Programmatic Environmental Impact Statement
Wetlands Appendix

WETLAND ANALYSIS
PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM

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INTRODUCTION

This report is a programmatic analysis of wetlands in the Central Platte River floodplain in Nebraska that might be impacted by the Platte River Recovery Implementation Program (Program). The analysis has two purposes: 1) to identify and document the extent of wetlands in the Central Platte River on a broad scale, and 2) to determine, at a programmatic level, potential impacts of the Program's actions on wetlands. This analysis will provide the starting point for a multi-level approach to site-specific wetland analysis should the Program pursue channel restoration work and seek permitting through Section 404 of the Clean Water Act or any other local or State regulations. Upon Program implementation, a more intensive analysis of wetlands will be conducted to determine local impacts of channel and land restoration activities on specific Program lands.

PROGRAM PURPOSES AND ACTIONS

In 1997, the States of Colorado, Nebraska, and Wyoming and Interior signed a *Cooperative Agreement for Platte River Research and Other Efforts Relating to Endangered Species Habitats Along the Central Platte River, Nebraska* (Cooperative Agreement). In this agreement, the signatories agreed to pursue a Basinwide, cooperative effort to improve and maintain habitat for the target species using the Central and Lower Platte River in Nebraska. For more detailed information on the proposed Program, see www.platteriver.org.

The Program, when implemented, is intended to provide compliance with the Endangered Species Act (ESA) for certain existing water projects and water uses in the Platte River Basin (Basin), as well as for certain future water uses during the first increment of 13 years, as they affect the target species and their habitat in the Central and Lower Platte River. The Cooperative Agreement established the general, long-term goal of improving and maintaining the target species-associated habitats in order to provide ESA compliance for certain water related activities in the Basin.

PROGRAM LAND MANAGEMENT GOALS AND OBJECTIVES

The land objective for the First increment of the Governance Committee Alternative is protecting, restoring where appropriate, and maintaining at least 10,000 acres of habitat for the target species in the Central Platte River Habitat Area, located between Lexington and Chapman, Nebraska (see map, figure WA-1).

> The 10,000 acres of land has been divided into two categories: (1) 9,200 acres of lands for habitat complexes with potential to achieve habitat characteristics similar to table WA-1, and (2) 800 acres of non-complex lands, such as sandpits and small palustrine wetlands, with the aim of approximating features described in table WA-2 (non-complex lands criteria).
>
> Wet Meadows: The first increment Adaptive Management objective is to increase wet meadow acreage by 10 percent over the 1998 baseline conditions for the Habitat Area.

Open Channel Habitat: The first increment Adaptive Management objective is to increase the acreage of channel area greater than 750-feet wide by 30 percent over the 1998 baseline conditions for the Habitat Area.

PROGRAM LAND HABITAT RESTORATION

Habitat Complexes

Habitat complexes along the Central Platte River would be created to meet the needs of the whooping cranes, least terns, and piping plovers. Habitat complexes include wide and long areas of unobstructed channel with shallow depths, providing adequate roost security for whooping cranes and with unvegetated sandbars providing nesting habitat for terns and plovers. Habitat complexes also include wet meadow areas near the river for crane foraging, loafing, and courtship. Complexes also may include lands that, while they are not channel roost area or wet meadows, provide an important "buffer" from other sources of disturbance (e.g., roads, dwellings). Characteristics for the components of habitat complexes are summarized from the *Land Action Plan* in table WA-1. These characteristics will be used as screening criteria for land considered for acquisition.

Table WA-1.—Summary of Target Habitat Complex Guidelines From the *Land Action Plan*, Table 1 (Governance Committee Program Document)

Riverine Habitat	**Characteristics**
Location	Platte River, between Lexington, and Chapman, Nebraska
Channel area	Approximately 2 miles long, 1,150 feet wide, and includes both sides of the river.
Water depth	A range of depths with approximately 40 percent of the channel area less than 0.7-foot deep during whooping crane migration periods.
Wetted width	90 to 100 percent of channel area inundated during migration periods.
Water velocity	During migration seasons, velocity should be less than 4 miles per hour in shallow areas.
Sandbars/channel morphology	Nonpermanent sandbars and low, nonpermanent islands, high enough to provide dry sand during the tern/plover nesting season and free of vegetation that inhibits use by tern, plover, or crane.
Proximity to wet meadow	Within 2 miles, but contiguous is preferred.
Distance from disturbance	*For whooping cranes*: In general, not less than 0.5-mile distant or appropriately screened from potential disturbances. *For interior least tern/piping plover*: In general, not less than 0.25-mile distant or appropriately protected from human disturbances.
Unobstructed view	Adequate visibility upstream, downstream, and across the channel.
Flight hazards	Overhead lines should be avoided, if possible.
Security	Sufficient control while target species are present to avoid human disturbance.
Wet Meadow Habitat	**Characteristics**
Location	Within 2 miles of the above-described channel area.
Size	Approximately 640 contiguous acres or more.
Distance from disturbance	In general, not less than 0.5-mile distant or appropriately screened from potential disturbance.
Vegetation composition	Native prairie grasses and herbaceous vegetation, lacking or mostly lacking sizable trees and shrubs, occurring in a mosaic of wetland (hydrophytic) and upland (nonhydrophytic) plants.
Hydrology	Swales subirrigated by groundwater seasonally near the soil surface and by precipitation and surface water, with the root zone saturated for at least 5 to 12.5 percent of the growing season.
Topography and soils	The topography is generally level or low undulating surface, dissected by swales and depressions. Mosaic of wetland soils with low salinity in swales and nonwetland soils occurring in uplands.
Food sources	Capable of supporting aquatic, semiaquatic, and terrestrial fauna and flora characteristic of wet meadows; especially aquatic invertebrates, beetles, insect larvae, and amphibians.
Buffer	**Characteristics**
Description	That portion of a complex used to isolate channel areas and wet meadows from potential disturbances. In general, it is up to 0.5 mile wide.

Non-complex Habitat

Non-complex habitat is land that, while not approximating the characteristics summarized in table WA-1, may provide demonstrable benefits to the target species.

These habitats include gravel mine sandpits that are, or could be, managed as nesting areas for terns and plovers, and small wet meadows or wetlands that may provide foraging or roosting habitat for cranes. Characteristics that will be used as screening criteria for land acquisition are summarized in table WA-2.

Table WA-2.—Summary of Non-complex Habitat
Guidelines From the *Land Action Plan*, Table 2

Sandpit Habitat for Interior Least Terns and Piping Plovers	**Characteristics**
Location	Within 2 miles of a river channel, between Lexington and Chapman.
Size	Approximately 3 acres or greater of nesting substrate that may be extended to include a management zone surrounding the nesting area.
Topography and soils	Open expanse of bare or sparsely vegetated (<25 percent) dry, sandy, or sand and gravel substrate.
Security	Sufficient control to avoid human disturbance to terns and plovers.
Nonriparian Habitat for Whooping Cranes	**Characteristics**
Location	Off-channel but within 3.5 miles of the centerline of the channel area, between Lexington and Chapman.
Type of habitat	Wetland or wet meadow areas.
Wetlands	Depressional wetlands with semipermanent, permanent, or seasonal shallow body(ies) of water.
Wet meadows	A generally level or low and undulating surface, dissected by swales and depressions. The area consists of a mosaic of wetland and upland soils and plants.
Distance from disturbance	In general, not less than 0.25-mile distant or appropriately screened from potential disturbance.
Unobstructed view	Good visibility in all directions.
Security	Sufficient control to avoid human disturbance to target species.

These characteristics will serve as the initial definition and focus for creation or restoration of habitat complexes and non-complex lands during the first increment of the Program but may be changed as new information is developed as part of the adaptive management process (see Adaptive Management Plan, Final Environmental Impact Statement (FEIS), volume 2, Governance Committee Program Documents).

Habitat Restoration Activities

Remediation for the loss of habitat involves reversing or minimizing habitat changes that have reduced the value of the Central Platte and Lower Platte River areas for the target species. The Service has assessed the needs of the three bird species and the pallid sturgeon for Platte River channel and adjacent habitat in the Central Platte River valley and Lower Platte and has identified various potential habitat changes to improve conditions for the target species. Habitat changes that may require State, local or Federal permitting include:

- Restoring some areas of wide, open river channel with unvegetated sandbars,
- Protecting and restoring wet meadows for crane foraging,
- Offsetting the ongoing erosion and downcutting of the riverbed in the habitat reach.
- Reducing disturbance to roosting, nesting, and foraging target species,
- Increasing sediment transport to the Lower Platte for pallid sturgeon habitat; increasing the occurrence of significant spring rise in the river to provide spawning cues, nutrient cycling, and reproductive habitat for the pallid sturgeon and its food base,
- Improving flows in the river during migration of the whooping crane and the nesting of the tern and plover species, and to maintain fish populations used as forage by the tern.

Some of the lands acquired or managed by the Program will already approximate the habitat characteristics described in tables WA-1 and WA-2. In these cases, little or no restoration will be required, and management will focus on protecting and maintaining those habitat qualities, through efforts such as controlling disturbance factors, controlling weeds and other invasive plants, promoting desirable plant communities, and other measures. Where Program lands do not approximate the desired habitat qualities, efforts will be undertaken, within the resources of the Program and within the capacities of the specific lands, to restore habitat to more closely approximate the characteristics of complex or non-complex habitats (see Adaptive Management Plan, FEIS, volume 2, Governance Committee Program Documents).

Restoration methods to be used on Program lands may include:

River Channel Habitat Restoration

- Vegetation clearing and discing on banks and islands to improve sight distance across and along the river and to create roosting and nesting opportunities.
- Lowering elevation of vegetated islands and river banks to improve sight distance and create sandbars.
- Moving river sand from islands or banks back into the river channel to offset ongoing erosion of the channel and support formation of new sandbars.
- Blocking or diverting higher flows from river subchannels into the main channel.
- Other actions to create sandbars in the river channel.

Channel Consolidation

The land plan alternatives for the Program incorporate flow consolidation techniques to initiate changes in river plan form and promote more reaches of wide, braided river. Consolidating flow raises streampower needed to sustain a braided plan form, and a braided plan form has a more consistent transport rate than the transport rate of existing anastomosed channels in the Central Platte River (See FEIS, volume 3, River Geomorphology Appendix). The divergence of flows

can be prevented by blocking entrances to side channels, or by redirecting flow in side channels back to the main channel. These actions are an immediate means of converting anastomosed plan form to braided plan form.

Nonchannel Habitat Restoration

Habitat Complexes

Restoration Activities

- Removing trees and shrubs to help restore wet meadows.
- Restoring swales and sloughs (and other measures) to improve hydrologic conditions in wet meadows.
- Converting cropland to grassland for wet meadows.
- Augmenting water supplies for wet meadows from existing drains or wells.

Land Management Activities

- Haying, grazing, and prescribed burning to promote desirable plant communities.
- Seeding with native plant species to improve food availability.
- Restricting land use activities during migration periods to reduce disturbance of the target bird species
- Other actions to reduce disturbance, such as screening roads and relocating structures and access points

Non-complex Habitat

Land Management Activities

- Controlling predators to reduce predation of nests.
- Controlling vegetation to maintain open sandy areas for tern and plover nesting.
- Reducing human disturbance.

Restoration activities would generally take place outside of the nesting and roosting seasons.

PROGRAM STUDY AREA

The study area for this report covers the mainstem, tributaries and associated water projects of the North Platte River, in Colorado, Wyoming, and Nebraska, the South Platte River below Greeley, Colorado, and the Platte River in Nebraska. Within these parts of the Platte River Basin, the study area also includes lands irrigated with Platte River water, generally located within a few miles of the river. The study area also includes the lands along the Central Platte River in Nebraska where habitat restoration will occur.

While elements of the action alternatives are located throughout the entire Basin, the intent of these actions is to improve habitat conditions in two habitat areas—the Central Platte River between Lexington, Nebraska, and Chapman, Nebraska. Figure WA-1 is a map of the "Central Platte Habitat Area," for the whooping crane, piping plover, and interior least tern. The Lower Platte River from the Elkhorn River to its confluence with the Missouri River is also part of the Program action area for the pallid sturgeon. However, no habitat restoration or impacts to wetlands will occur below Chapman, Nebraska in the Lower Platte River. Therefore, this analysis does not include an analysis of wetland areas below Chapman, Nebraska.

METHODS

The methods used for this analysis must address the needs of the Program and the need for identification of wetlands in the study area. This analysis is programmatic in nature since the specific lands for acquisition are not known and will not be known until the Program is implemented and habitat acquisition and restoration begins. This is a reconnaissance level analysis that is as accurate as possible given the limited data available.

This analysis is not intended to make a final wetland delineation or to provide all of the information necessary to determine jurisdiction status of wetland habitats in the Central Platte River study area. This analysis does provide preliminary, broad scale information on wetland criteria of floodplain habitats in the study area

Wetland Characteristics and Definitions

This analysis uses the Cowardin system to classify floodplain habitats identified in the 1998 Geographic Information System (GIS) Land Cover/Land Use database. In addition, this analysis includes information on Federal wetland delineation criteria (COE, 1987). The regulatory definition of wetlands and delineation criteria are outlined below:

a. *Definition.* The U.S. Army Corps of Engineers (*Federal Register* 1982) and the Environmental Protection Agency (*Federal Register* 1980) jointly define wetlands as:

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

b. *Diagnostic environmental characteristics.* Wetlands have the following general diagnostic environmental characteristics:

(1) *Vegetation.* The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described in *a* above. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions.

(2) *Soil.* Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions.

(3) *Hydrology.* The area is inundated either permanently or periodically at mean water depths <6.6 feet, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.

c. *Technical approach for the identification and delineation of wetlands.* Except in certain situations defined in the U.S. Army Corps of Engineers Manual, evidence of a minimum of one positive wetland indicator from each parameter (hydrology,

soil, and vegetation) must be found in order to make a positive wetland determination.

Programmatic Natural Resources Characterization Method

This programmatic wetland analysis uses the Level 1 wetland determination method (onsite inspection unnecessary) using the extensive remote sensing and other information developed in support of the Platte River Recovery Implementation Program Environmental Impact Statement.

Available data in the study area includes:

Vegetation

- GIS Land Cover/Land Use Database
- Vegetation Community Classification
- National Wetland Inventory (NWI) Digital Maps

  NWI mapping for the study area was conducted between May and September 1981 using 1:58,000 scale photography (USFWS 1997). The GIS/Land Cover/Land Use digital database was developed from 1998, 1:12,000 aerial photography. In addition, field data was collected on dominant plant species in 1999 in support of the accuracy assessment and vegetation community classification for the GIS Land/Cover/Land Use database. Therefore, the GIS Land Cover/Land Use Database and community types were used in this analysis.

Soils

- SSURGO Soil Database

  Soil surveys in the SSURGO database for the study area include a digital map layer delineating “hydric soils,” “partially hydric soils,” “not hyric,” and “unknown soils” (NRCS 2005). The digital information also includes the soil map unit name, as well as flooding and drainage characteristics within each of these classifications. This digital soils layer was overlayed on the GIS Land Cover/Land Use digital maps and acreages of each soil map unit within each vegetation community type were calculated.

Hydrology

- OPSTUDY Hydrology Model
- SEDVEG Gen 3 sediment transport and vegetation model

These models are detailed models of hydrology and river geometry and geomorphology within the active channel of the Central Platte River. The Department of the Interior (DOI) believes that these models adequately characterize the frequency of inundation and soil saturation for riverine wetlands within the active channel during the growing season.

The DOI believes that these analysis tools to assess vegetation, soils, and hydrology are sufficient to determine the presence of hydrophytic vegetation, wetland soils, and wetland hydrology to make an accurate wetland determination for the study area.

Hydrophytic Vegetation Analysis Methods

Remote Sensing

In 1998, Reclamation's Remote Sensing and Geographic Information Group classified and created a digital Geographic Information System (GIS) database representing land cover and land use in the 90-mile long, 7-mile-wide habitat area between Lexington and Chapman. Twelve natural vegetation, 7 agricultural land-cover types, 5 surface hydrology, and 14 land-use classifications were interpreted from 1998 color-infrared aerial photography and transferred into a GIS database. Figure WA-2 Is an example of the infrared photographs used in delineation of vegetation communities. Figure WA-3 is an example of one of the GIS land-cover/land use maps for one reach of the Central Platte River from Kearney to Odessa, Nebraska. The legend of the map shows all of the land-cover/land use classes used in the GIS classification.

The GIS database is registered to 1998 color-infrared digital orthophotos specifically produced for this project. The overall map classification (thematic) accuracy was evaluated using a modification of the National Vegetation Classification Standard protocol and was determined to be 88.8 percent. Final geographic information system products comply with the national standards (Federal Geographic Data Committee and National Biological Information Infrastructure) and are described in the FEIS, volume 3, Land and GIS Appendix (Friesen et al. 2004).

Field Inventory and Vegetation Community Classification

An initial field inventory was conducted by BOR–RSGIG biologists and GIS specialists in October 1998 to examine land-cover and land-use elements, review the CALMIT mapping effort, assess the quality of 1998 CIR aerial photography, determine aerial photo signatures for the various mapping units, and become familiar with access within the corridor (Friesen et al. 2004). A more detailed Field Survey effort was conducted during the summer of 1999 which focused on describing the non-agricultural vegetation sufficiently to meet the National Vegetation Classification Standard (NVCS) (Butler 1999, TNC–ESRI 1994).

This classification was based on a modification of the standards presented in *Field Methods for Vegetation Mapping* (TNC-ESRI 1994). Modifications were necessary because of limited access to potential sample sites, as most of the study corridor lies on private land. Vegetation classification involved two levels of intensity for collection of mapping data: 1) observation points and 2) sample plots. All data points obtained for vegetation type descriptions also served as accuracy assessment points because they were collected independently of the photo-interpretation and digital transfer efforts. See Vegetation Classification of the Central Platte River 1998 Land Cover/Use Mapping Project) in FEIS, volume 3, Land and GIS Appendix (Butler 1999, TNC–ESRI 1994 for a detailed report on vegetation community classification.

Field Survey

Field surveys began in the first week of June 1999. Data collection included plot, observation points, and accuracy assessments. These allowed the field investigator to simultaneously record typical vegetation types and assess the variation in the plant communities across larger areas. A second survey was conducted during the middle of July 1999. To facilitate the logistics of conducting the field survey, the project area was divided up into 12 bridge segments. Plot data, observation point data, and accuracy assessment point data were collected from selected random points within each bridge segment. A total of 200 random points were generated for each bridge segment; however, access to these points was a significant challenge for the field investigator.

Access to areas was often limited because of land ownership, high water flows of the Platte River, and high rainfall in the project area during the field survey. With due considerations to access, the field investigator made every attempt to record data from the random points. However, in several instances, the field investigator substituted a subjectively placed point in place of a random point. Observation point and accuracy assessment data on cultivated land were collected by reviewing the 1998 records provided by the County Farm Service Agency in each county of the project area. Also, slope, aspect, elevation, and landscape position, which are normally recorded, were not recorded for this project because all of the points (plots, observation points, and accuracy assessments) occurred within the floodplain of the river on relatively level ground.

Observation Points

Observation points were used to quickly become familiar with plant community characteristics, plant community ranges of variation, and to field check preliminary classification. Observation points also provided an opportunity to crosswalk the 1998 Central Platte River vegetation classification with the NVCS (i.e., verify the presence or absence of plant associations currently listed versus those not currently listed). Sampling observation points included basic information on habitat and vegetation composition and structure. Specific information recorded included in the Land and GIS Appendix in volume 3 of the FEIS.

UTM x,y coordinates (using NAD83 datum), dominant species cover data, and brief environmental characteristics. The form used to record Observation Points is presented in the Land and GIS Appendix in volume 3 of the FEIS. Limitations of observation point data included no measurement of delineation of the sampling area, and cover was estimated only for the common species in each stratum. In addition, the name of the plant communities located within 50 meters of the observation point was recorded on the form. Data from 82 observation points were collected during the field survey.

Plot Samples

Intensive plot samples (with more detailed information on vegetation composition and structure than for Observation Points) were collected from 116 points selected either randomly or subjectively by the field investigator depending on access. Sampling was conducted in June and July of 1999. The specific locations of sample plots were identified using standard methodology (Mueller-Dumbois 1974). Detailed sampling plots were subjectively placed in vegetation that was representative of an area, relatively homogeneous, and which covered more than 0.5 hectare (the minimum mapping unit). Thus, ecotones and small patches of vegetation were avoided. Forest and woodland communities were sampled with 20- by 20-meter plots, while shrubland and herbaceous communities were sampled with 10- by 10-meter plots. Collected data included primarily soil characteristics (e.g., soil texture and drainage), vegetation composition and structure, and other site features such as wildlife use or human disturbance.

To characterize vegetation structure, all species found within a plot were recorded and foliar cover for each species by stratum was estimated using methods modified from Daubenmire (1959). Because cover was estimated independently for both species and strata, total coverage for some of the plots was greater than 100 percent. The UTM coordinates of all plots were recorded using a hand-held Global Positioning System (GPS) receiver (Garmin 12XL) connected to a portable differential GPS receiver. The differential reference receiver used to differentially correct the coordinates is located in Kansas City, Missouri. Atmospheric conditions and dense canopy cover often disrupted reception of the differential signal, thus reducing the accuracy of the hand-held GPS receiver.

Hydric Soils Analysis Methods

Soils Database

The Natural Resources Conservation Service (NRCS) - National Cartography and Geospatial Center (NCGC) previously archived and distributed the Soil Survey Geographic (SSURGO) Database. This data set is a digital general soil association map developed by the National Cooperative Soil Survey. It consists of a broad based inventory of soils and nonsoil areas that occur in a repeatable pattern on the landscape and that can be cartographically shown at the scale mapped. The soil maps for STATSGO are compiled by generalizing more detailed soil survey maps. Where more detailed soil survey maps are not available, data on geology, topography, vegetation, and climate are assembled, together with Land Remote Sensing Satellite (LANDSAT) images. Soils of like areas are studied, and the probable classification and extent of the soils are determined.

Hydric/Partially Hydric/Not Hydric/Unknown Soils Maps

Bridge Segments 1 through 5 in Merrick, Hamilton, Hall, Adams, Buffalo, and Kearney Counties were mapped identifying all hydric and partially hydric soils. Bridge Segments 6 through 13 in Buffalo, Kearney, Phelps, Dawson, and Gosper Counties were mapped identifying all hydric soils; no partially hydric soils are included in these surveyed bridge segments.

Soils Maps Overlayed on GIS Land Cover/Land Use Maps

Using GIS software, the soils maps layer was overlayed onto the GIS Land Cover/Land Use GIS layer and intersections of soils types in each land cover/land use type were determined and acreages calculated.

Wetland Hydrology Analysis Methods

SEDVEG Gen 3 Analysis of Hydrology of wooded, shrubbed, and bare sand islands within the active channel

The SEDVEG Gen 3 Model (described below) was used to simulate how often flows overtop wooded, shrubbed, and bare sand islands with the active channel. Cross-sections from the SEGVEG Gen 3 Model were used in this analysis and include only those cross-sections that cross wooded islands, shrubbed islands, and barren beach bars. These modeled cross-sections were used to simulate groundwater levels, how often flows overtopped these islands, and for what duration. The model results were used to determine the frequency of flooding on islands within the active channel and average depth to groundwater (Murphy et al. 2006).

The sediment-vegetation model, SEDVEG Gen 3, was developed to evaluate the process linkages between hydrology, river hydraulics, sediment transport, and vegetation for the Platte River in Nebraska. Input requirements for the model include hydrographs of mean-daily river flow for the North and South Platte Rivers and for various points along the Platte River channel. Model input also includes river cross sections to define the channel geometry (defined as a series of points across the channel), channel roughness and sediment grain size for each cross section point, the initial composition of vegetation species at each cross section point, the vegetation growth rates and removal criteria for each species. Sediment inflow to the Platte River from the North and South Platte Rivers is computed by the model based on the river flow, hydraulic conditions, and the bed material grain-size distribution at the tributary cross sections.

The model simulates the evolution of channel geometry, sediment grain-size distributions, and vegetation growth and removal for each indicator species. River flow is the dominant variable affecting channel width, but channel encroachment by vegetation occurs rapidly with even one or two feet of channel aggradation or degradation.

Model output includes cross-section graphs (for the end of each year) that show the initial and the predicted channel geometry, water-surface elevation, and the height of vegetation relative to the channel bed. Model output also includes plots of sediment transport, deposition, and erosion rates with time for each cross section. Graphs of flow velocity and depth versus time, at selected cross sections, and plots of channel width versus time are also available. See FEIS, volume 3, SEDVEG Gen 3 Appendix for more details on the SEDVEG Gen 3 Model.

For lowland grasslands, emergent wetlands and herbaceous riparian outside the active channel, qualitative information was used to determine hydrology.

Methods Used to Determine Wetland Classifications of Central Platte River Vegetation Communities

The Cowardin system was used to determine wetland and deepwater habitat classifications for each GIS Land Cover/Land Use type in the Central Platte River. Figure WA-4 provides a diagram of the Cowardin riverine and palustrine classifications. The highlighted classifications in this figure are wetland types found in the Central Platte River study area. The following is a brief description of each classification used in this analysis:

Riverine

The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 percent. A channel is "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water."

Upper Perennial

The gradient is high and velocity of the water fast. There is no tidal influence and some water flows throughout the year. The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water, and there are few or no planktonic forms.

Palustrine

The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents:

Emergent

The Emergent Wetland Class is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years.

Persistent

Persistent Emergent Wetlands are dominated by species that normally remain standing at least until the beginning of the next growing season.

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Nonpersistent

Wetlands in this subclass are dominated by plants which fall to the surface of the substrate or below the surface of the water at the end of the growing season so that, at certain seasons of the year, there is no obvious sign of emergent vegetation.

Scrub-Shrub

The Scrub-Shrub Wetland Class includes areas dominated by woody vegetation less than 6-feet tall. The species that dominate these areas include true shrubs, young trees and trees or shrubs that are small or stunted due to environmental conditions.

Broad-leaved deciduous

In the palustrine system, broad-leaved deciduous wetland types are dominated by alders, willows, and red osier dogwood.

Forested

Forested wetlands are characterized by woody vegetation that is 20-feet tall or taller.

Broad-leaved deciduous

Common dominants in forested wetlands in the southern and eastern United States include red maple, American elm, ashes, black gum, tupelo gum, swamp white oak, overcup oak, and basket oak. Wetlands in this subclass generally occur on mineral soils or highly decomposed organic soils.

Open Water

Palustrine open water habitat is characterized by surface water of less than 6 feet in depth for a portion of the growing season.

Aquatic Bed

The Aquatic Bed class includes wetlands and deepwater habitats dominated by plants that grow on or below the surface of the water for most of the growing season for most years.

Methods Used to Assess Potential Impacts to Wetlands

GIS Land Plans

Illustrative land plans were developed using the GIS Land Cove/Land Use mapping to estimate potential land restoration activities. Since it cannot be determined what lands will be available and acquired, these land plans are for analysis purposes only and are not intended to represent actual land parcels that will be acquired. Habitat restoration activities are evaluated based on conversion of land cover types (i.e., wetted channel to bare sand).

Analysis of Wetland Vegetation Communities

This analysis focuses on non-agricultural and undeveloped lands within the floodplain of the Central Platte River valley. Table WA-5 is a summary of the GIS land cover/land use types in the Central Platte River study area, their topographic position, their acreage, and percent cover in the study area. Also included in this summary are the Cowardin system classifications of each land cover/land use category. Table WA-6 is a summary of the hydrophytic vegetation criteria for each land cover/land use category. Table WA-7 is a matrix showing hydric, partially hydric, not hydric and unknown soils for each cover type and each bridge segment. Table WA-8 is the estimated hydrology (using SEDVEG Gen 3 modeling) of in-channel vegetation types.

Table WA-5 - Central Platte River Study Area
Summary of Land Cover/Land Use Classifications, Cowardin Classifications, and Wetland Determination Criteria

Land Cover Classifications	Cowardin Classification	Cowardin Code	Hydric Vegetation	Hydric Soils	Wetland Hydrology	Acreage*	Percent
INSIDE FLOODPLAIN							
Emergent Wetlands	Palustrine, Emergent, Persistent	PEM	Yes	No	Yes	131	
Herbaceous Riparian	Palustrine, Emergent, Persistent	PEM	Yes	Yes	Yes	2,253	
Lowland Grasslands	Palustrine, Emergent, Persistent	PEM	Yes	No	Yes	18,605	
Open Water	Palustrine, Open water	POW	Yes	Yes	Yes	1,526	
Shrublands	Palustrine, Scrub-Shrub, Broad-leaved deciduous	PSS				2,048	
Higher Islands			Yes	Yes	No		
Lower Islands			Yes	Yes	Yes		
Woodlands	Palustrine, Forested, Broad-leaved deciduous	PFO	No	Yes	No	16,708	
					Totals	**41,271**	**53%**
INSIDE CHANNEL							
Bare Sand	Palustrine, Emergent, Persistent/Non-persistent	PEM	Yes	Yes	Yes	665	
Emergent Wetlands	Palustrine, Emergent, Persistent	PEM	Yes	No	Yes	182	
Herbaceous Riparian	Palustrine, Emergent, Persistent	PEM	Yes	Yes	Yes	1,275	
Lowland Grasslands	Palustrine, Emergent, Persistent	PEM	Yes	No	Yes	10,497	
Shrublands	Palustrine, Scrub-Shrub, Broad-leaved deciduous	PSS				3,210	
Higher Islands			Yes	Yes	No		
Lower Islands			Yes	Yes	Yes		
Wetted Channel	Riverine, Upper Perennial, Unconsolidated Bottom	R3UB	No	Yes	Yes	9,967	
Woodlands	Palustrine, Forested, Broad-leaved deciduous	PFO	Yes	Yes	No	10,326	
					Totals	**36,122**	**47%**
					Grand Total	**77,393**	**100%**

*Vegetation acreages within the channel and within the floodplain are generally flow-dependent. Acreages of each land cover/land use classes are based on 1998 aerial photography when flows in the study area ranged from 325 to 1030 cfs.

DESCRIPTION OF CENTRAL PLATTE RIVER WETLANDS

The primary effects of Program activities will be focused within the floodplain of the Central Platte River. Therefore, the following descriptions of wetland types within the study area include wetland types found within the floodplain and within the channel in the study area. The following wetland descriptions include the Central Platte River land cover/land use categories, their topographic position within the floodplain, dominant plant species, hydrophytic vegetation, wetland soils, wetland hydrology and Cowardin wetland classifications.

Inside the Floodplain

Lowland Grasslands

Lowland grasslands occupy about 10 percent of the study area on lower terraces of the Platte River valley from high, dry areas to lower, moist areas. These grasslands occur throughout the historic floodplain of the Central Platte River. Wet meadows are a subset of the lowland grassland classification and generally occur adjacent to the river or within 2 to 3 miles of the present river channel. However, wet meadows were not delineated in the Land Cover/Land Use database because the photo signature of micro-topographic features of these meadows could not be readily identified on the infra-red photography. However, lowland grasslands likely occupy the majority of the lowland grassland vegetation class.

Wet meadows generally form a mosaic of emergent wetlands mixed with tall grasses. The undulating topography with a shallow groundwater table provides both lowland grassland communities in higher, drier areas and wetland habitats in lower, wetter areas. Lower areas may contain sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), and smartweed (*Polygonum* spp.). Often, a fringe of tall prairie grasses and wetland shrubs is present, which includes prairie cordgrass, switchgrass, sandbar and peachleaf willow (*Salix exigua* and *S. amygdaloides*), and leadplant (*Amorpha* spp.). Emergent wetland species include both broad and narrow-leaved cattails (*Typha latifolia* and *T. angustifolia*); softstem, river, and three-square bulrush (*Scirpus validus*, *S. fluviatalis*, and *S. pungens*); sedges; spikerush; reed-canarygrass (*Phalaris arundinacea*); and smartweed (*Polygonum* spp.).

Hydrophytic Vegetation

As shown in table WA-6, the dominant vegetation in the lowland grassland class is considered hydrophytic. The highest areas have 60-percent FACW or FAC and 40-percent FACU plant species.

Hydric Soils Analysis

As shown in table WA-7, 35 percent of the soils in this classification are hydric or partially hydric and 64 percent not hydric. Lowland grasslands, and wet meadows in particular, form a mosaic of micro-topographic features with tall grasses mixed with wetlands. Since these lower features could not be delineated using 1:12,000 photography, it is likely they could not be detected using the digital orthophotography used for soils surveys in 1993. Considering the dominance of hydrophytic vegetation present in these communities and microtopography features that could not be detected from aerial photography, DOI believes there are more wetland soils in these communities than indicated by the surveys. Therefore, the Lowland grassland community type is judged to fulfill the hydric soils criteria.

Hydrology Analysis

Lowland grasslands generally have a shallow depth to groundwater during the growing season, ranging from the surface in late spring and early summer, to 3 feet during late summer and fall. Wet meadows adjacent to the river are hydrologically connected to the river channel and groundwater levels in these meadows fluctuate with the river's water surface levels. Further from the river channel, meadows are sub-irrigated by tributaries and irrigation return flows.

Lowland grasslands have shallow depth to groundwater during the growing season and are considered to have wetland hydrology.

Cowardin Classification

Palustrine, emergent, persistent	PEM

Woodlands

Riparian woodlands are one of the common habitats of the Central Platte River valley, occupying islands, terraces, and tributary drainages along the length of the corridor. In mature riparian stands, eastern cottonwood trees 20 to 35-meters tall provide up to 60 percent of the ground cover. In a few stands, the mature eastern cottonwood trees were estimated to be nearly 50-meters tall. Shorter-statured green ash (*Fraxinus pennsylvanica*), eastern red cedar (*Juniperus virginiana*), peachleaf and black willow (*Salix amygdaloides* and *S. nigra*), slippery elm *(Ulmus rubra*), red mulberry (*Morus rubra*), hackberry (*Celtis* spp.), and Russian-olive (*Elaeagnus angustifolia*) trees form a subcanopy and contribute 30 to 60 percent additional ground cover.

Riparian woodland understory shrubs, ranging from 1 to 5-meters tall, include rough-leaved dogwood (*Cornus drummondii*), sapling eastern red cedar and green ash trees, chokecherry (*Prunus virginiana*), Arkansas rose (*Rosa arkansana*), false indigo (*Amorpha fruiticosa*), prickly ash (*Zanthoxylum americanum*), and coralberry (*Symphoricarpos orbiculatus*). They provide up to 50 percent additional vegetation cover. The lianas, wild grape (*Vitis riparia*), and Virginia creeper (*Parthenocissus quinquefolia*) are also present in some locations.

Herbaceous riparian woodland understory species form a dense layer of up to 80-percent cover and include the following grasses: switchgrass, Kentucky bluegrass, smooth brome (*Bromus inermis*), Canada and Virginia wildrye (*Elymus canadensis* and *E. virginiana*), prairie cordgrass, redtop, orchardgrass (*Dactylis glomerata*), reed canarygrass, and the annual Japanese brome (*Bromus japonicus*). Common forbs and grasslike plants include sedges, Nuttall sedge (*Carex nutallii*), common and western ragweeds (*Ambrosia artemisiifolia* and *A. psilostachya*), field mint (*Mentha arvensis*), fog fruit (*Phyla lanceolatum*), smooth horsetail (*Equisetum laevigatum*), dandelion (*Taraxacum officianale*), northern bedstraw (*Galium aprine*), hemp (*Cannabis sativa*), catnip (*Nepeta cataria*), dogbane (*Apocynum cannabinum*), mullein (*Verbascum thapsus*), common curly dock (*Rumex crispus*), white avens (*Geum canadense*), stinging nettle *(Urtica dioica*), poison ivy (*Toxicodendrom rydbergii*), goldenrod (*Solidago* spp.), white and yellow sweetclover (*Melilotus alba* and *M. officianalis*), black medic (*Medicago lupulina*), marsh-elder (*Iva annua*), musk thistle (*Carduus nutans*), and showy milkweed (*Asclepias speciosa*).

Based on field sampling, as detailed in table WA-6, the overstory canopy is dominated by eastern cottonwood (FAC), green ash (FAC), and American elm (FACW) which does indicate

dominance by hydrophytic vegetation. The dominant subcanopy tree species are also hydrophytic; using the FAC neutral test, there are 50-percent OBL and 50-percent FACU/FACU-species. However the shubby understory and the herbaceous understory are dominated by FACU and UPL species. Using dominants from all strata, the FAC neutral test indicates that 10-percent OBL, 20-percent FACW, 10-percent FACU, 40-percent FACU, 10-percent UPL, and 10-percent FACW-UPL. Analysis of all strata indicates this community type does not support more than 50-percent wetland species.

Hydric Soils Analysis Results and Discussion

As shown in table WA-7, the wooded classification has 60-percent hydric and 14-percent partially hydric soils. The wooded community type meets hydric soils criteria.

Hydrology Analysis Results and Discussion

As shown in table WA-8, wooded islands, from March to October, have surface water that exceeds the height of islands 1.7 years out of 48 for an average of 96 days. In the years that the surface water exceeds the height of islands, the average number of days of inundation ranges from 2 days to 264 days. In any one year, the maximum number of days the water surface exceeds wooded island height ranges from 2 days to 67 days with an average duration of 2 to 63 days. The average surface water elevation over a 48 year period is 4.5 feet below the height of the island. These islands are, therefore, rarely flooded and their groundwater levels are below 4 feet during the growing season. Wooded island do not meet the wetland hydrology criteria.

Cowardin Classification	
Palustrine, forested, broad-leaved deciduous	PFO

Shrublands

Shrublands are common on islands in the Platte River and along shorelines immediately adjacent to the river. These shrublands are dominated by either sandbar willow or rough-leaf dogwood. Sandbar willow most often occupies newly exposed or recently deposited sand sites and forms fairly dense stands with little or no understory. Rough-leaf dogwood shrublands occur adjacent to, or intermixed with, woodlands and forests on drier sites. False indigo, black willow, peach-leaf willow, and American elm (*Ulmus americana*) can also be a component of the shrublands along the Platte River. Typically, these shrublands are characterized by a high density of tall and short shrubs. Green ash, eastern cottonwood, and red mulberry trees are often a small, but conspicuous component of the canopy or subcanopy layer. Kentucky bluegrass is the most common understory herbaceous species.

Hydrophytic Vegetation

As shown in table WA-6, the overstory shrub layer is 66-percent OBL and 33-percent FACU. However, the understory dominant species is 100-percent FACU. Combining all strata the 40-percent OBL and 60-percent FACU with a FAC neutral test result of 50-percent OBL. Therefore, shrublands meet the hydrophytic vegetation criteria.

Hydric Soils Analysis

As shown in table WA-7, 50 percent of soils are hydric or partially hydric. Forty-five percent of the soils are unknown due to water detected in photo interpretation. Soils in shrub communities meet the hydric soils criteria.

Hydrology Analysis

As shown in table WA-8, higher shrubbed islands (cross sections 13 and 31), from March to October, have surface water elevations that exceed the height of the islands 2.5 years out of 48 for an average of 30 days. In any one year, the water surface elevation exceeded the island height for a maximum of 31 days for a maximum duration of 31 days. The average surface water elevation over a 48 year period is 5 feet below the height of the island.

On the higher shrubbed islands (cross section 55), from March to October, the surface water elevations exceeds the height of the island 15 years out of 48 for an average of 317 days. In any one year, the water surface elevation exceeded the island height for a maximum of 74 days for a maximum duration of 62 days. The average surface water elevation for the higher shrubbed islands is 1.8 feet below the island.

Based on available hydrologic information, higher shrubbed islands are likely frequently flooded with a shallow depth to the water table and meet the wetland hydrology criteria. However, lower shrubbed islands are rarely flooded with a depth to the water table of 5 feet or more and do not meet the wetland hydrology criteria.

Cowardin Classification

Palustrine, scrub-shrub, broad-leaved deciduous	PSS

Open Water (Ponds, Lakes, and Other)

This category includes ponds, lakes, sloughs and canals. Most open water areas are less than 20 acres in size.

Surface water in these open waters are generally less than 6.6 feet deep (old gravel pit ponds can be deeper) and less than 20 acres in size. In areas of slow-moving water, free-floating and submersed vegetation is common, including duckweed (*Lemna/Spirodela* sp.) and pond weeds (*Potamogeton sp.)*. Margins of open water habitats are most often dominated by cattails (*Typha* sp.), bulrush (*Scirpus* sp.), and spikerush (*Eleocharis* sp.).

Hydrophytic Vegetation

As shown in table WA-6, pond margins and pond surface water are dominated by greater than 50 percent hydrophytic vegetation and meet hydric vegetation criteria.

Hydric Soils Analysis

As shown in table WA-7, ponds and pond margins have 12-percent hydric and partially hydric soils. However, 70 percent of soils are unknown due to surface water. The open water community type meets hydric soils criteria

Hydrology Analysis

Lakes and ponds in the study area have surface water for most of the growing season and pond margins are saturated for the majority of the growing season. Sloughs also have surface water for most of the year. This vegetation type meets wetland hydrology criteria

Cowardin Classification	
Palustrine, Open Water	POW
Palustrine, emergent, persistent	PEM

Herbaceous Riparian Wetlands

Herbaceous riparian wetlands occur adjacent to the river and on vegetated islands. These areas are dominated by wetland grasses and forbs, which are present in very dense stands. Typically associated with these habitats are common reedgrass (*Phragmites australis*), reed-canarygrass, smooth brome, three-square bulrush, smooth horsetail, wild licorice (*Glycyrrhiza lepidota*), cocklebur (*Xanthium strumarium*), yellow- and white-sweetclover, and sandbar willow.

Hydrophytic Vegetation

As shown in table WA-6, herbaceous riparian communities adjacent to the river and on higher vegetated islands meet the hydrophytic vegetation criteria with more than 50-percent OBL and FACW species.

Hydric Soils Analysis

As shown in table WA-7, 58 percent of the herbaceous riparian communities are all hydric and partially hydric soils. Herbaceous riparian wetlands meet the hydric soils criteria

Hydrology Analysis

Herbaceous riparian wetlands are generally on low islands or depressions similar to emergent wetlands described below.

Meets wetland hydrology criteria.

Inside the Channel

Barren Beach/Bar (Bare Sand)

These areas are located within the active channel as islands and point bars. They are exposed sandy deposits in the river that are usually exposed during summer as river levels decline. Vegetation on these bare sand areas has less than 30-percent cover and can include many wetland grass and forb species, as well as seedling willows and cottonwoods. Higher river levels during spring result in scouring the islands and the removal of short-lived plant species (Currier 1982). Vegetation characteristic of barren beach/bar is typically annuals and biennials that become established quickly following exposure of the riverbed. Dominant plant species of this community include lovegrass (*Eragrostis* sp.), various nutsedges (*Cyperus* sp.), cocklebur (*Xanthium strumarium*), barnyard grass (*Echinochloa crus-galli*), and sand dropseed (*Sporobolus cryptandrus*).

Hydrophytic Vegetation

As shown in table WA-6, sandbars in the active channel are generally sparsely vegetated with hydrophytic vegetation with 80-percent OBL, FACW, or FAC species. Depending on hydrology during the growing season, periods of high flow and low flow vary throughout the year. Late in the season vegetation on barren beach/bars will fall to the surface giving the appearance of very sparse or no vegetation. Meets Hydrophytic Vegetation Criteria

Hydric Soils Analysis

As shown in table WA-7, the barren beach/bar vegetation community has 33-percent hydric and partially hydric soils; 62 percent have unknown soils. The unknown soils are noted as water. Therefore, this community type meets the hydric soils criteria.

Hydrology Analysis

As shown in table WA-8, higher sandbars (cross sections 52 and 22), from March to October, have surface water elevations that exceeds the height of islands from 28 to 31 years out of 48 for an average of 696 to 790 days. In any one year, the water surface elevation exceeded the island height for a maximum of duration of 84 to 97 days). The average surface water elevation over a 48 year period is 1 to 1.4 feet below the height of the bare sand islands.

Lower sandbars (cross section 41), from March to October, have surface water elevations that exceed the height of the island 3 years out of 48 for an average of 24 days. In any one year, the water surface elevation exceeded the island height for a maximum duration of 24 days. The average surface water elevation of the lower sandbars is 3.9 feet below the height of the bare sand islands.

Cowardin Classification	
Palustrine, emergent, persistent	PEM
Palustrine, emergent, non-persistent	PEM

Emergent Wetlands

Emergent wetlands occur throughout the study area in low areas adjacent to rivers and creeks, or on seeps and springs. Emergent wetlands range from saturated soils that support prairie cordgrass and three-square bulrush to inundated sites dominated by cattail. Other species in these emergent wetlands include reed canarygrass, foxtail barley (*Hordeum jubatum*), redtop, Kentucky bluegrass, intermediate wheatgrass (*Agropyron intermedium*), Arctic rush (*Juncus balticus*), spikerush, showy milkweed, western ragweed (*Ambrosia artemisifolia*), field horsetail (*Equisetum arvense*), sedges, curly dock, giant ragweed (*Ambrosia trifida*), and smooth brome.

Hydrophytic Vegetation

As shown in table WA-6, emergent wetlands are dominated by greater than 50-percent OBL and FACW species. This vegetation community meets hydrophytic vegetation criteria

Hydric Soils Analysis

As shown in table WA-7, only 18 percent of the soils in emergent wetlands are considered hydric. The absence of hydric soils in the emergent wetland classification is likely an artifact of the small areas occupied by this class. The average size of emergent wetlands throughout the study area is less than 2 acres. Because of the presence of hydrophytic vegetation and wetland hydrology (see below) this analysis will consider the emergent wetland class as having hydric soils.

Hydrology Analysis

Emergent wetlands are generally inundated by surface water for most of the growing season. Many depressional wetlands are subirrigated with groundwater at the surface for at least part of the growing season. Soils are saturated for most of the growing season.

Meets wetland hydrology criteria

Wetted Channel

The main channel of the Central Platte River has an unconsolidated bottom with a sand and gravel bed. The channel is generally less than 6.6 feet deep during normal flows. There is essentially no aquatic vegetation in the main channel. There is aquatic vegetation in backwaters, sloughs, and other areas with slow-moving water; these vegetation communities are discussed in the Open Water, Lakes, Ponds, section of this report.

Hydrophytic Vegetation Analysis

There is essentially no hydrophytic vegetation in the main river channel. Where flows are swift, submersed vegetation cannot become established in the unconsolidated, sand and gravel river bed. The main channel does not meet wetland vegetation criteria.

Hydric Soils Analysis

Based on the soils surveys, soils in the river channel are unknown, primarily because of the presence of water. The unconsolidated bottom is comprised of at least 25 percent cover of particles smaller than stones and is primarily sand and gravels.

Hydrology Analysis

The Central Platte River is a perennial river with flowing water for most of the growing season in most years.

ANALYSIS OF IMPACTS OF PROGRAM LAND ACTIVITIES ON WETLANDS (BY ALTERNATIVE)

Habitat Complexes

Land management plans will be developed based upon the features on individual parcels rather than strict adherence to table WA-1. To the extent practical, however, the characteristics summarized in table WA-1 will guide development of the parcel's management plan. In general, restoration and enhancement would seek to increase the amount of available open channel habitat for roosting and nesting; the amount of wet meadow habitat for crane foraging, loafing, and courtship; and the continuity of "buffer" lands around channel and wet meadow habitat to minimize disturbance.

Land management outside the river channel could include removing trees and shrubs, restoring sloughs, swales, and wet meadows by reshaping and lowering land, plugging agricultural drains, and reducing downcutting of the river channel through water and sediment management. Water available on the parcel might be directed into these lower areas.

Non-complex Habitat

Land management of non-complex habitats would be guided by the habitat characteristics described in table WA-2. There are two types of non-riverine habitats related to non-complex habitats: sandpit habitat for terns and plovers and nonriparian habitat for whooping cranes.

Management of sandpits may involve vegetation control through harrowing, discing, and pre-emergent herbicides. Vegetation management may also include removing grasses, weeds, willow and cottonwood seedlings as needed. These vegetation management efforts are conducted around potential nesting areas on an annual basis to curtail vegetation encroachment.

Predator control can also be a significant issue on sandpits. Portable and permanent electric fencing has been used to discourage predators from entering nesting areas. Fencing is configured to prevent predators from digging under, and to discourage avian predators from perching on the fence.

Nonriparian wetlands will be restored and managed to ensure protection of whooping cranes from human disturbance.

Initial Focus for Habitat Complexes

In addition to the Program land objectives described above, the Adaptive Management Plan (FEIS, volume 2) describes more specific management targets that will be the initial focus for restoration and protection of habitat complexes.

> Location: While the long-term objective described by the Fish and Wildlife Service is to have one habitat complex in each of ten bridge segments in the Habitat Area, the Adaptive Management Plan indicates that the first increment focus will be on the river above Minden, Nebraska, with a target of 6,400 acres of Program habitat complexes in this reach, and the remaining 2,800 acres downstream to Chapman.

Restoration: The Adaptive Management Plan also describes a first increment focus on restoration of habitat, as opposed to protection of existing habitat, with roughly 50 percent of Program lands undergoing significant restoration or enhancement (change in cover type or land category) during the first increment.

Wet Meadows: The first increment Adaptive Management objective is to increase wet meadow acreage by 10 percent over the 1998 baseline conditions for the Habitat Area. Methods for accomplishing this objective are described in the Adaptive Management Plan (FEIS, volume 3).

Open Channel Habitat:

The first increment Adaptive Management objective is to increase the acreage of channel area greater than 750-feet wide by 30 percent over the 1998 baseline conditions for the Habitat Area. Methods to be tested for achieving this goal include:

i. mechanically clear vegetation from islands and banks in the channel as needed to aid the widening process,
ii. mechanically lower islands to a level that will be inundated by anticipated annual peak flows,
iii. scour channel vegetation, maintain channel width and form, and build higher sandbars through short-duration near-bankfull within banks, and other flow management methods,
iv. consolidation of the flow and river sub-channels where practical to maximize stream power and help induce braided channel characteristics.

Offsetting Channel Erosion:

The first increment Adaptive Management objective is to assist in attaining sediment balance in the river reach above Kearney through actions on Program lands. Methods for achieving these objectives that will be tested through the Adaptive Management process include:

i. Starting in Year 1 of the Program, move river sand perched on approximately 20 acres of river islands and banks at Cottonwood Ranch or other areas above Kearney managed by the Program into the channel where it can be mobilized by the river flow between Jeffery Island and Cottonwood Ranch. Cleared areas will ultimately be lowered to the elevation that can be overtopped by a flow of 1,000 cfs. Movement of the island or bank sand into the active channel should occur at a rate that allows the material to be moved by the river, but does not raise average bed elevation so much that flow begins to spill into subchannels.
ii. Begin investigating alternative methods such as channel plan form changes, tributary delivery improvements, or flow routing changes.
iii. Develop a master plan for sustaining sediment balance in the habitat area:

    a. focus efforts on Program lands in the area at and immediately downstream of Jeffery Island to protect all potential habitat downstream for future restoration.
    b. develop and begin implementing a proactive plan for attaining sediment balance, possibly incorporating multiple sediment sources.

These objectives were used to formulate illustrative Program land plans.

Land Management Plans

Illustrative Scenario for Program Lands under the Governance Committee Alternative

Acquisition of interests in lands for the Program is based entirely upon willing sellers. Therefore, it is not possible to determine, prior to Program implementation, exactly which lands will become part of the Program. However, based upon meeting the objectives described above, an illustrative scenario for land acquisition and management has been analyzed. While the ultimate plan implemented for the Program will differ in specific location and management of each land parcel, the overall scale of actions, the types of actions, and hence their overall effect on key habitat characteristics should be similar to those produced by this scenario.

Table WA-9 shows the acres of land managed under this scenario for various reaches of the river.

Table WA-10 shows how this land management scenario modifies various land cover types as restoration is undertaken. For example, in this scenario, lands are acquired in areas where the river flood plain is filled with wooded islands. To more closely achieve the habitat characteristics of open channel described in table WA-1, the Governance Committee Alternative could convert roughly 300-400 acres of vegetated islands in the river channel to wetted channel by removing vegetation and lowering the islands to an elevation that can be overtopped by flows within the riverbanks.

Table WA-9.—Illustrative Distribution of Land Plan Acreage by River Segment,* Governance Committee Alternative.

River Reach	Acreage
Lexington to Johnson-2	24
Johnson-2 to Overton	195
Overton to Elm Creek	3,110
Elm Creek to Odessa	57
Odessa to Kearney	1,760
Kearney to Minden	1,551
Minden to Gibbon	75
Gibbon to Shelton	1,094
Shelton to Wood River	116
Wood River to Alda	230
Alda to Doniphan	61
Doniphan to Phillips	42
Phillips to Chapman	1,685
Total	**10,000**

*Includes all Program interests in lands, whether fee title, leases, or easements.

Under the Adaptive Management Plan, restoration will be accomplished in phases over several years. Initial efforts would be small in scale, with monitoring of progress and effects, as described in detail in the Adaptive Management Plan. In this scenario, approximately 300-400 acres of vegetated islands on Program lands are cleared and lowered by the end of the First increment of the Program.

Table WA-10.—Summary Table of Estimated Land Cover Changes for All Land Parcels Managed in the Governance Committee Alternative

Restoration Activities	Change in Cover Type	Acres	Subtotal
Conversion to Lowland grasses- PEM	Wooded – PFO to lowland grasses – PEM1	2,235	
	Herbaceous riparian – PEM to lowland grasses – PEM1	271	
	Agriculture (NW) to lowland grasses – PEM	1,161	
	Shrublands – PSS to lowland grasses – PEM	513	
	Upland grasses – NW to lowland grasses - PEM	94	
	Emergents – PEM to lowland grasses – PEM	3	**4,277**
Conversion to Wetted channel - R3UB	Wooded – PFO to wetted channel – R3UB	152	
	Shrubs – PSS1 to wetted channel – R3UB	163	
	Herbaceous riparian – PEM to wetted channel – R3UB	19	
	Bare sand - PEM1/2 to wetted channel – R3UB	19	
	Lowland grasses – PEM1 to wetted channel – R3UB	2	**355**
Restored lands		**4,632**	**4,632**
Unmodified lands		4,568	4,568
Total non-complex habitat		800	800
Totals		**10,000**	**10,000**

Potential Impacts to Wetlands – Governance Committee Alternative

4,277 acres of lowland grasslands (PEM) created

274 acres of emergents (PEM) and herbaceous riparian (PEM) converted to 274 acres lowland grasslands (PEM)

4003 acres of shrubs (PSS1) and wooded islands (PFO) converted to lowland grasslands (PEM)

345 acres of river channel (R3UB) created

40 acres of bare sand (PEM) , herbaceous riparian (PEM), and lowland grassland (PEM) converted to river channel (R3UB)

315 acres of shrubs (PSS) and wooded islands (PFO) converted to river channel (R3UB)

Illustrative Scenario for Program Lands under the Water Leasing Alternative

Land plan for the Water Leasing Alternative is the same as the Governance Committee Alternative.

Illustrative Scenario for Program Lands under the Wet Meadow Alternative

Land elements are discussed below and summarized in tables WA-11 and WA-12.

Table WA-11 shows the acres of land managed under this alternative for each river reach. This alternative includes the same land management plan as contained in the Governance Committee Alternative, but adds roughly 7,000 acres of additional wet meadow acquisition and/or restoration. Methods for restoration of wet meadows are described in Platte River Endangered Species Partnership, *Habitat Management Methods for Least Terns, Piping Plovers, and Whooping Cranes,* 2000. Primary actions include removal of woody and herbaceous vegetation and regrading some areas to restore swales and sloughs. Further, actions to restore sediment balance in the river are aimed at reducing the downcutting of the river channel and in fact may raise the elevation of the channel bottom in degraded areas. This may result in raising the groundwater level near the river sufficiently to help restore former wet meadows that have been dried up as the river channel was degraded and groundwater levels declined.

Table WA-11.—Illustrative Distribution of Program Lands,
Managed by River Reach, for the Wet Meadow Alternative

River Reach	Acreage
Lexington to Johnson-2	24
Johnson-2 to Overton	195
Overton to Elm Creek	3,110
Elm Creek to Odessa	2,596
Odessa to Kearney	2,578
Kearney to Minden	2,766
Minden to Gibbon	75
Gibbon to Shelton	2,014
Shelton to Wood River	116
Wood River to Alda	230
Alda to Doniphan	61
Doniphan to Phillips	1,603
Phillips to Chapman	1,685
Total	**17,053**

Wet Meadow Alternative Land Management

The management of lands for this alternative is similar to the methods and focus for the Governance Committee Alternative. Table WA-12 shows the approximate changes in land cover types associated with this land management strategy.

Table WA-12—Summary Table of Estimated Land Cover Changes for All Land Parcels Managed in the Wet Meadow Alternative

Restoration Activities	Change in Cover Type	Acres	Subtotal
Conversion to Lowland grasses – PEM	Wooded - PFO to lowland grasses – PEM	3,864	
	Herbaceous riparian – PEM to lowland grasses - PEM	414	
	Agriculture – NW to lowland grasses – PEM	3,188	
	Shrubs – PSS1 to lowland grasses – PEM	636	
	Upland grasses – NW to lowland grasses – PEM	107	
	Emergents - PEM to lowland grasses	3	**8,212**
Conversion to Wetted channel – R3UB	Wooded – PFO to wetted channel – R3UB	152	
	Shrubs – PSS to wetted channel – R3UB	163	
	Herbaceous riparian – PEM to wetted channel – R3UB	19	
	Bare sand - PEM to wetted channel – R3UB	19	
	Lowland grasses- PEM to wetted channel – R3UB	2	
	Emergents – PEM to wetted channel – R3UB	0	**355**
Conversion to Bare sand – PEM	Wooded – PFO to bare sand – PEM	7	
	Shrubs – PSS to bare sand – PEM	0	
	Herbaceous riparian – PEM to bare sand – PEM	0	**7**
Restored lands		**8,574**	**8,574**
Unmodified lands		7,679	7,679
Total non-complex habitat		800	800
Totals		**17,053**	**17,053**

Potential Impacts to Wetlands – Wet Meadow Alternative

Based on the illustrative land plan for the Wet Meadow Alternative, the following are estimates of potential impacts to wetlands:

8,212 acres of lowland grasslands (PEM) created

7,795 acres of shrubbed (PSS) and wooded islands (PFO), upland grasses (NW), and agricultural (NW) converted to lowland grasslands (PEM)

417 acres of emergent (PEM) and herbaceous riparian (PEM) converted to lowland grasslands (PEM)

355 acres of river channel (R3UB) created

315 acres of shrubbed (PSS1) and wooded islands (PFO) converted to river channel (R3UB)

40 acres of bare sand (PEM), herbaceous riparian (PEM), and lowland grassland (PEM) converted to river channel (R3UB)

7 acres of wooded (PFO) converted to bare sand (PEM)

Water Emphasis Alternative Land Management

Under the Water Emphasis Alternative, relatively more water and less land is managed under the Program. The land habitat component for this alternative is a reduced form of the land plan used for the Governance Committee and Full Water Leasing Alternatives. As shown in table WA-13, the plan involves 7,475 acres of land. Management of the parcels would be similar to that for the Governance Committee Alternative, but on a smaller scale.

Table WA-13.— Illustrative Distribution of Program Lands, By River Reach, for the Water Emphasis Alternative

River Reach	Acreage
Lexington to Johnson-2	24
Johnson-2 to Overton	195
Overton to Elm Creek	3,110
Elm Creek to Odessa	57
Odessa to Kearney	1,760
Kearney to Minden	95
Minden to Gibbon	75
Gibbon to Shelton	25
Shelton to Wood River	116
Wood River to Alda	230
Alda to Doniphan	61
Doniphan to Phillips	42
Phillips to Chapman	1,685
Total	**7,475**

Land management strategies and methods for this alternative are the same as for the Governance Committee Alternative, except on a smaller scale, due to the fewer total acres managed.

Table WA-14 presents land management for the Water Emphasis Alternative.

Table WA-14.—Summary Table of Estimated Land Cover Changes for All Land Parcels Managed in the Water Emphasis Alternative

Restoration Activities		**Acres**	**Subtotal**
Conversion to lowland grasses – PEM	Wooded - PFO to lowland grasses – PEM	1,863	
	Herbaceous riparian – PEM to lowland grasses – PEM	225	
	Agriculture - NW to lowland grasses- PEM	451	
	Shrubs – PSS1 to lowland grasses – PEM	354	
	Upland grasses – NW to lowland grasses – PEM	93	**2,986**
Conversion to wetted channel – R3UB	Wooded – PFO to wetted channel – R3UB	108	
	Shrubs – PSS to wetted channel – R3UB	113	
	Herbaceous riparian – PEM to wetted channel – PEM	18	
	Bare sand – PEM to wetted channel – R3UB	19	
	Lowland grasses – PEM to wetted channel – R3UB	2	**260**
Restored lands		3,246	3,246
Unmodified lands		3,428	3,428
Total non-complex habitat		800	800
Totals		**7,474**	**7,474**

Potential Impacts to Wetlands – Water Emphasis Alternative

Based on the illustrative land plan for the Water Emphasis, the following are estimates of potential impacts to wetlands:

2,986 acres lowland grasslands (PEM) created

2,761 acres of shrubbed (PSS) and wooded islands (PFO), upland grasslands (NW), and agricultural lands (NW) converted to lowland grasslands (PEM)

225 acres of herbaceous riparian (PEM) converted to 225 acres of lowland grasslands (PEM) wetlands)

261 acres of river channel (R3UB) created

221 acres of shrubbed (PSS) and wooded islands (PFO) converted to river channel (R3UB)

40 acres of bare sand (PEM), herbaceous riparian (PEM), and lowland grassland (PEM) converted to river channel (R3UB)

Channel Consolidation

Implementation of channel consolidation could convert areas of active channel to backwater sloughs and lower flow habitats. This could change the active channel habitat to as much as 345 acres of palustrine, emergent wetlands. However, through adaptive management and monitoring, changes in habitat as a result of channel consolidation will be further investigated. No loss of wetlands is anticipated.

CLEAN WATER ACT SECTION 404 PERMITTING

Land Acquisition

Identification of land parcels to be considered for acquisition by the Program will be guided by the Program's Land Plan (see FEIS, volume 2, Governance Committee Program Documents). The Land Plan includes a Land Evaluation Worksheet (attachment 4) which will be used to determine appropriate parcels for restoration and/or protection. This evaluation includes information on wetlands within the parcel under consideration.

Site Restoration Management Planning and Implementation

Once specific parcels are acquired, the Program will provide appropriate site development specifications and accompanying management plans. Technical review will be solicited from natural resource agencies and local conservation organizations. Concurrently, site plans will be submitted to Federal, State and local regulatory agencies for a final determination of permit requirements and necessary approvals. Information to be included in this preconstruction review phase will include the following:

- Statement of Site Restoration Goals and Objectives
- Description of restoration treatments and management plans
- Pre-Construction Site Characterization
- Description of the site's anticipated response
- Specification of performance standards, monitoring protocols and identification of remedial management prescriptions should performance standards and project targets be deficient.
- Documentation of Site Protection measures and Maintenance Methods
- Documentation of Final Assurances (financial obligations, responsible parties and schedules)

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