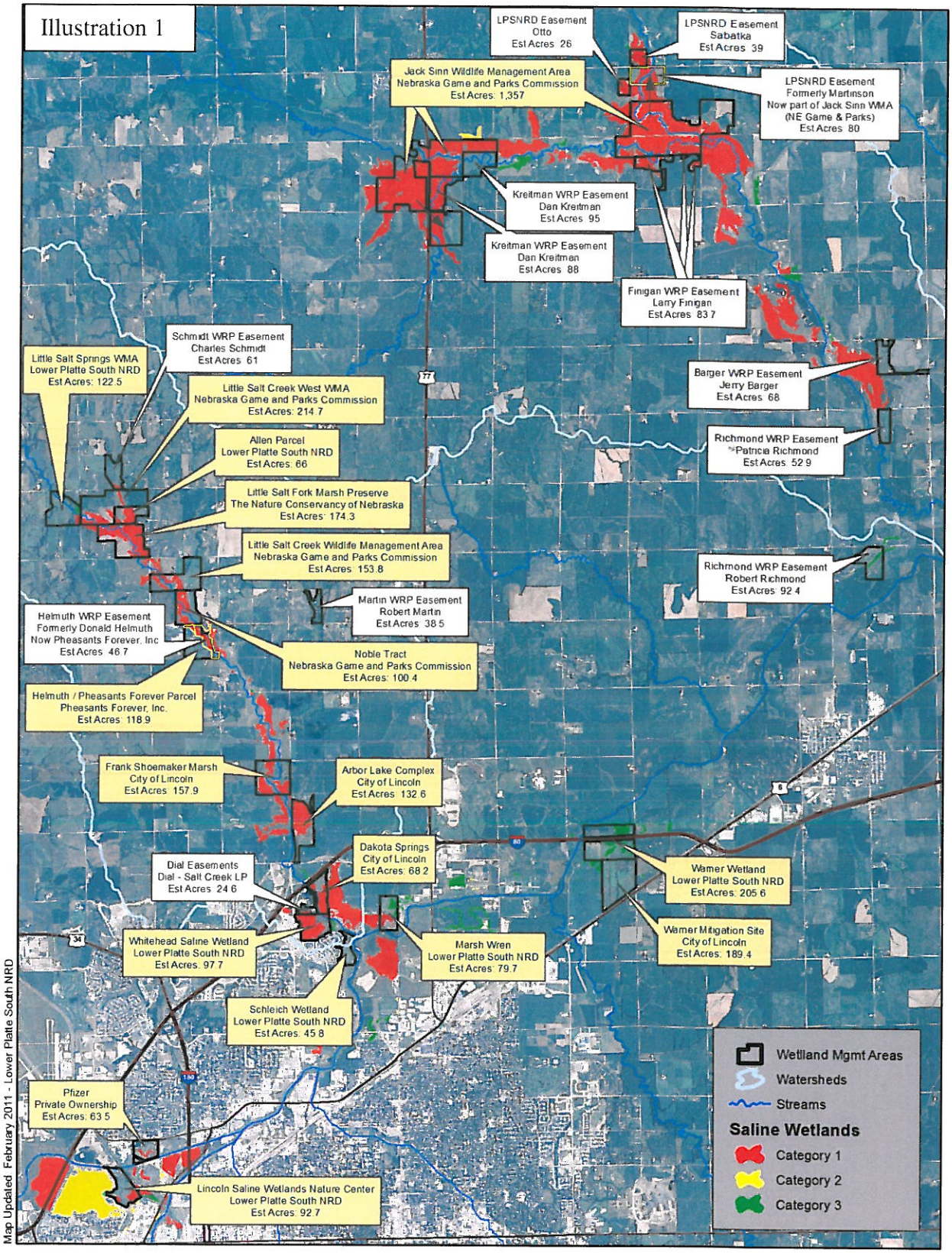


Illustration 1
LPSNRD Easement
Otto
Est Acres 26
LPSNRD Easement
Sabatka
Est Acres 39
Jack Sinn Wildlife Management Area
Nebraska Game and Parks Commission
Est Acres: 1,357
LPSNRD Easement
Formerly Martinson
Now part of Jack Sinn WMA
(NE Game & Parks)
Est Acres 80
Kreitman WRP Easement
Dan Kreitman
Est Acres 95
Kreitman WRP Easement
Dan Kreitman
Est Acres 88
Finigan WRP Easement
Larry Finigan
Est Acres 83 7
Schmidt WRP Easement
Charles Schmidt
Est Acres 61
Little Salt Springs WMA
Lower Platte South NRD
Est Acres: 122 5
Little Salt Creek West WMA
Nebraska Game and Parks Commission
Est Acres: 214 7
Barger WRP Easement
Jerry Barger
Est Acres 68
Allen Parcel
Lower Platte South NRD
Est Acres: 66
Richmond WRP Easement
Patricia Richmond
Est Acres 52 9
Little Salt Fork Marsh Preserve
The Nature Conservancy of Nebraska
Est Acres: 174.3
Little Salt Creek Wildlife Management Area
Nebraska Game and Parks Commission
Est Acres 153.8
Richmond WRP Easement
Robert Richmond
Est Acres 92 4
Martin WRP Easement
Robert Martin
Est Acres 38 5
Helmuth WRP Easement
Formerly Donald Helmuth
Now Pheasants Forever, Inc
Est Acres 46 7
Noble Tract
Nebraska Game and Parks Commission
Est Acres: 100 4
Helmuth / Pheasants Forever Parcel
Pheasants Forever, Inc.
Est Acres: 118 9
Frank Shoemaker Marsh
City of Lincoln
Est Acres 157 9
Arbor Lake Complex
City of Lincoln
Est Acres 132 6
Dakota Springs
City of Lincoln
Est Acres: 68 2
Dial Easements
Dial - Salt Creek LP
Est Acres 24 6
Warner Wetland
Lower Platte South NRD
Est Acres: 205 6
Warner Mitigation Site
City of Lincoln
Est Acres: 189.4
Whitehead Saline Wetland
Lower Platte South NRD
Est Acres. 97 7
Marsh Wren
Lower Platte South NRD
Est Acres 79.7
Schleich Wetland
Lower Platte South NRD
Est Acres. 45 8
Pfizer
Private Ownership
Est Acres: 63 5
Lincoln Saline Wetlands Nature Center
Lower Platte South NRD
Est Acres 92 7
Wetland Mgmt Areas
Watersheds
Streams
Saline Wetlands
Category 1
Category 2
Category 3
Map Updated February 2011 - Lower Platte South NRD

SUMMARY OF 2011 ACTIVITIES

WETLAND RESTORATION

Arbor Lake, located north of Interstate 80 along 27th Street is a 132 acre area containing over 65 acres of saline wetlands. It is owned by the City of Lincoln. The public recreation area provides habitat for a variety of wildlife and plant species.

A wetland restoration conceptual design was completed in August 2009. In 2010, the City of Lincoln hired a firm to complete the final design for the wetland restoration. A core and technical/planning team consisting of several agency representatives worked with the consultants on the final design. An Open House was held on October 19, 2010 and was attended by 27 persons.

The Flatwater Group, Inc completed a final design for the restoration of the area in December 2010 and is providing construction management activities. The City of Lincoln hired Commercial Contractors Equipment to perform construction of the wetland restoration project. The construction project began in September 2011 and will be completed by April 2012.

The various components of the restoration include: restoration to enhance and restore degraded wetland systems; remove and replace existing berm and outlet structure; remove sediment in wetland areas; construct sediment control dikes; install water level control structures in wetland areas; removal of undesirable vegetation (cattails); installation of grade control structures within the tributary; reshaping and restoring the banks of the tributary at selected areas; and improve access within the site for land management. Illustration 2 shows the north site plan and Illustration 3 shows the south site plan for the restoration project.

This project is being funded with Federal Section 319 funds and the 2008 NETF Grant, all received by the City of Lincoln.

Illustration 2 – Arbor Lake Complex North site plan

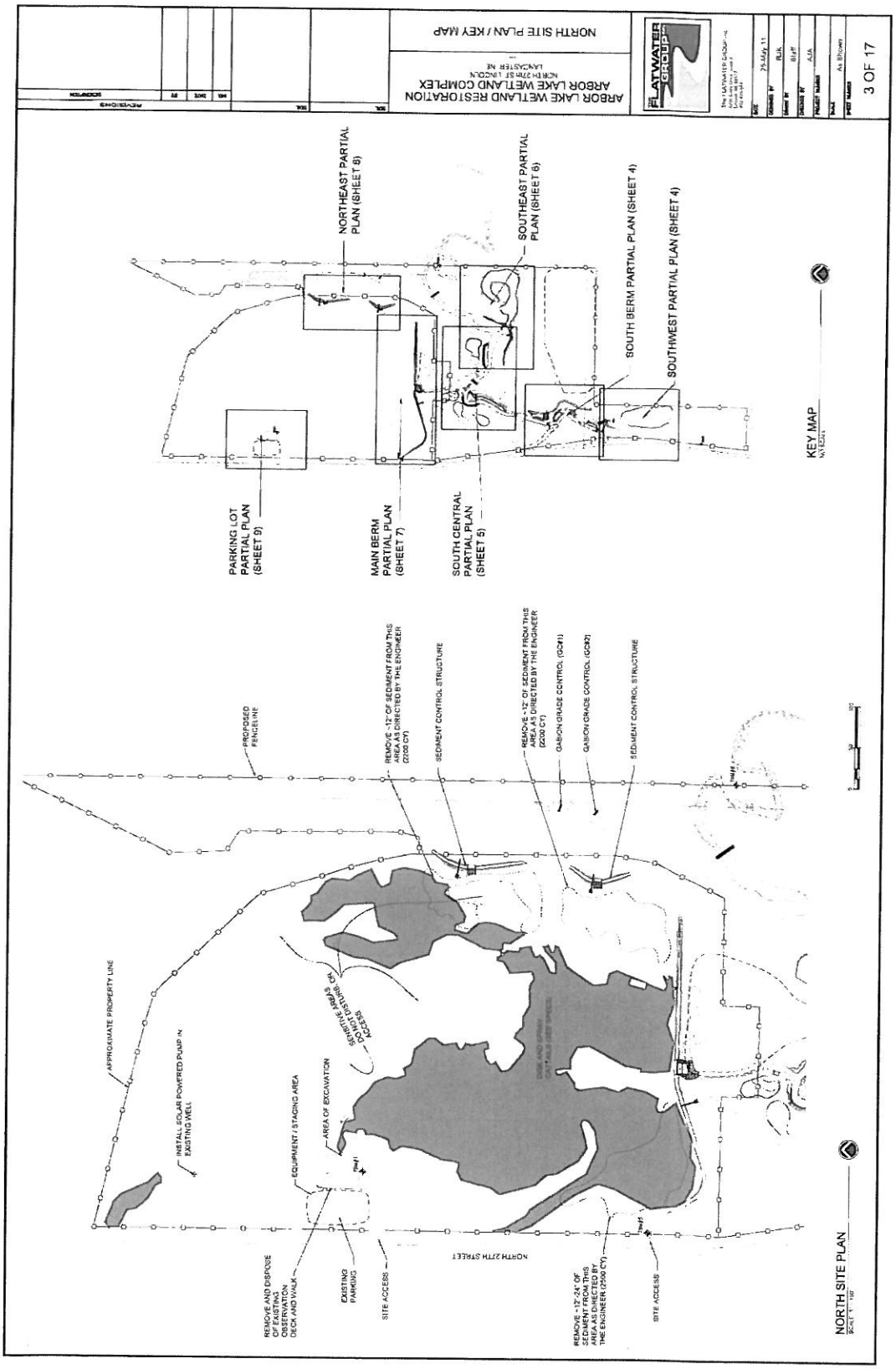
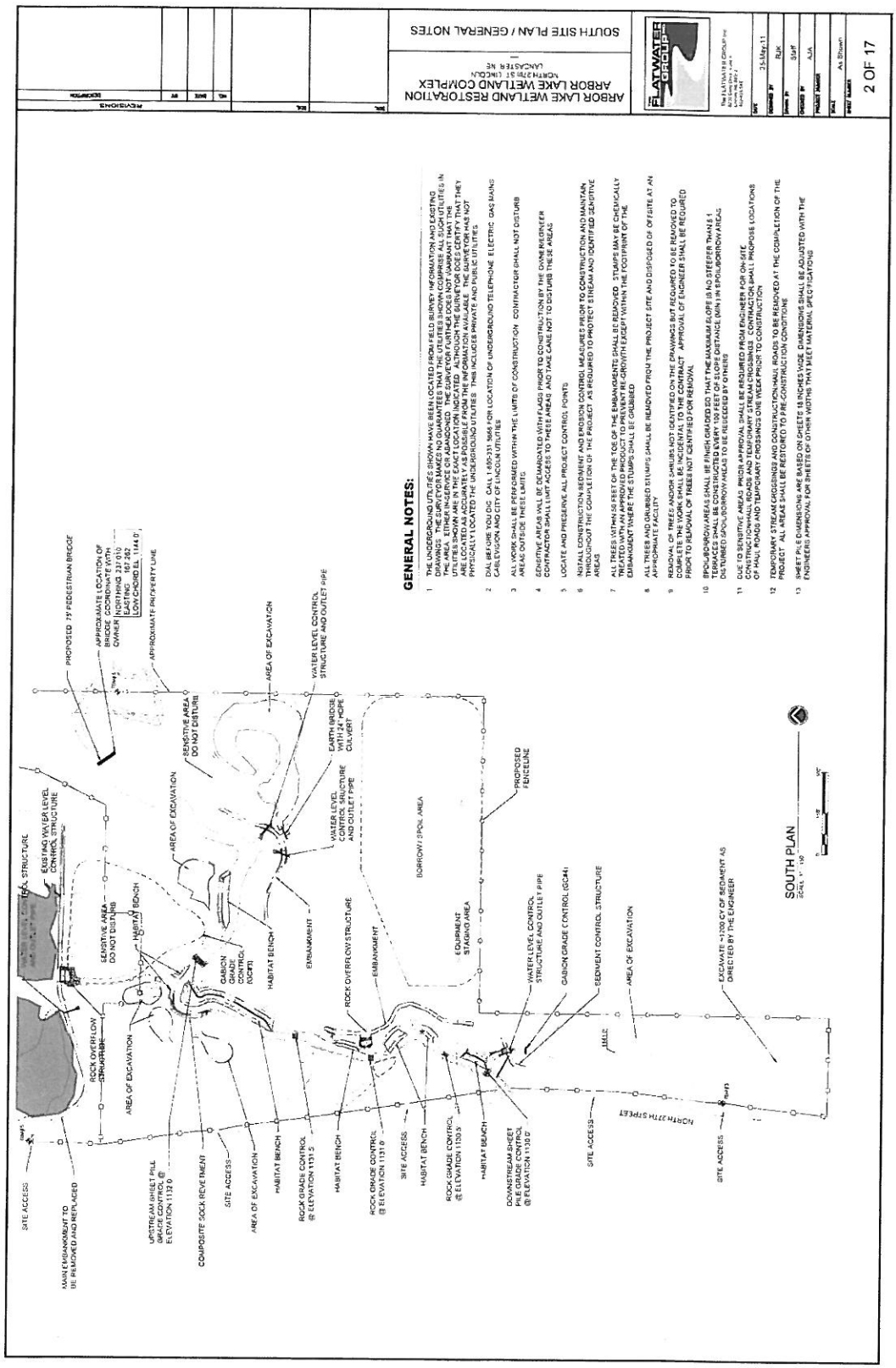


Illustration 3 – Arbor Lake Complex South site plan



Pre-construction **Mid- restoration construction**

Cattail remediation – re-establish saline wetlands

Endangered species habitat bench

In-stream grade control

WETLAND MANAGEMENT

Three seasonal employees were hired by the City of Lincoln in 2011 to perform management on the saline wetland areas. Members of the Partnership established management activities to be addressed within the eastern saline wetlands complex. These employees primarily worked on noxious weed and woody vegetation removal, and access and structure maintenance. Funding for these positions is provided with 2001 State Wildlife Grant funds the NGPC received from the U.S. Fish and Wildlife Service (USFWS). A total of 1,013.5 hours were worked by the seasonal employees in 2011 on saline wetland management activities primarily from May through mid-August. The Coordinator provided supervision of the employees.

SALINE WETLAND RESEARCH

In 2007, the NGPC received funding from the U.S. Fish and Wildlife Service to collect biological and hydrological data. This information could be used for the development of a Habitat Conservation Plan for the Salt Creek tiger beetle (SCTB) and the Eastern Saline Wetlands of Nebraska. The SWCP has worked with partners on soil and plant community inventories in the past and in 2011 assisted with a wetland assessment project of the saline wetlands. Following is a summary of research conducted in 2011.

Salt Creek Tiger Beetle Research

The following research information provided by:
Steven M. Spomer
School of Natural Resources, University of Nebraska-Lincoln
Federal Permit #TE37351A-0
State Permit #9

Field Collection and Rearing – Summary for 2011

Permits for obtaining eggs from *C. n. lincolniana* allowed field collection of females and males. A total of 13 SCTB were collected on June 14, 2011 and 17 collected on June 20, 2011. Adults were returned to the collection site after 10 days (males) or 14 days (females).

Captive rearing is being conducted in cooperation with Omaha Henry Doorly Zoo and Lincoln Children's Zoo. The resulting larvae collected from the females was transferred on August 20, 2011 and split between the two zoos.

Population Estimates for 2011

Preliminary surveys began on June 4, 2011 with the first visual of a Salt Creek tiger beetle adult on June 7, 2011. The population estimates were conducted between June 28, 2011 and July 5, 2011. A total of 318 Salt Creek tiger beetles were counted. The adult beetles were gone by the second week of August 2011.

Wetland Assessment - Ecological condition of saline wetlands

The following research information provided by:
Nicholas Smeenk
Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska –Lincoln

Craig Allen
USGS, Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska –Lincoln

Ted LaGrange
Wetland Programs Manager, Nebraska Game and Parks Commission

Wetlands are important landscape features that provide many ecosystem services including improved water quality, flood control, and important habitat for fish, wildlife, and plants. The ecological condition of wetlands can directly impact their ability to provide these services. As a part of an effort to measure the ecological condition and understand factors that affect condition of wetlands across Nebraska, condition surveys were conducted at ten saline wetlands in Lancaster County (Figure 1).

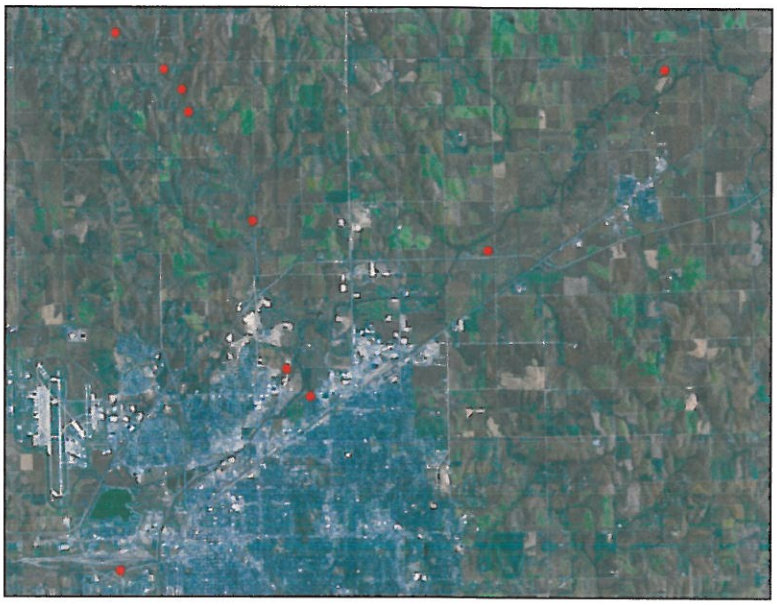


Figure 1. Wetland condition assessments were performed at ten saline wetland sites in Lancaster County.

Wetland condition assessment

Nine random sites were selected to represent a range of condition. This selection included sites on both public and private property. Also surveyed was a "reference standard" wetland site that represents the healthiest saline wetland on the landscape based on the input from local experts. Three levels of condition assessment were performed at each wetland site: 1) landscape assessment, 2) USA Wetland Rapid assessment, and 3) intensive site level assessment. Landscape assessment is forthcoming and will be based on land-use in the buffer surrounding wetland sites. From the rapid assessment (USA-RAM), a condition score was calculated that is based on condition of and stressors to both the wetland itself and buffer surrounding the wetland (Table 1). Likewise, a Floristic Quality Assessment Index (FQAI) condition score was calculated for each wetland, which is based on vegetative diversity and relative cover of each plant species (Table 1). For both USA-RAM and FQAI scores, a higher score indicates a high quality wetland, while a low score indicates a lower quality wetland.

Table 1. Condition scores for the saline wetlands. Species diversity is the number of native plant species and invasive species is the number of non-native plant species.

	USA-RAM	FQAI	Species Diversity	Invasive Species
Reference Standard	81.14	90.51	7	1
Other sites				
Mean	50.93	47.4	18	4
High	73.6	149.27	27	7
Low	28.71	3.62	8	1

As expected, the reference standard saline wetland site scored the highest using the rapid assessment method. In general, the ecological condition as measured by the USA-RAM was most impacted by surrounding land-uses. For example, those sites that scored the lowest occurred in highly modified agricultural and urban landscapes. Two saline sites scored higher FQAI scores than the reference standard site. This appears to be a result of the presence of dense mats of star duckweed (*Lemna trisulca*) at those two sites. Saline wetland sites that scored the lowest had vegetative communities dominated by non-native invasive species and cattails (*Typha augustifolia* and *T. x Glauca*). Saltwort (*Salicornia rubra*), a state-listed endangered species, was present at two saline wetland locations (Figure 2). In the future, landscape assessment condition scores will be calculated based on land-uses surrounding wetland sites and compared to the three methods of ecological condition assessment. Wetland condition surveys will also continue in other wetland complexes across the state over the next two years.

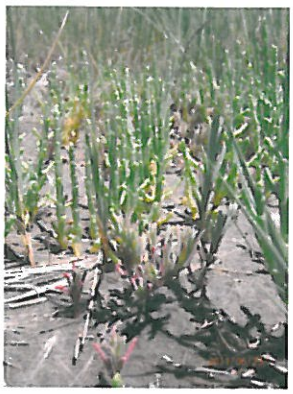


Figure 2. Saltwort (*Salicornia rubra*)

Frog and toad surveys

Due to their complex life cycle that involves the use of both aquatic and terrestrial environments, amphibians may be particularly vulnerable to environmental degradation. During the months of April and May, nighttime frog and toad breeding call surveys were performed at each saline wetland site. Surveys were conducted after sunset and consisted of a two minute acclimation period and five minute call survey at each site. During each call survey, all frog and toad species heard calling were recorded.

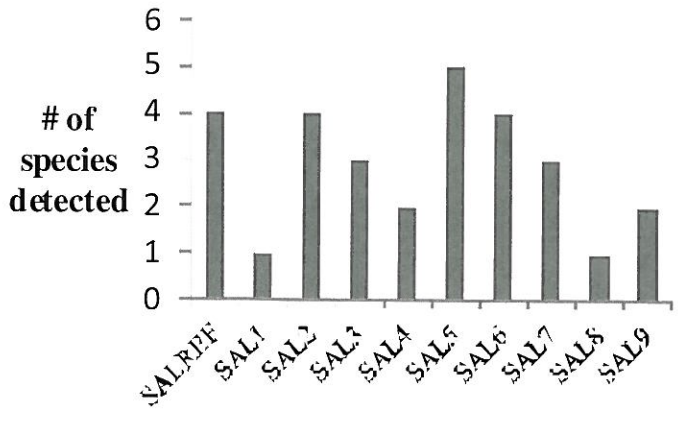


Figure 3. The number of frog and toad species detected at ten saline wetland sites.

Figure 4. Boreal chorus frog (*Pseudacris maculata*)

A total of five frog and toad species were detected during the breeding call surveys conducted at ten saline wetland sites (Figure 3). Boreal chorus frogs (*Pseudacris maculata*) were present at all ten wetland sites (Figure 4). Both Northern cricket frogs (*Acris crepitans*) and Woodhouse toads (*Anaxyrus woodhousii*) were also frequently detected. Because some species may be more sensitive than others to environmental quality, species diversity alone may not be a good predictor of wetland condition. For example, the species diversity was highest at a site that scored poorly using both metrics of wetland condition. This does not, however, mean that individual species may not be good indicators of wetland condition. This data will be used to statistically model the presence-absence of species based upon measures of habitat quality and our ability to detect the calls of each species and develop amphibian specific measures of wetland condition.

Acknowledgements

This work would not have been possible without the financial support of the USEPA and EPA Region VII and support of the members of the project's core planning team including, in no particular order: Randy Stutheit, John Bender, Tyler Janke, Ed Harvey, Tom Malmstrom, Gerry Steinauer, Eliodora Chamberlain, Ken Bazata, and Dan Shurtliff.

ENDANGERED SPECIES

The Salt Creek tiger beetle (*Cicindela nevadica lincolniana* Casey) was listed as a Federal endangered species on October 2005. It is endemic to the eastern saline wetlands in Lancaster and southern Saunders counties. Saltwort (*Salicornia rubra*) is a state listed endangered species. Saltwort is only found in the eastern saline wetlands.

In 2007, the U.S. Fish and Wildlife Service listed the Proposed Rule in the Federal Register regarding the Designation of Critical Habitat for the Salt Creek tiger beetle (SCTB). In April 2009, the USFWS reopened Critical Habitat Designation to add a total of 138 acres to three of the four previously proposed units. As a result, the proposed revised critical habitat designation for the species now includes four critical habitat units totaling approximately 1,933 acres. The rule was made final on April 6, 2010.

In February 2011, three conservation groups; The Center for Native Ecosystems; Center for Biological Diversity; and the Xerces Society sued the U.S. Fish and Wildlife Service saying it was not protecting enough habitat to save the insect. An agreement was reached in June 2011, to require the Service to re-examine the areas already designated as critical habitat but also new areas in Lancaster County. The re-evaluation must be completed by April 1, 2013.

During 2011, The City of Lincoln, Nebraska Game and Parks Commission, and Lower Platte South Natural Resources District worked with the U.S. Fish and Wildlife Service, Omaha Henry Doorly Zoo, and Lincoln Children's Zoo to identify areas for re-introduction of the endangered species.

SUMMARY OF SALINE WETLANDS AND SOILS PROTECTED (2001-2011)

In order to preserve and restore these wetlands, an Implementation Plan for the Conservation of Nebraska's Eastern Saline Wetlands was completed in 2003. This plan identifies four Landscape Objectives, which establish projection and restoration targets for the conservation of the Eastern Saline Wetlands. A summary of acres acquired through fee-title acquisition since 2001 by the SWCP is provided below. Conservation easement information is not provided in the summary.

LANDSCAPE OBJECTIVE	ACRES OF WETLAND PROTECTED OR RESTORED
1 – Permanently protect 100% (148 acres) of intact Category 1 saline wetlands and their associated conservation zones to ensure that the wetlands and their functions are sustained	28.7
2 – Restore and Protect 80% (1,412 acres) of unprotected degraded Category 1 saline wetlands and their associated conservation zones to ensure that the wetlands and their functions are sustained	206.7
3 – Restore (to intact Category 1 wetlands) and protect 50% (167 acres) of unprotected Category 3 saline wetlands and their associated conservation zones to ensure that the wetlands and their functions are sustained as intact Category 1 wetlands	62.0
4 – Restore (to intact Category 1 wetlands) and protect 50% (2,360 acres) of unprotected current non-wetland areas on saline hydric soils so that they become intact and sustained Category 1 saline wetlands	287.4
TOTAL	**584.8**

Source: Ted LaGrange and Rachel Simpson of the NGPC, August 2011

EDUCATION

- North Star High School – Coordinator established annual program with environmental Studies class on saline wetlands in 2005. The coordinator in cooperation with the environmental studies instructor at North Star sponsors field trips for a selected group of students to the saline wetlands. The field trips include presentations to the students by personnel of the LPSNRD, UNL, NGPC, and the NRCS. Topics covered regarding the saline wetlands included vegetation, hydrology, entomology, restoration and mitigation, management, soils, well monitoring and sampling, wildlife, and the relationship of urbanized development with natural areas. In the fall of 2011, a total of eight (8) field trips and two (2) class presentations were held.

- Coordinator educational presentations - The Coordinator continues to present "saline wetland jeopardy" to fifth grade students attending the Earth Wellness Festival. Other presentations were given to local groups and conservation agencies.

- Coordinator participates in Elementary School Nature Nights and field trips to saline wetlands sponsored by the LPSNRD

FUNDING RESOURCES

- Federal Section 319 Grant (2007 and 2009) – The coordinator on behalf of the City of Lincoln submitted a grant in 2005 for Federal Section 319 funds in the amount of $500,000 for the eastern saline wetland complex. In November of 2007, the City was awarded $250,000. A total of $207,195.66 was expended for engineering services related to the Arbor Lake Wetland Restoration Project. The remainder, $42,804.34 was expended for Arbor Lake Wetland Restoration construction. An interim final Report was completed and submitted to the Nebraska Department of Environmental Quality on November 30, 2011.

  The remaining $250,000 was awarded in 2009. Of this, $18,257.78 was expended in 2011 for Arbor Lake Wetland Restoration construction engineering leaving a balance of $231,742.22 at the end of 2011. This will be expended on engineering and construction services for the Arbor Lake Wetland Restoration Project.

- 2008 Nebraska Environmental Trust Grant – The grant amount is $1,200,000 over a three year period. A total of $366,250.42 was expended in 2009 and $156,900 in 2010 for land acquisition and billboard removal ($3,900). In 2011, $318,840.95 was expended on construction at the Arbor Lake Wetland Restoration Project. A total of $358,008.63 remains and will be expended on the Arbor lake Wetland Restoration Project and land acquisition.

- Federal Section 6 – In 2011, the NGPC through the U.S. Fish and Wildlife Service was awarded $135,000 for the acquisition of a property containing saline wetlands. Negotiations were initiated in the fall of 2011 and it is expected a fee-title acquisition will occur in 2012.

- A grant was submitted to the Nebraska Environmental Trust in 2011 for the "Eastern Saline Wetlands Project – 2012." The amount requested was $1.4 million for land acquisition, restoration, and planning activities for a three year grant period.

SUMMARY OF OTHER COORDINATOR ACTIVITIES

- Attend and participate in Nebraska inter-agency wetland meetings sponsored by the U.S. Corps of Engineers

- Attended meetings regarding City and County projects regarding construction activities scheduled near or on saline wetland areas

- Presented information regarding the saline wetlands to LPSNRD Recreation, Forestry, and Wildlife sub-committee, LPSNRD Board of Directors, and Wachiska Audubon

- Toured saline wetland areas with several agencies and local zoos regarding endangered species recovery habitat.

- Youth education – presented and participated in elementary school Nature Nights sponsored by the Lower Platte South NRD, the Earth Wellness Festival, and UNL Career Day

- Land management – Supervision of seasonal employees, annual saline wetland area task discussions with land managers from other agencies, noxious weed and woody vegetation control at publicly owned saline wetland sites, and Phragmites location identification with established GPS coordinates

- Completed Management Plan for the Allen Property

- Participate with Natural Resources and Conservation Service (NRCS) B Team regarding the scoring and design of Wetland Reserve Program applications in Lancaster County

- Assisted Nebraska Environmental Trust Fund with "Our Town" footage along with KOLN/KGIN television

- Met with personnel from Pfizer regarding their saline wetland area and with the NGPC provided a summary of management activities they could pursue to enhance the area

- Project Manager for the Arbor Lake Complex wetland restoration project.

- Member and participant of the Educational Workgroup of the Nebraska Partnership for All-Bird Conservation.

- Participant of the Habitat Conservation Plan committee sponsored by the U.S. Fish and Wildlife Service and miscellaneous activities related to endangered species

- Participant and team representative of Nebraska Wetland Assessment grant project through the NGPC

- Miscellaneous grant administration and participation in grant applications through conservation agencies regarding wetland projects

SALINE WETLAND PROPERTIES

- **Frank Shoemaker Marsh** – 27th Street and Bluff Road

Size:	160 acres
Purchase price and date:	$472,000 on June 12, 2003
Funding sources:	2001 State Wildlife Grant through the USFWS ($222,000) 2002 NET grant ($250,000)
Owner:	City of Lincoln

Activity summary – Noxious weed removal continued and included the documentation of several new plots of Phragmites. Post-restoration monitoring includes observations of wetland vegetation and management of the hydrology through the five water control structures in place. Prescribed fire breaks completed for spring 2012 burn. Sprayed brome encroaching from road ditch into planted grasses.

Several monitoring wells installed by UNL are continually monitored. The total number of wells includes three shallow wells (15-30 feet), three intermediate wells (60-90 feet), and one deep well (~180 feet).

- **Dakota Springs** – South of Arbor Road and East of 27th Street

Size:	68.7 acres
Purchase price and date:	$204,700 in January 2004
Funding sources:	Federal Section 6 ($153,525) 2002 NET grant ($51,175)
Owner:	City of Lincoln

Dakota Springs Extension Purchase (Dial Realty, 7.45 acres)

Purchase price and date:	$48,500 on December 31, 2008
Funding source:	Federal Section 6

Activity summary – Noxious weed removal continued. Portion of property hayed and brome along west property line adjacent to Little Salt Creek sprayed.

Monitoring wells installed by UNL and are continually monitored. The total number of wells in place includes two shallow wells (15-30 feet) and two intermediate wells (60-90 feet).

- **Warner Saline Wetlands** - 98th Street and Interstate 80

Size:	140 acres
Purchase price and date:	$298,580 on December 7, 2004
Funding sources:	Federal Section 319 ($179,148) LPSNRD ($43,043.20) SWCP ($76,388.80)
Owner:	LPSNRD

Activity summary – Woody vegetation removal continues with Honey locust and cedars. Prescribed burn on west 40 acres. North parcel is a youth mentor hunt site.

- **Little Salt Creek Wildlife Management Area** – 1st Street and Raymond Road

Total Size:	256.5 acres
Purchase price and date:	$476,000 in June 2004 (original 156 acres)
Funding sources:	Federal Section 6 ($276,000)
	2004 NET grant through NGPC ($200,000)
Owner:	NGPC

Noble Tract Extension - Along Little Salt Creek, between Mill Road and the southern boundary of the original Little Salt Creek Wildlife Management Area. (100.5 acres)

Activity summary – Prescribed grazing was conducted. Cedar removal and noxious weed control continues.

Monitoring wells were installed by UNL and are continually monitored. The total number of wells includes three shallow wells (15-30 feet) and three intermediate wells (60-90 feet).

- **Little Salt Creek West Wildlife Management Area –** South of Branched Oak Road between NW 12th and 1st Streets

Total Size:	220.0 acres
Purchase price and date:	$979,000 on October 9, 2009
Funding sources:	Federal Section 6 ($560,000)
	2005 NET Grant ($42,838.58)
	2008 NET Grant ($366,250.42)
	Ducks Unlimited ($10,000)
Owner:	Nebraska Game and Parks Commission

Activity summary – Prescribed grazing was conducted. Cedar removal and noxious weed control continues. Food plots were established and former farmed ground planted with natives. Prescribed fire breaks completed for spring 2012 burn.

- **Arbor Lake Complex** – North of Arbor Road and east of 27th Street.

Total Size:	132.5 acres
Owner:	City of Lincoln

Arbor Lake Extension Purchase (Anderson Property, 69.2 acres)

Purchase price and date:	$361,710.67 on September 1, 2004
Funding source:	2002 NET grant through City of Lincoln

Activity summary –Approximately 9 acres were cropped by an adjacent landowner; this includes areas under the transmission line, which were disturbed during construction in 2007. Wetland restoration construction began in September 2011.

Monitoring wells installed by UNL are continually monitored. The total number of wells includes three shallow wells (15-40 feet) and two intermediate wells (60-90 feet).

- **Little Salt Springs** – NW 12th Street and Branched Oak Road

Size:	123 acres
Purchase price and date:	$472,188 on July 31, 2007
Funding sources:	Lower Platte South NRD ($187,960.35) 2005 NET grant ($227,227.95) Partnership Funds ($57,000)
Owner:	Lower Platte South NRD

Activity summary – Continued efforts to control noxious weeds and woody vegetation. CRP planted with pollinators. Prescribed fire breaks completed for spring 2012 burn. NW 12th Street was closed, which is eastern boundary of property.

- **Marsh Wren –** Between 40th and 56th Streets and north of Salt Creek

Total Size:	80.0 acres
Purchase price and date:	$320,000 on May 27, 2009
Funding sources:	Lower Platte South NRD ($25,000) SWCP ($25,000) City of Lincoln floodplain acquisition funds ($178,000 ($89,250 each from the City of Lincoln and the Lower Platte South NRD)) 2005 NET Grant ($91,500)
Owner:	Lower Platte South Natural Resources District

Activity summary – Continued efforts to control noxious weeds and woody vegetation.

- **Allen Parcel –** Between Branched Oak Road and Raymond Road and adjacent to the west of 1st Street

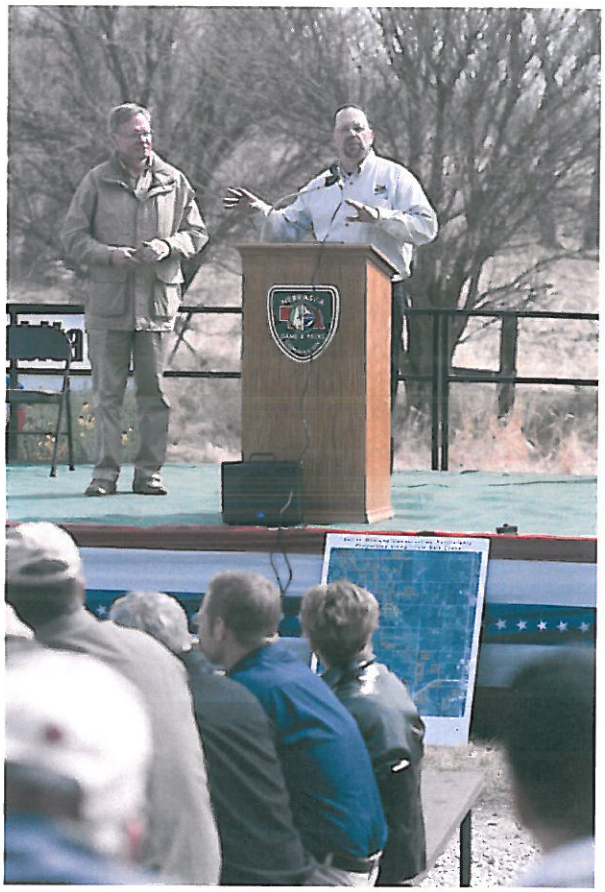
Size:	66.6 acres
Purchase price and date:	$304,000 on February 17, 2010
Funding sources:	Lower Platte South NRD ($76,000) SWCP ($75,000) 2008 NET Grant ($153,000)
Owner:	Lower Platte South Natural Resources District

Activity summary – Continued efforts to control noxious weeds and woody vegetation. Gate installed on south fence line adjacent Little Salt Fork Marsh Preserve. Prescribed fire breaks completed for spring 2012 burn. Management Plan completed.

- **Helmuth Parcel –** South of Mill Road and west of 14th Street

Size:	119.0 acres
Purchase price and date:	$630,000 on November 23, 2010
Funding sources:	Federal Section 6 ($275,000) 2001 State Wildlife Grant through the U.S. Fish and Wildlife Service ($131,666.50) NGPC ($23,333.50) Donation from Helmuth family ($200,000)
Owner:	Pheasants Forever, Inc.

Activity summary – Prescribed grazing was conducted. Cedar removal and noxious weed control continues. Prescribed fire breaks completed for spring 2012 burn and structures razed. Dedication ceremony held on March 18, 2011.



Pete Berthelsen of Pheasants Forever and Don Helmuth at Dedication Ceremony

- **Seacrest Range** (43 acres) – Located west of Folsom Street along both the north and south sides of Rosa Parks Way. The area is owned by the City of Lincoln. Efforts continued to remove cedar trees and Honey locust and to control noxious weeds on the site.

- **Lincoln Saline Wetlands Nature Center** (92.7 acres) – It is located near Capitol Beach in Lincoln. The area is owned by the LPSNRD. Management activities in 2011 were noxious weed control and removal of Russian olive, Honey locust, and cedar trees. Considerable efforts to control Phragmites.

  Well installed by UNL is monitored for groundwater levels and water quality.

- **Schleich Wetlands** (50.2 acres) – It is located southwest of Little Salt Creek near where it empties into Salt Creek and east of the Northbridge subdivision in Lincoln. The area is owned by the LPSNRD. Management activities in 2011 were noxious weed and woody vegetation control. Engineering design for Maintenance Bridge was completed.

- **Whitehead Wetlands** (98.8 acres) – It is located east of 27th street and a short distance south of Interstate 80. The area is owned by the LPSNRD. Management activities in 2011 were noxious weed control and removal of trees in drainage area along south and east boundaries.

  Monitoring wells installed by UNL are continually monitored. The total number of wells includes five shallow wells (15-30 feet), four intermediate wells (60-90 feet), and one deep well (~180 feet).

- **Little Salt Fork Marsh Preserve** (174.2 acres) – It is located northwest of 1st and Raymond Road and owned by The Nature Conservancy. Management activities in 2011 included a prescribed grazing rotation throughout the property for the majority of the growing season and control of noxious weeds.

- **Jack Sinn Wildlife Management Area** (1,352.3 acres) – Located south of Ceresco in Saunders and Lancaster counties. This area is owned by the NGPC. Perimeter fencing construction continues. Management activities in 2011 were noxious weed control, woody vegetation removal, and prescribed fire and grazing.

This program has been very successful and continues to accomplish many of the goals of the Implementation Plan for the Conservation of the Eastern Saline Wetlands. Your continued support for the conservation of these natural areas is appreciated. If you have any questions, please contact me at 476-2729 or tmalmstrom@lpsnrd.org. You can visit the saline wetland website at http://lincoln.ne.gov/city/parks/ParksFacilities/wetlands/index.htm

Habitat

Eastern Saline Wetlands Project - City of Lincoln

In 2008, the City of Lincoln received a $1.2 million three-year grant from the Nebraska Environmental Trust Fund (NET) for the Eastern Saline Wetlands Project. The project is preserving and protecting the most imperiled natural community in Nebraska, which is located primarily in the Salt Creek watershed in northern Lancaster and southern Saunders counties.

A total of 360 acres containing 110 acres of eastern saline wetlands were purchased during this grant project. These acquisitions include endangered species habitat and provide flood control and water quality protection. The 2008 NET grant funded $519,250 for these acquisitions and were matched with $931,411. The matching funds were provided by a Federal Section 6 grant ($559,911), local floodplain acquisition funds ($178,500), Lower Platte South NRD ($101,000) and project partners ($100,000).

A wetland restoration project is currently in progress. The Arbor Lake Wetland Restoration Project will enhance and restore degraded wetland systems, expand saline wetlands on the site, prevent further stream degradation within the project boundaries while maintaining and developing habitat for endangered species and complement the restored wetland systems with native plant species. A total of approximately $450,000 of NET is obligated to the project, which will be completed in the spring of 2012. Additional matching funds in the amount of $310,000 from Federal Section 319 funds are being used to pay for engineering and restoration costs.

Through the grant period, members of the Saline Wetlands Conservation Partnership provided $390,000 in matching funds for the Eastern Saline Wetlands Project and nearly $25,000 from State Wildlife Funds received from the U.S. Fish and Wildlife Service has been used for land management.

Project sustainability is increased with the collaboration between partners and these funding sources. The matching funds are necessary and reasonable for the proper and efficient accomplishment of the goals of the Implementation Plan for the Conservation of the Eastern Saline Wetlands.

Restoring Eastern Nebraska's Saline Wetlands

Eastern Nebraska's saline wetlands are one of the most unique ecosystems in the state. Originally estimated at 20,000 acres, only about 4,000 acres remain. Many of these remaining acres are degraded and reasonable candidates for wetland rehabilitation. The wetlands are primarily located within northern Lancaster and southern Saunders counties in eastern Nebraska. These wetlands are home to a variety of unique salt tolerant plants and insects. These wetlands are identified by saline soils and halophytic vegetation (salt tolerant) plant species such as spearscale, inland salt grass, sea blite, prairie bulrush and the state endangered saltwort.

In addition to unique plant species, the saline wetlands are home to the federally endangered Salt Creek tiger beetle (SCTB). The SCTB is a subspecies of tiger beetle and is endemic to the saline wetlands. Only a few hundred of these insects remain. The saline wetlands are groundwater discharge wetlands and are threatened by a variety of actions including draining and filling and commercial, residential and agricultural development.

A Partnership for Preservation

To ensure long-term protection of this threatened resource, the Saline Wetland Conservation Partnership (SWCP) was formed in 2002. The SWCP takes a unique approach to saline wetland protection by applying a partnership approach. Full partners of the SWCP include the City of Lincoln, Lancaster County, Lower Platte South Natural Resources District, The Nature Conservancy and the Nebraska Game and Parks Commission. Secondary partners include the Natural Resources Conservation Service, Ducks Unlimited, Pheasants Forever, Nebraska Wildlife Federation, Nebraska Sierra Club, Home Builders Association of Lincoln, Conservation Alliance of the Great Plains, Wachiska Audubon and private landowners. The SWCP's primary "Implementation Plan" calls for a "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".

Looking west in September 2009. White/gray area denotes a critical habitat of the federally endangered Salt Creek tiger beetle. All photo credits: TFG.

Saline Wetland Restoration

In 2003, the SWCP purchased the Frank Shoemaker Marsh. This is a 160-acre wetland complex adjacent to Little Salt Creek north of Lincoln, Nebraska with approximately 50 acres of saline wetlands present at the time of purchase. The Flatwater Group, Inc. (TFG), a Lincoln-based water resources engineering and planning firm, was contracted by the SWCP to provide planning, engineering design and construction oversight services for wetland restoration and habitat improvement design throughout the entire 160-acre Frank Shoemaker Marsh wetland complex. Frank Shoemaker Marsh contains saline soils and halophytic vegetation indicative of a saline wetland. Due to channel incision of Little Salt Creek traversing the property and prior land practices within the property, the saline wet-

lands were in a degraded state at the time of purchase by the SWCP.

To address these issues, TFG worked closely with the SWCP to develop a restoration plan. The overall project included strategic planning, design workshops, technical advisory team coordination, agency consultation, public meetings, permit applications, adaptive management techniques, funding identification and GIS coverage and CADD mapping.

Project Funding

Funding for the Frank Shoemaker Marsh purchase and restoration was provided in part by a $250,000 grant awarded to the City of Lincoln by the Nebraska Environmental Trust and $222,000 from a 2001 State Wildlife Grant awarded to the Nebraska Game and Parks Commission by the U.S. Fish and Wildlife Service. Saline wetland acres were purchased by the SWCP through fee title (one of the partners is an owner) or conservation easements with private landowners.

Design and Construction

TFG applied the following steps for restoration design: 1) Project initiation; 2) Data collection and field investigation; 3) Conceptual design and development; 4) Permit and NEPA compliance coordination; 5) Final design development; 6) Construction phase; and 7) Post-construction phase.

Improved stream crossing.

During initiation, the project team met to discuss overall goals of the project and roles of the partners. TFG conducted a detailed field effort and collected topographical survey data and critical elevations of the existing streambed. Berms existed throughout the property due to the site's former use by a duck hunting club. The survey data and critical elevations were used to create the first sets of conceptual designs for the project based on discussions with the SWCP.

Once a draft-final set of plans was prepared, the Clean Water Act Section 404 permit was prepared and submitted to the U.S. Corps of Engineers-Omaha District (Corps). The Corps was contacted early in the process and invited to the site for a walk-through. A Nationwide 27 permit was issued for the project. Agency consultation letters were also submitted for

Threatened and Endangered species review, state historical society review, and wetlands review to comply with NEPA regulations for the federal funding used on the project. Final designs were approved by the SWCP and final bid documents were prepared by TFG. The project was put out for public bid and a Yost Excavating from Nebraska City, Nebraska was selected based on their low bid. Because of the sensitive nature of the area, Yost complied with a number of site restrictions and was required to carefully protect certain areas of the wetland during construction.

Construction for the project occurred from August 2006 through March 2007. Todd Yost, of Yost Excavating worked closely with the design team during construction. Careful sequencing of certain project elements was important to minimize disturbances to existing plant communities. Yost proved to be a good partner and during construction employed a variety of equipment on-site including scrapers, excavators, and dump trucks to excavate suitable clay material from upland areas on-site to construct and compact low-hazard berms. These berms mimicked natural flood terraces that developed along the streams in the area, creating much of the original wetland habitat. The berms were compacted to a 95% compaction density. Rock riprap was delivered to the site and transferred via dumptruck to select locations for bank protection, grade control, and headcut plugging. Pull-behind scrapers were also used for shallow sediment excavation in the wetland cells and to remove cattails. Steel sheet piling was installed with a pile driver on an excavator. A mobile crane was also used to deliver a metal and wood decking pre-fabricated bridge to the site for a pedestrian and wetland manager access crossing over Little Salt Creek. Seeding was an important element in the design and required some specialized equipment and subcontractors for that component.

Stormwater pass-thru.

"Less Is More"

Throughout TFG's saline wetland restoration projects, a "less-is-more" philosophy has been followed. This concept calls for concentrating structures on fringe areas away from sensitive species and by naturalizing structures to the extent possible. For example, grade control structures constructed within the main channel of Little Salt Creek were designed to blend in with the streambed. Steel sheet pile was installed in the main channel for grade control. Riprap was placed up and down stream immediately adjacent to the sheet pile. The piling was installed so that the riprap and sheet pile blended in with streambank vegetation and will be concealed more with sediment accumulation among the riprap. Another critical component was the design and construction of the berms. Placement and elevation of the berms was important to simulate the natural terraces that were compromised by channel headcutting. The berms were set to elevations that allow for the floodplain to be engaged by the stream at a frequency of every 3 to 5 years.

PROJECT CHALLENGES

Sodium Affected Soils

Saline groundwater has deposited salts within the floodplain soils of Frank Shoemaker Marsh. These sodium affected soils, sometimes referred to as dispersive soils, posed many challenges such as an unsuitable construction material and construction access and safety. The dispersive soils cause "piping" to occur within the soil column. Large holes existed and therefore the edge of the streambank was hazardous for construction equipment due to the threat of soil structure failure. A 100-foot buffer from the top of bank was maintained during construction. Additionally, low-hazard berms constructed onsite were built from suitable soils excavated and transported on-site. The dispersive clays were not suitable for compaction and water impoundment.

Sensitive Species

Tiger beetle species are prevalent throughout the salt flats at Shoemaker Marsh. In addition to insect species, many unique salt tolerant plant communities also existed. To minimize disturbance to these rare plants and insects, the project team worked closely with personnel from the U.S. Fish and Wildlife Service-Nebraska Field Office and the University of Nebraska-Lincoln's (UNL) entomology department to identify these areas. Sensitive areas were marked and protected throughout construction. A detailed plant inventory was also performed. The plant inventory was used to delineate sensitive plant communities and to benchmark monitoring of the saline wetland recovery.

Headcutting and Streambed Erosion

Little Salt Creek traverses Shoemaker Marsh and it is a tributary to Salt Creek. In the 1930's, Salt Creek was channelized (along with sections of Little Salt Creek) for flood control within the City of Lincoln. As Salt Creek became channelized, this caused headcutting to move up through its tributaries. To minimize further headcutting within Frank Shoemaker Marsh, grade control structures were installed. They are comprised of steel sheet piling and riprap. A grade control was installed the southern and northern property boundary's. They were designed to accommodate future grade raises in the channel to facilitate efforts to mitigate channel degradation. An existing stream crossing constructed of

concrete rubble and broken aphalt was located near the center of the property. It was providing an important function in controlling upstream migration of channel degradation, however it was showing signs of failure. In its place Yost drove a series of steel piles that were supplemented with rip-rap. This structure created a permanent crossing for future construction and maintenance and will maintain an important channel feature.

Throughout the site, headcuts had formed from Little Salt Creek and were draining portions of the wetland complex. Some headcuts were filled with suitable material and gabion rock structures were installed on other drainages to minimize future headcutting and restore hydrologic conditions. The gabion rock structures were filled onsite with Class C riprap by the contractor and were designed to blend in with the surrounding vegetation.

Erosion Control

A part of the project design, TFG developed a stormwater pollution prevention plan (SWPPP). During construction, the SWPPP was followed to minimize sediment discharge to Little Salt Creek. Yost installed silt fences around disturbed borrow sites and headcut repairs. Select areas disturbed during construction were protected with erosion control blanket materials. Turf reinforcement matting was used on the berms for stabilization until native seeding became established.

Habitat shelf after.

Invasive Vegetation

Throughout Frank Shoemaker Marsh, there were a number of large monoculture cattail communities. During construction, the top 18-inches of soil was removed in an effort to eradicate the cattail community. This amount of soil generally coinciding with deposits eroded from adjacent upland agricultural areas. In addition to removing unwanted vegetation, former areas of hard pan salt crusts were again exposed. These areas are already developing with saline plants on their fringe and creating the habitat thought to be used by the SCTB.

Water Level Control

The Shoemaker Marsh wetland was generally split into three pond areas ("cells") from previous site management as waterfowl production. These cell boundaries were generally preserved as part of the restoration project, however they retained too much water with little ability to manage water levels. Water level control is a key to successful management of saline wetlands. This provides a management tool for balancing water supply to sustain saline species and control intrusion of freshwater wetlands. To fit the flexibility needed for water level management, Agri-Drain water level control structures were selected and installed at select locations throughout the project site. These structures have provided wetland managers with the ability to independently manage water levels in the cells.

Watershed Development

Frank Shoemaker Marsh is about a

mile from residential and commercial developments on the north edge of Lincoln. To plan for future development around the marsh, TFG designed a freshwater "pass through" structure on the west side of the site. Wetland managers have the ability to regulate the amount of stormwater that enters the site. As the watershed develops, wetland managers will be able to manage stormwater runoff by diverting it through the site and not allowing it to significantly dilute the saline water in wetland cells.

Innovative Techniques at Frank Shoemaker Marsh

The salt tolerant plant and insect species rely on a mix of highly saline groundwater and stormwater. As saline groundwater historically rose to the surface from deeper saline formations, salts were deposited in the floodplain soils. Capillary action allowed shallow saline groundwater to move throughout the upper soil column to the surface. As this salty shallow groundwater rose to the surface, salts were deposited on the surface through the wetting and drying of the upper soil column. This wetting and drying relied on a high water table beneath the saline wetland.

When Little Salt Creek was channelized, the stream incised and lowered the water table of the adjacent wetlands. By lowering the water table, the shallow groundwater connection to the surface was disconnected. This moist saline soil is vital to SCTB habitat.

Saline soil layer.

In an attempt to imitate saline wetland hydrology in a new system, TFG and the Partners came up with a "habitat shelf" design. This design feature called for "pulling back" the streambank and this created a lower sloped "bench" near the stream channel. The bench is sloped at 10:1. This bench is near the stream and during runoff events, the bench is connected to the water of the stream directly by saturation from stormwater and indirectly by the bench's proximity to the stream. Because the bench is near the stream and subject to wetting, the habitat shelf surface will experience the necessary wetting and drying to bring salinity to the soil surface.

In the summer of 2010, two years after the wetland restoration project was completed, UNL entomologists found SCTB living on the habitat shelves at Frank Shoemaker Marsh. Researchers found signs of beetle colonies and found evidence that the SCTB were breeding at the habitat shelf. The existence of beetles at the habitat shelf is an indicator of success.

Current Restoration Work

In addition to the Shoemaker Marsh project, the City of Lincoln purchased an additional tract of land across the road to expand an existing saline wetland site called the Arbor Lake Complex (ALC). TFG was hired for an additional saline wetland restoration project at this site in 2008. TFG completed a conceptual design and was then hired for final design in 2010. The project design is complete and the construction is underway. Construction began in September 2011 and it is anticipated to be done by April 2012. Due to the presence of SCTB habitat, construction must

be completed by then to avoid possible disturbance of SCTB emerging from winter burrows.

Wetland Too Wet?

Not only does a lack of groundwater connection limit saline wetland functions, too much water impounded on saline wetlands may restrict functions. At the ALC, the SWCP decided to experiment with operating the wetland site with less standing water. The plug on the outlet structure at ALC was removed in November 2009 and since that time, large areas of saline wetland vegetation have appeared in areas previously inundated by standing water. Through this experiment, the existing seed bank of the wetland was able to re-establish in less saturated conditions. Salt tolerant vegetation such as sea blite, spearscale and saltwort has thrived in the drier conditions.

Innovative Techniques at Arbor Lake Complex

The Natural Resource Conservation Service (NRCS) has been an active contributor to the ALC project. As part of its continued statewide soil mapping efforts, the NRCS was interested in excavating a soil pit at ALC to measure soil salinity through the soil column. The northern portion of ALC is covered by 1-3 feet of sediment that has deposited on the site due to adjacent agricultural land disturbance.

As described earlier, saline soils exist within the floodplain as a result of saline groundwater transported to the wetland surface. To measure the distribution of salinity throughout the site, the NRCS used a sensor called the EM-38. This sensor measures the electrical current charge in the soil. Soil electrical conductivity (EC) correlates to many soil properties including soil salinity. At ALC, the EM-38 had an effective measurement depth of 1.5m (5 feet) (Source: NRCS website). The EM-38 was used alongside a GPS unit to map the levels of soil salinity in portions of the ALC site. This map was used during wetland design to determine areas of shallow excavation of sediment. The goal is to remove shallow sediment and expose saline soils.

Conclusion

A variety of unique techniques have been used to restore degraded saline wetlands in eastern Nebraska. The formation of the SWCP allows wetlands managers the ability to draw from a wide pool of expertise to make informed decisions about wetland management. Consultants and members of the SWCP work closely together to test new restoration techniques and monitor their success. These experiments have shown successful results in the area of insect population expansion and salt tolerant vegetation reestablishment. **L&W**

by Gordon R. Coke & Thomas E. Riley

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