Lower Platte River
CORRIDOR ALLIANCE

LEAD. ORGANIZE. INSPIRE.
The voice of the Lower Platte.

Environmental **Suitability Assessment**

for the Lower Platte River Corridor

March 2009

A PLANNING RESOURCE FOR NATURAL ENVIRONMENTS

Next ›

ENVIRONMENTAL SUITABILITY ASSESSMENT:

A suite of tools for land-use decision makers to explore educated and sustainable decisions

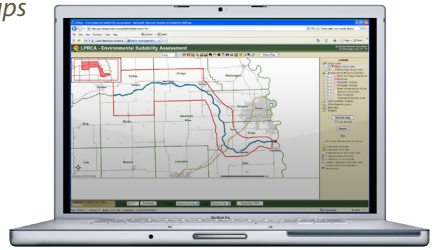
ARC GIS

A Comprehensive Web Site that Visually Organizes the Data by:

- Hyperlink to ESA Report
- LSA Factor Information
- Interactive Data Layer Viewing

Key Feature:

- *Tailored maps created by user*



ESA REPORT

A Comprehensive Report that Discusses:

- Data Acquisition
- Needs Assessment
- Data Layers
- LSA Factors
- ARC GIS

Key Feature:

- *Explanation of all things ESA*

NEEDS ASSESSMENT

PLANNING AID TOOLBOX

FUTURE PHASES

- Natural Resources Planning and Policy Assistance
- Prioritize Stream Assessment
- Opportunity and Constraints Analysis
- Visioning Workshops and Scenario Development
- Growth Scenario Cost-Benefit Analysis

Key Feature:

- *Description of future phases for the ESA*

LAND SUITABILITY ANALYSIS

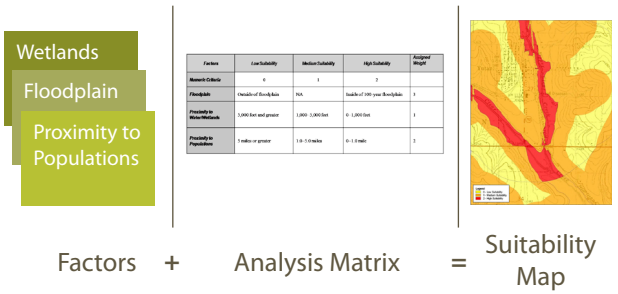
Features for Analysis:

- Recreation
- Agriculture
- Land Conservation
- Water Quality
- Niche Agriculture

Key Feature:

- *Identification of areas more/less suitable for features of analysis*

EXAMPLE FEATURE ANALYSIS



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DEFINITIONS AND ACRONYMS

Aggregate industry	Producers of construction aggregates: primarily stone, sand, and gravel.
ArcGIS	An interactive software developed by ESRI that delivers scalable maps and Geographic Information Systems (GIS) data and services via the Internet.
Brownfields	Real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.
Cluster development	Residential development that groups homes to make the most efficient use of land and infrastructure.
Comprehensive plan	A plan identified by the community or county that reviews existing land use and zoning and establishes future land use.
Conservation easement	A recorded deed restriction to personal property that protects some important conservation quality of a particular parcel, such as habitat, open space, or scenic views.
Development	The act of making some area of land or water more profitable or productive or useful.
DNR	Nebraska Department of Natural Resources
Environmental overlay district	Used when a particular area requires special protection (such as a historic preservation district) or has a special problem (such as steep slopes or flooding).
Environmental Suitability Assessment	A multi-phase effort to develop a planning framework for development in the Lower Platte River Corridor.
GIS	Geographic Information Systems
Greenways	Corridors of undeveloped land, as along a river or stream or between urban centers, that is reserved for recreational use or environmental preservation.
HDR	HDR Engineering, Inc.
Land suitability analysis model	A model that provides an analysis to determine the best use of the land for features such as water quality, open space, wildlife habitat, or agricultural production.
Lower Platte River	The portion of the Platte River from Columbus, NE to the confluence of the Missouri River near Plattsmouth.
LPRCA	Lower Platte River Corridor Alliance, a consortium of three natural resource districts and six state agencies.
MAPA	Metropolitan Area Planning Agency, a volunteer association of local governments to address problems regional in scope.
MapMaker	A free web-based application that allows a user to create and print customized interactive maps using Geographic Information System (GIS) data.

McHargian analysis	A system for overlaying GIS layers that represent environmental resources to identify overlapping areas of these resources.
MUD	Metropolitan Utilities District
Natural resources	Resources (actual and potential) supplied by nature.
NDEQ	Nebraska Department of Environmental Quality
NDOR	Nebraska Department of Roads
NGPC	Nebraska Game and Parks Commission
NLT	Nebraska Land Trust, a non-profit organization that uses conservation easements for land protection.
NOP	Nebraska Ordinance Plant
NRD	Natural Resource District
NRHP	National Register of Historic Places
NRIS	National Register Information System
Planning	The process by which an organization envisions its future and develops strategies, goals, objectives, and action plans to achieve that future.
SHPO	State Historic Preservation Office
Stakeholder	Any individual or organization (government or non-governmental) with an interest in the Lower Platte River Corridor.
Sustainable development	A socio-ecological process characterized by the fulfillment of human needs while maintaining the quality of the natural environment indefinitely.
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
Watershed	An area of land bounded by a divide where all of the water that is under it or on it ultimately drains to a particular water body
Zoning	Designation and reservation under a master plan of land use for light and heavy industry, dwellings, offices, and other buildings; use is enforced by restrictions on types of buildings in each zone.

EXECUTIVE SUMMARY

In pursuit of its mission to foster the development and implementation of locally drawn strategies, actions, and practices to protect, enhance, and restore the vitality of the Lower Platte River's resources, the Lower Platte River Corridor Alliance (LPRCA) initiated the *Environmental Suitability Assessment for the Lower Platte River Corridor – A Planning Resource for Natural Environments* (Environmental Suitability Assessment). This multi-phased effort developed a planning framework for responsible, consistent and sustainable development of the Lower Platte River Corridor.

Development of the Lower Platte River Corridor is already underway and is likely to progress over time. As it progresses, planning and coordination will become increasingly important. LPRCA believes that careful planning can ensure both the efficient provision of infrastructure to support development and the preservation of critical natural resources in the corridor. Furthermore, LPRCA asserts that any land use decisions should be assessed at a watershed scale.

Development in the Lower Platte River Corridor

The first phase of the Environmental Suitability Assessment, completed in 2006, included data identification, collection, evaluation, and organization. Phase I compiled all reports, plans, and studies related to the entire Lower Platte Corridor, from the City of Columbus to the City of Plattsmouth. The information from this material was analyzed and mapped to achieve a comprehensive land use, environmental, and infrastructure assessment of the Study Area.

The second and third phases of the Environmental Suitability Assessment outlined planning needs and environmental considerations framework for making land use decisions. The second phase focused on a Study Area from the City of Fremont to the Platte River confluence with the Missouri River, while the third phase focused on a Study Area that included the portion of the corridor from the City of Columbus to the City of Fremont. Both phases included the development of a Needs Assessment Survey and follow-up small-group meetings with key decision makers in the Study Area. It assessed the existing natural environmental resources and considered the resources as they relate to land use decisions.

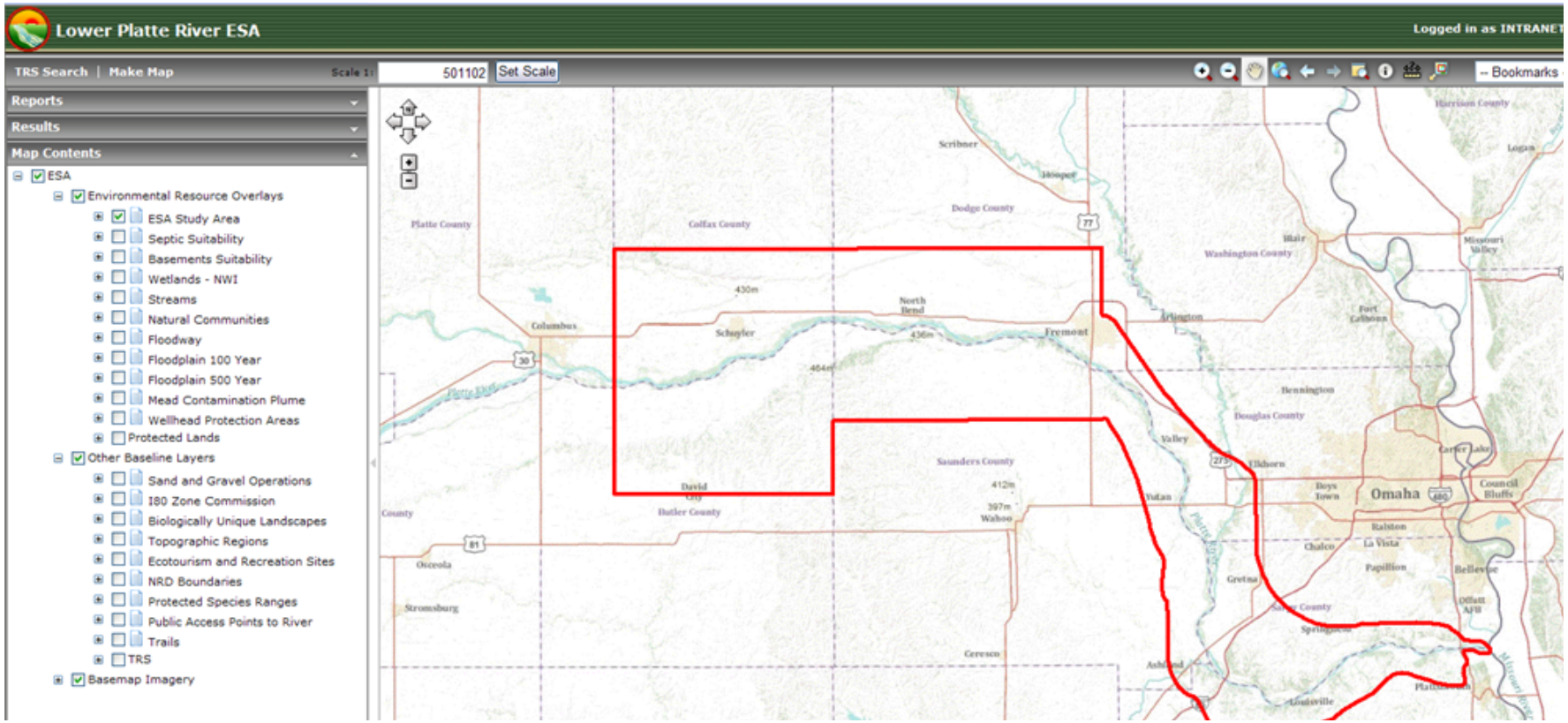
A Geographic Information Systems (GIS) database is available for public use in locating these natural environmental resources. GIS provides a system for overlaying map layers representing environmental resources to identify the most critical natural environmental areas, sometimes referred to as a McHargian overlay analysis. LPRCA, along with four other Natural Resource Districts (NRDs) host MapMaker, a web-based application that can be used to generate custom maps (http://www.nrdmapmaker.org/).

The MapMaker system uses ESRI's ArcGIS software technology to deliver maps through a web browser.

LPRCA developed land suitability analysis models for the Lower Platte River watershed. These models assess how proper or appropriate it is for a particular use of the land in a particular location. Watersheds can have a set of features that make it more suitable for certain land uses and less suitable for other types of land use.

The Environmental Suitability Assessment document, its associated GIS database, and its resulting ArcGIS site are intended to be used as a planning resource for jurisdictions, decision makers, property owners, and the managers of Lower Platte River Corridor natural resources and critical environmental areas. This document intends to provide a planning framework for responsible, consistent, and sustainable development of the Lower Platte River to assist communities faced with challenging environmental and development decisions.

Future phases of the Environmental Suitability Assessment may include implementation of the land use suitability model, natural resources planning with policy assistance, and study of alternative development scenarios.



Lower Platte River ESA ArcGIS Website

Section 1

DATA ACQUISITION

1.1 INTRODUCTION

The LPRCA initiated the first phase of the Environmental Suitability Assessment for the Lower Platte River Corridor in 2004. **The goal of this multi-phase effort is to develop a planning framework for responsible, consistent, and sustainable development of the Lower Platte River**.

The LPRCA recognizes that the development of the Lower Platte River Corridor is already underway and will likely to progress over time. As it progresses, planning and coordination will become increasingly important. The LPRCA believes that careful planning can ensure both the availability of infrastructure to support development and the preservation of critical natural resources in the corridor.

The first phase the multi-phased project involved data identification, collection, evaluation, and organization. Data acquisition included land use plans, natural resources, environmental constraints, water supply and wastewater management, and infrastructure for the Lower Platte Corridor from the City of Columbus to the confluence with the Missouri River near the City of Plattsmouth. This phase was completed in March 2006.

1.2 SUMMARY OF RESULTS

A detailed summary of the data collected during this phase was published in a report to LPRCA in March 2006. Data from counties, cities, and watersheds included:

- Comprehensive plans
- Zoning and subdivision regulations
- Flood control plans
- Wastewater studies
- Occurrences of threatened or endangered species
- Streams and watershed drainage patterns
- Native vegetation
- Demographic information

A copy of the report, *The Environmental Carrying Capacity within the Lower Platte Watershed* (HDR Engineering, Inc., 2006) is available from the LPRCA upon request.

ESA REPORT

A Comprehensive Report that Discusses:

- Data Acquisition
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- Data Layers
- LSA Factors
- ARC GIS

Key Feature:

- *Explanation of all things ESA*

2.1 INTRODUCTION

2.1.1 Purpose of Study

The LPRCA initiated the Environmental Suitability Assessment to map existing environmental resources, to identify environmental considerations relative to development suitability, and to develop an environmental resources database to assist local jurisdictions in making land use decisions. The Environmental Suitability Assessment was divided into two phases, each taking approximately a year to complete. These second and third phases analyzed and incorporated data obtained during the first phase.

2.1.2 Process of Study

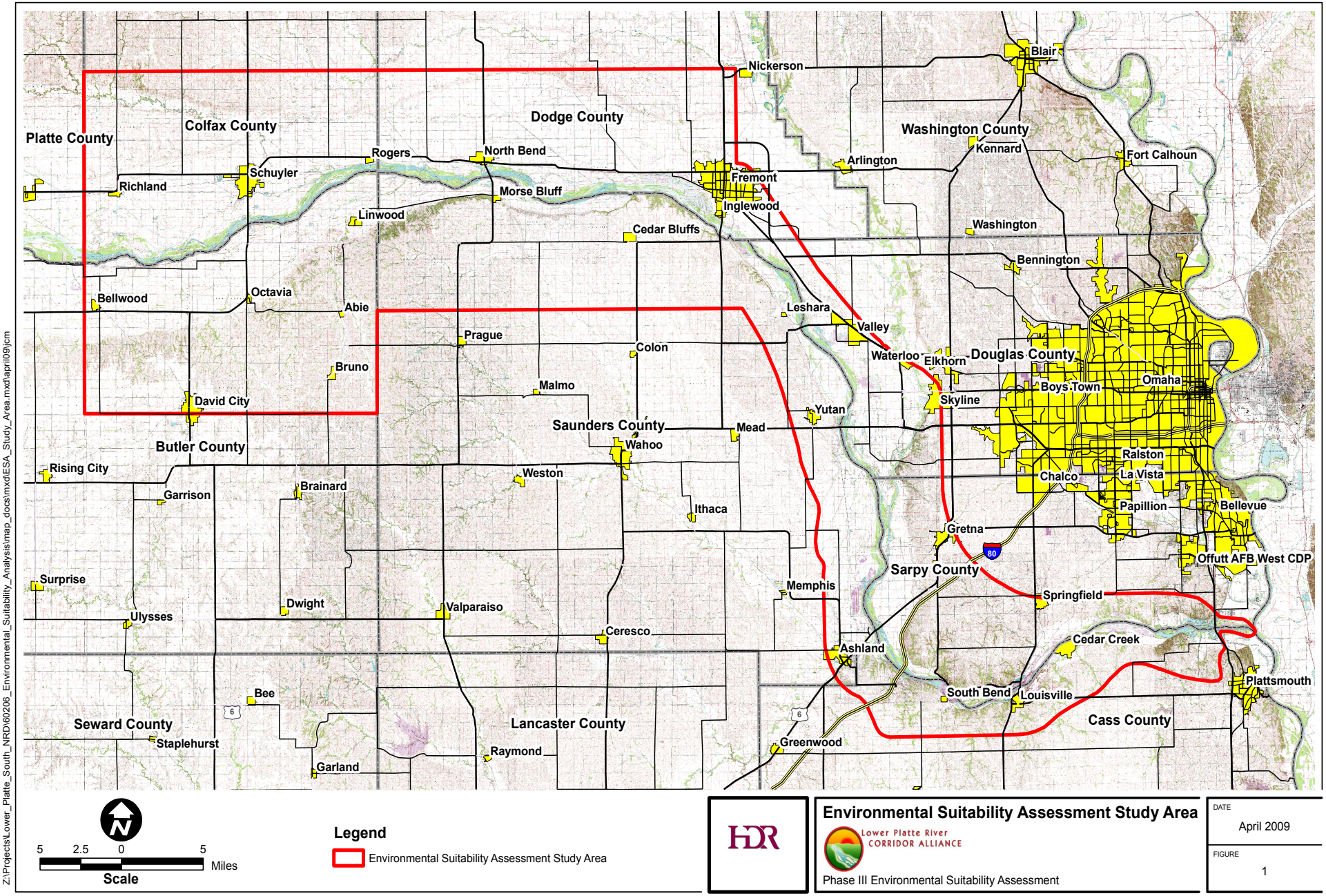
The second phase of this project focused on a Study Area of the Lower Platte River Corridor from the City of Fremont to the confluence with the Missouri River, while the third phase included a Study Area from the City of Columbus to the City of Fremont. Figure 1 shows the entire Environmental Suitability Assessment Study Area for the second and third phases.

In both phases, LPRCA prepared a needs assessment survey for local planning jurisdictions, environmental resource managers, utility companies and aggregate mining companies. Representatives for LPRCA followed up the mailed survey with small group meetings with these stakeholders. Several of the communities shared some of the same key issues and concerns. Almost every community had issues involving water and sewer availability, water quality and management. Several of the communities and counties were concerned with updating floodplain maps and land use planning. Infrastructure was another common issue (see Section 2.2).

Information gathered through the needs assessment then guided the development of the GIS database and McHargian style analysis that geographically identifies environmental resources. The electronic data gathered in Phase I was used for the development of the GIS database and for the organization of the McHargian style analysis process (see Section 2.3 for an explanation of the McHargian style analysis.)

A table of environmental resources used in the GIS database was created to explain all of the data used in the GIS database and McHargian style overlay analysis (see Appendix A, Table A-1, Environmental Suitability Assessment GIS Database). Together, this report, table, and GIS database, create a framework for responsible, consistent and sustainable land use decisions.

Ultimately, this information will be made available publicly on the MapMaker website (http://www.nrdmapmaker.org), but can also be found through the Lower Platte South NRD website under the LPRCA/ MapMaker link (http://www.lpsnrd.org/docs/Mapmaker/mapmaker.htm). The MapMaker website uses an ArcGIS software technology to deliver maps through a web browser (see Section 4).


Platte County
Colfax County
Dodge County
Washington County
Douglas County
Sarpy County
Butler County
Saunders County
Seward County
Lancaster County
Cass County
Nickerson
Blair
Kennard
Fort Calhoun
Arlington
Fremont
Inglewood
Rogers
North Bend
Schuyler
Richland
Morse Bluff
Linwood
Cedar Bluffs
Washington
Bennington
Bellwood
Octavia
Abie
Leshara
Valley
Waterloo
Elkhorn
Omaha
Boys Town
Skyline
Prague
Colon
Bruno
Malmo
David City
Yutan
Mead
Wahoo
Rising City
Weston
Ralston
La Vista
Chalco
Garrison
Brainard
Ithaca
Papillion
Bellevue
Gretna
Offutt AFB West CDP
Surprise
Dwight
Valparaiso
Memphis
Springfield
Ulysses
Ceresco
Ashland
Cedar Creek
Bee
South Bend
Louisville
Plattsmouth
Staplehurst
Raymond
Greenwood
Garland
5 2.5 0 5
Miles
Scale
Legend
Environmental Suitability Assessment Study Area
Environmental Suitability Assessment Study Area
Lower Platte River CORRIDOR ALLIANCE
Phase III Environmental Suitability Assessment
DATE
April 2009
FIGURE
1
Z:\Projects\Lower_Platte_South_NRD\60206_Environmental_Suitability_Analysis\map_docs\mxd\ESA_Study_Area.mxd\april09\jcm

2.2 NEEDS ASSESSMENT SURVEY SUMMARY

LPRCA sent a needs assessment survey to local planning jurisdictions, environmental resource managers, utility companies, and aggregate mining companies and met with these stakeholders located within the Environmental Suitability Assessment Study Area. Table 2.1 summarizes the key issues identified by each stakeholder as a result of these meetings.

Table 2-1. Needs Assessment Survey Summary

Stakeholder	Key Issues
Counties	
Butler County	Need final floodplain maps; scour on Skull Creek; comprehensive plan and zoning regulations
Cass County	Infrastructure; roads; water; sewer; growth along I-80 corridor
Colfax County	Land use surrounding Shell Creek and Lost Creek; gravel pit lake development; need for 'central leadership' of the Platte River; floodplain management
Dodge County	Roadway improvement projects are on hold; lack of development; sand and gravel pit lake development
Douglas County	Water and sewer extension to county-wide; residential development and resource extraction; public versus well water
Platte County	Access to base flood elevations; Shell Creek; stream assessment and modeling
Polk County	Floodplain mapping; transportation infrastructure; public water supplies and quality; comprehensive plan revisions
Sarpy County	Transportation infrastructure; preserving rural areas; stormwater runoff; sewer and water availability
Saunders County	Water supply and quality; commercial development with infrastructure improvements; need for mapping system; well moratorium areas; groundwater concerns; land use balance
Cities and Villages	
Ashland	New sewer system; I-80 development; mapping resources for areas of concern
Bellevue	Housing studies (big lots for big houses); waters of the U.S.
Cedar Creek	Limited growth potential; rural water issues; no sewer system; floodplain management; updated floodplain information
Columbus	Continued industrial, residential, and commercial development; need for recreational development; levee recertification; water supply; regulatory requirements
David City	Surface water and runoff control; no zoning in Butler County; wellhead protection program
Fremont	Recreational lake development; flooding and floodplain management; water quality issues; levee improvements; need for mapping and GIS; wastewater capacity for allowing growth
Linwood	Stormwater drainage; lack of central wastewater system; FEMA's natural disaster planning
Louisville	Floodplain mapping and management; limited growth area
Morse Bluff	Lacks a second well; lack of central wastewater system; FEMA's natural disaster planning
North Bend	Dike maintenance; FEMA's natural disaster planning; river access
Plattsmouth	Floodway/floodplains mapping and management; protected species and wetlands; old industrial sites and contamination; sewer mandates; wellfield flooding
Rogers	Schuyler's decisions may affect Rogers; FEMA's natural disaster planning
Schuyler	Shell Creek flooding; updated FEMA floodplain maps; uranium in wells; need education regarding drinking water and conservation easements
South Bend	Infrastructure and mapping of areas; water needs; sewer system to meet new standards
Springfield	Preserving small-town feel; updated floodplain maps
Valley	Need for mapping and GIS; land use planning
Yutan	Land use planning; community development; park development; stream restoration and management
Other	
Lincoln Water	Water quality; emphasis on buffer strips
Lyman-Richey	Ability to mine and ability to develop
MUD	Land use; infrastructure implementation; water quality; impacts of Mead Superfund site
NGPC	Land use; zoning; encroachment

When available, the LPRCA collected environmental resource data in response to a stakeholder's issue(s).

2.3 GEOGRAPHIC INFORMATION SYSTEM DATABASE

2.3.1 Database Development

Data obtained during the first phase of the study was used as the initial basis of the GIS database. Based on needs assessment meetings, additional data was obtained during the second and third phases. Examples are given below:

- Cass County provided information on corporate limits, rural water districts, cemeteries, lakes, parks, sand and gravel pits, a conservation overlay, and floodplains.
- Ducks Unlimited provided information on one parcel protected with a conservation easement.
- Metropolitan Utilities District (MUD) provided a GIS layer for their wellhead protection areas.
- Nebraska Department of Environmental Quality (NDEQ) provided hard copy maps of wellhead protection areas, which were then digitized.
- Nebraska Game and Parks Commission (NGPC) provided GIS layers of documented occurrences of natural communities and priority areas for conservation. NGPC also provided written descriptions of typical habitats of federal- or state-listed threatened or endangered species.
- Nebraska Land Trust (NLT) provided information on eight parcels protected with conservation easements, ranging in size from 40 to 800 acres.

Table A-1, Environmental Suitability Assessment GIS Database, identifies the layers included in the GIS database. The table also describes the layer, the reason it was included in the database, the issues associated with the layer, individuals or entities that can be contacted for more information regarding the layer, and references to examples of how other entities have managed that particular environmental resource. As new data or updates to existing data becomes available, the database and corresponding tables will be updated.

2.3.2 Intent of McHargian Style Analysis

Within the GIS database, the McHargian style analysis provides a series of relevant environmental and natural resource information that can be overlaid to develop a mosaic of environmental features, constraints, and opportunities. The end result of the McHargian style analysis is a series of GIS layers representing environmental resources that, when reviewed in succession, identify areas of overlapping environmental features. Other layers are included in the GIS database to identify elements that aid in location or geographic reference as part of considerations for land use decisions.

2.3.3 Process of McHargian Style Analysis

The first step in the McHargian style analysis was determining the environmental resource layers that should be used in the overlay. This was done by reviewing the data obtained in Phase I, analyzing information gained from the needs assessment, and evaluating the newly obtained environmental resource data.

Each environmental resource layer was then developed within the GIS database and assigned a graphically compatible color for each layer. As the environmental layers are added in succession, they overlap so that the overlapping areas are distinguishably darker. The resulting map shows areas with multiple environmental resources as dark and areas with fewer environmental resources as light.

Mapping of each individual layer or mapping several layers cumulatively can be performed within the GIS database as discussed in Section 2.1.2.

See Figure 2 for an example of the cumulative overlay of the McHargian style analysis.

2.3.4 Layers in the McHargian Style Analysis

See Table A-1 in Appendix A for a description of the layers used environmental resource overlay layers used in the McHargian style analysis.

The following provides some additional information on selected layers in the database:

Existing Sand and Gravel Operations

The aggregate (sand and gravel) industry has several existing facilities in the Study Area. These facilities are primarily owned and operated by three corporations:

- Lyman-Richey Sand and Gravel Company
- Western Sand and Gravel (NEBCO, Inc.)
- Mallard Sand and Gravel (Oldcastle Minerals)

Each of these companies either owns or leases properties for aggregate extraction. The primary purpose of the aggregate extraction is for use in making concrete for all types of building purposes. Each company spends a great deal of effort in identifying areas that are likely to have high-yielding sub-surface aggregate. These companies may already have options on properties for future extraction. Past and existing locations are provided as a GIS layer, but future areas are not identified due to the sensitive nature of potential real estate transactions and other factors.
The importance of aggregate industry in the Lower Platte River Corridor is two-fold:

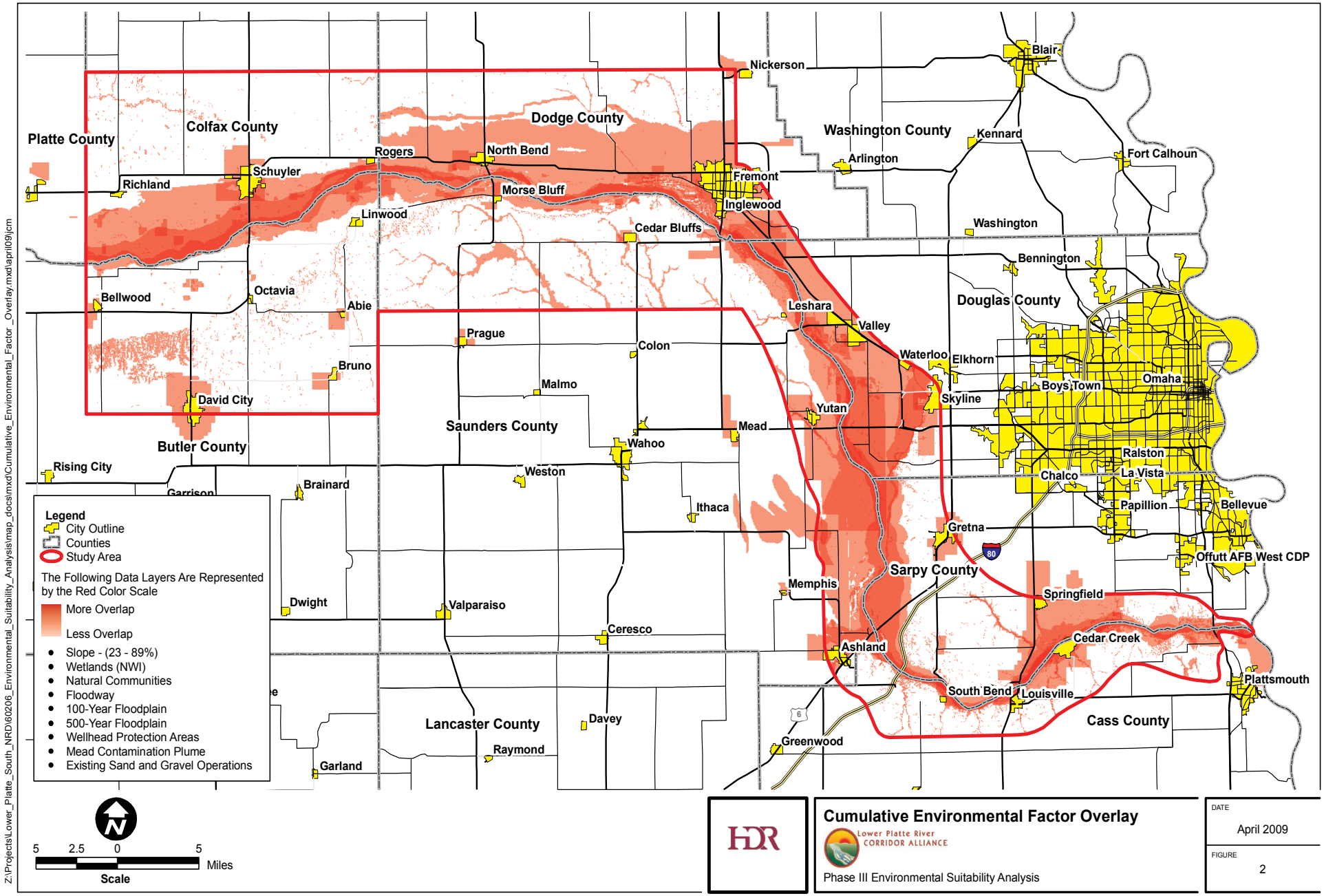
1. The geographic locations of the existing or future extraction areas provide the construction and development industry of eastern Nebraska with a close source of aggregate necessary for concrete production. This proximity allows for a lower cost of concrete production which translates to lower costs for construction and development in the region of the state where these activities are robust.
2. The extraction process typically creates an open body of water that is fed from groundwater sources. The resulting areas can be prime lake-front development locations.

To aid in communication by and between the aggregate industry, communities, and conservation interests, PACE (Planning – Aggregates – Community – Environment) has been established as part of the Platte River Initiative. PACE was organized to develop and facilitate cooperation among and between communities, conservation interests and the sand/gravel producers of Nebraska. See Appendix B for more information on PACE.

Wellhead Protection Areas

Due to security reasons, specific locations of public water supplies, primarily wells and other infrastructure, is not included in the GIS database. However, various NDEQ-delineated wellhead protection areas (WPAs) are identified. The WPAs are public information and show the area that may affect the quality of drinking water sources.

The Wellhead Protection Program is a voluntary program which assists communities and other public water suppliers in preventing contamination of their water supplies. Wellhead Protection Program activities include delineating the zones of influence which may impact public supply wells, training communities on how to inventory all potential sources of pollution within these vulnerable zones, working with the local officials to identify options to manage these potential pollution sources, working on monitoring plans, and helping develop contingency plans to provide alternate water supplies and site new wells (NDEQ 2009).


Platte County
Colfax County
Dodge County
Washington County
Douglas County
Sarpy County
Saunders County
Butler County
Lancaster County
Cass County
Nickerson
Blair
Kennard
Fort Calhoun
Arlington
Fremont
Inglewood
Rogers
North Bend
Schuyler
Richland
Morse Bluff
Linwood
Cedar Bluffs
Washington
Bennington
Bellwood
Octavia
Abie
Leshara
Valley
Prague
Colon
Waterloo
Elkhorn
Omaha
Boys Town
Skyline
Bruno
Malmo
David City
Yutan
Mead
Wahoo
Rising City
Weston
Ralston
La Vista
Chalco
Brainard
Ithaca
Papillion
Bellevue
Gretna
Offutt AFB West CDP
Memphis
Springfield
Dwight
Valparaiso
Ceresco
Cedar Creek
Ashland
South Bend
Louisville
Plattsmouth
Davey
Raymond
Greenwood
Garland
Legend
City Outline
Counties
Study Area
The Following Data Layers Are Represented by the Red Color Scale
More Overlap
Less Overlap
Slope - (23 - 89%)
Wetlands (NWI)
Natural Communities
Floodway
100-Year Floodplain
500-Year Floodplain
Wellhead Protection Areas
Mead Contamination Plume
Existing Sand and Gravel Operations
5 2.5 0 5
Miles
Scale
Z:\Projects\Lower_Platte_South_NRD\60206_Environmental_Suitability_Analysis\map_docs\mxd\Cumulative_Environmental_Factor_Overlay.mxd\april09\jcm
HDR
Cumulative Environmental Factor Overlay
Lower Platte River CORRIDOR ALLIANCE
Phase III Environmental Suitability Analysis
DATE
April 2009
FIGURE
2

Many communities, including Lincoln and the geographic area served by the MUD, obtain their public water supply from groundwater sources within the Lower Platte River Valley. Land use decisions made upstream from their well systems, in combination with regionalized precipitation events, directly affect water quality of the groundwater source and treatments to meet drinking water standards. The effects of water quality impairments, either temporary or long-term, extend to the Elkhorn and Loup Rivers, contributing watersheds to the Lower Platte River. Cass County also has two rural water districts that provide service for populations not located within the Study Area.

Mead Contamination Plume

The former Nebraska Ordnance Plant (NOP) site occupies approximately 17,250 acres located 0.5 mile south of Mead, Saunders County, Nebraska. During World War II and the Korean War, bombs, shells, and rockets were assembled at the site. Most of the raw materials used to manufacture the weapons were produced at other locations and shipped the NOP facility for assembly. Routine plant operations included washout of explosive materials prior to bomb loading and assembly, and bomb washing following assembly. Wash water was discharged to sumps and in open ditches.

During the 1950s and early 1960s, the U.S. Air Force operated an Atlas Missile Launch facility. Construction and maintenance activities at the site resulted in the release of TCE[1] into the groundwater.

Because the former NOP is a large site with different types of contamination in different locations, investigation and cleanup activities were organized in categories called "operable units". Three operable units (OUs) were organized to help expedite investigation and cleanup activities (USACE, 2009).

- OU1, which includes soils contaminated with explosive compounds, was completed in 1999 with the excavation of soils and treatment through an on-site incinerator.
- OU2 consists of a groundwater extraction and treatment system that hydraulically contains 11 square miles of contaminated groundwater, preventing its further migration to the south and east. In place at the site is a network of containment and focused extraction wells for remediation and groundwater wells for monitoring of site conditions. Extracted groundwater is treated and then properly discharged and, in some cases, made available for beneficial reuse.
- OU3 includes a former on-site landfill and former unidentified waste disposal areas not previously identified. Contaminants evaluated include metals, explosives, volatiles and semi-volatiles. The only chemical contamination requiring remediation is the heavy metal antimony, which was found in localized areas related to painting operations.

Impaired Surface Waters

Every 2 years, NDEQ under Section 305(b) of the Clean Water Act, releases a report that describes the status and trends of existing water quality, the extent to which designated uses are supported, pollution problems and sources, and the effectiveness of the water pollution control programs (NDEQ, 2008). In the report, NDEQ outlines those surface waterbodies in the Lower Platte River Basin that are impaired from pollutants. Waterbodies where one or more beneficial uses (that is, recreation, aquatic life, public drinking water, agriculture water supply, industrial water supply, or aesthetics) are determined to be impaired by

[1] TCE is trichloroethylene. According to the Agency for Toxic Substances & Disease Registry (ATSDR), trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death (ATSDR 2003).

one or more pollutants and all of the total maximum daily loads (TMDLs) for the pollutants have not been developed constitute the Section 303(d) list of impaired waters. Table 2-2 lists the impaired waterbodies found in the Study Area, its impairments, and its parameters of concern from the 2008 Water Quality Integrated Report (NDEQ, 2008).

Table 2-2. Section 303(d) Impaired Waters in the Study Area

Waterbody Name	Impairments	Parameters of Concern
Fremont Lake No. 1 (SRA)	Dissolved oxygen	Nutrients
Fremont Lake No. 3 (SRA)	Chlorophyll a	Nutrients
Fremont Lake No. 5 (SRA)	Dissolved oxygen, pH	Nutrients
Missouri River	Fish consumption advisory	Dieldrin, PCBs
Papillion Creek	E. coli, Selenium, Fish consumption advisory	E. coli, Selenium, Dieldrin, PCBs
Platte River	E. coli, Selenium, High pH, Atrazine-Water supply, Fish consumption advisory	E. coli, Selenium, Unknown, Atrazine, PCBs
Salt Creek	E. coli, Ammonia, Fish consumption advisory	E. coli, Ammonia, Dieldrin, PCBs
Wahoo Creek	E. coli, Selenium, Impaired aquatic community	E. coli, Selenium, Unknown
Elkhorn River	E. coli, Selenium, Fish consumption advisory	E. coli, Selenium, Dieldrin, PCBs

Source: NDEQ 2008.

2.3.5 Layers Not in GIS Database

Some environmental resources or other layers are important for consideration, but, due to the complexity of these resources or sensitivity of these resources, they are not included in the GIS database. A description of these resources and their importance in making land use decisions follows.

Cultural Resources Sites and Potentially Historic Properties

Information on places listed or eligible for the National Register for Historic Places (NRHP) is publicly available. The National Register Information System (NRIS) is a computerized database that contains information on places listed in or determined eligible for the NRHP. Access to the NRIS is found at: http://www.nps.gov/history/nr/research/nris.htm (NPS, 2008).

However, specific location information for some places, such as archaeology sites, is not publicly available to prevent trespassing and unauthorized digging at these sites. Also, not all pertinent historic or archaeological sites are listed on the NRHP. Prior to development, an entity should consult with the Nebraska State Historic Preservation Office. The Nebraska State Historic Preservation Office (SHPO) would provide information on sites with historical or archaeological significance in the area of the development.

Wastewater Treatment

Most communities have a current and future wastewater treatment area based on the capacity and design life of their wastewater system. The service area for each community varies depending on their existing infrastructure, system capacity, and geographic setting that determines gravity drainage for the system. Each community regularly updates their service area depending on these factors and are the best source for determining the availability municipal wastewater treatment for locations within their jurisdiction.

The following communities have their own centralized systems (list may not be all inclusive):

- Ashland
- Columbus
- David City
- Fremont/Inglewood

- Louisville
- North Bend
- Plattsmouth
- Schuyler
- Springfield
- Yutan
- Waterloo

For areas without centralized systems, a variety of methods are used to provide wastewater service. The City of Valley has an agreement with the City of Fremont to treat wastewater. South Bend, Cedar Creek, Rogers, and Morse Bluff do not have municipal wastewater treatment systems, so residences and businesses use individual septic tank systems. Linwood uses individual septic tank systems, but are investigating a municipal system. Portions of Douglas County and Sarpy County, including Gretna, use the City of Omaha's facilities for wastewater treatment. The City of Omaha's wastewater service area is provided as a layer in the GIS database.

Groundwater Resources

Wise management of groundwater resources requires knowledge of the distribution and characteristics of water-bearing rocks and sediments. Complicating this management task is the susceptibility of some groundwater resources to contamination by industrial, domestic, and agricultural chemicals and byproducts. Evaluating and managing these threats of groundwater contamination require improved knowledge of the occurrence and manner of movement of groundwater in the subsurface (U.S. Geological Survey [USGS], 1995).

Surface water and groundwater relationships are particularly important to Nebraskans in two major instances. Roughly one-third of the public water supply for the Omaha Metropolitan Area and all of the public water supply for Lincoln, Nebraska's two largest cities comes from well fields in close proximity to the Platte River. Nebraska's 23 NRDs play a major role in groundwater quantity and quality management, primarily through the Groundwater Management and Protection Act. This act also has provisions related to the integrated management of hydrologically connected groundwater and surface water. This management practice, termed Conjunctive Use, is the coordinated management of surface water and groundwater supplies to maximize the yield of the overall water resource (Nebraska Department of Natural Resources [DNR], 2002).

Groundwater investigations are carried out by more than 150 USGS field offices throughout the 50 states, Puerto Rico, and the trust territory. Regional groundwater studies are especially important for understanding long-term resource issues and providing background information over multi-state areas. The USGS provides a national infrastructure for consistently measuring and understanding groundwater resources and for sharing this information with all parties (USGS, 1995).

Surface water quality also is an important factor in groundwater quality. The LPRCA has established with USGS a water quality monitoring network for the Lower Platte River Corridor. The purpose of the program is to collect surface water quality data from the Lower Platte River and tributaries to effectively characterize the health of the river system as well as level and source of contaminants. Information on the locations and results of the water quality monitoring network can be found at http://ne.water.usgs.gov/lowerplatte/.

Transportation Improvements

Nebraska Department of Roads (NDOR) publishes planned road construction outlined for the current fiscal year, in a five-year plan, and in a "2014 and Beyond" plan. The current fiscal year and five-year plans include improvements to:

- U.S. 77 (Wahoo to Fremont)
- U.S. 77 (Fremont South Bridge)

- U.S. 34 (Missouri River Bridge in Bellevue)
- U.S. 75 (Plattsmouth to Bellevue with Bay Road, Platteview Road, and Fairview Road Interchanges)
- U.S. 30 (Columbus to Fremont)
- N-79 (Valparaiso to the Dodge County Line)
- N-92 (Mead to Yutan)

Beyond 2014, NDOR plans to improve State Highways 66 and 50 in and around Louisville and Springfield. However, some changes may occur by local systems that are not currently known. These changes are important to consider in making a land use decision as it may influence traffic patterns and numbers in an area or region.

NDOR's planned road construction is not presented as a layer because their plan changes annually. Uncertainty about the availability of future federal and state funding, changes in state revenues, and preventative maintenance projects that arise during the year all change the focus of NDOR's plan. Instead, a link to NDOR's Surface Transportation Program website (http://www.nebraskatransportation.org/hwy-pgm/) provides the current and future plans.

In addition to NDOR, the Metropolitan Area Planning Agency (MAPA) plans for and studies transportation improvements in the Omaha metropolitan area. MAPA's 2030 Long Range Transportation Plan proposes interchanges on I-80 at 180th Street and Pflug Road. Sarpy County is currently studying the need for an interchange on Interstate 80 (I-80) at Pflug Road, three miles east of the Platte River Bridge. Proponents of the interchange would like to attract developers to this area; potential businesses are seeking sites with relatively flat topography, willing property owners, and access to I-80. Opponents are concerned about development in close proximity to the Platte River (Environmental Studies: Pflug Road and Interstate 80 Interchange, 2008).

The MAPA is also conducting a study of an outer loop roadway (also known as a beltway) for the Omaha-Council Bluffs metropolitan area. The concept of an outer loop roadway, or beltway, has been included in the MAPA long range transportation plan for over 10 years. A beltway is a major, usually limited access, road that follows a circular route around a city. The purpose of a beltway is to provide an alternate route for traffic traveling around or through a city and to relieve congestion on streets and highways inside of the beltway (MAPA, 2008).

2.4 DISCUSSION OF DEVELOPMENT CONCEPTS

The intent of this section is to provide discussion on the development concept examples outlined in Table A-1 (see Appendix A). Development concepts provide an example of how the resource layer was identified, incorporated, avoided, or otherwise considered as part of a general or development plan. Table A-3 provides contact information for each development concept.

2.4.1 Cluster Development

Cluster development is a mechanism that allows development in an area with environmental constraints while maintaining a natural setting. For example, slopes greater than 9 percent are included in the McHargian style overlay analysis to indicate areas where steep slopes may provide either prominent views and/or may be prohibitive to traditional development without substantial land alterations such as cut and fills and retaining walls. Cluster development would provide an opportunity for development of these areas yet maintain the natural setting and reduce the amount of land alternations needed is to implement the development. Cluster development is residential development that groups homes to make the most efficient use of land and infrastructure. Cluster developments vary greatly according to site conditions in order to respond to the environment. Usually, individual home sites are smaller with natural features preserved

as common open space. Careful siting of homes can allow all home sites to have views of open space.

Cluster Development

2.4.2 Conservation Easements

A conservation easement is, in essence, a recorded deed restriction to personal property. The easement protects some important conservation quality of a particular parcel, such as habitat, open space, or scenic views.

The right to enforce the restriction is given to a tax-exempt charitable organization (generally in the conservation field) or a government agency. In its most basic form, a conservation easement will protect land against future real estate development, industrial use, and many potential commercial uses. A conservation easement generally allows the land owner to continue current uses, including, residential, recreational, agriculture, forestry, or ranching. The gift of a conservation easement to a charitable organization involves voluntarily giving up or restricting some of these rights and putting in the hands of the new holder of these rights the power to enforce the restrictions on the use of the property.

Conservation easements are a land management tool that can be supported by local land use jurisdictions, state resource agencies, and environmental groups, for long-term management and conservation of unique natural areas of the landscape (see Table A-3 for background and contact information for conservation easements).

2.4.3 Environmental Overlay Districts

Environmental overlay districts are used when a particular area requires special protection (such as a historic preservation district) or has a special problem (such as flooding or Brownfields[2]). Soil conditions, topography, or other natural features can require relatively large portions of a jurisdiction to be developed with additional considerations to environmental impact. To address an area's specific environmental constraints, jurisdictions can create environmental overlay districts to establish environmental performance standards for development based on standard criteria such as stormwater runoff, wasterwater disposal, erosion, or preservation of existing vegetation. Performance standards help ensure development in environmentally sensitive areas is appropriate by setting overall environmental objectives but not prescribing how these objectives are met (see Table A-3 for background and contact information for environmental overlay districts.

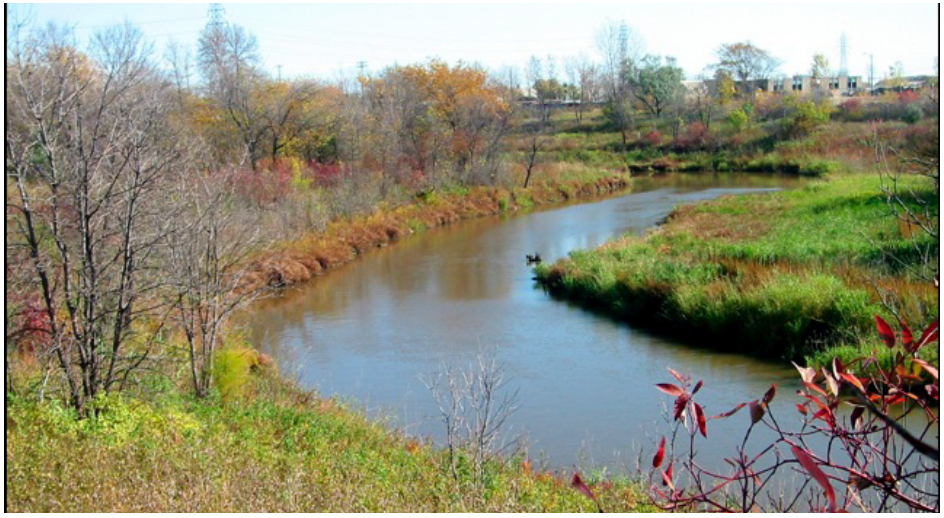
[2] According to the U.S. EPA, Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

2.4.4 Greenways (Riparian Corridors)

Greenways are corridors of undeveloped land, as along a river or stream or between urban centers, that are reserved for recreational use or environmental preservation. A greenway can operate in six basic ways:

- as habitat for plant and animal communities;
- as a conduit for plants, animals, water, sediment, and chemicals;
- as a barrier preventing movement of some species;
- as a filter allowing some things to pass while inhibiting others;
- as a source for animals and seeds which move to other parts of the landscape; and
- as a sink for trapping sediment, toxins, or nutrients (Labaree, 1992).

A greenway may not be able to meet all six functions; a greenway should be established to maximize the functions that are important to the surrounding area.



Greenways

Greenways should be planned so that the locally oriented land protection translates into long-term ecological gain in a feasible and cost-effective way. The National Park Service (NPS) has published the *Economic Impacts of Protecting Rivers, Trails, and Greenway Corridors* (NPS, 1991) that details how greenways bring businesses into a community and provide natural alternatives to water filtration and flood control projects. Greenways can also be set aside as conservation easements so that taxing benefits remain a possibility.

Sources for consultation for development of greenways include the LPRCA, the Papio-Missouri, Lower Platte North, and Lower Platte South NRDs, NGPC, and the NPS (see Table A-3 for background and contact information for greenways).

2.4.5 Parks and Open Space Planning in Floodplains

The City of Omaha recognizes the importance of planning for parks and open space. Their Suburban Park Master Plan (BCDM, 2007) divides parks into four major categories (neighborhood parks, community parks, special use parks, and regional parks) proposes five other recreational or environmental features (boulevards, cultural and historic sites, natural areas, multi-use trail systems, and urban filter/wildlife corridors). Their Suburban Park Master Plan specifically calls for urban filter/wildlife corridors to be planned along floodplains to function as natural filters to urban runoff and to serve as linear wildlife corridors.

2.4.6 Wetland Restoration, Development, and Stormwater Management

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Water saturation (hydrology) largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may support both

aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance (EPA, 2009).

Wetland restoration is an essential tool in the campaign to protect, improve, and increase wetlands. Wetlands that have been filled and drained retain their characteristic soil and hydrology, allowing their natural functions to be reclaimed. Restoration is a complex process that requires planning, implementation, monitoring, and management. It involves renewing natural and historical wetlands that have been lost or degraded and reclaiming their functions and values as vital ecosystems. Restoring our lost and degraded wetlands to their natural state is essential to ensure the health of America's watershed (EPA, 2007). Organizations such as Prairie Nebraska or Ducks Unlimited and agencies such as your local NRCS or NRD can help develop wetland restoration plans.

Stormwater Wetlands

As discussed in Section 2.2.4, PACE was organized to develop and facilitate cooperation among and between communities, conservation interests and the sand/gravel producers of Nebraska. Aggregate operations often leave a large groundwater fed wetland or lake that is then developed into a residential community. Wetlands can be incorporated into developments. However, any manipulation of wetlands would require a permit from the U.S. Army Corps of Engineers (USACE) under Section 404. See Appendix B for more information on PACE.

Stormwater wetlands are constructed wetland systems designed to maximize the removal of pollutants from stormwater runoff via several mechanisms such as biological breakdown of pollutants, plant uptake, retention, settling, and absorption. Typically stormwater wetlands will not have the full range or ecological functions of natural wetlands. Instead, these wetlands are designed specifically for flood control and water quality purposes. Some advantages to using wetlands for stormwater management include improvements in water quality, decrease in flooding, enhancement of vegetation diversity and wildlife habitat, and addition of community green space. Limitations to using wetlands for stormwater management include relatively high construction costs, larger land requirements, discharge of warmer water to downstream water bodies, and difficulty maintaining vegetation under a variety of flow conditions (Barr Engineering Company, 2001).

2.4.7 Wellhead Protection Areas

As discussed in Section 2.2.4, Nebraska communities may voluntarily participate in NDEQ's Wellhead Protection Program.

2.4.8 Unique Wastewater Solutions

Topography, soil type, surrounding land use, and proximity to municipal systems may affect the wastewater treatment options of a land owner, developer, or community. EPA's Office of Wastewater Management provides a clearinghouse of wastewater management solutions from septic tanks and other decentralized systems technology, biological treatments, stormwater, combined sewer overflows, and other collection systems at http://www.epa.gov/owm/mtb/mtbfact.htm.

2.4.9 Comprehensive Trails Plan

The State of Nebraska published its most recent comprehensive trails plan in 2004 (RDG Planning & Design, 2004). The plan recognizes that Nebraska's trail system should be statewide, should benefit a wide variety of users, should have multiple benefits, should create economic opportunities, should provide many levels of experience, must be strategic and sustainable, should build on and enhance existing networks, should incorporate a variety of facilities and contexts, and should recognize and address the various perspectives of adjacent property owners. Trails may benefit the state or local community by providing recreation, increased health and physical activity, alternative transportation options, economic or community development, improved community image, historical interpretation, environmental education and corridor conservation for multiple uses.

2.4.10 Joint Development

Joint developments are usually a voluntary joining of governmental entities with private for-profit organizations to undertake mutually beneficial development in connection with public infrastructure. A common example of joint development in the Lower Platte River Corridor is sand and gravel operations that are redeveloped into lake-based communities.

2.4.11 Public/Private Partnerships

Public/private partnerships are contractual agreements formed between a public agency and a private sector entity. Public/private partnerships can encompass many types of agreements from oversight of a community park to privatization of wastewater treatment. A common example of a public/private partnership in the Lower Platte River Corridor is landowner/agency agreements for land use or land management.

2.4.12 Stewardship in Land Use Plans

Stewardship involves the careful and responsible management of, in this case, environmental resources. The City of Lincoln focuses on stewardship of its surrounding environmental resources in its land use plan (City of Lincoln, 2006). Their land use plan attempts to maintain the richness and diversity of Lancaster County's urban and rural environments, to be broadly inclusive, and to focus on unique landscapes. Three "Core Resource Imperatives" called for in the plan include protecting and preserving saline and freshwater wetlands; native prairies; and riparian, floodplain and stream corridors.

LAND SUITABILITY ANALYSIS MODEL

LAND SUITABILITY ANALYSIS

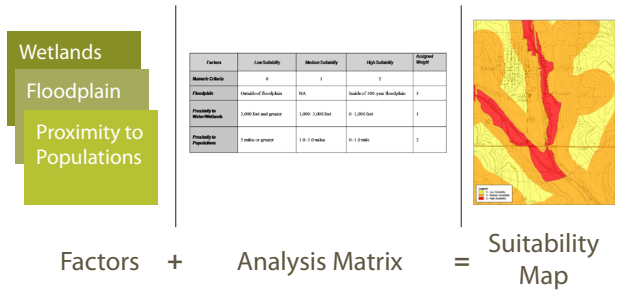
Features for Analysis:

- Recreation
- Agriculture
- Land Conservation
- Water Quality
- Niche Agriculture

Key Feature:

- *Identification of areas more/less suitable for features of analysis*

EXAMPLE FEATURE ANALYSIS



3.1 INTRODUCTION

The LPRCA created land suitability analysis models for the Lower Platte River Corridor. A land suitability analysis is the assessment of an area to determine how proper or appropriate it is for a particular use of land in a particular location. Watersheds, like the Lower Platte River Corridor, have a variety of land factors that make them more or less suitable for certain land uses.

3.2 MODEL CONSIDERATIONS, REVIEW, AND SELECTION

LSA models are generally focused on a certain type of land feature. Thus, the first step in developing a model is to identify the features for which the model is needed. Based on conversations with LPRCA, including key members from the Natural Resource Districts belonging to LPRCA on September 24, 2008, the following preliminary features were identified:

- Development
- Recreation
- Water Quality/Supply
- Wildlife/Conservation
- Agriculture
- Mining

LSA models assessing these types of features can be divided into two types: planning-based and technical models. These model types vary in intensity with regard to the data needed, the time required to complete the model, and the information provided. Generally, planning-based models use more general, user-defined data, and are better for instances when detailed data is unavailable. Technical models require more data and comprehensive analysis of factors relating to each feature.

The appropriate type of LSA model depends on the question(s) the model is expected to answer. The value of the answer needs to be considered relative to who will be utilizing the results of the model and how the model will be used. LPRCA determined that suitability should be based on a technical rather than a value-based approach, that the primary end-users are county and city land use decision makers, and that model inputs should focus on existing, available information.

Five LSA models, listed below, were reviewed for this project in order to choose a preferred model to apply to the study area. Both types of models were reviewed, although use and user consideration, and feedback from LPRCA during the September 24, 2008 meeting indicated a preference for more technical-based models. Pros and cons for each model were identified and used in the selection.

- A toolkit for the evaluation of land parcels for green space planning (Kramer and Dorfman, 2007), the only planning-based model reviewed
- Decision-Support Model of LSA for the Ohio Lake Erie Balanced Growth Program (MacDonald, 2007)
- LSA User Guide (NC Division of Costal Management et al., 2005)
- Land Conservation and Watershed Management (Barten and Ernst, 2004)
- LSA for the Upper Gila River Watershed (Steiner et al., 2000) \

3.3 THE PREFERRED MODEL

The LSA model suggested for this project is a hybrid of the DecisionSupport Model, the LSA User Guide, and the LSA for the Upper Gila River Watershed, and contained a list of preliminary factors (such as, existing land use, proximity to wetlands, and percent slope) that affect land suitability for each of the six identified features (development, recreation, water supply, wildlife/conservation, agriculture and mining).

These factors were then developed into a matrix and the preliminary suitability values for each of the factors in relation to the six features were defined. The suitability values were:

- High suitability (numeric value of 2) —— an area with no limitations or hazard to the feature.
- Medium suitability (numeric value of 1) —— an area having one or more factors that may affect the feature and would require measures to reduce potential problems and/or costs.
- Low Suitability (numeric value of 0) —— an area having severe limitations that inhibit or prohibit a particular feature.

A technical advisory committee was assembled and consulted to assess and weigh the factors. Factor weights ranked 1 through 3, with 3 having the most weight with respect to land suitability. Members of the committee came from development, recreation, agriculture, or mining backgrounds.

Using this criteria and GIS layers of available data, maps for individual factors for each feature were developed. These factor maps were then combined to create an overall suitability map for each feature to determine the preferred land use for a given area. These maps used the high-medium-low suitability rankings previously defined to display this information.

3.4 MODEL REFINEMENT AND ADAPTATION

Once a model was drafted, LPRCA continued to refine and update the land suitability analysis model to incorporate input following technical advisory committee meetings and field studies that determined the usefulness of the model. Typical refinements involved removing from or adding to consideration factors for certain features, reassessing the criteria for factor suitability, or reassigning the weight values of factors for certain features. Following these revisions, the models were finalized.

As land uses continue to change, growth and development continues, and preferences for how development and natural areas are viewed, the models as developed for the LSA can be adapted to meet different needs. The following are potential model adaptations that could be performed if stakeholders deem valuable:

- Predictive Capabilities – Each model can be modified to reflect a potential change in future condition or to reflect a higher or lower degree of conservation practices in relation to a particular factor of the model.
- Land based recreation –The LSA model for Land Based Recreation focused on camping and hiking. However, different models could be built to show the importance of different areas for the different types of land based recreation.
- Niche Agriculture – A more detailed analysis of the importance of niche agriculture could be performed that explores the supply and demand of this type of industry at an economic level. Depending on the supply and demand, if the demand for a certain type of product is not being met, a model could be developed specific to that product.

In addition to these potential model adaptations, if newer information becomes available that could update an existing factor for any of the models, the newer information should be incorporated into the respective model to provide the best available information.

The entire report on the land suitability analysis models is provided in Appendix C of this document.

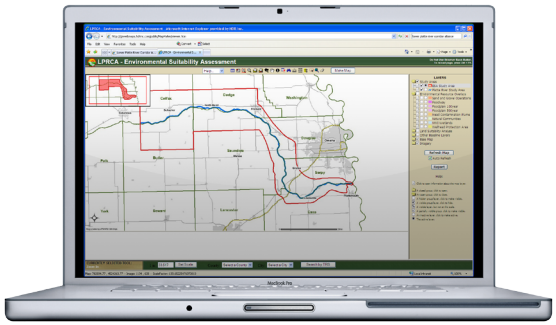
ARC GIS

A Comprehensive Web Site that Visually Organizes the Data by:

- Hyperlink to ESA Report
- LSA Factor Information
- Interactive Data Layer Viewing

Key Feature:

- *Tailored maps created by user*



4.1 INTRODUCTION

NRD MapMaker is a free web-based application that allows the user to create and print customized interactive maps using GIS data. The MapMaker system uses ArcGIS technology to deliver maps through a web browser. The maps are interactive and can be panned, zoomed, queried, and printed according to the user's specifications. A partnership including four NRDs and the LPRCA developed the NRD MapMaker system.

MapMaker is intended for anyone with an interest in generating custom geo-referenced maps: farmers, landowners, city and county officials, utility managers, etc. MapMaker was developed to provide all of these groups and more with easy access to geographical data compiled by natural resources districts, state and federal agencies, and other groups, without the need to purchase expensive software.

Currently, MapMaker information is available for eastern Nebraska. In the future, coverage may be expanded to include other areas of the state as well. Within the current coverage area of the system, there are several specialized mapping sites (such as the Assessment site), containing a variety of information for use in generating custom maps. In addition to the GIS data gathered in Phases II and III of the Assessment, coverages include (but are not limited to):

- Study Area boundary
- Cities and towns
- Streams
- Major & minor roadways
- County boundaries
- Township boundaries
- Floodplains and floodways
- Soil data

4.2 ENVIRONMENTAL SUITABILITY ASSESSMENT

The GIS shapefiles and coverages collected in Phases II and III were posted on the NRDs MapMaker. This data can be used by decision makers in the Lower Platte River Corridor to determine what environmental constraints may be present in a particular location prior to making a development or land use decision. However, this data is equally useful to stakeholders, agencies, municipalities, members of the general public, or anyone who may be interested in certain attributes of a parcel of land or surrounding lands.

4.2.1 Using ArcGIS

The Environmental Suitability Assessment ArcGIS program is located on the NRD Mapmaker at: http://www.nrdmapmaker.org/. When the user enters the map site, he will view a map with the entire extent of the Lower Platte River. To the top of the map is a series of tools that allow the user to view the legend, toggle an overview map, change the extent of the map (that is, zoom in and out), pan the extent, identify, query data, find data, measure, set units, buffer, select by rectangle, select by line or polygon, clear the selection, and create a map. To the right of the map is the shapefile and coverage data displayed as layers (see Table A-1 in this document for a list and description of the data). This column allows the user to identify the available layers, choose which layers to display on the map, view the metadata (see Section 4.2.2), and refresh the map.

To create a map, the user can choose the extent of the map, select the environmental features he wants displayed on the map, and print the information.

4.2.2 ArcGIS Features

A useful feature of the ArcGIS program is the ability to display metadata. Metadata is data about data, and in this case provides a description of

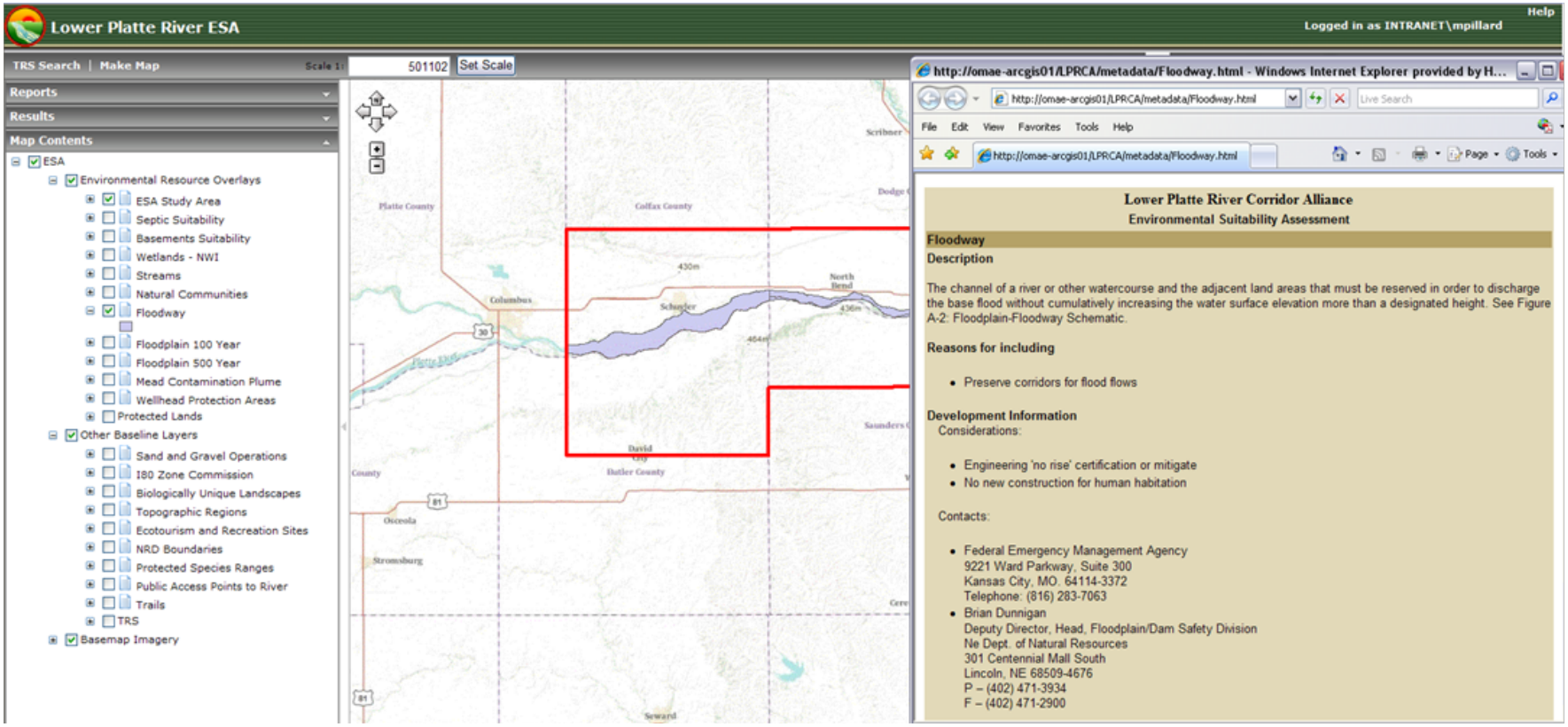
the layer, reasons for including the layer, development considerations, contact information for agencies or people who would have additional information about that layer, and implementation information from agencies, municipalities, developers or others who may have incorporated that layer into a land use decision.

The site features a help menu for those that are new or inexperienced with using GIS software. The help menu provides an overview, layer list help, and toolbar help.

The ArcGIS program is linked to this report, so the user would be able to visit the site and access this report for more information on the project purpose, the Study Area, and the layers.

4.3 DATABASE UPDATES

LPRCA recognizes that data is constantly being introduced or updated. LPRCA, along with the participating NRDs, would update the GIS database on the MapMaker website yearly in an attempt to provide the users with the most current data that is available.



Lower Platte River ESA ArcGIS

ESA FUTURE PHASES

FUTURE PHASES

- Natural Resources Planning and Policy Assistance
- Prioritize Stream Assessment
- Opportunity and Constraints Analysis
- Visioning Workshops and Scenario Development
- Growth Scenario Cost-Benefit Analysis

Key Feature:

- *Description of future phases for the ESA*

LPRCA will continue its mission to foster the development and implementation of locally drawn strategies, actions, and practices to protect, enhance, and restore the vitality of the Lower Platte River's resources through the development of future phases of the Environmental Suitability Assessment.

At the request of, and in coordination with local jurisdictions, LPRCA will assist in the coordination and/or development of additional planning tools that will build upon the Environmental Suitability Analysis. LPRCA will continue to collaborate with jurisdictions to complete reference documents for responsible, consistent and sustainable development in the Lower Platte River Corridor. The following are examples of other potential studies or analysis that would continue to develop a sustainable approach for development in the Lower Platte River Corridor.

5.1 NATURAL RESOURCES PLANNING AND POLICY ASSISTANCE

LPRCA would aid in development of policies and practices for promoting growth opportunities in suitable areas while preserving critical natural features. Policies and practices will become part of a comprehensive approach to meet the objectives of participating jurisdictions and LPRCA goals.

5.2 PRIORITIZE STREAM ASSESSMENT

LPRCA would determine which portions of the Lower Platte River or its tributaries are in greatest need of a stream assessment.

5.3 OPPORTUNITY AND CONSTRAINTS ANALYSIS

Through working with interested parties, a review of key demographic trends, development trends, environmental factors, opportunities, and constraints can be identified in relation to growth goals. This analysis can provide the framework for future policy and land use decisions.

5.4 VISIONING WORKSHOPS AND SCENARIO DEVELOPMENT

LPRCA envisions holding a series of regional visioning workshops for Corridor stakeholders. The workshops will incorporate a visioning process and a hands-on land development exercises to allow participants to create a preferred development concept for the project area.

Based on data analysis and result of the visioning workshops, a range of regional growth scenarios can be created to illustrate growth and development options.

5.5 GROWTH SCENARIO COST-BENEFIT ANALYSIS

LPRCA may conduct a preliminary review of growth scenarios to determine the relative cost-benefit of development options versus the cost of infrastructure, environmental impacts, and associated mitigation.

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Appendix A

GIS LAYERS

Environmental Resource Overlays

Other Baseline Layers

Implementation Concept Contacts

Table A-1
Environmental Suitability Assessment GIS Database Layers

Environmental Resource Overlays

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Information		Implementation Information (see Table A-3 for Contact Information)	
			Considerations	Contacts	Concepts	Examples
Layers used in the McHargian Style Analysis	Provides a description of this layer	Provides a listing of why the layer was included as a McHargian style overlay layer and how it relates to environmental suitability	Identifies issues that are associated with development/construction in areas where this feature is present	Provides resource contacts to obtain more information on the layer and associated development issues that need consideration	Provides an example of how the resource associated layer was identified, incorporated, avoided, or otherwise considered as part of a general or development plan	Examples of Implementation Concepts
Slopes greater than 9 percent	Slopes are elevation change divided by distance; for every 100 horizontal feet, there is 9 or more feet of vertical elevation deviation	• Vistas • Natural habitats	• Inhibitive for building • Earth moving	County Natural Resource Conservation Service (NRCS) offices Local engineering departments Development engineers	• Environmental overlay districts • Cluster development	Douglas County Comprehensive Development Plan pages 49 – 50. http://www.dcplanning.org/pzpdfs/cplan/dccomplan.pdf National Association of Homebuilders See *Smart Growth Case Study: Garnet Oaks* (Bethel Township, PA) http://www.nahb.org/generic.aspx?genericContentID=493
Suitability of septic	Soil properties and site features that affect the absorption of sewage effluent and construction of the septic system	• Water quality	• Proximity to surface water • Slope • Depth of water table • Soil composition	Local planning or engineering departments	• Unique wastewater solutions	Subsurface constructed wetland systems Chris and Hanson's Lakes, Sarpy County, Nebraska http://www.chrisandhansonlakes.com/ Judd Brothers Construction http://www.juddsbros.com/projects/ See *Sanitary sewer: phase II, collection and treatment system*
Suitability of basements	Soil properties and site features that affect the construction, maintenance, and liabilities of basement constructions	• Suitability for built environments	• Incompatibility for building	County NRCS offices Local engineering departments Development engineers	• Open space planning	2025 Lincoln City/Lancaster County Comprehensive Plan http://www.lincoln.ne.gov/city/plan/complan/2025/index.htm
Mapped wetlands	Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support hydrophytic vegetation mapped in the National Wetland Inventory by U.S. Fish and Wildlife Service (see Figure A-1: Riverine and Palustrine Wetland Systems)	• Water quality • Flood control • Erosion control • Fishing/Recreation • Wildlife habitat	• Section 404 permitting • Poor drainage • Potential protected species habitat	U.S. Army Corps of Engineers – Omaha District Wehrspann Field Office 8901 South 154th Street Omaha, NE 68138-3635 (402) 896-0896	• Wetland restoration • Wetlands for stormwater management • Conservation easements	National Wetland Inventory http://www.fws.gov/wetlands/ Wetland and Deepwater Habitats Classification http://www.fws.gov/wetlands/_documents/gNSDI/WetlandsDeepwaterHabitatsClassification.pdf Restoring Rivers

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Information		Implementation Information (see Table A-3 for Contact Information)	
			Considerations	Contacts	Concepts	Examples
Layers used in the McHargian Style Analysis	Provides a description of this layer	Provides a listing of why the layer was included as a McHargian style overlay layer and how it relates to environmental suitability	Identifies issues that are associated with development/construction in areas where this feature is present	Provides resource contacts to obtain more information on the layer and associated development issues that need consideration	Provides an example of how the resource associated layer was identified, incorporated, avoided, or otherwise considered as part of a general or development plan	Examples of Implementation Concepts
						See *Boise Urban Wetland Restoration: Five Mile/Victory Wetland* http://restoringrivers.org/oldsite/example/pacificnw/2fivemilevictory.html Urban wetland http://www.earthplatform.com/urban/wetland
Streams	Perennial, intermittent, and ephemeral waterways	• Water quality • Flood control • Erosion control • Fishing/Recreation • Wildlife habitat • Greenway corridors	• Section 404 permitting • Potential protected species habitat • Flooding • Potential trails network	U.S. Army Corps of Engineers – Omaha District Wehrspann Field Office 8901 South 154th Street Omaha, NE 68138-3635 (402) 896-0896	• Riparian zone planning • Greenways	Smart Growth See *Sample Stream Corridor Protection Ordinances* http://www.smartgrowthgateway.org/stream_sample.shtml Elkhorn Valley Trails Network http://www.evtn.org/ North Fork riverfront development http://www.northforkne.com/
Natural communities	Identified areas of native vegetation observed by the NGPC	• Wildlife habitat • Biodiversity • Unique landscapes	• Conservation areas	Nebraska Game and Parks Commission Tammy S. Snyder LIP Coordinator / Wildlife Biologist Lincoln, NE 68503 (402) 471-0641	• Conservation Easements • Cluster development • Deed restrictions • Public/private partnerships	Schramm Bluffs conservation easements http://www.nelandtrust.org/News/The%20Landscape%20-%20Fall%202006.pdf
Floodway	The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. (see Figure A-2: Floodplain-Floodway Schematic)	• Preserve corridors for flood flows	• Engineering 'no rise' certification or mitigate • No new construction for human habitation	Federal Emergency Management Agency 9221 Ward Parkway, Suite 300 Kansas City, MO. 64114-3372 (816) 283-7063 Brian Dunnigan Deputy Director, Head, Floodplain/Dam Safety Division Nebraska Department. of Natural Resources (DNR) 301 Centennial Mall South Lincoln, NE 68509-4676 (402) 471-3934	• Floodplain management districts	City of Lincoln, NE See *Overview of Existing Floodplain/Stormwater Regulations* http://www.lincoln.ne.gov/city/pworks/watrshed/mfptf/activity/overview/reg01.htm
100-year floodplain	Areas that are subject to a 1 percent probability of a certain size flood occurring in any given year (see Figure A-2:	• Areas of potential flooding and flood storage • Reduce risk of flooding • Water Quality	• Obtain floodplain development permit • Elevate structures to 1 foot above base-flood elevation	Federal Emergency Management Agency 9221 Ward Parkway, Suite 300 Kansas City, MO. 64114-3372	• Floodplain management districts • Parks and open space	City of Lincoln, NE Floodplain Task Force http://www.lincoln.ne.gov/city/pworks/watrshed/mfptf/index.htm

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Information		Implementation Information (see Table A-3 for Contact Information)	
			Considerations	Contacts	Concepts	Examples
Layers used in the McHargian Style Analysis	Provides a description of this layer	Provides a listing of why the layer was included as a McHargian style overlay layer and how it relates to environmental suitability	Identifies issues that are associated with development/construction in areas where this feature is present	Provides resource contacts to obtain more information on the layer and associated development issues that need consideration	Provides an example of how the resource associated layer was identified, incorporated, avoided, or otherwise considered as part of a general or development plan	Examples of Implementation Concepts
	Floodplain-Floodway Schematic)			(816) 283-7063 Brian Dunnigan Deputy Director, Head, Floodplain/Dam Safety Division DNR 301 Centennial Mall South Lincoln, NE 68509-4676 (402) 471-3934		Omaha Suburban Park Master Plan, page 17 http://www.ci.omaha.ne.us/parks/
500-year floodplain	Areas that are subject to a 0.2 percent probability of a certain size flood occurring in any given year	• Areas of potential flooding and flood storage	Determine if the activity in the 500-year floodplain is a critical action, such as: • Produce or store highly volatile or toxic materials; • Provide essential and irreplaceable records or utility or emergency services (e.g. data storage centers, utility lines, sole egress from flood-prone areas); • Contain occupants who may not be sufficiently mobile (e.g. hospitals, nursing homes)	Federal Emergency Management Agency 9221 Ward Parkway, Suite 300 Kansas City, MO. 64114-3372 (816) 283-7063 Brian Dunnigan Deputy Director, Head, Floodplain/Dam Safety Division DNR 301 Centennial Mall South Lincoln, NE 68509-4676 (402) 471-3934	• Floodplain management districts	City of Lincoln, NE Floodplain Task Force http://www.lincoln.ne.gov/city/pworks/watrshed/mfptf/index.htm
Wellhead protection areas	Designated surface and subsurface area surrounding a well or well field that supplies a public water supply and through which contaminants or pollutants are likely to pass and eventually reach the aquifer that supplies the well or well field	• Water quality • Water quantity	• Land use considerations	Nebraska Department of Environmental Quality 1200 "N" Street, Suite 400 P.O. Box 98922 Lincoln, Nebraska 68509 (402) 471-2186	• Wellhead protection areas	Nebraska's wellhead protection program: http://www.deq.state.ne.us/ City of Holdrege, NE Wellhead Protection Plan http://www.holdrege.org/city/highlights/media/Holdrege_Wellhead_Protection_Plan.pdf David City, NE wellhead protection areas http://www.davidcityne.com/wellhead.asp

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Information		Implementation Information (see Table A-3 for Contact Information)	
			Considerations	Contacts	Concepts	Examples
Layers used in the McHargian Style Analysis	Provides a description of this layer	Provides a listing of why the layer was included as a McHargian style overlay layer and how it relates to environmental suitability	Identifies issues that are associated with development/construction in areas where this feature is present	Provides resource contacts to obtain more information on the layer and associated development issues that need consideration	Provides an example of how the resource associated layer was identified, incorporated, avoided, or otherwise considered as part of a general or development plan	Examples of Implementation Concepts
Trails	Pedestrian, bicycle, horse, cross-country ski, and canoe	• Recreation • Connectivity • Wildlife corridors	• Encroachment • Connectivity to existing trails	Nebraska Game and Parks Commission 2200 N. 33rd St. Lincoln, NE 68503 (402) 471-0641 Nebraska Trails Network www.americantrails.org/resources/statetrails/NEstate.html Local parks and recreation departments	• Comprehensive trails plan	National Park Service Rivers, Trails, and Conservation Assistance Program http://www.nps.gov/ncrc/programs/rtca/ Nebraska Game and Parks Commission Comprehensive State Trails Plan http://www.ngpc.state.ne.us/parks/programs/trailplan/trailplan.asp Papio-Missouri River Natural Resources District http://www.papionrd.org/ Elkhorn Valley Trail Network http://www.evtn.org/
Mead contamination plume	Areas of contaminated or mediated groundwater near the former Nebraska Ordnance Plant, 0.5 mile south of Mead	• Development within plume • Groundwater extraction • Concern of plume migration	• Migration of plume • Land use and water needs	U.S. Army Corps of Engineers Kansas City District 601 East 12th street Mead Project Manager Kansas City, MO 64106 (816) 983-3486 Mead Public Library 316 S. Vine Street P.O. Box 203, Mead, NE 68041-0202 (402) 624-6605 Environmental Protection Agency Region VII ATT: SUPR/FFSE 901 North 5th Street Kansas City, KS 66101 Fax Number - 913.551.7063 Nebraska Department of Environmental Quality Suite 400, the Atrium 1200 "N" Street P.O. Box 98922 Lincoln, NE 68509	• Environmental overlay districts for Brownfield sites	EPA National Priority List sites in Nebraska: http://www.epa.gov/region7/cleanup/npl_files/index.htm#Nebraska EPA Region 7 Brownfields Assessment, Clean-up, and Revolving Loan Fund Pilots/Grantees http://www.epa.gov/brownfields/reg7.htm#ne

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Information		Implementation Information (see Table A-3 for Contact Information)	
			Considerations	Contacts	Concepts	Examples
Layers used in the McHargian Style Analysis	Provides a description of this layer	Provides a listing of why the layer was included as a McHargian style overlay layer and how it relates to environmental suitability	Identifies issues that are associated with development/construction in areas where this feature is present	Provides resource contacts to obtain more information on the layer and associated development issues that need consideration	Provides an example of how the resource associated layer was identified, incorporated, avoided, or otherwise considered as part of a general or development plan	Examples of Implementation Concepts
Sand and gravel operations	Locations of operational sand/gravel operations within the corridor	• Land use considerations • Future development • Habitat creation	Current: • Noise • Construction Future: • Recreation • Section 404 Permitting • Potential protected species habitat	Planning Aggregates Community Environment (PACE) Mr. John Heaston 112 W 8th St PO Box 144 Cozad, NE 69130 (308) 784-5336	• Joint development • Wetland development	Lyman-Richey Sand and Gravel http://www.lymanrichey.com/LR-Sand-Gravel.aspx Western Sand and Gravel http://www.westernsand.com/
Lake front developments	Former sand and gravel operations that are now lake front developments	• Land use considerations • Ongoing development • Habitat interface	• Recreation • Potential protected species habitat	Nebraska Lakes Association Mr. Woody Thelin 7813 Molokai Dr. Papillion, NE 68046 (402) 593-7200 http://www.nebraskalakes.org/index.htm	• Joint development • Wetland development	Riverview Shores near North Bend, NE http://www.riverviewshores.com/ Woodcliff Lakes in Fremont, NE http://www.woodcliffLakes.com/
Protected lands	Federal or state lands, properties owned by the local jurisdiction, or privately owned pieces on which legal protection exists to maintain or conserve outstanding natural conditions	• Wildlife habitat • Recreation	• Encroachment	U.S. Fish and Wildlife Service Nebraska Field Office 203 West Second Street Federal Building, Second Floor (308) 382-6468 Nebraska Game and Parks Commission Tammy S. Snyder, LIP Coordinator / Wildlife Biologist Lincoln, NE 68503 (402) 471-0641 Nebraska Land Trust 233 13th Street, Suite 1712 Lincoln, NE 68508 (402) 438-5263	• Stewardship in land use plans • Public/private partnerships	Lincoln/Lancaster County Comprehensive Plan Protection of wetlands, native prairies and riparian corridors http://www.lincoln.ne.gov/City/plan/complan/2030/environ.pdf

Table A-2
Environmental Suitability Assessment GIS Database Layers

Other Baseline Layers for Consideration

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Considerations	Contacts for Guidance
Jurisdictional boundaries	City and county boundaries	• Municipality jurisdiction	• Following relevant rules and procedures for development	Local jurisdiction
Future land use	Compilation of future land use plans, as they appear in the Comprehensive Plans of the varying jurisdictions within the area	• Projected development	• Parks/Recreation/Open Space • Agriculture • Transitional Agriculture • Low Density Residential Medium • Density Residential High Density • Residential Mixed Use • Office/Commercial • Industrial • Civic/Institutional	Local planning departments
Existing zoning	Zoning designation as authorized by the local jurisdiction	• Allowable land use	• Development compatibility with zoning	Butler County http://www.co.butler.ne.us/webpages/planning/zoning_regs.htm Cass County http://www.cassne.org/downloads/web%20page%20zoning%20regulations2.pdf Douglas County http://www.dcplanning.org/07pzregs.htm Polk County http://www.polkcounty.ne.gov/zoning.html Sarpy County http://www.sarpy.com/planning/ZoningRegulations.htm Saunders County http://www.saunderscounty.ne.gov/pdfs/zoning/zoning_regs.pdf City of Columbus http://www.columbusne.us/commdev/Columbus%20Plan.pdf City of David City http://www.davidcityne.com/zoning.asp City of Fremont http://www.fremontne.gov/DocumentView.aspx?DID=449&DL=1 City of Gretna

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Considerations	Contacts for Guidance
				http://www.gretnanebraska.com/buildzone/pdf/ZoneColor8.5x14_43008.pdf City of LaVista http://cityoflavista.org/DocumentView.asp?DID=808 City of Papillion http://www.egovlink.com/public_documents300/papillion/published_documents/Planning%20Department/Zoning%20Map/Zoning%20Map%20060408.pdf City of Schuyler http://schuylernebraska.net/IMAGES/SchuylerZoningMap.JPG Omaha by Design http://www.omahabydesign.org/Urban_Design_Element/Implementation/Implemetation.html
Nebraska Innovation Zone Commission	The Nebraska Innovation Zone Commission (NIZC) received a grant from the U.S. Department of Commerce, Economic Development Administration to complete a regional comprehensive plan for the six-county (Douglas, Sarpy, Cass, Saunders, Washington and Lancaster), Omaha and Lincoln metropolitan areas along the Intestate 80 corridor	• Comprehensive inventory of existing conditions within zone of study	• Utility provision • Natural and special amenities • Regional land use • Interchange development • Regional economic development practices.	Nebraska Innovation Zone Commission (NIZC) Kathy McKillip Executive Director P.O. Box 94666 Lincoln, Nebraska 68509-4666 (402) 471-1558 Kathy.mckillip@ded.ne.gov NIZC Regional Comprehensive Plan http://www.neded.org/content/view/199/427/
Biologically unique landscapes	Areas that the NGPC has determined are a priority for conservation efforts based on the Nebraska Natural Legacy Plan	• Wildlife habitat • Recreation • Biodiversity • Unique landscapes	• Context sensitive design	Nebraska Game and Parks Commission Tammy S. Snyder, LIP Coordinator / Wildlife Biologist Lincoln, NE 68503 (402) 471-0641
Topographic regions	General regions of similar geographic, geologic, and/or ecological attributes	• Diverse or unique ecosystems	• The geographic area can have general issues associated with it, such as steep slopes or groundwater recharge, depending on the region of interest	Conservation and Survey Division School of Natural Resources Hardin Hall 3310 Holdrege Street University of Nebraska-Lincoln Lincoln, Nebraska 68583-0961 (402) 472-3471
Levees	FEMA-recognized levees which provide protection from the 100-year event (see Figure A-3: Plan and Profile of Standard Levee System)	• Flood Control • Recreation	• Encroachment • FEMA designation	U.S. Army Corps of Engineers – Omaha District Randall L. Behm, P.E. Chief, Floodplain Management Services Section (402) 221-4596
Recreational/ecotourism lands and sites	Public or private lands which contain an exceptional recreational or natural component that is utilized by public users	• Recreation • Population Growth	• Encroachment • Traffic • Utilities	Nebraska Game and Parks Commission 2200 N. 33rd St. Lincoln, NE 68503 (402) 471-0641 U.S. Fish and Wildlife Service - Nebraska Field Office 203 West Second Street Federal Building, Second Floor (308) 382-6468

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Considerations	Contacts for Guidance
				Nebraska Department of Economic Development http://neded.org/ County economic development departments Local parks and recreation departments Private owners
Nebraska Game and Parks Commission properties	State-owned lands that include State Parks, State Recreation Areas, and Wildlife Management Areas	• Wildlife habitat • Recreation • Biodiversity • Unique landscapes	• Natural amenities • Section 6(f) • Hunting and recreational use	Nebraska Game and Parks Commission 2200 N. 33rd St. Lincoln, NE 68503 (402) 471-0641 Realty - Land Atlas http://www.ngpc.state.ne.us/realty/gpland/landatlas.asp
Existing roads	All road classifications from interstate highway to minimum maintenance	• Connectivity • Growth patterns	• Noise • Traffic	Nebraska Department of Roads - District 2 Main Office 4425 S 108th St PO Box 45461 Omaha, NE 68145-0461 (402) 595-2534 Local city or county engineer
Natural Resource District boundaries	NRDs are local government entities with broad responsibilities to protect out natural resources. Major Nebraska river basins form the boundaries, enabling districts to respond best to local needs.	• Natural resource management • Flood control • Erosion prevention • Structures such as dams, drainage ditches, reservoirs and recreational trails	• Conservation practices	Nebraska Association of Resource Districts 601 S. 12th St., Ste. 201 Lincoln, NE 68508 http://www.nrdnet.org/
Planned road improvements	Select future road improvements currently identified by state and local jurisdictions	• Connectivity • Growth patterns	• Noise • Construction	Nebraska Department of Roads - District 2 Main Office 4425 S 108th St PO Box 45461 Omaha, NE 68145-0461 (402) 595-2534 Surface Transportation Program http://www.nebraskatransportation.org/hwy-pgm/ Local city or county engineer
Cultural resources sites and potentially historic properties	Properties listed, or eligible for listing, on the National Register of Historic Places, per the requirements of Section 106 of the National Historic Preservation Act of 1966	• Zoning • Historic Farmsteads	• SHPO coordination • Potential mitigation • Historic district zoning overlay	National Register Information System http://www.nr.nps.gov/ Nebraska State Historical Society 1500 R Street, P.O. Box 82554 Lincoln, Nebraska 68501-2554 (402) 471-3270 or (800) 833-6747 http://www.nebraskahistory.org Lincoln, NE Downtown Master Plan and Zoning of Historic Districts Ed Zimmer, Historic Preservation Planner Lincoln City/Lancaster County Planning Department

Layer	Description of Layer	Relevance to Environmental Suitability Assessment	Development Considerations	Contacts for Guidance
				555 South 10th Street, Room 210 Lincoln, NE 68516 (402) 441-6360 ezimmer@lincoln.ne.gov
Protected species habitat	General descriptions of habitat for those species that are state or federally listed threatened or endangered that may be found along the Lower Platte River Corridor	• Wildlife habitat • Biodiversity • Unique landscapes	• Impact to protected species	U.S. Fish and Wildlife Service - Nebraska Field Office 203 West Second Street Federal Building, Second Floor (308) 382-6468 Nebraska Game and Parks Commission 2200 N. 33rd St. Lincoln, NE 68503 (402) 471-0641
Public access points to the river	Public access points to either the Lower Platte River or the Elkhorn River in the Study Area, for use by boaters, canoeists, fishermen, or recreationists	• Wildlife habitat • Recreation	• Proximity to natural environments	Nebraska Game and Parks Commission 2200 N. 33rd St. Lincoln, NE 68503 (402) 471-0641 Lower Platte North NRD PO Box 126 Wahoo, NE 68066 (402) 443-4675 Lower Platte South NRD 3125 Portia Street P.O. Box #83581 Lincoln, NE 68501-3581 (402) 476-2729 Papio-Missouri River NRD 8901 S. 154th Street Omaha, NE 68138 (402) 444-6222

Table A-3
Environmental Suitability Assessment GIS Database Layers
Implementation Concept Contacts

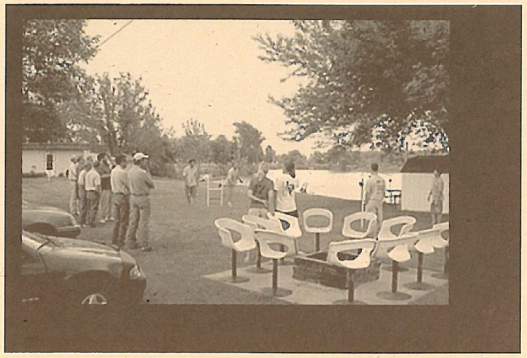
Implementation Concept	Contact Information
Cluster development	Georgia Quality Growth Partnership http://www.dca.state.ga.us/toolkit/ToolDetail.asp?GetTool=58 Smart Growth America http://www.smartgrowthamerica.org Smart Growth Online http://www.smartgrowthonline.org Joslyn Castle Institute http://www.ecospheres.com
Conservation easements	Northern Prairie Lands Trust 233 S. 13th St. Suite 1712 Lincoln, NE 68508 (402) 438-5263 http://nelandtrust.org/ Nebraska Game and Parks Commission 2200 N. 33rd St. Lincoln, NE 68503 (402) 471-0641 http://www.ngpc.state.ne.us
Environmental overlay districts	City of Omaha Planning Department 1819 Farnam St., Suite 1100 Omaha, NE 68183-1100 (402) 444-5150 http://www.cityofomaha.org/planning Douglas County Planning Commission 3015 Menke Circle Omaha, NE 68134 (402) 444-6181 http://www.dcplanning.org Sarpy County Planning Department Sarpy County Courthouse Annex 1261 Golden Gate Drive, Suite 2E Papillion, NE 68046 (402) 593-2156 http://www.sarpy.com/planning/ Smart Growth America http://www.smartgrowthamerica.org/documents/SGAguidebookFinal.pdf
Historic district zoning overlay	Nebraska State Historical Society 1500 R Street, P.O. Box 82554 Lincoln, Nebraska 68501-2554 (402) 471-3270 or (800) 833-6747 http://www.nebraskahistory.org
Floodplain management districts	City of Lincoln, NE Floodplain Task Force http://www.lincoln.ne.gov/city/pworks/watrshed/mfptf/index.htm
Environmental overlay districts for Brownfield sites	U.S. Environmental Protection Agency See *Superfund Redevelopment* http://epa.gov/superfund/programs/recycle/index.html
Greenways (riparian corridors)	National Park Service Rivers, Trails, and Conservation Assistance Program Mary Hanson 601 Riverfront Drive Omaha, NE 68102 (402) 661-1554 http://www.nps.gov/ncrc/programs/rtca/
Riparian zone planning	Smart Growth See *Sample Stream Corridor Protection Ordinances* http://www.smartgrowthgateway.org/stream_sample.shtml
Parks and open space in floodplains	City of Omaha Parks, Recreation, and Public Property 1819 Farnam St., Ste 701 Omaha, NE 68183 http://www.ci.omaha.ne.us/parks
Open space planning	City of Lincoln – Lancaster County Planning Department Marvin Krout, Director 555 South 10th Street, Room 213 Lincoln, NE 68508 P – (402) 441-7491 http://www.lincoln.ne.gov/City/plan/
Wetland restoration	Prairie Nebraska http://www.prairienebraska.org/native.html See *Restoration Guide*
Wetland development	Planning Aggregates Community Environment (PACE) Mr. John Heaston 112 W 8th St PO Box 144 Cozad, NE 69130 (308) 784-5336 U.S. Army Corps of Engineers – Omaha District Wehrspann Field Office 8901 South 154th Street Omaha, NE 68138-3635 (402) 896-0896
Wetlands for stormwater management	Metropolitan Council 390 Robert Street N St. Paul, Minnesota 55101 (651) 602-1000 http://www.metrocouncil.org/environment/water/BMP/manual.htm

Implementation Concept	Contact Information
Wellhead protection areas	Nebraska Department of Environmental Quality 1200 N Street, Suite 400 Lincoln, NE 68509 (402) 471-2186 http://www.deq.state.ne.us/ See *Focus on Water; Wellhead Protection Program*
Unique wastewater solutions	Nebraska Department of Economic Development http://www.neded.org See *Community Development Block Grant* U.S. Environmental Protection Agency *Constructed Wetlands Treatment of Municipal Wastewater* http://www.epa.gov/owow/wetlands/pdf/Design_Manual2000.pdf
Comprehensive trails plan	City of Omaha http://www.ci.omaha.ne.us/parks/ http://www.omahatrails.com Lower Platte South Natural Resources District (NRD) 3125 Portia St. Lincoln, NE 68521 (402) 476-2729 http://www.lpsnrd.org Papio-Missouri NRD 8901 S. 154th St. Omaha, NE 68138-3621 (402) 444-6222 http://www.papionrd.org Lower Platte North NRD 511 Commercial Park Road Wahoo, NE 68066 http://www.lpnnrd.org
Joint development	Planning Aggregates Community Environment (PACE) John Heaston 112 W 8th St PO Box 144 Cozad, NE 69130 (308) 784-5336

Implementation Concept	Contact Information
Public/private partnerships	U.S. Fish and Wildlife Service - Nebraska Field Office 203 West Second Street Federal Building, Second Floor (308) 382-6468 http://www.fws.gov/landowner.html NGPC Tammy S. Snyder, LIP Coordinator / Wildlife Biologist Lincoln, NE 68503 (402) 471-0641 http://www.ngpc.state.ne.us/wildlife/programs/landownerincentive/ Nebraska Land Trust 233 13th Street, Suite 1712 Lincoln, NE 68508 (402) 438-5263 http://www.nelandtrust.org/
Stewardship in land use plans	City of Lincoln – Lancaster County Planning Department Marvin Krout, Director 555 South 10th Street, Room 213 Lincoln, NE 68508 (402) 441-7491 http://www.lincoln.ne.gov/City/plan/

Appendix B

PACE INFORMATION



Participants

Sand/Gravel Companies

Lyman–Richey Corporation
Overland Sand & Gravel
Paulsen Construction
Western Sand & Gravel
Overton Sand & Gravel
Werner Construction
T & F Sand & Gravel
Mid–Nebraska Aggregate

Agencies & Organizations

Nebraska Department of Environmental Quality
Prairie Plains Resource Institute
Papio–Missouri NRD
Lower Platte Corridor Alliance
US Fish & Wildlife Service
UNL–Conservation & Survey Division
Least Tern/Piping Plover Conservation Partnership
The Nature Conservancy
Grand Island/Hall County Planning Department

Credits:
Design • DPI Graphics • John Deitering
Photography • Carl Roberts • Bill Whitney • NGPC

For more information contact:

John T. Heaston • 402.694.2335
Carl Roberts • 402.649.3554
Bill Whitney • 402.694.5535

Platte corridor INITIATIVE

PACE is a working group of the Platte Corridor Initiative. For more information go to www.plattecorridor.org

P A C E

Planning • Aggregates • Community • Environment

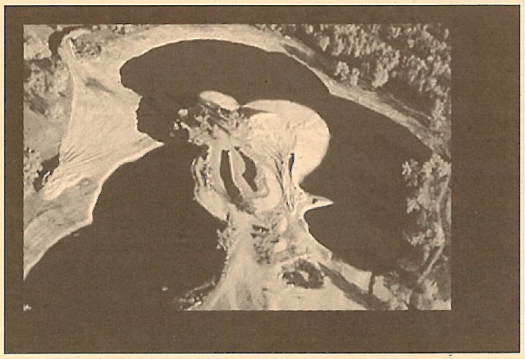
Mission Statement

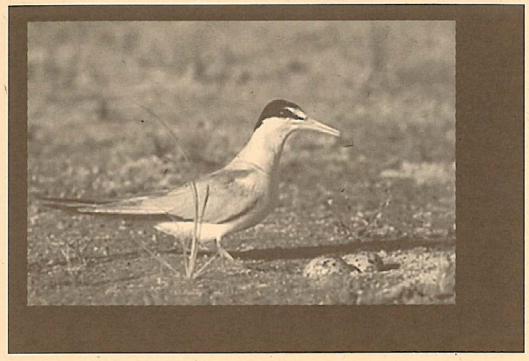
To develop and facilitate cooperation among and between communities, conservation interests and the sand/gravel producers of Nebraska.

Background

When some in conservation think of the sand and gravel industry, they think of noise, pollution and destruction. Some in sand and gravel picture environmental groups as meddling, regulatory crusaders. However, an unlikely combination of partners from each group has formed PACE (Planning, Aggregates, Community and Environment) to develop common interests.

John Heaston of the Conservancy, Bill Whitney of the Prairie Plains Resource Institute and Carl Roberts of Lyman–Richey Sand and Gravel Company have spearheaded this effort to change perceptions, to share expertise and to work together to provide the resources necessary to build roads, houses and sidewalks while protecting the environment.





Objectives

1. Encourage **effective communication** and **cooperative decision–making** among and between mining interests, communities, conservation and state/federal regulatory agencies.

2. Construct a workable plan to allow mining along the Platte River, with a resulting landscape **beneficial to wildlife**, that encourages **sustainable land use**.

3. Create a **participatory planning process** informing the public and involving them where appropriate.

4. Develop an **education** and **outreach** plan to provide a **basic understanding of mining, reclamation and conservation**.

5. Build an organized **working group** to nurture a **continuing relationship** between and among the members of the group.

6. Construct a **25–year and a 50–year** action plan for the Platte Valley with an **annual review** and **annual objectives**.

7. Produce a guide for **self–regulation of the mining industry**.

Five Issues

1. Access to Resources
– wildlife
– aggregate

2. Rapidly Changing Land Use
– increased development pressure
– recreation use
– absentee ownership
– conservation ownership

3. Cost of Doing Business
– cost of environmental protection
– cost of mineral extraction
– increased social and economic costs of doing both

4. Lack of Public Understanding
–"people want roads and houses but don't want to see us coming" (Sand/Gravel)
–"people want wildlife and open green space but they don't want to see us coming" (Conservation Interests)

5. Regulatory Issues
– multiple agency jurisdiction and policy has made working on the river cumbersome for all parties

Appendix C

LAND SUITABILITY ANALYSIS MODEL

HDR Engineering, Inc.

Lower Platte River CORRIDOR ALLIANCE

ENVIRONMENTAL SUITABILITY ASSESSMENT FOR THE LOWER PLATTE RIVER CORRIDOR:

A PLANNING RESOURCE FOR NATURAL ENVIRONMENTS

Land Suitability Analysis Model for the Lower Platte River Corridor

June 2011

HDR Project No. 60206

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1.0 INTRODUCTION

The Lower Platte River Corridor Alliance (LPRCA) recognizes that growth in the lower Platte River watershed is inevitable and that efforts are needed to ensure the sustainability of the natural resources of the area. In addition, LPRCA recognizes that community growth and natural resource protection can co-exist, but this requires careful planning and collaboration.

Land suitability analysis[1] (LSA) is a planning tool that resource agencies and municipalities can use to identify, classify, and prioritize land suitability in order to promote sustainable land use plans and decisions. LSA is the assessment of an area to determine how proper or appropriate a particular use of the land is in a particular location (MacDonald, 2007). The concept of land suitability analysis is based on the separation of the Earth's landscape by natural systems such as drainage areas, or watersheds, each of which is more suitable for certain uses than for others. Land suitability analysis models are a means of determining the best use of the land for features such as development, recreation, water supply, wildlife habitat, and agricultural production.

This document discusses such features as well as types of LSA models and considerations for selecting a model. Further, this document reviews several existing models, identifies the preferred model for the Environmental Suitability Assessment (ESA) project, and includes a preliminary outline of a preferred model for LPRCA implementation.

2.0 LAND SUITABILITY ANALYSIS FEATURES AND FACTORS

LSA models are generally composed of features. Thus, the first step in developing a model is to identify the features for which the model is needed. Based on conversations with LPRCA, including key members from the Natural Resource Districts belonging to LPRCA on September 24, 2008, the following preliminary features were identified:

- Development
- Recreation
- Water Quality/Supply
- Wildlife/Conservation
- Agriculture
- Mining

Each feature is reviewed in terms of its suitability factors (the qualities or elements that make up or influence a feature), which are determined by their impact on the establishment of a feature. Table 1 identifies the suitability factors initially identified for each feature for the ESA project.

[1] "Land" refers to ground or soil of a specified nature or quality; "suitability" refers to the state of being adapted to a certain use or purpose; and "analysis" means the separation of the whole into its component parts.

Table 1 – Preliminary Features and Factors for Land Suitability Analysis

	Features					
Suitability Factors	*Development*	*Recreation*	*Water Quality/ Supply*	*Wildlife / Conservation*	*Agriculture*	*Mining*
Existing Easements	x			x		x
Land Values	x				x	x
Comprehensive Plans	x				x	x
Resource Locations	x					x
Proximity to Existing Infrastructure	x		x[1]			
Floodplain	x	x	x		x	
Proximity to Water/Wetlands		x	x	x		
Riparian Buffers			x			
Public Access		x				
Proximity to Populations		x		x		
Existing Land Use	x	x[2]	x[3]	x[4]	x[5]	
Wildlife Value						
Scenic Qualities		x				
Proximity to Well Head Protection			x		x	
Groundwater Recharge Zones			x			
Existing Wildlife Corridors		x		x		
Existing Threatened and Endangered Species (T&E) Habitat				x		
Habitat Connectivity				x		
% Slope	x				x	
Soil type	x				x	
Parcel Size					x	
Historic Farmsteads					x	

Notes: The following are of particular interest with respect to the factors:
[1] *Septic tanks*
[2] *Proximity to existing recreation areas*
[3] *Point sources, impervious surfaces*
[4] *Land Cover*
[5] *Irrigation*

This preliminary list of factors was considered when reviewing existing models and developing a model specific for LPRCA (see Section 6.0, Model Selection, and 7.0, Model Refinement). The features and factors for the selected model will be modified and adjusted, as necessary, based on:

- Rationale for factor suitability
- Existing data availability
- Data detail necessary for the suitability analysis

The formulation of factors and overall feature suitability will be determined through discussion with technical experts pertaining to a particular factor.

3.0 LAND SUITABILITY ANALYSIS MODELS

For ease of discussion, LSA models can be divided into two types: planning-based and technical models. These model types vary in intensity with regard to the data needed, the time required to complete the model, and the information provided.

3.1 Planning-Based Models

Planning-based models typically use general data, thus making modeling possible in cases where there is a lack of detail data. A key characteristic is user-defined input or rankings to determine value; qualitative values are assigned to the suitability factors using stakeholder involvement. The outcome is often a map or a ranking based on inputs that indicate the suitability of the land based on one or multiple factors. This type of model can also produce a rapid assessment of parcels of land. Its advantages and disadvantages are listed in Table 2.

Table 2 – Planning-Based Model Advantages and Disadvantages

Advantages	*Disadvantages*
Data input/computational requirements are low.	Assessments are value driven, with qualitative measures.
Models can be performed on a large or small scale.	Data inputs remain the same regardless of scale.
The approach is non-technical.	For the model to have value, end user buy-in of the qualitative measures is required..
Community values are incorporated into the ranking.	The analysis can have a biased result.
The output can be used as a plan because of stakeholder input on values as priorities.	Values and priorities will differ from stakeholder to stakeholder, community to community.

3.2 Technical Models

Technical models provide a more in-depth analysis of the suitability factors that affect a particular feature. The number and complexity of the factors can vary with the specificity of the feature. In many cases, a complex LSA model will require more data than a planning-based model, thus providing a comprehensive analysis of the factors affecting a feature. General values are assigned to the factors by consulting technical experts in that field. This approach provides a technical summary of a land feature based on factors determined to be important for that feature. Table 3 lists advantages and disadvantages of technical models.

Table 3 – Technical Model Advantages and Disadvantages

Advantages	*Disadvantages*
Value ranking bias is limited.	The model requires technical input and agreement on the factor and factor value rationale.
The model can be used on a large or small focus.	Data inputs may be time consuming to establish if a small focus is combined with a large geographical area.
The model provides a technical view of land suitability.	The model does not provide a sense of priority with regard to the land suitability or implement a community/stakeholder value of one factor or another.
The output is a map indicating the technical characteristics of the land.	Priorities of a community are not included; this is the next step needed for decision making.

3.3 Summary

LSA models vary with respect to the information they provide and the data needed to apply the models. The appropriate type of LSA model depends on the question(s) the model is expected to answer. The value of the answer needs to be considered relative to who will be utilizing the results of the model and how the model will be used.

4.0 SELECTING A LAND SUITABILITY ANALYSIS MODEL

The use of an LSA model for specific features, such as agriculture or development, depends on several considerations. To successfully apply the concept of land suitability, these considerations are important when selecting an LSA model. Table 4 lists the considerations and the related questions that need to be answered.

Table 4 – Considerations for Selecting an LSA Model

Consideration	*Questions*
Model Goal(s)	What questions are to be answered by the model? How will the results be used?
Model End Users	Who is going to use the model? What are the user's interests/needs?
Application Area of the Model	How widespread is the question we are trying to answer? What is the size of area to which the model will be applied?
Inputs Required	What data are available for input into the model? What are the costs of additional data gathering?

Based on discussions with LPRCA, including key members of the Natural Resources Districts, and needs assessment surveys from Phase II of the ESA project, the following considerations were noted for model selection and development.

Model Goal

It is essential to identify the goal of the model in order to help determine the type of model to use for the ESA project. For the LPRCA, the goal is to assess areas suitable for land conservation and sustainable development. The model should look at a variety of features from a technical standpoint, and suitability should be based on a technical rather than a value-based approach. The model should be general enough to be able to include the entire study area for the ESA project.

Model Users

The primary end users of the model are county and city land use decision makers. Other users may include developers, resource agencies, and conservation groups.

Model Application Area

The Phase II and Phase III study areas for the ESA project will be the application areas for the model.

Model Inputs

Model inputs should focus on existing, available information. Geographic Information Systems (GIS) data have been assembled for Phase II and Phase III of the ESA project.

5.0 LAND SUITABILITY ANALYSIS MODEL REVIEW

Five LSA models, listed below, were reviewed for this project in order to choose a preferred model to apply to the study area. Both types of models were reviewed, although feedback from LPRCA during the September 24, 2008 meeting indicated a preference for more technical-based models.

- A toolkit for the evaluation of land parcels for green space planning (Kramer and Dorfman, 2007), the only planning-based model reviewed
- Decision-Support Model of LSA for the Ohio Lake Erie Balanced Growth Program (MacDonald, 2007)
- LSA User Guide (NC Division of Costal Management et al., 2005)
- Land Conservation and Watershed Management (Barten and Ernst, 2004)
- LSA for the Upper Gila River Watershed (Steiner et al., 2000)

The following sections describe each of the five LSA models reviewed. The description includes the purpose of the model and the method utilized by the model.

5.1 A Toolkit for Evaluation of Land Parcels for Green Space Planning

5.1.1 Purpose of the Model

The toolkit for evaluation of land parcels for green space planning has two goals: 1) to provide communities with an overview of concepts used in the planning process and 2) to develop a tool that allows communities to prioritize their rankings of individual properties for incorporation into a green space plan. A spreadsheet is generated to determine decision makers' priorities in order to create meaningful results (Kramer and Dorfman, 2007).

5.1.2 Methodology

The following steps were taken to apply the toolkit:

- Members of the community were selected for the planning team.
- The planning team began by ranking five categories: water quality, farmland protection, economic impact, wildlife protection, and cultural protection. Weights can be changed to reflect community values and priorities for each of the categories. For example, if a community values its historic district, then cultural protection will receive the highest weight.
- A member of the planning team filled out 40 questions, ranging from information regarding wetlands, forested areas, groundwater, topography, and streams to recreation, cultural resources, and economic resources for each tax parcel.
- Each of the 40 questions was answered "yes" or "no" for each tax parcel. Each response was given a numeric number (example: yes=1, no=0). The spreadsheet then did a raw calculation and scaled the scores.
- In each of the five above-mentioned categories, the scaled scores were ranked between 1 and 10, with the best parcel for each category always receiving a ranking of 10.

5.2 Decision-Support Model of LSA for the Ohio Lake Erie Balanced Growth Program (Decision-Support LSA Model)

5.2.1 Purpose of the Model

The principle objective of the Decision-Support Model of LSA is to encourage local governments to address land use issues together, rather than individually, on a watershed basis. The methodology that drives this model requires participants to decide the suitability ratings for each factor. The model creates land suitability maps that display the high suitability areas for agriculture, conservation, and development. Therefore, the suitability analysis does not dictate that stakeholders follow a certain course of action; rather, it provides the data, tools, and encouragement for them to work together to plot their own course (MacDonald, 2007).

The Decision-Support Model is based on a GIS approach that includes constructing three independent, objective suitability analyses (for agriculture, conservation, and development). The model is predicated on a watershed approach to land use decision making.

5.2.2 Methodology

The following steps were taken to apply the Decision-Support Model:

- A literature review was completed to determine which factors affect agriculture, conservation, and development land suitability. The literature review included state rules, policies, and technical documents.
- Three technical advisory committees were assembled for the following features: agriculture, conservation, and development.
- Feedback from the literature review and the technical advisory committees was applied to convert factor values into high, medium, and low factor suitability levels.
- The factor suitability levels were combined to generate the land suitability levels for each of the features (agriculture, conservation, and development).
- Results were presented to pilot watershed representatives, who provided comments and/or approval.
- The land suitability for agriculture, conservation, and development was applied to a test watershed.
- The land suitability maps for each feature were presented to the pilot watershed representatives for comments and/or approval.
- The land suitability maps for each feature were overlaid in GIS, and land suitability (high suitability for agriculture, conservation, or development) was determined for each tract.
- A basin-wide suitability methodology report and land suitability maps for each feature were generated.
- When superior data became available, the project team amended the LSA model.

5.3 Land Suitability Analysis User Guide

5.3.1 Purpose of the Model

The LSA User Guide model is a GIS-based process for evaluating the suitability of land for development. An environmental composite map and a land suitability map are generated. The environmental composite map shows the extent and overlap of natural systems and environmental conditions that indicate the capability and limitations of the natural systems for urban

development. The land suitability map shows the relative suitability of land in a planning area for urban development (NC Division of Costal Management et al., 2005).

5.3.2 Methodology

The following steps were taken to apply the LSA User Guide model:

- The project team determined the factors for urban-type development to analyze in the model.
- The project team defined the suitability value for each factor—such as high, medium, low, and least suitable. For example, areas within 100-year flood zones have low suitability for development.
- The values for the factors were quantitatively scored according to suitability for development. For example, a low suitability value received a numeric value of -2.
- The factors were given a numeric ranking with the highest ranking having the most weight with respect to land suitability. These rankings can change by watershed, county, or a determined area. The rankings were converted into a percent weight.
- The numeric value and percent weight were multiplied to determine a weighted suitability layer to the each factor.
- The GIS layers were created to display the weighted suitability layer for each factor. After all GIS layers were prepared, they were added together to obtain a suitability rating.
- The project team analyzed the suitability map to determine the validity of the results. The LSA was modified using the project team's comments and available new information.

5.4 Land Conservation and Watershed Management

5.4.1 Purpose of the Model

A Source Water Stewardship Project was conducted for the purpose of land conservation and watershed management. As part of the project, a model was established to design and implement source protection projects in watersheds. The goal was to demonstrate the use of forest conservation and watershed management as drinking water protection strategies. A set of criteria was used to identify watersheds where land conservation and forest management could be a viable source protection strategy (Barten and Ernst, 2004).

5.4.2 Methodology

The following steps were taken to apply the model:

- A steering committee consisting of approximately five individuals from the area provided broad representation of the interests of the water utilities, state and local governments, and nongovernmental organizations.
- The steering committee formed a broad-based local committee with 25 to 45 participating individuals and organizations to guide the process and to ensure collaboration among the multiple jurisdictions and entities within the watershed.
- GIS layers were gathered for the watershed. The committees utilized GIS to identify and rank place-based conservation, restoration, and stormwater management prioritizes for the watersheds. The committees also analyzed the water quality threats to the watershed and compiled a Source Waters Issues report.

- Each GIS layer was developed by assigning ratings of high (3), intermediate (2), low (1), or not applicable (0) integer codes to represent potential influence on source water. The ratings were assigned based on literature review and consensus reached by the steering and local committee.
- Priority rating maps were created by overlaying the GIS layers, which displayed areas that could be utilized to protect the watershed from pollution.
- The priority rating maps and the Source Waters Issues report were given to a project team consisting of four or five volunteers with training and expertise that matched the interests and needs of the community. The project team met for a week-long conference that included briefings from stakeholders, round table discussions, public events, and pertinent community activities.
- The project team gave a final presentation of findings, conclusions, and recommendations to the community in regard to the watershed. The project team outlined potential implementation recommendations for the watershed, which included recommended land uses for certain areas.

5.5 Land Suitability Analysis for the Upper Gila River Watershed

5.5.1 Purpose of the Model

An LSA was created for a large watershed to assess suitability for four specific land uses: low-density housing, commercial development, industrial development, and recreation. The LSA focused on identifying factors of primary and secondary suitability, as well as factors believed to be unsuitable for certain land uses. Primary suitability was defined as having no limitations or hazards to that land use. Secondary suitability was defined as having one or more factors that may affect future development and would require measures to reduce potential problems and/or costs. Unsuitable areas are those that have severe limitations that inhibit or prohibit a particular land use (Steiner et al., 2000).

5.5.2 Methodology

The following steps were taken to apply the LSA to the upper Gila River Watershed:

- A management committee of local experts was formed to make determinations throughout the process.
- Three matrices were created:
    1. The land use/land use needs matrix plots relationships between the land uses chosen for analysis (low-density housing, etc.) and their land use needs (surface water availability, infrastructure, etc.). Land use needs include all factors necessary and desirable. This matrix is very similar to Table 1, above.
    2. The factors/land use needs matrix examines relationships between general environmental issues (such as hydrology) and land use needs (such as the land use need for surface water availability, which is affected by climate, hydrology, physiography, and geology).

3. The specific factors/land use needs matrix is a suitability matrix based on the previous two matrix types for each of the land uses chosen for analysis: low-density housing, commercial development, industrial development, and recreation. A separate table is created for each land use category. The model plots the general factors against the land use needs and categorizes the suitability of each as suitable relationship, unsuitable relationship, and no relationship.

- The suitability ratings in the specific factors/land use needs matrix are evaluated and weighted, assigning a numeric rating to the suitability level.
- The numeric rating for the specific factors for each of the features — low-density housing, commercial development, industrial development, and recreation—gives guidance on suitable areas. For example, areas with 0 to 3 percent slope are suitable for commercial and low-density housing. Areas with 15 percent and greater are suitable for recreation. No land suitability maps were produced, but numeric charts were generated so that local entities can apply the suitability ratings.

6.0 MODEL SELECTION

Table 5 lists the pros and cons of each of the LSA models presented above. Based on the review of the models and meetings with LPRCA, it became apparent that a technical model would suit the goals of this project. The LSA model suggested for this project is a hybrid of the Decision-Support Model, the LSA User Guide, and the LSA for the Upper Gila River Watershed.

Table 5 – Pros and Cons of the LSA Models Reviewed

LSA Models	Pros	Cons
Toolkit for evaluation of land parcels for green space planning	- User friendly - Analysis done by land parcel - Evaluation of five categories that are similar to the features for this project	- Time consuming analysis of each land parcel - No GIS application - LSA focused on green space planning - Difficult to modify and update
Decision-Support Model	- LSA based on stakeholders' values - Multiple features analyzed for land suitability - Land suitability determined using GIS	- GIS data not available for all information - Amount of effort needed to coordinate between local entities to apply the LSA results
LSA User Guide	- Criteria and ratings clear and easy to understand - Land suitability determined using GIS.	- LSA for urban development; determines only land suitability for development - Difficult to interpret all the factors at once to determine land suitability
Land Conservation and Watershed Management	- Suggestions implemented by expert stakeholders - Land suitability determined using GIS	- Focus of analysis on only one feature: watershed protection - Time and resource requirements.
LSA for the Upper Gila River Watershed	- Relationships between factors, features, and land suitability displayed in matrix - Multiple features assessed - Public buy-in promoted by management committee - Suitability values suggested for factors are relevant to the ESA project.	- No GIS application - No suitability maps produced

The following sections describe the steps proposed in the hybrid model and start the LSA process by creating preliminary suitability values.

6.1 Components of the Preferred LSA Model

Based on the review of the various LSA models, a model was developed. The preferred LSA model is a composite of the models reviewed. The following are the steps of the preferred LSA model:

Step 1: Assemble a preliminary list of factors that affect land suitability **for each of the features**. Use the literature reviews and meetings completed to date to assemble the list.

Step 2: Using a matrix table, define the preliminary suitability values for each of the factors in relation **to the six features (development, recreation, water quality/supply, wildlife/conservation, agriculture, and mining).** The suitability values will be:

- High suitability—an area with no limitations or hazard to the feature
- Medium suitability—an area having one or more factors that may affect the feature and would require measures to reduce potential problems and/or costs
- Low Suitability—an area having severe limitations that inhibit or prohibit a particular feature

Step 3: Assemble and consult a technical advisory committee to review and provide input on the suitability values for each factor. Proposed committee members are as follows:

- Development—residential builders, commercial builders, industrial builders, real estate analysts, economic development coordinators
- Recreation, water quality/supply, wildlife/conservation—water quality specialists, park planners, conservationists, regulatory agencies
- Agriculture—soil scientists, local farmers, local soil conservation districts
- Mining—local mining companies

Step 4: Assign the numeric criteria (0, 1, and 2, respectively) to the low, medium, and high suitability values. See Table 6 as an example.

Table 6 – Example of Step 4
Land Suitability for XX Feature

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*
Numeric Criteria	0	1	2
Floodplain	Outside of floodplain	N/A	Inside of 100-year floodplain
Proximity to Water/Wetlands	5,000 feet and greater	1,000–5,000 feet	0–1,000 feet
Proximity to Populations	5 miles or greater	1.0–5.0 miles	0.5–1.0 mile
Existing Land Use	Large farm	Urban forest	Small forest, unofficial town park, greenbelt

Step 5: To weigh the factors, assign a number ranking 1 through 3 to each factor, with 3 having the most weight with respect to land suitability. The technical advisory committee will determine the importance. See Table 7 as an example of this step.

Table 7 – Example of Step 5
Land Suitability for XX Feature

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Floodplain	Outside of floodplain	NA	Inside of 100-year floodplain	3
Proximity to Water/Wetlands	5,000 feet and greater	1,000–5,000 feet	0–1,000 feet	1
Proximity to Populations	5 miles or greater	1.0–5.0 miles	0.5–1.0 mile	2
Existing Land Use	Large farm	Urban forest	Small forest, unofficial town park, greenbelt	2

Step 6: Once the technical advisory committee agrees on a ranking, add all the rankings (1, 2, and 3) together and divide the sum into 100 (percent). For example, if there are 4 factors for the feature of development, sum the rankings of 1 through 3. If the sum is 8, divide 8 into 100, which gives a percent weight of 12.5. Then assign percent weights of 12.5, 25, and 37.5 to the rankings of 1, 2, and 3, respectively. Convert the percent weight into a percent weight multiplier, 0.125, 0.25, and 0.375. See Table 8 for an example of this step.

Table 8 – Example of Step 6
Land Suitability for XX Feature

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*	*Percent Weight*	*Multiplier*
Numeric Criteria	0	1	2			
Floodplain	Outside of floodplain	NA	Inside of 100-year floodplain	3	37.5	0.375
Proximity to Water/Wetlands	5,000 feet and greater	1,000–5,000 feet	0–1,000 feet	1	12.5	0.125
Proximity to Populations	5 miles or greater	1.0–5.0 miles	0.5–1.0 mile	2	25	0.25
Existing Land Use	Large farm	Urban forest	Small forest, unofficial town park, greenbelt	2	25	0.25
Total				8	100.0	1.0

Step 7: Prepare the GIS layers for each factor with the numeric criteria assigned to each suitability value multiplied by the percent weight multiplier, thereby giving a weighted suitability value to the factor layer. Then sum the factors by their respective value to determine the suitability for each feature. See Table 9 for an example parcel analyzed for XX Feature.

Table 9 – Example of Step 7
Example Parcel Analyzed for XX Feature

Factors	*Description*	*Suitability Value*	*Multiplier*	*Weighed Suitability Value*
Floodplain	Outside of floodplain	0	0.375	0
Proximity to Water/Wetlands	50 feet	2	0.125	0.25
Proximity to Populations	1.2 miles	1	0.25	0.25
Existing Land Use	Large farm	2	0.25	0.50
Total Suitability Value for Parcel				1.0

Step 8: Assign a low, medium, and high suitability to each area (parcel, etc) based on the sum of the suitability values for each factor. The suitability will be based on a value range such as low suitability equals 0 to less than 0.5. See Table 10 for an example of the ranges for XX feature.

Table 10 – Example of Step 8
Example Value Range for XX Feature

	Total Suitability Value Range
Low Suitability	0
Medium Suitability	1
High Suitability	2

Step 9: Create a suitability map for each feature, displaying the results of the suitability analysis.

6.2 Preliminary Assignment of Suitability Ratings to Suitability Factors

The suitability factors for the six features (development, recreation, water quality/supply, wildlife/conservation, agriculture, and mining) were determined by means of a literature review

and a meeting with LPRCA on September 24, 2008. Based on feedback from the technical advisory committee, these factors and features will be modified and adjusted as necessary.

In the following sections, the factors are assigned preliminary suitability values based on a literature search of LSA models. The preliminary suitability values were determined by Step 2 of the preferred model. These values are subject to modification by the technical advisory committee, which will review each feature and factor.

Based on the preliminary assignment of suitability values, the GIS data needed for the projects were analyzed. A wide range of information completed for the broader Environmental Suitability Assessment developed by LPRCA is available to utilize in the LSA model. Each factor describes the GIS layer proposed to complete the analysis.

6.2.1 Land Suitability for Development and Mining

Based on the availability of data, the objectives of the LPRCA, and the land suitability analysis being performed for the other features, a suitability analysis for development and mining was determined to be addressed through the results of the other features' analysis. Land suitability analysis for the other features, will address suitability for each of these features individually. Stakeholders can review these results when making decisions as to the value of these areas for development and/or mining and the value it has as related to the feature of analysis. Development and/or mining will takes place when financially feasible and when constraints such as permitting and infrastructure are obtainable. Based on this reasoning, the development and mining features will not be analyzed individually, but will be up to the stakeholders to review the results of the other feature's analysis for guidance in making land use decisions.

6.2.2 Preliminary Suitability Values for Recreation

Preliminary suitability values for the recreation feature were determined from the review of LSA models. These values, which are proposed for this project, are shown in Table 11. The reference column in Table 11 indicates the LSA model that suggested the suitability value. A brief description of the proposed values for each factor follows:

- For recreation areas, the use of 100-year floodplains designated by the Federal Emergency Management Agency (FEMA) allows green spaces to protect the water quality in the area. Green spaces can be used as flood control and hazard mitigation and can reduce the costs of stormwater control for communities (Kramer and Dorfman, 2007). The FEMA Q3 digital files will be utilized to determine the suitability for this factor.
- The LSA model for the Upper Gila River Watershed suggested that the proximity of a recreation area to water was suitable from 0 to 1,000 feet, but unsuitable at a distance of 1,000 feet and greater (Steiner et al., 2000). The mapped wetland and stream GIS layers will be utilized to determine the suitability for this factor.
- Public access to the Platte River will be identified. Frequency and location of access points will be evaluated to identify suitability.
- The proximity to a population center is suggested to be suitable at a distance of 0 to 1.0 mile but unsuitable beyond 1 mile in distance (Steiner et al., 2000). A GIS layer with the city limits will be utilized to determine the population centers within the study area.
- The preferred existing land use for recreation areas are listed in Table 11. The types of land uses shown in Table 11 correspond to the CIS GIS layer created from a previous project, which will be utilized for the factor of recreation.

- The scenic value of an area is difficult to quantify because it depends on the values of the members of the community (Kramer and Dorfman, 2007). For this analysis, it is proposed to create a GIS layer of recreational state parks and other areas of recreational significance. A buffer will then be placed around these areas to assign suitability ratings, in order to preserve the scenic view from these recreational areas.
- Recreation areas can provide vital wildlife habitat in an urban setting, especially when the recreation area is able to extend a conservation area. Placing a recreation area adjacent to or within existing wildlife habitat preserves larger tracts of land (Kramer and Dorfman, 2007). The following wildlife GIS layers available will be utilized for this factor's analysis: federal or state protected lands, Nebraska Game and Parks Commission (NGPC) biologically unique landscapes, or NGPC natural communities.

Table 11 – Preliminary Suitability Analysis for Recreation

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Reference*	*Assigned Weight*
Numeric Criteria	0	1	2		
Floodplain	Outside of floodplain		Inside of 100-year floodplain	Toolkit for green space planning (Kramer and Dorfman, 2007)	1
Proximity to Water/Wetlands	5,000 feet and greater	1,000–5,000 feet	0–1,000 feet	LSA for the Upper Gila River Watershed (Steiner et al., 2000)	2
Public Access	Not within 5 miles of an access to the Platt River	One access point located within a 5 miles	Two access points located within a 5 miles		1
Proximity to Populations	5 miles or greater	1.0–5.0 miles	0.5–1.0 mile	LSA for the Upper Gila River Watershed (Steiner et al., 2000)	3
Existing Land Use	Barren	Urban, Agriculture	Range, Forest		2
Scenic Qualities	1 mile and greater from recreational area	0.5-1.0 mile from recreational area	Less than 0.5 mile from recreational area	Toolkit for green space planning (Kramer and Dorfman, 2007)	2
Existing Wildlife Corridors	Not adjacent to a permanent conservation protection area		Adjacent to or within a permanent conservation protection area	Toolkit for green space planning (Kramer and Dorfman, 2007)	2

6.2.3 Preliminary Suitability Analysis for Water Quality/Supply

Preliminary suitability values for the water quality/supply feature were determined from the review of LSA models. These values, which are proposed for the project, are shown in Table 12. The reference column in Table 12 indicates the LSA model that suggested the suitability value. A brief description of the proposed values for each factor follows:

- The proximity to existing infrastructure can influence water quality because of the infrastructure that exists within city limits, such as a central sewer and water. Rural residents must have individual septic systems, which in many cases are degraded and failing. The city limits GIS layer will be utilized to make this determination. Areas with

available infrastructure were assigned high suitability, whereas areas that require private infrastructure were assigned low suitability.

- Floodplains provide area for the storage of excess water and filtering of contaminants. Protected floodplains act as natural filters of containments and sediment; therefore, areas within the 100-year floodplain are ranked as having high suitability (Kramer and Dorfman, 2007). The FEMA Q3 digital files will be utilized to determine the suitability for this factor.
- Areas highly suitable for water quality protection are less than 30 feet from wetlands, lakes, and streams. Areas that are still suitable but not ideal are approximately 30 to 90 feet. Areas with low suitability are greater than 90 feet from wetlands, lakes, and streams (Barten and Ernst, 2004). A buffer will be applied to the following GIS layers to make this determination: mapped wetlands, streams, and lakes.
- In general, riparian forest vegetation and wetlands, particularly those that are approximately 10 to 50 meters wide, have been demonstrated as effective nutrient filters. Narrower riparian buffers (5 to 6 meters wide) may still reduce nutrient inflows (Mayer et al., 2006). Therefore, the stream GIS layer will be buffered 50 meters. The area within the buffer will be designated as high suitability, while the area outside will be low suitability for protecting water quality.
- The suggested existing land uses that would protect water quality are forestand Range. All other land uses were assigned low suitability (Barten and Ernst, 2004). Therefore, an the existing land use GIS layer from the CIS project will be utilized for this factor of water quality/supply.
- Areas with proximity to well head protection and groundwater recharge zones were assigned high suitability if within a wellhead protection zone. Areas outside of the well head protection area or groundwater recharge zones were assigned low suitability. A GIS layer of the wellhead protection zones is available for this analysis.

Table 12 – Preliminary Suitability Analysis for Water Quality/Supply

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Reference*	*Assigned Weight*
Numeric Criteria	0	1	2		
Proximity to Existing Infrastructure	Outside of existing infrastructure		Inside of existing infrastructure		1
Floodplain	No 100-year floodplain present		100-year floodplain present	Toolkit for green space planning (Kramer and Dorfman, 2007)	2
Proximity to Water/Wetlands	Greater than 90 feet	30–90 feet	Less than 30 feet	Land Conservation and Watershed Management (Barten and Ernst, 2004)	2
Riparian Buffers	Not within 50 meter buffer of stream		Within 50 meter buffer of stream	Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness (Mayer et al., 2006)	3
Existing Land Use	All others		Forest, Water, and Range	Land Conservation and Watershed Management (Barten and Ernst, 2004)	1
Proximity to Well Head Protection/ Groundwater Recharge Zones	Outside of a well head protection area		Inside a well head protection area		2

6.2.4 Preliminary Suitability Analysis for Wildlife/Conservation

Preliminary suitability values for the wildlife/conservation feature were determined from the review of LSA models. These values, which are proposed for the project, are shown in Table 13. The reference column in Table 13 indicates the LSA model that suggested the suitability value. A brief description of the proposed values for each factor follows:

- Existing easements located in the project area include the NRCS CRP and WRP areas, NRD held easements, and conservation easements held by the Nebraska Land Trust. Areas inside an easement were assigned high suitability because they are rich in habitat and provide needed shelter for wildlife.
- The proximity to water and wetlands determines the habitat available to wildlife as well as the areas where conservation is needed. Areas closer to water sources and wetlands provide habitat and opportunities to preserve riparian buffer communities. The streams and mapped wetland GIS layers will be utilized to determine the proximity to water and wetlands.
- The proximity to populations affects the wildlife habitat available and creates fragmentation of wildlife populations. Areas within city limits were assigned low suitability, whereas areas outside of city limits were assigned high suitability for wildlife/conservation. A city limits GIS layer will be utilized for the proximity to populations analysis.
- The Decision- Support LSA Model assessed the land uses categories for the feature of conservation. Through analysis of the runoff curve, the suitability ratings were proposed

for conservation. High suitability was assigned to forest areas pasture, recreational grasslands, wetlands, and open water (MacDonald, 2007). For this factor, the CIS GIS layer will be utilized, so high suitability will be assigned to Forest and Range. These existing land uses have been previously mapped. The preliminary suitability values for distance to existing wildlife corridors is based on the available wildlife data within the project area. Available GIS layers include federal or state protected land, NGPC biologically unique landscapes and native vegetation observed by NGPC. Areas within or adjacent to known habitat or potential habitat were assigned high suitability.

- Areas known to be T&E species habitat were assigned high suitability. Areas that are not T&E species habitat were assigned low suitability. Existing GIS layers of protected species habitat will be utilized for identifying the T&E habitat areas.
- Habitat can be diminished by the development of infrastructure creating fragmented habitat areas. The connection of habitats is a necessity for many species communities, and is a consideration for wildlife protection. Habitat connectivity will be determined by buffering riparian corridors that connect other areas of presumed habitat, such as forested areas, other riparian corridors, or other known natural areas.

Table 13 – Preliminary Suitability Analysis for Wildlife/Conservation

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*References*	*Assigned Weight*
Numeric Criteria	0	1	2		
Existing Easements	Outside of easement areas		Inside of easement areas		2
Proximity to Water	Areas that do not meet the high suitability criteria		Within 300 feet of edge of stream that drains 300 square miles (mi^2); 120 feet of edge of stream that drains 20–300 mi^2; 75 feet of edge of stream that drains 0.5–20 mi^2; or 25 feet of edge of stream that drains less than 0.5 mi^2	Decision-Support Model (MacDonald, 2007)	2
Proximity to Populations	Inside of city limits		Outside of city limits		1
Existing Land Use	Barren	Agriculture, Urban	Forest, Water, and Range	Decision-Support Model (MacDonald, 2007)	1
Existing Wildlife Corridors	Areas that do not meet medium or high suitability criteria	Within a mile of federal or state-protected land, NGPC biologically unique landscapes, or identified areas of native vegetation observed by NGPC	Inside of or adjacent to federal or state-protected lands, NGPC biologically unique landscapes, or identified areas of native vegetation observed by NGPC		3
Existing T&E Habitat	Outside of identified T&E habitat		Inside of identified T&E habitat		3
Habitat Connectivity	Not within a corridor	Within 1000 feet of a corridor	Within a corridor		2

6.2.5 Preliminary Suitability Analysis for Agriculture

Preliminary suitability values for the agriculture feature were determined from the review of LSA models. These values, which are proposed for the project, are shown in Table 14. The reference column of Table 14 indicates the LSA model that suggested the suitability value. A brief description of the proposed values for each factor follows:

- Land values can determine land use, especially the conversion of agricultural land to a developed area. The land value of less than $5,000 per acre is proposed as high suitability for agriculture land. A GIS layer of land values will be created by applying land values based on recent transactions and applied general to a region.
- Areas designated as agriculture within the comprehensive plan were assigned high suitability. Areas not designated as agriculture were assigned low suitability. The GIS layer of future land use will be utilized to determine the agricultural areas designated by the comprehensive plans.
- Depositional soils found within flat, broad floodplains comprise some of the best agricultural soils. High suitability is assigned to parcels within the FEMA-designated 100-year floodplain as delineated in the "Q3" data (Lewis County Agricultural Technical Advisory Committee, 2005). The GIS layer of FEMA Q3 will be utilized to determine the 100 year floodplain areas.
- For existing land use, the areas that are currently agriculture will be high suitability. An existing land use GIS layer created during the CIS project will be utilized to designate the agricultural areas. Proximity to well head protection zones should be considered for agricultural lands due to the application of fertilizers and pesticides. Locations within the well head protection areas are medium suitability and areas outside are high suitability. A GIS layer that displays the well head protection areas will be utilized.
- Areas that have irrigation development will be identified. Identification will include central pivot locations and/or registered wells. If a well is registered but no pivot is in place, a buffer of 1000 feet will be applied for areas of high suitability.
- The percent slope can also be determined for the suitability of agriculture. A GIS layer that displays areas greater than 9 percent slopes will be utilized to determine the suitability of areas. Areas greater than 9 percent slopes will be considered low suitability for agriculture land, while areas less than 9 percent slopes will be high suitability.
- The soil types for high, medium, and low suitability will be determined by prime farmland designation. Areas designated as prime farmland will be high suitability. The GIS layer for soils data will be utilized for this analysis.
- Although agricultural activities, including niche agriculture, may take place on smaller parcels of land, larger parcels are more suitable to typical agricultural activities, including row cropping and grazing. The suggested parcel sizes were taken from a land suitability analysis for Lewis County, Washington (Lewis County Agricultural Technical Advisory Committee, 2005). At this time, parcel size information does not exist for some areas of the study area. Therefore, it was determined to eliminate this factor from consideration.
- Farmsteads registered as a historic farmstead are assigned high suitability, whereas farmsteads not registered are assigned low suitability. The analysis will be conducted from a NHRP listed farmstead obtained from State Historical Preservation Office (SHPO).

Table 14 – Preliminary Suitability Analysis for Agriculture

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*References*	*Assigned Weight*
Numeric Criteria	0	1	2		
Land Values	>$10,000/ ac	Between $5,000 and $10,000/ac	<$5,000 / ac		2
Comprehensive Plans	Parcel is not designated as agriculture in the plan.		Parcel is designated as agriculture in the plan		1
Floodplain	Area is outside the 100-year floodplain.		Area is inside the 100-year floodplain.	Lewis County Agricultural Technical Advisory Committee, 2005	1
Existing Land Use	All other land uses		Agriculture	Decision-Support Model (MacDonald, 2007)	3
Proximity to Well Head Protection		Inside well head protection area	Outside of well head protection area		1
Site Improvements	No irrigation or registered wells within 1,000 feet		Irrigation or within 1,000 feet of a registered well		2
% Slope	Slopes greater than 9 percent		Slopes less than 9 percent		2
Soil Type	Not prime farmland; water features		Prime farmland		3
Parcel Size	Not recommended for inclusion at this time.				
Historic Farmsteads	Farmstead not registered as historic		Farmstead registered as historic		1

7.0 MODEL REFINEMENT

In an effort to establish a sound working model that would best evaluate feature suitability, a technical workgroup was formed. The technical workgroup, referred to as the technical advisory committee (TAC), consisted of experts from various resource disciplines. Members of the TAC included representatives from:

- USDA Natural Resources Conservation Service
- U.S. Fish and Wildlife Service
- Nebraska Department of Environmental Quality

- Nebraska Department of Natural Resources
- Nebraska Game and Parks Commission
- Nebraska State Historical Society
- Nebraska Land Trusts
- Natural Resource Districts employees and board members
- City planning administrators

The TAC first convened on July 9, 2009. The intent of the first meeting was to review the model selection process, the features to be analyzed, the factors that comprise each feature, the suitability ratings for each factor, and the assigned weight for each factor. A second meeting was held on December 2, 2009. The purpose of this meeting was to discuss the changes made to the model based on the first meeting at to review the assigned weights for each feature. The following is a summary of the meeting discussion.

7.1 Model Selection

The justification for the technical-based model using an assigned weighting system for factors was presented to the TAC. This type of model was the preferred model for the TAC, with notable discussion relevant to the assigned weights for each factor. The potential for overlapping factors and interdependency of factors is an issue for this type of analysis. It was discussed that the weights would be reviewed in context with each factor for each feature.

7.2 Feature Selection

The features originally provided were the result of a discussion with NRD management. Those five features were:

- Development and Mining
- Recreation
- Water Quality/Supply
- Wildlife/Conservation
- Agriculture

The following provides a discussion of each feature and outcome of those discussions.

7.2.1 Development and Mining

A Land Suitability Analysis for Development and Mining was presented as a feature for which, through preliminary assessment, would not be modeled. The rationale for this decision (Section 6.2.1) is that a stakeholder can use the analysis for the other features in making land use decisions. The determination for a stakeholder relative to development and mining suitability is based on a priority use of the land.

7.2.2 Recreation

The recreation feature was reviewed and the TAC determined that factors that recreation should be discussed in two forms: water-based and land –based. The intent of water-based recreation is to focus on suitable areas for boating and fishing, providing the public with areas ideal for these activities. The intent of land-based recreation is to focus on suitable areas for camping and hiking, providing the public with ideal areas for these activities. Separating these two forms of recreation

will allow the modeling effort to take into account any difference in factors and analysis of these two different types of recreation.

7.2.3 Water Quality/Supply

After review of this feature and the intent of the land suitability analysis for this feature, protection of this resource was determined to be the ultimate goal. The intent of this feature is to focus on areas that are vulnerable to water quality issues such as recharge areas for groundwater. Protection of water supply was determined not be to a goal for this feature. Therefore, this feature was renamed as Land Suitability for Water Quality Protection.

7.2.4 Wildlife/Conservation

The TAC determined that the intent of conservation is to protect areas that contain valuable habitats, contain significant cultural history, and possess scenic qualities. Conservation, by nature, will benefit wildlife. Therefore, it was determined that a land suitability analysis for land preservation would provide benefits for wildlife species as well as anthropogenic resources.

7.2.5 Agriculture

The feature of agriculture was determined to be appropriate for a land suitability analysis. The intent of suitability for agriculture is to aid in determining areas that optimize crop production, particularly row crops. However, the TAC was also interested land suitability for niche agriculture. For the purpose of this study, niche agriculture is defined as production of crops that are traditionally locally unavailable or not produced for commercial distribution. The intent of developing a land suitability for niche agriculture is to aid in identifying areas that are bust suited for crops such as vegetables, fruits, etc, that can provide adjacent communities with produce. Therefore, two land suitability analyses would be performed, one for traditional agriculture and one for niche agriculture.

7.3 Factors, Suitability, and Weights

Factors and weights were then discussed for each land suitability analysis feature. The following tables provide a general discussion of the factors considered, those that were added and eliminated, suitability criteria, and weights. Attachment A contains the complete Preliminary Draft Model Suitability Analysis Tables.

7.3.1 Water-Based Recreation

Table 15 – Preliminary Suitability Analysis for Water-Based Recreation

Factors	*Discussion*	*Assigned Weight*
Floodplain	Dismissed as a factor as floodplains were determined not to be of significance as a factor for water-based recreation. Other factors, such as proximity to water/wetlands provide the factor of importance for this feature.	NA
Proximity to Water/Wetlands	Retained as a factor with suitability priority provided to closer proximity to the resource.	Weighting of 2 was determined appropriate
Public Access	Retained as a factor. Suitability for this factor was addressed address obstructed or unobstructed access (or no access). Obstructed access are barriers such as interstates and railroads. Areas of no access are obvious areas that are restricted, such as well fields, active (or non-active) sand and gravel operations.	Weighting of 1 was determined appropriate
Proximity to Populations	Dismissed as a factor as it is important to have recreation closer to populations due to user numbers, it does not make it more or less	NA

Factors	Discussion	Assigned Weight
	suitable.	
Existing Land Use	Retained as a factor with higher suitability provided to low impact land uses.	Weighting of 1 was determined appropriate
Scenic Qualities	Dismissed as a factor as water-based recreation, scenic qualities were not a factor thought to be of importance.	NA
Existing Wildlife Corridors	Dismissed as a factor as, for water-based recreation, existing wildlife corridors were not a factor thought to be of importance.	NA
Proximity to Public Lands	Added as a factor. Utilized distance to public lands as a suitability factor.	Weighting of 2 was determined appropriate
Proximity to Existing Roadways/Trails	Added as a factor. Utilized distance to public roads and trails to assess suitability.	Weighting of 2 was determined appropriate
Public Access to the Platte River	Added as a factor. Addresses the importance of this for water-based recreation and used proximity to existing public access points as the means to assess suitability.	Weighting of 3 was determined appropriate

7.3.2 Land-Based Recreation

Table 16 – Preliminary Suitability Analysis for Land-Based Recreation

Factors	Discussion	Assigned Weight
Floodplain	Dismissed as a factor as floodplains were determined to not to be of significance as a factor for land-based recreation.	NA
Proximity to Water/Wetlands	Dismissed as a factor as it was determined not to be important in evaluation of land-based recreation.	NA
Public Access	Retained as a factor. Suitability for this factor was addressed address obstructed or unobstructed access (or no access). Obstructed access are barriers such as interstates and railroads. Areas of no access are obvious areas that are restricted, such as well fields, active (or non-active) sand and gravel operations.	Weighting of 1 was determined appropriate
Proximity to Populations	Dismissed as a factor because while it is important to have recreation closer to populations due to user numbers, it does not make it more or less suitable.	NA
Existing Land Use	Retained as a factor and suitability criteria remained unchanged.	Weighting of 3 was determined appropriate
Percent Slope	Added as a factor. Determined that, in general, areas with more relief would be more suitable for land-based recreation due to potential views and topography.	Weighting of 1 was determined appropriate
Scenic Qualities	Dismissed as a factor. While scenic qualities were important for consideration, due to the variation of potential land-based recreation opportunities, acriteria for suitability could not be determined.	NA
Existing Wildlife Corridors	Dismissed as a factor due to lack of data for locations of wildlife corridors and relevance (or conflict) to land-based recreation.	NA
Proximity to Public Lands	Added as a factor. Utilized distance to public lands as a suitability factor.	Weighting of 2 was determined appropriate

Factors	Discussion	Assigned Weight
Proximity to Existing Roadways/Trails	Added as a factor. Utilized distance to public roads and trails to assess suitability.	Weighting of 2 was determined appropriate

7.3.3 Water Quality Protection

Table 17 – Preliminary Suitability Analysis for Water Quality Protection

Factors	Discussion	Assigned Weight
Proximity to Existing Infrastructure	Dismissed as a factor. While an important component relative to waste-water infrastructure, mapping and updating of this resource is currently not available. Further, with the focus on water quality protection, areas that have existing infrastructure does not effect the physical parameters of an area relative to vulnerability to water quality issues, other than existing land use which remains a factor for this feature.	NA
Floodplain	Dismissed as a factor because other factors were added that address conditions that would be contained in a floodplain (soil permeability, groundwater vulnerability).	NA
Proximity to Water/Wetlands	Retained as a factor and the suitability criteria were adjusted to address areas closer to a water source were more suited (or important) for protection.	Weighting of 2 was determined appropriate
Riparian Buffers	Dismissed as a factor as the proximity to water/wetlands factor adequately addresses the riparian areas.	NA
Existing Land Use	Retained as a factor and suitability criteria remained unchanged.	Weighting of 2 was determined appropriate
Proximity to Well Head Protection	Retained as a factor with focus on well head protection areas. Adjusted the criteria for suitability to give high suitability (protection) to areas inside a well head protection area.	Weighting of 2 was determined appropriate
Soil Permeability	Dismissed as a factor as it is a component of groundwater vulnerability	NA
Soil Erodibility	Added as a factor. Uses NRCS erodibility factors for soil types for criteria for suitability, with areas with higher factors more suitable for protection. This factor addresses surface water runoff.	Weighting of 2 was determined appropriate
Groundwater Vulnerability	Added as a factor as a method to address groundwater vulnerability. The DRASTIC[1] method will be implemented and ranges of values to address protection to groundwater.	Weighting of 2 was determined appropriate

[1] The seven variables from which the name of the model isderived, include Depth to water, Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone, and Conductivity (hydraulic).

7.3.4 Land Preservation

Table 18 – Preliminary Suitability Analysis for Land Preservation

Factors	Discussion	Assigned Weight
Existing Easements	Existing easements was incorporated into a new factor for protected lands. It was determined that protected lands were more inclusive than focusing solely on easements. In addition, conservation reserve program easements through NRCS would not be used due to there short-term nature and dynamic nature of these lands.	NA

Factors	Discussion	Assigned Weight
Proximity to Protected Lands	Added as a factor to consider all areas of protected lands with a higher suitability to those areas closer to these protected lands.	Weighting of 2 was determined appropriate
Proximity to Water	Retained as a factor for suitability. Focused on distances from streams, while considering stream size as a component of setbacks for suitability determinations.	Weighting of 2 was determined appropriate
Proximity to Populations	Retained as a factor and the suitability criteria were adjusted to address areas closer to a water source were more suited (or important) for protection.	Weighting of 2 was determined appropriate
Existing Land Use	Retained this factor for suitability. Focused on low impact land uses for higher suitability and developed/high impact land use for low suitability.	Weighting of 2 was determined appropriate
Existing Wildlife Corridors	Dismissed as a factor due to duplication among other factors.	NA
Existing T&E Habitat	Retained as a factor. Adjusted the criteria for suitability to focus on inside verses outside of established ranges.	Weighting of 2 was determined appropriate
Habitat Connectivity	Dismissed as a factor due to duplication among other factors.	NA
Historical/ Cultural Resources	Added as a factor to address locations to historic and cultural sites. Cannot show this factor independently due to confidentiality, but can use as a component within the analysis. Address suitability criteria as those areas being closer in proximity to a site receiving higher suitable than lands further from sites.	Weighting of 2 was determined appropriate

7.3.5 Agriculture

Table 19 – Preliminary Suitability Analysis for Agriculture

Factors	Discussion	Assigned Weight
Land Values	Dismissed as a factor due to focus on physical parameters for suitability.	NA
Comprehensive Plans	Dismissed as a factor due focus on physical parameters for	NA
Floodplain	Retained as a factor with focus of high suitability being within the 100-yewar floodplain.	Weighting of 1 was determined appropriate
Floodway	Added as a factor to identify the floodway and to exclude all areas within the floodway as no suitability and therefore eliminated from analysis.	NA
Existing Land Use	Retained as a factor in an effort to have a factor that addresses the value of range/pasture land as part of this feature. The suitability criteria identified currently developed areas as no suitability, thereby eliminating those areas from analysis. Land uses currently used as range land received a high suitability. Areas in row crop production received a medium suitability. Natural areas were a low suitability.	Weighting of 2 was determined appropriate
Proximity to Well Head Protection	Retained as a factor with high suitability for areas outside of a well head protection area.	Weighting of 1 was determined appropriate

Factors	Discussion	Assigned Weight
Site Improvements	Dismissed as a factor due to broad nature of site improvements. However, a new factor was added that focused this factor on irrigation wells and surface water diversions.	NA
Irrigation Wells/ Surface Diversions	Added as a factor to address on-site improvements conducive to agriculture production. Suitability criteria focused on locations to a registered agricultural well or visible surface (or pivot) irrigation.	Weighting of 2 was determined appropriate
% Slope	Retained as a factor. Suitability criteria based on steeper slopes being less suitable for row crop production.	Weighting of 2 was determined appropriate
Soil Type	Dismissed as a factor due to broad range of soil types. Added Land Classifications as a facto to address soil types.	NA
Riparian Buffers	Added as a factor to address that areas closer to a water source are less suitable for agriculture.	Weighting of 3 was determined appropriate
Land Capability Classifications (LCC)	Added as a factor to identify areas for which suitability for crop production, based on NRCS criteria, is more or less suitable for agricultural production.	Weighting of 3 was determined appropriate
Parcel Size	Dismissed as a factor as parcel size is not available for the study area nor indicate how land is distributed and managed.	NA
Historic Farmsteads	Dismissed as a factor as this is a factor for preservation.	NA

7.3.6 Niche Agriculture

As this was a newly added feature, all factors are new. Factors were determined based on review of factors for agricultural suitability and re-assessing suitability determinations and weights for niche-agriculture purposes.

Table 20 – Preliminary Suitability Analysis for Niche Agriculture

Factors	Discussion	Assigned Weight
Floodplain	Included factor with focus of high suitability being within the 100-yewar floodplain.	Weighting of 1 was determined appropriate
Floodway	Included as a factor to identify the floodway and to exclude all areas within the floodway as no suitability and therefore eliminated from analysis.	NA
Proximity to Well Head Protection	Included as a factor with high suitability for areas outside of a well head protection area.	Weighting of 1 was determined appropriate
Irrigation Wells/ Surface Diversions	Included as a factor to address on-site improvements conducive to agriculture production. Suitability criteria focused on locations to a registered agricultural well or visible surface (or pivot) irrigation.	Weighting of 2 was determined appropriate
% Slope	Included as a factor. Suitability criteria based on steeper slopes being more suitable for some applications of niche agriculture.	Weighting of 2 was determined appropriate
Riparian Buffers	Included as a factor to address that areas closer to a water source are less suitable for agriculture.	Weighting of 3 was determined appropriate
Land Capability Classifications (LCC)	Included as a factor to identify areas for which suitability for crop production, based on NRCS criteria, is more or less suitable for agricultural production.	Weighting of 3 was determined appropriate

Factors	Discussion	Assigned Weight
Proximity to Populations	Included as a factor to address ability to provide farm to market services.	Weighting of 2 was determined appropriate

8.0 DRAFT MODEL SUITABILITY ANALYSIS

8.1 ArcGIS ModelBuilder

As a means to apply the factors and associated weights of each model in a geospatial environment, ArcView's ModelBuilder application was selected as the software to compile these factors to produce the land suitability output for each of the features. ModelBuilder is an application inside of ArcGIS in which you create, edit, and manage models. The advantage creating a model is that it automates a desired series of analysis that would otherwise need to be executed individually then compiled. When a model is created in ModelBuilder, the input set of tasks, or a workflow, can be executed multiple times and is preserved for future use or adaptation. There are an infinite number of workflows that can be automated using models. Models are created by chaining together a series of tools (2010, Esri.com).

8.2 LSA Model Development

The models built for the Land Suitability Analysis (LSA) project were designed to analyze and manipulate raster based formats. A raster file consists of grids or cells; each cell is assigned a value. A value can represent features such as water, grass, pavement, elevation, and so on. A vector file format consists of points, lines, and polygons. Vector file formats can also be assigned values based on various features.

The objective of the LSA models was to analyze the factors identified (that includes land uses , land cover, land features) to determine areas of high, medium, or low suitability for a land feature within the designated study area. In order to produce accurate results, it was essential to use an overlay analysis. An overlay analysis looks layers of information, virtually stacked on top of each other, in order to identify how those layers interact with each other. This type of analysis can use both vector or raster formats. For this LSA, it was found that using a raster overlay analysis would be most beneficial because each cell of each raster layer references the same geographic location and spatial resolution.

The LSA models uses multiple layers (factors). Some of the layer's native formats were vectors while others were raster. Each layer needed to be assigned the same coordinate system, and spatial resolution. All features reference the Nebraska State Plane Feet (NAD83) coordinate system. The raster's spatial resolution or cell size was set to match the University of Nebraska 2005 Land Use Patterns raster dataset at 93.48 feet.

ModelBuilder was used to convert multiple vector layers to raster layers and setting the output raster cell size to 93.48 feet. Native raster layers used in the overlay were also set to the defined output cell size. Prior to converting vector layers to raster layers, model builder assigned values to vector layers. Several geo-processing tools were also used inside of model builder. For example the buffer tool was used to add additional surface area to a vector file such as stream. The buffered stream was then assigned values previously determined. The stream file was then converted to a raster layer matching the cell size and geographic location of other converted features. The newly created raster layers were then added together using weighted factors within ModelBuilder to achieve the final output.

8.3 Draft Model Suitability Analysis

As described in 8.2 above, a model was built for each land suitability analysis feature. As the model was built on the geospatial limits of the suitability factors applied, it became obvious that the following changes would be made for each feature (Draft Model Suitability Analysis tables are available in Attachment B):

8.3.1 Suitability Analysis for Water Based Recreation

Public Access was eliminated as a factor. This is because it was not possible to determine obstructed verses unobstructed access to the various features. There was substantial subjectivity involved and the effort would not be able to be replicated. Therefore, this factor was eliminated.

8.3.2 Suitability Analysis for Land Based Recreation

Public Access was eliminated as a factor. This is because it was not possible to determine obstructed verses unobstructed access to the various features. There was substantial subjectivity involved and the effort would not be able to be replicated. Therefore, this factor was eliminated.

8.3.3 Suitability Analysis for Water Quality Protection

No changes were necessary to the factors for this feature.

8.3.4 Suitability Analysis for Land Preservation

Through discussion with TAC representatives familiar with aspects of land preservation, the Scenic Qualities factor was determined to be identical to the Proximity to Protected Lands factor in its intent. For this reason, the factor of Scenic Qualities was eliminated.

8.3.5 Suitability Analysis for Agriculture

No changes were necessary to the factors for this feature.

8.3.6 Suitability Analysis for Niche Agriculture

No changes were necessary to the factors for this feature.

8.4 Results

The results of the Draft Model are provided in Attachment B. These results show the individual factor analysis and the composite suitability mapping.

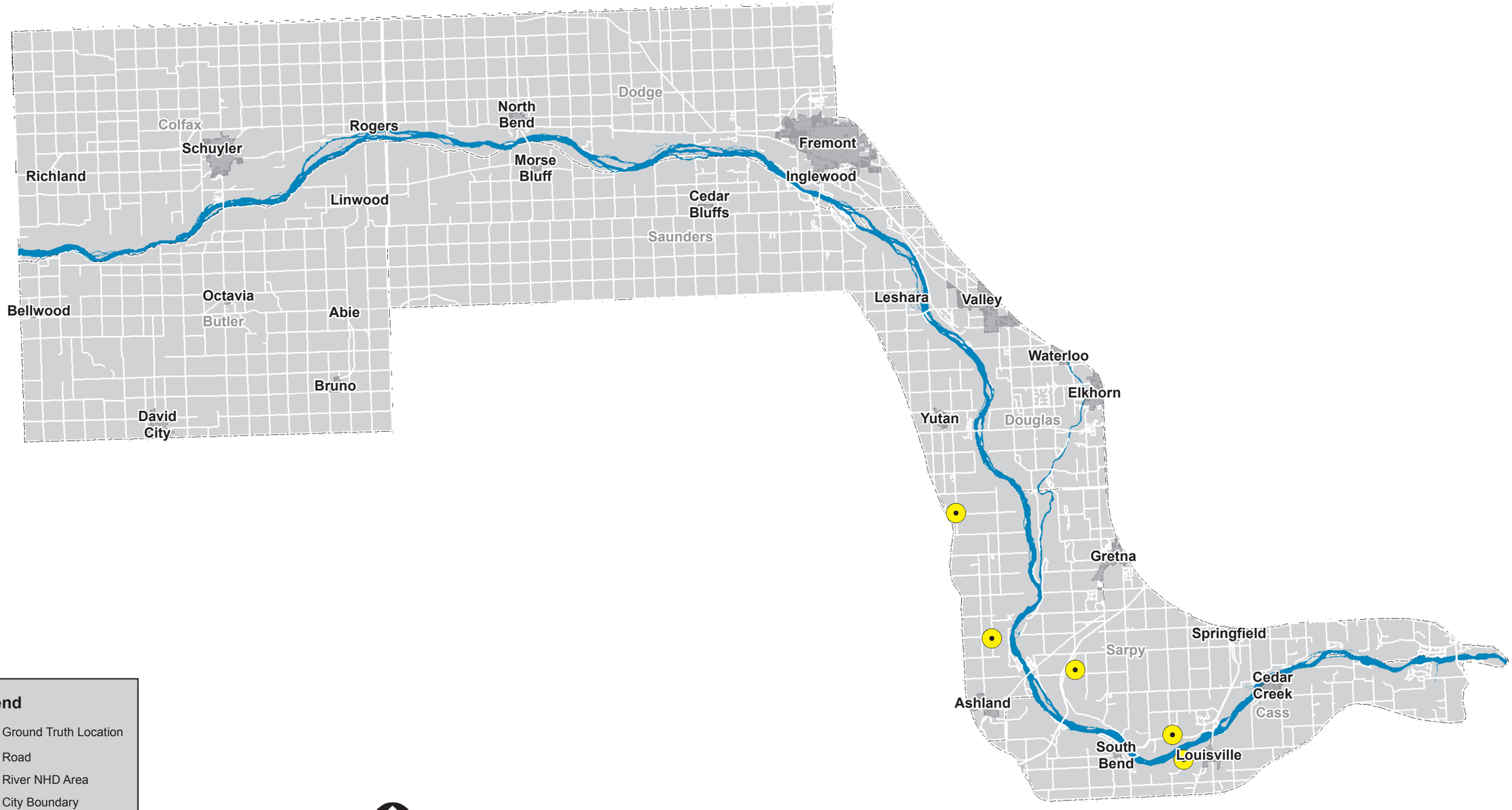
9.0 MODEL REVISIONS AND FINALIZATION

9.1 Field Review

The Draft Model Suitability Analysis results were reviewed in the field to determine if the model results accurately reflect or mimic what one would expect on the landscape. Multiple locations were selected to perform the proof-of-concept and are depicted in Figure 1.

The field review indicated that, in some circumstances, the model was not useful in identifying land suitability for a feature in a way that would be valuable to a local stakeholder. In other cases, minor changes to the factor suitability were evaluated to improve the functionality of the model.

Based on this review, preliminary model revisions were developed for each the following land features. These modifications are described in the following sections (changed items in bold, deleted items in strikeout text).



Legend

- Ground Truth Location
- Road
- River NHD Area
- City Boundary
- Study Area
- Counties

0 2.5 5 10
Miles

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Ground Truthing Locations

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DATE
June 2011

FIGURE
1

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\LSA_Ground_Truth_Figure_B_1.mxd

9.1.1 Suitability Analysis for Water Based Recreation

The results for this analysis did not yield useful results due to the wide range of factors used to determine suitability. For example, all waters and wetland polygons were buffered by various distances to determine suitability. Therefore, anywhere within a the specified distances would indicated some suitability for water based recreation, even if the source of the buffer is not suitable for water based recreation itself. Based on this factor alone, the model was not providing useful suitability analysis.

Because of this, it was recommended to refine this model to a specific source, the Platte River, to determine suitable locations for river access and amenity locations. The following criteria were suggested:

Criteria	*Description*
Distance Between Access Points	A distance of 5 miles was used as the desire distance between Platte River access points. This point was "buffered by 1 mile both upstream and downstream (access zone).
Public Road Crossing	This criteria was used to isolate locations of a public road crossing or location where a public road is within 500 feet of a river bank.
Adjacent Land Use	For each potential access zone, land use was reviewed to determine locations of land in a private easement, or under public ownership

This feature would not be modeled using ModelBuilder, but would be developed as a layer to be used in combination with other analysis or data layers.

9.1.2 Suitability Analysis for Land Based Recreation

For this feature, the existing land use factor was modified by moving agriculture land use from the medium suitability category to low suitability category. The decision for this move was because of the fast amount of land use in agriculture and that its suitability in its current land use state is not of medium suitability.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Existing Land Use	Urban, **Agriculture**	~~Agriculture~~	Range, Forest	~~3~~1
Percent Slope	0-3%	3-9%	>9%	1

Proximity to Public Lands	Greater than 1 mile from public land		Within 1 mile of public land	~~2~~3
Proximity to roadways/trails	Greater than 1 mile	½ mile- 1 mile	0 - ½ mile	2

9.1.3 Suitability Analysis for Water Quality Protection

The Proximity to Water/Wetlands factor suitability was adjusted to provide for a larger difference in distances to a water/wetlands from a water quality protection stand point. In addition, Agriculture was recommended to be added as a land use of high suitability for water quality protection and forest, water, and range was moved to medium suitability. Weights

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Proximity to Water/Wetlands	Greater than ~~150~~ **1000** feet	~~100-150~~ **1,000 -- 500** feet	Less than ~~100-~~**500** feet	2
Existing Land Use	All others	**Forest, Water, and Range**	~~Forest, Water, and Range~~ **Agriculture**	~~2~~**1**
Proximity to Well Head Protection	Outside of a well head protection area		Inside a well head protection area	2
Soil Erodibility	0.0-0.22	0.23-0.44	0.45 - 0.69	~~2~~**3**
Groundwater Vulnerability (DRASTIC Index)	2-0	5-3	9-6	~~2~~**3**

9.1.4 Suitability Analysis for Land Preservation

For this feature, the Level 7 streams were suggested to be moved to medium suitability for the proximity to water/wetland factor. This is because of their small size.

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Proximity to Protected Lands	Inside of easement areas	Greater than 1 mile from protected land		Within 1 mile of protected land	2
Proximity to Water		Areas that do not meet the high suitability criteria	**Within 150 Feet of Level 7**	NHD Data Set Levels: Within 300' of Level 3 Within 250' of Level 4 Within 200' of Level 5 and 6 ~~Within 150 Feet of Level 7~~	2

Factors	No Suitability	Low Suitability	Medium Suitability	High Suitability	Assigned Weight
Existing Land Use		Agriculture, Urban		Forest, Water, and Range	2
Existing T&E Habitat		Outside of identified T&E range		Inside of identified T&E range	2
Historic/ Cultural Resources		Outside of ¼ mile of historic/cultural site		Within ¼ mile of historic/cultural site	2

9.1.5 Suitability Analysis for Agriculture

No changes were made to the factors for this feature.

9.1.6 Suitability Analysis for Niche Agriculture

No changes were necessary to the factors for this feature. However, through the filed review, it was not clear how much different this feature is from Agriculture or how it would benefit the niche agriculture community due to the broadness of niche agriculture environment.

9.2 Final Model Revisions

The preliminary model revisions were discussed with members of the TAC. Based on these discussions, the following changes were made to the each suitability analysis, respectively, the models were finalized and outputs of the model were produced. Attachment C provides the Final Model Suitability Analysis Tables and associated model outputs.

9.2.1 Suitability Analysis for Water Based Recreation

The TAC concurred with the decision to eliminate this feature and modify it to develop a layer for the purpose of identifying potential locations of access points and amenities along the Platte River.

9.2.2 Suitability Analysis for Land Based Recreation

The TAC determined that the factors and weighting used for this feature needed some revision. Proximity to public land was retained, but the weighting changed from a 2 to a 1. Also, considered the factor “Proximity to roadways/trails” to be inaccurate. At this time, only linear trails are being used as a factor as roadways are very prevalent in the Study Area and do not distinguish one area from another. This factor to be renamed to “Proximity to Linear Trails”. The weighting for “Existing Land Use” was changed from a 3 to a 2 and “Percent Slope” was changed from a 1 to a 2.

9.2.3 Suitability Analysis for Water Quality Protection

No changes were made to the factors, suitability determinations for each factor, nor the weights associated with each factor. However, one comment was to add the National Hydrologic Dataset as part of the Proximity to Water/Wetlands coverage. In addition, one clarification was suggested for the Existing Land Use Factor. For this factor, the “all other” land use grouping for low suitability was defined to include barren areas, roads, and urban areas.

9.2.4 Suitability Analysis for Land Preservation

No changes were made to the factors, suitability determinations, or weights for this feature.

9.2.5 Suitability Analysis for Agriculture

No changes were made to the factors, suitability determinations, or weights for this feature. However, stream levels 5-8 were added to the data set for the Riparian Buffers factor.

9.2.6 Suitability Analysis for Niche Agriculture

This suitability analysis was eliminated due to the wide range of types of niche agriculture and the corresponding range of conditions that may support a certain type of niche agriculture. For example, land suitability for grape production for a winery is different than vegetable production. Fruit trees or other specific botanical or forestry production could also be included as niche agriculture and therefore widens this range of potential land suitably. The model could be limited to a specific type of niche agriculture if it were deemed important.

10.0 MODEL ADAPTATIONS

As land uses continue to change, growth and development continues, and preferences for how development and natural areas are viewed, the models as developed for the LSA can be adapted to meet different needs. The following are potential model adaptations that could be performed if stakeholders deem valuable:

- Predictive Capabilities – Each model can be modified to reflect a potential change in future condition or to reflect a higher or lower degree of conservation practices in relation to a particular factor of the model. For example, future land use can be change to reflect a more developed condition to see how that may impact land suitable for features developed for this LSA model. As an example to of a change in conservation practices, buffer widths to waters/wetlands could be increase or decreased to see how this would affect land suitability.
- Land based recreation – There are many forms of land based recreation. This can include hiking, bike riding, sport activities (soccer, baseball, etc.), upland game hunting, large game hunting, etc. Each of these types of activities have different land form characteristics. The LSA model for Land Based Recreation focused on camping and hiking. However, different models could be built to show the importance of different areas for the different types of land based recreation.
- Niche Agriculture – A more detailed analysis of the importance of niche agriculture could be performed that explores the supply and demand of this type of industry at an economic level. Depending on the supply and demand, if the demand for a certain type of product is not being met, a model could be developed specific to that product.

In addition to these potential model adaptations, if newer information becomes available that could update an existing factor for any of the models, the newer information should be incorporated into the respective model to provide the best available information.

11.0 REFERENCES

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ATTACHMENT A

PRELIMINARY DRAFT-MODEL SUITABILITY ANALYSIS TABLES

Preliminary Draft-Model Suitability Analysis for Recreation- Water Based (boating, fishing)

The intent of the Feature: The Recreation- Water Based feature focuses on suitable areas for boating and fishing, providing the public with areas ideal for these activities.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Proximity to Water/Wetlands	5,000 feet and greater	1,000–5,000 feet	0–1,000 feet	2
Public Access	No Access	Obstructed Access	Unobstructed Access	1
Existing Land Use	Urban	Agriculture	Range, Forest	1
Proximity to Public Lands	Greater than one mile from public land		Within 1 mile of public land	2
Proximity to existing roadways/trails	Greater than one mile from existing roadways/trails	½ mile to 1 mile from existing roadways/trails	0 to 1/2 mile from existing roadways/trails	2
Public Access to Platte River	Not within 5 miles of an access to the Platte River	One access point located within 5 miles	Two access points located within 5 miles	3

Preliminary Draft Model Suitability Analysis for Recreation- Land Based (camping, hiking)

The intent of the Feature: The Recreation- Land Based feature focuses on suitable areas for camping and hiking, providing the public with areas ideal for these activities.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Public Access	No Access	Obstructed Access	Unobstructed Access	1
Existing Land Use	Urban	Agriculture	Range, Forest	3
Percent Slope	0-3%	3-9%	>9%	1
Proximity to Public Lands	Greater than 1 mile from public land		Within 1 mile of public land	2
Proximity to roadways/trails	Greater than 1 mile	½ mile- 1 mile	0 - ½ mile	2

Preliminary Draft Model Suitability Analysis for Water Quality Protection- Groundwater and Surface Water

The intent of the Feature: The Groundwater and Surface Water feature focuses on protecting areas that are vulnerable to water quality issues such as recharge areas for groundwater and surface water degradation.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Proximity to Water/Wetlands	Greater than 150 feet	100–150 feet	Less than 100 feet	2
Existing Land Use	All others		Forest, Water, and Range	2
Proximity to Well Head Protection/	Outside of a well head protection area		Inside a well head protection area	2
Soil Erodibility	0.0-0.22	0.23-0.44	0.45 - 0.69	2
Groundwater Vulnerability (DRASTIC Index)	2-0	5-3	9-6	2

Preliminary Draft Model Suitability Analysis for Land Preservation

The intent of the Feature: The Land Preservation feature focuses on protecting areas that are valuable habitats, cultural resources present, and possess a scenic quality that should be preserved.

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Proximity to Protected Lands	Inside of easement areas	Greater than 1 mile from protected land		Within 1 mile of protected land	2
Proximity to Water		Areas that do not meet the high suitability criteria		NHD Data Set Levels: Within 300' of Level 3 Within 250' of Level 4 Within 200' of Level 5 and 6 Within 150' of Level 7	2
Existing Land Use		Agriculture, Urban		Forest, Water, and Range	2
Existing T&E Habitat		Outside of identified T&E range		Inside of identified T&E range	2
Scenic Qualities		1 mile and greater from recreational area	0.5-1.0 mile from recreational area	Less than 0.5 mile from recreational area	2
Historic/ Cultural Resources		Outside of ¼ mile of historic/cultural site		Within ¼ mile of historic/cultural site	2

Preliminary Draft Model Suitability Analysis for Agriculture

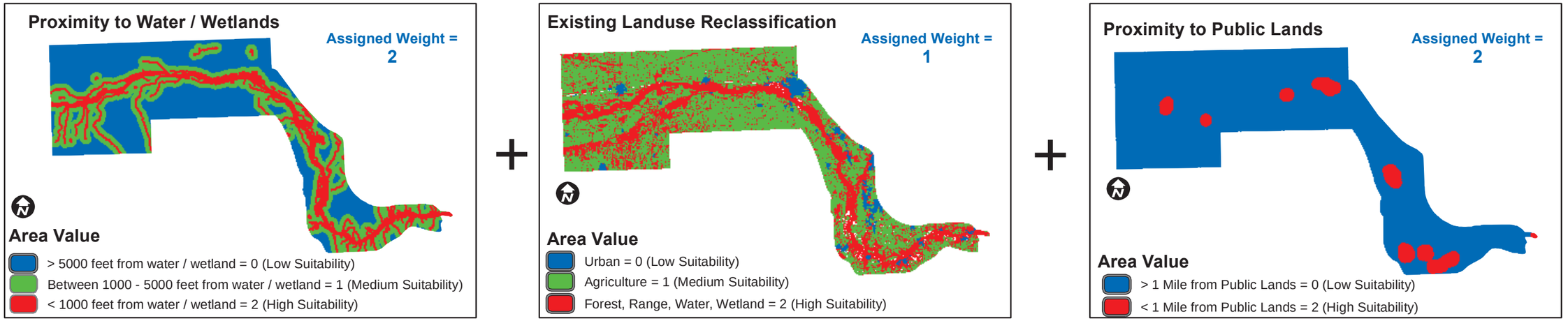
The intent of the Feature: The Agriculture feature focuses on areas of farmland that provide sustainable production of crops, with an emphasis on row crops

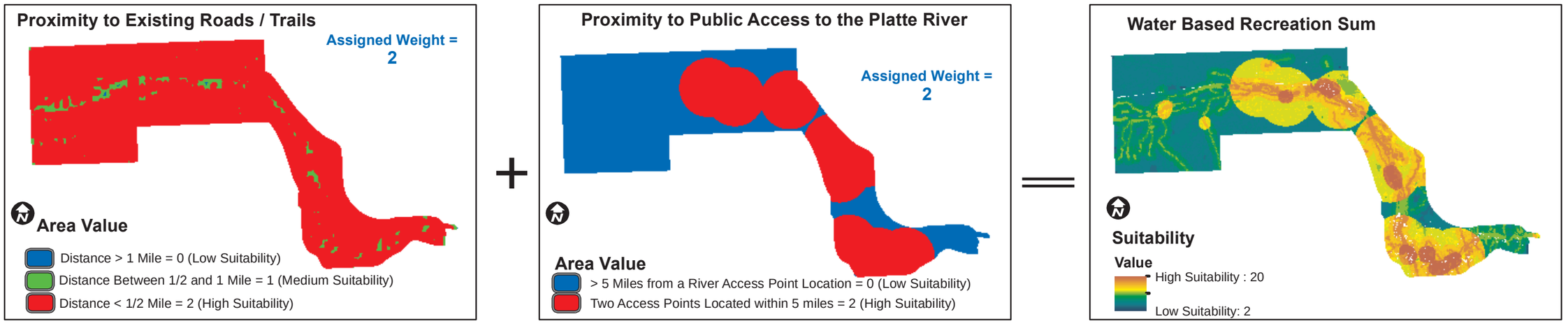
Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Floodplain		Area is outside the 100-year floodplain.		Area is inside the 100-year floodplain.	1
Floodway	Within Floodway				N/A
Existing Land Use	Urban	Forest/Water	Agriculture	Range	2
Proximity to Well Head Protection			Inside well head protection area	Outside of well head protection area	1
Irrigation Wells/ Surface Diversions			No irrigation or registered wells within 1,000 feet	Irrigation or within 1,000 feet of a registered well	2
% Slope		Slopes greater than 9 percent	2-9 percent slopes	Slopes less than 9 percent	2
Riparian Buffers		Within 100 feet from water source	Between 100 and 150 feet from a water source	Greater than 150 feet from a water source	3
Land Classification/ LCCs		> 4	3	1,2	3

Preliminary Draft Model Suitability Analysis for Niche Agriculture

The intent of the Feature: The Niche Agriculture feature focuses on those areas that are best suited for crops such as vegetables, fruits, etc. that can provide adjacent communities with produce.

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Floodplain		Area is outside the 100-year floodplain.		Area is inside the 100-year floodplain.	1
Floodway	Within Floodway				N/A
Proximity to Well Head Protection			Inside well head protection area	Outside of well head protection area	1
Irrigation Wells/ Surface Diversions		No irrigation or registered wells within 1,000 feet		Irrigation or within 1,000 feet of a registered well	2
% Slope		Slopes less than 9 percent	Slopes greater than 9 percent	2-9 percent slopes	2
Riparian Buffers		Within 100 feet from water source	Between 100 and 150 feet from a water source	Greater than 150 feet from a water source	3
Land Classification/ LCCs		> 4	3	1,2	3
Proximity to Populations		Greater than 50 miles from city limits	30 to 50 miles from city limits	Less than 30 miles from city limits	2





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Environmental Suitability Assessment

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Water Based Recreation Suitability Analysis
Draft Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
A-1

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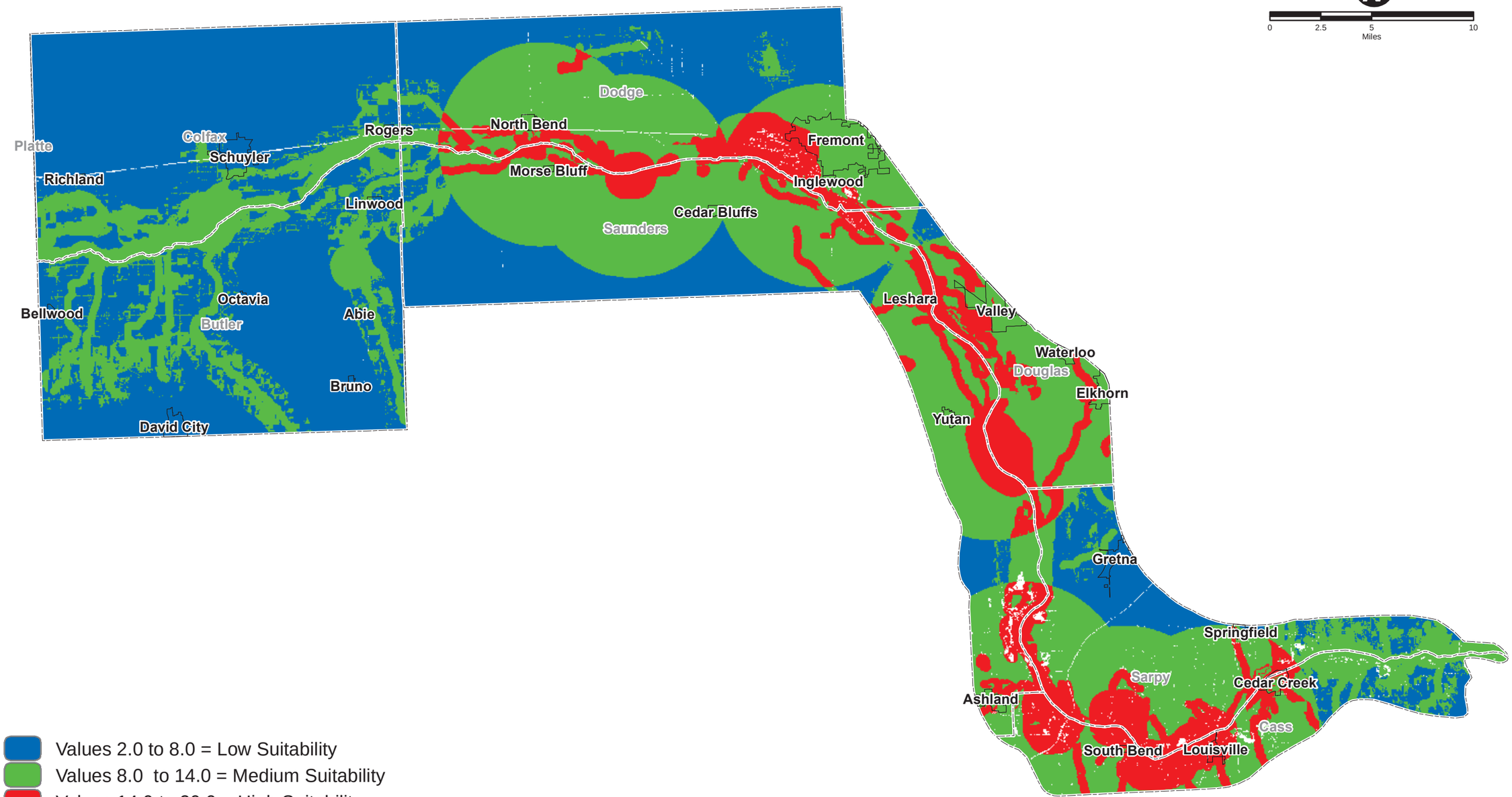

Values 2.0 to 8.0 = Low Suitability
Values 8.0 to 14.0 = Medium Suitability
Values 14.0 to 20.0 = High Suitability

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Environmental Suitability Assessment

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Water Based Recreation Suitability Analysis
Draft Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
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FIGURE
A-2

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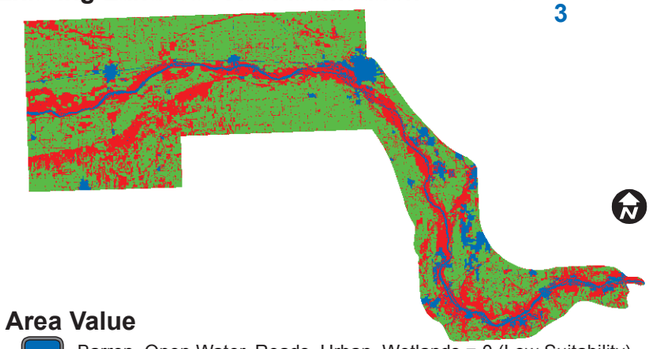
Existing Land Use Reclassification

Assigned Weight = 3



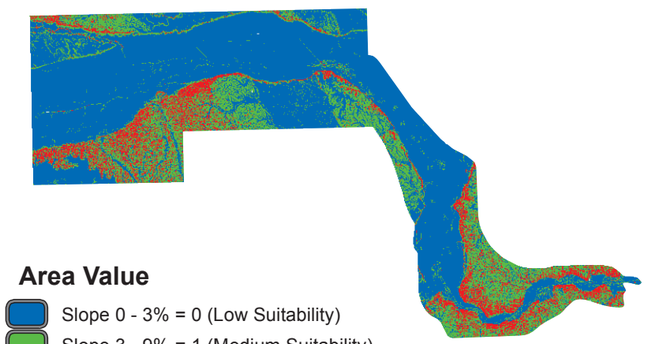
Area Value

- Barren, Open Water, Roads, Urban, Wetlands = 0 (Low Suitability)
- Agriculture = 1 (Medium Suitability)
- Range, Pasture, Grassland, Wooded/Riparian = 2 (High Suitability)

+

Percent Slope

Assigned Weight = 1



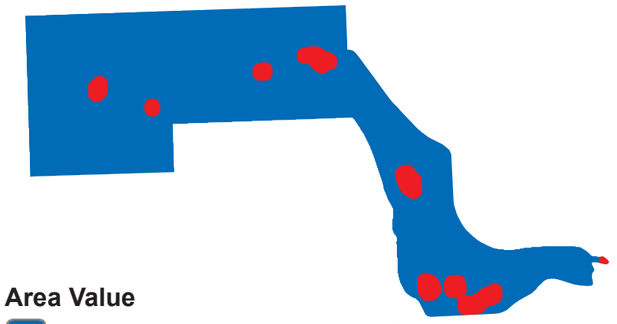
Area Value

- Slope 0 - 3% = 0 (Low Suitability)
- Slope 3 - 9% = 1 (Medium Suitability)
- Slope > 9 = 2 (High Suitability)

+

Proximity to Public Lands

Assigned Weight = 2



Area Value

- > 1 Mile from Protected Land = 0 (Low Suitability)
- < 1 Mile from Protected Lands = 2 (High Suitability)

+

Proximity to Roadway / Trails

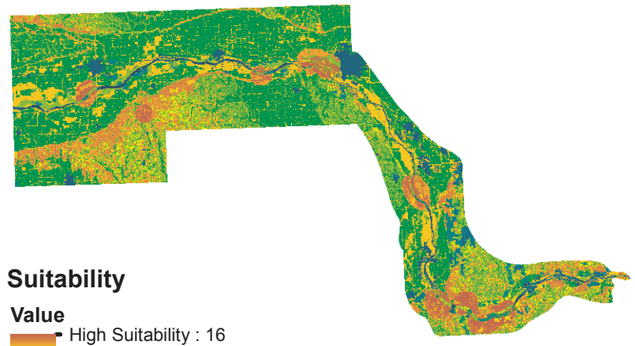
Assigned Weight = 2

Area Value

- Distance > 1 Mile = 0 (Low Suitability)
- Distance Between 1/2 and 1 Mile = 1 (Medium Suitability)
- Distance < 1/2 Mile = 2 (High Suitability)

=

Land Based Recreation Model Sum



Suitability

Value

- High Suitability : 16
- Low Suitability: 0

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Draft Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

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FIGURE
A-3

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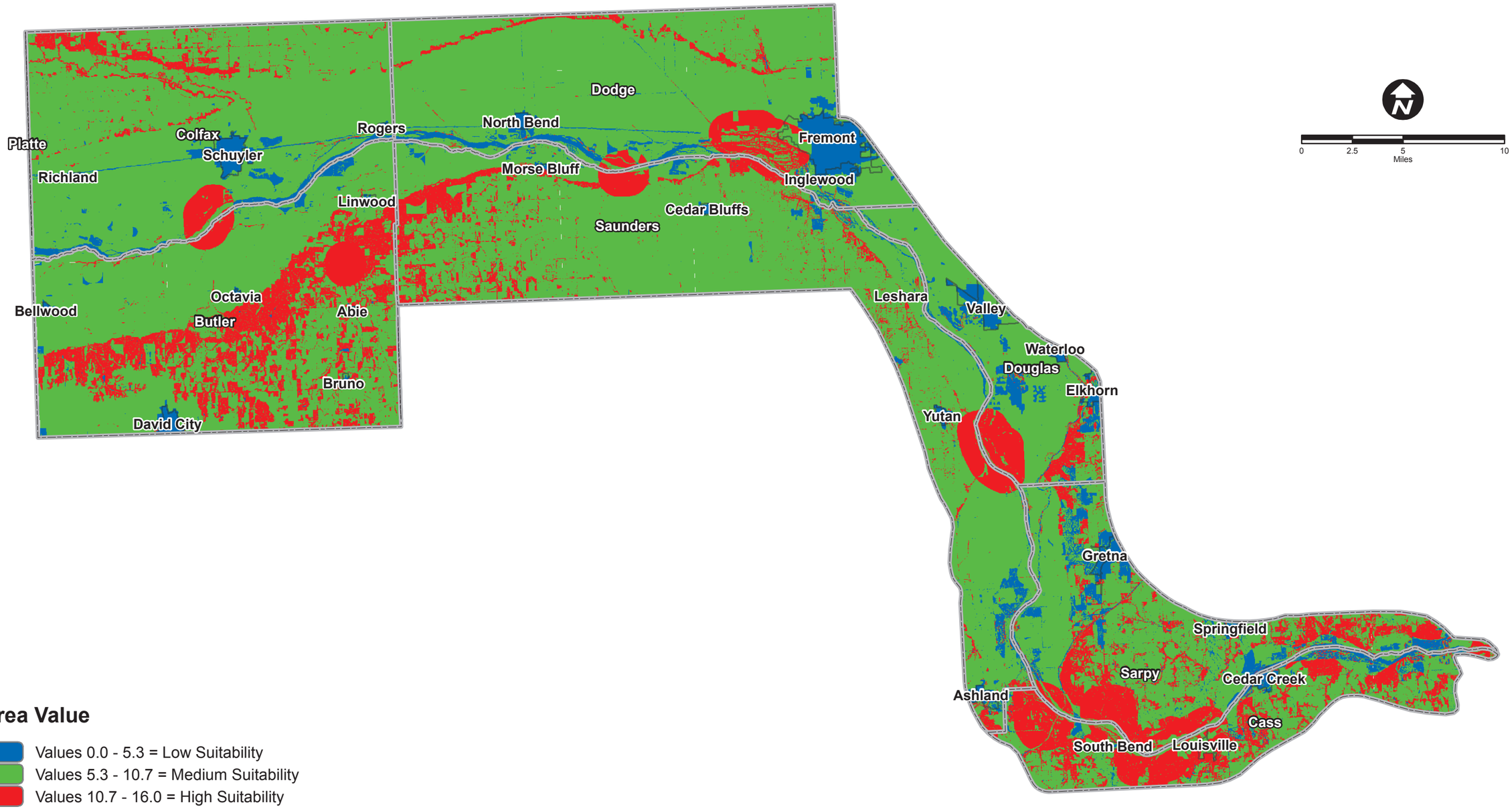

Area Value

- Values 0.0 - 5.3 = Low Suitability
- Values 5.3 - 10.7 = Medium Suitability
- Values 10.7 - 16.0 = High Suitability

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Land Based Recreation Suitability Analysis
Draft Model Suitability Analysis
Composite Output

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DATE
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FIGURE
A-4

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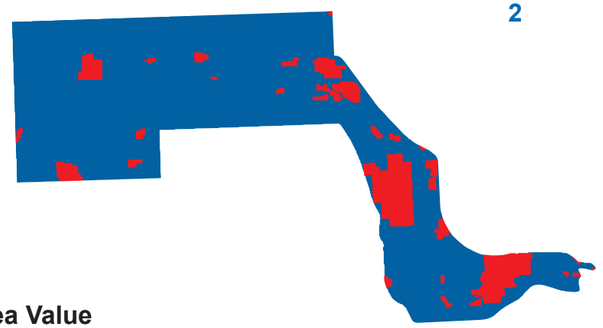
Wellhead Protection Area

Assigned Weight = 2



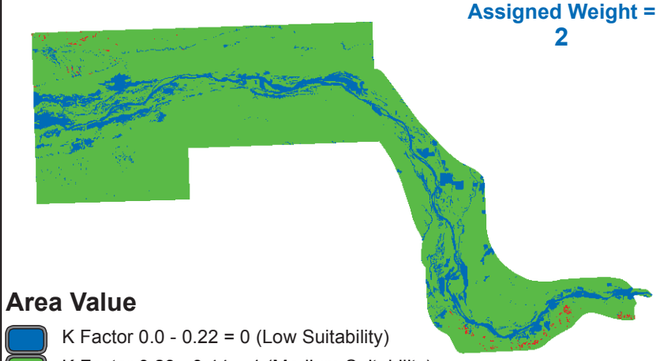
Area Value

- Outside Wellhead Protection Area = 0 (Low Suitability)
- Inside Wellhead Protection Area = 2 (High Suitability)

+

Soil Erodibility

Assigned Weight = 2



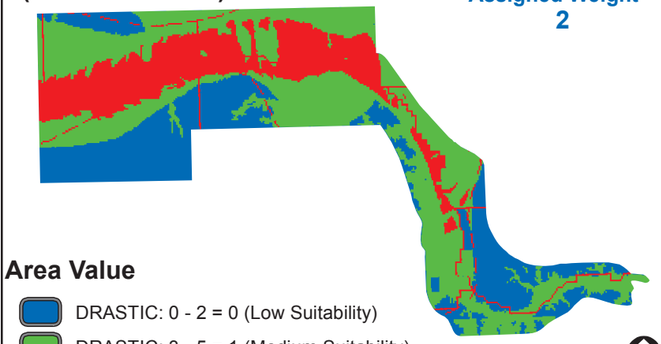
Area Value

- K Factor 0.0 - 0.22 = 0 (Low Suitability)
- K Factor 0.23 - 0.44 = 1 (Medium Suitability)
- K Factor 0.45 to 0.69 = 2 (High Suitability)

+

Ground Water Vulnerability (DRASTIC Index) Reclassification

Assigned Weight = 2



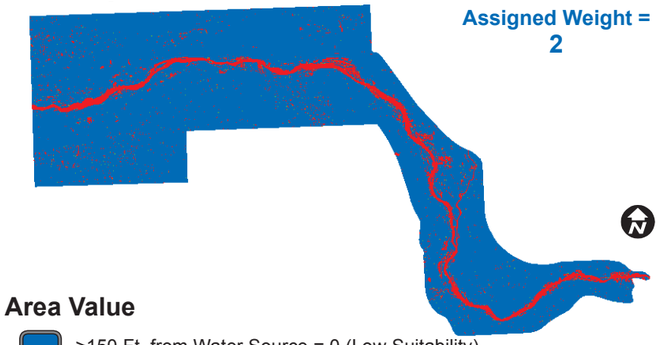
Area Value

- DRASTIC: 0 - 2 = 0 (Low Suitability)
- DRASTIC: 3 - 5 = 1 (Medium Suitability)
- DRASTIC: 6 - 9 = 2 (High Suitability)

+

Proximity to Water / Wetlands

Assigned Weight = 2



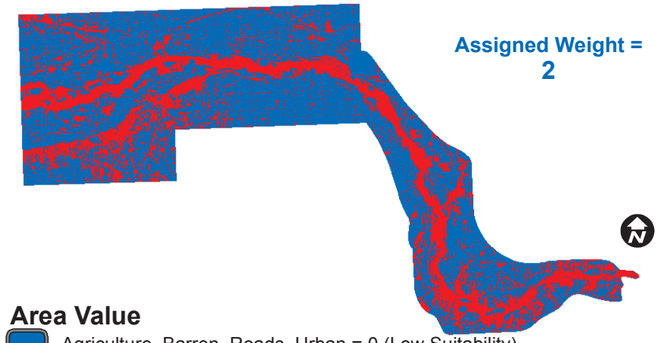
Area Value

- >150 Ft. from Water Source = 0 (Low Suitability)
- Between 100 & 150 Ft. from a Water Source = 1 (Medium Suitability)
- <100 Ft. from a Water Source = 2 (High Suitability)

+

Existing Land Use Reclassification

Assigned Weight = 2

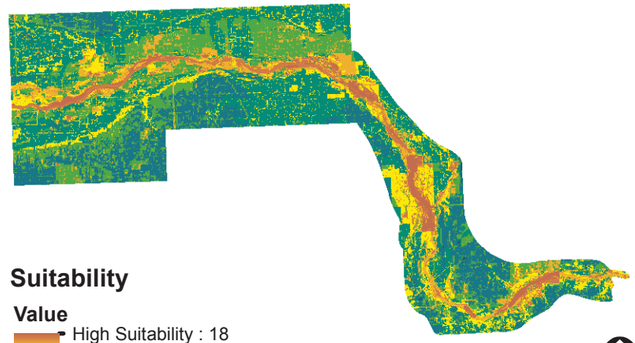


Area Value

- Agriculture, Barren, Roads, Urban = 0 (Low Suitability)
- Open Water, Range, Pasture, Grassland, Wooded, Wetland = 2 (High Suitability)

=

Water Quality Protection Model Sum



Suitability

Value

- High Suitability : 18
- Low Suitability: 0

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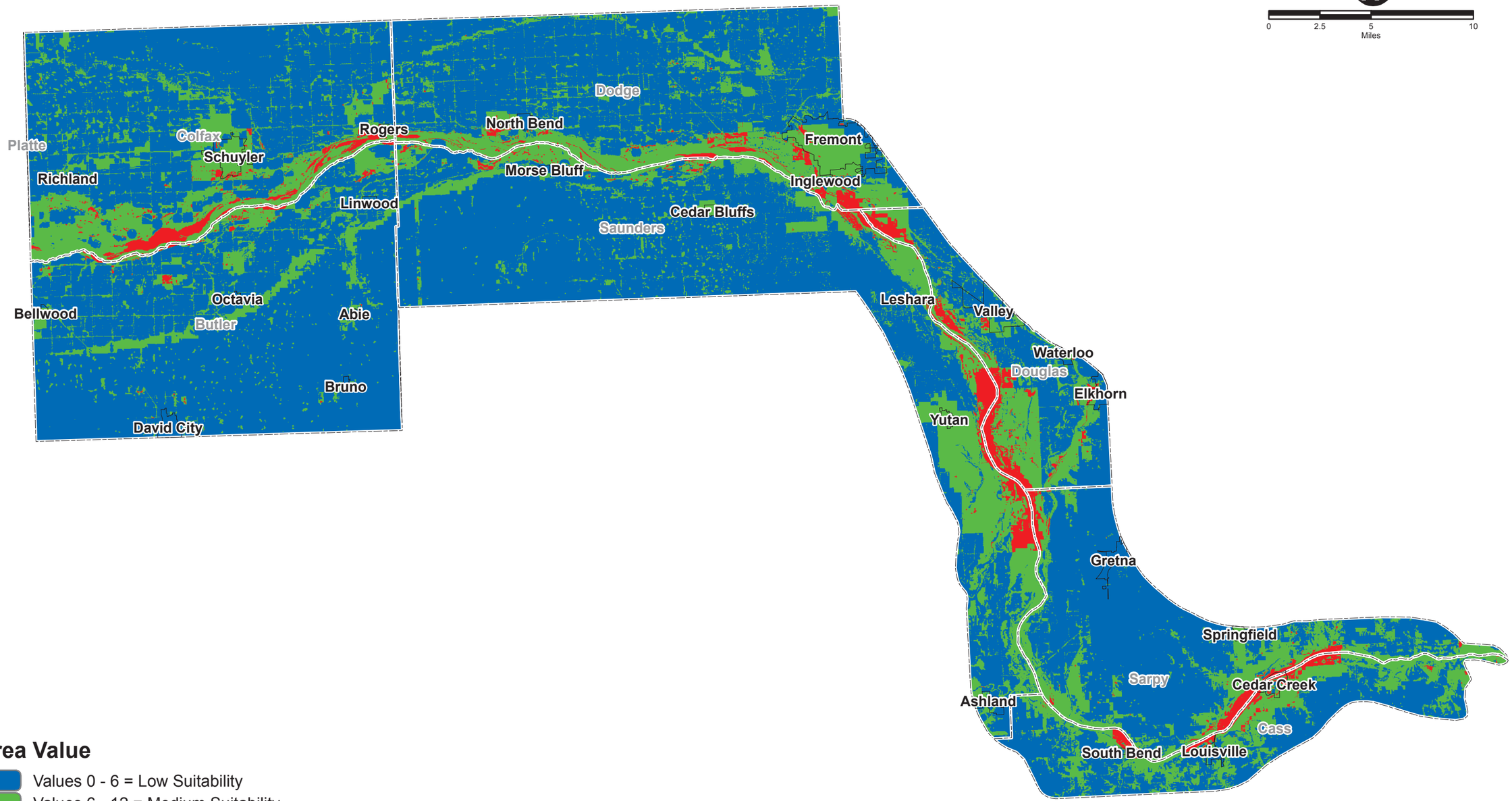
Water Quality Suitability Analysis
Draft Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
A-5

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Water_Quality_Protection\Report_Figures\Water_Quality_Model_V1_Fig_A7.mxd



Area Value

- Values 0 - 6 = Low Suitability
- Values 6 - 12 = Medium Suitability
- Values 12 - 18 = High Suitability

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Water Quality Land Suitability Analysis
Draft Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

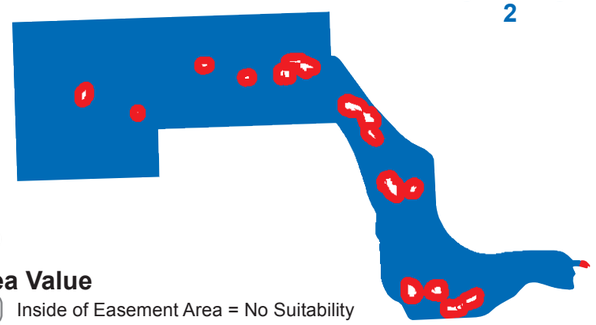
DATE
June 2011

FIGURE
A-6

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Water_Quality_Protection\Report_Figures\Water_Quality_Model_V1_Fig_A8.mxd

Proximity to Protected Lands

Assigned Weight = 2



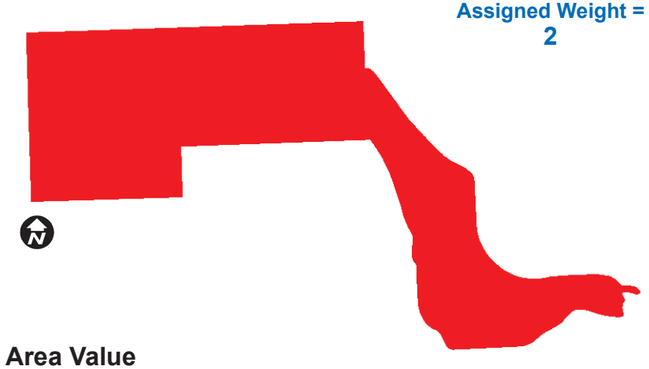
Area Value

- Inside of Easement Area = No Suitability
- > 1 Mile from Protected Land = 0 (Low Suitability)
- < 1 Mile from Protected Lands = 2 (High Suitability)

+

Existing T&E Habitat

Assigned Weight = 2



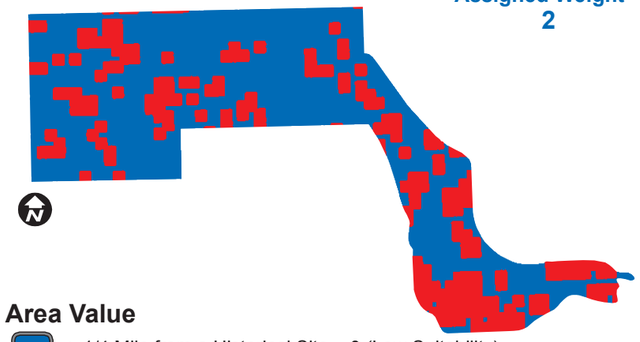
Area Value

- Inside of Identified T&E Range = 2 (High Suitability)

+

Historical / Cultural Resources

Assigned Weight = 2



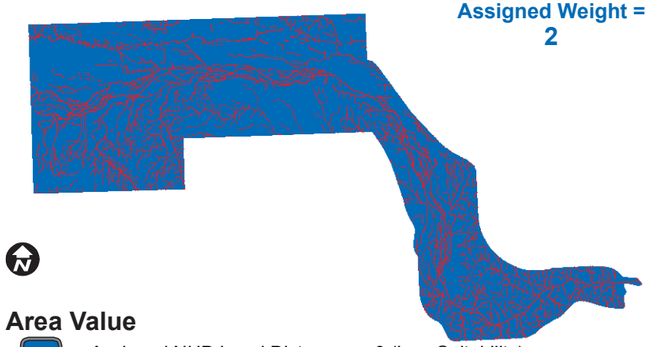
Area Value

- > 1/4 Mile from a Historical Site = 0 (Low Suitability)
- < 1/4 Mile from a Histrocial Site = 2 (High Suitability)

+

Proximity to Water / Wetlands

Assigned Weight = 2



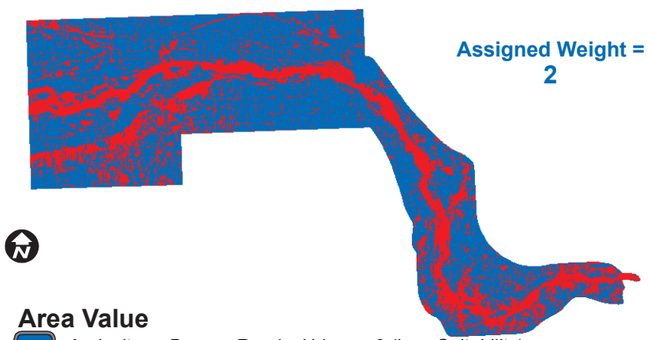
Area Value

- > Assigned NHD Level Distances = 0 (Low Suitability)
- Within 300 Ft. of Level 3, 250 Ft. Level 4, 200 Ft. of Level 5 & 6, 150 Ft. of Level 7 = 2 (High Suitability)

+

Existing Land Use Reclassification

Assigned Weight = 2

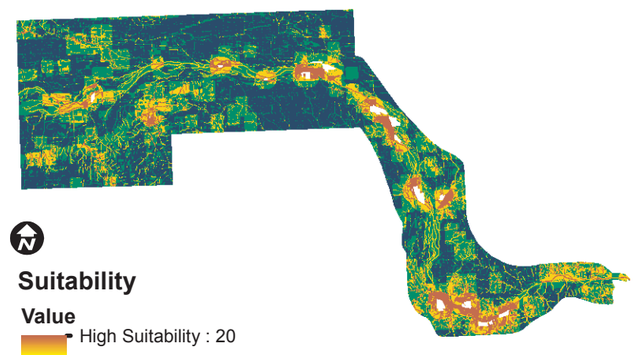


Area Value

- Agriculture, Barren, Roads, Urban = 0 (Low Suitability)
- Open Water, Range, Pasture, Grassland, Wooded, Wetland = 2 (High Suitability)

=

Land Preservation Model Sum



Suitability

Value

- High Suitability : 20
- Low Suitability: 4

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Land Preservation Suitability Analysis
Draft Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

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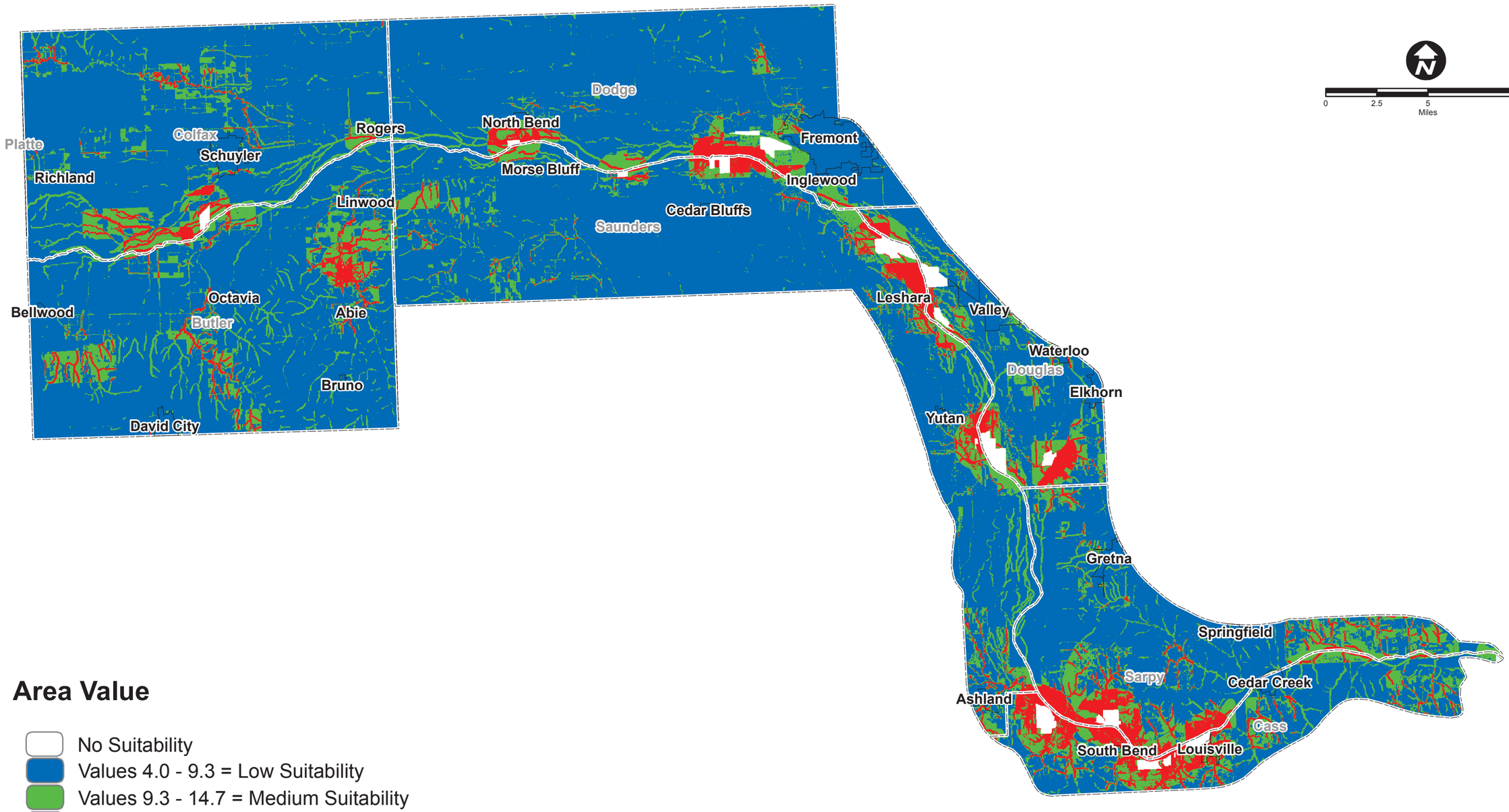
FIGURE
A-7

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Land_Preservation\Report_Figures\Land_Preservation_V1_Fig_A5.mxd



Area Value

- No Suitability
- Values 4.0 - 9.3 = Low Suitability
- Values 9.3 - 14.7 = Medium Suitability
- Values 14.7 - 20.0 = High Suitability

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Environmental Suitability Assessment

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Land Preservation Suitability Analysis
Draft Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
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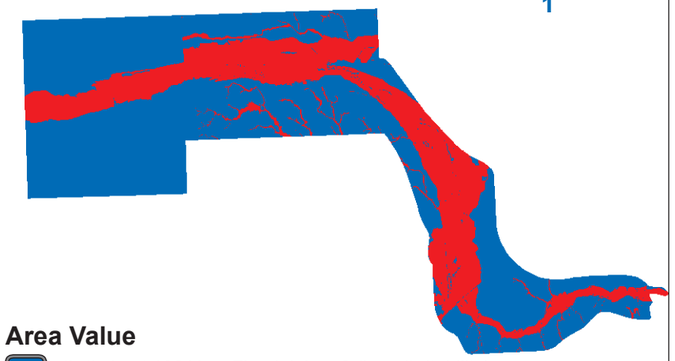
FIGURE
A-8

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Land_Preservation\Report_Figures\Land_Preservation_V1_Fig_A6.mxd

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Agriculture\Report_Figures\Agricultural_Model_V1_Figure_1.mxd

100 Year Floodplain

Assigned Weight = 1



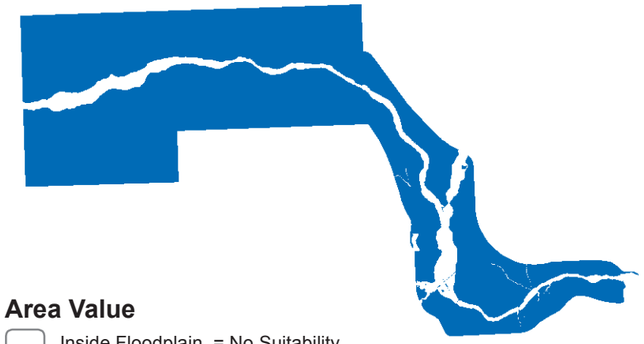
Area Value

- Outisde of 100 Year Floodplain = 0 (Low Suitability)
- Within 100 Year Floodplain = 2 (High Suitability)

+

Floodway

Assigned Weight = 1



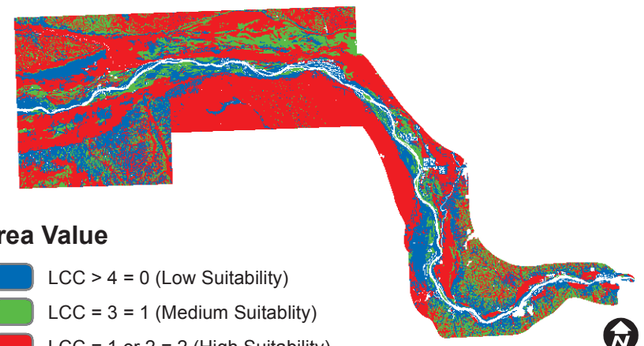
Area Value

- Inside Floodplain = No Suitability
- Outisde of Floodway = 0 (Low Suitability)

+

Land Capability Classification Reclassification

Assigned Weight = 3



Area Value

- LCC > 4 = 0 (Low Suitability)
- LCC = 3 = 1 (Medium Suitablity)
- LCC = 1 or 2 = 2 (High Suitability)

Wellhead Protection Area

Assigned Weight = 1

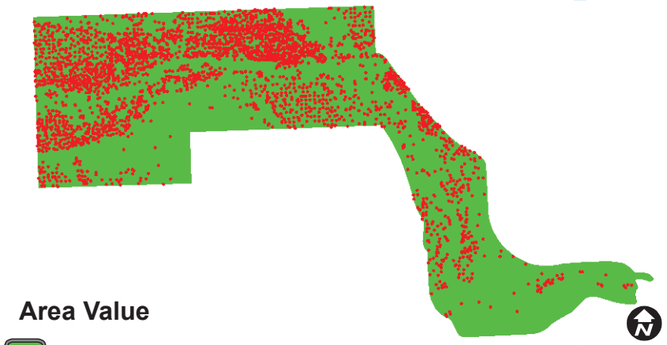
Area Value

- Within Wellhead Protection Area = 1 (Medium Suitability)
- Outside Wellhead Protection Area = 2 (High Suitability)

+

Irrigation Wells / Surface Diversions

Assigned Weight = 2



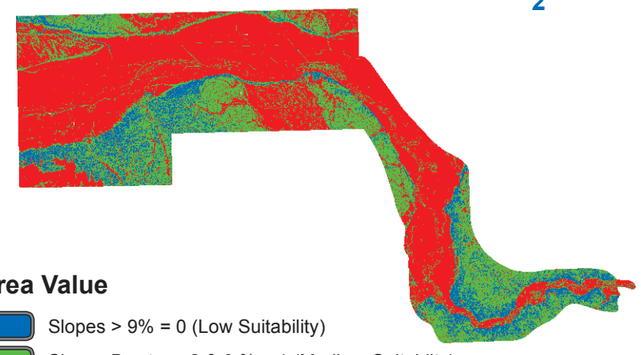
Area Value

- No Irrigation or Registered Well Within 1000 Ft. = 1 (Medium Suitablity)
- Irrigation or Registered Well Within 1000 Ft. = 2 (High Suitablity)

+

Percent Slope

Assigned Weight = 2

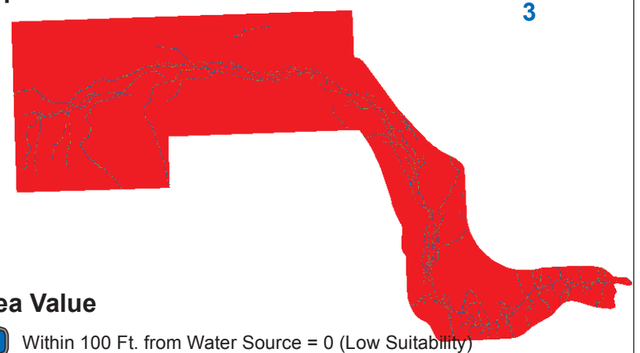


Area Value

- Slopes > 9% = 0 (Low Suitability)
- Slopes Bewteen 2 & 9 % = 1 (Medium Suitablity)
- Slopes = 1 or 2% = 2 (High Suitability)

Riparian Buffer

Assigned Weight = 3



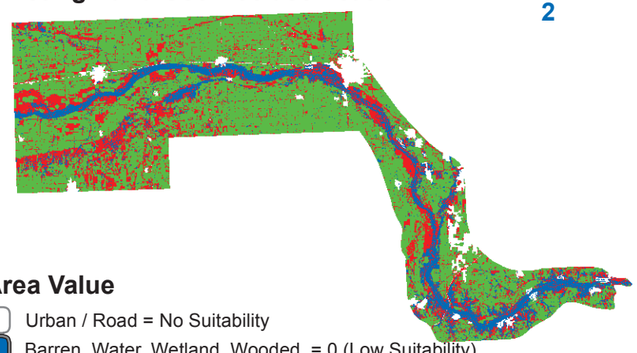
Area Value

- Within 100 Ft. from Water Source = 0 (Low Suitability)
- Between 100 & 150 Ft. from a Water Source = 1 (Medium Suitability)
- Greater than 150 Ft. from a Water Source = 2 (High Suitability)

+

Existing Land Use Reclassification

Assigned Weight = 2

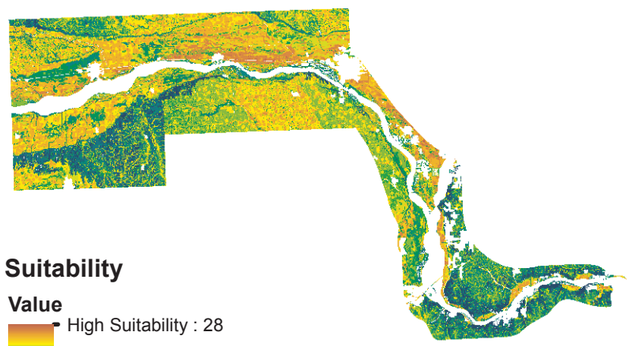


Area Value

- Urban / Road = No Suitability
- Barren, Water, Wetland, Wooded = 0 (Low Suitability)
- Agriculture = 1 (Medium Suitability)
- Range, Pasture, Grassland = 2 (High Suitability)

=

Agricultual Model Calculation



Suitability

Value

- High Suitability : 28
- Low Suitability: 3

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Agricultural Land Suitability Analysis
Draft Model Suitability Analysis
Factor Components

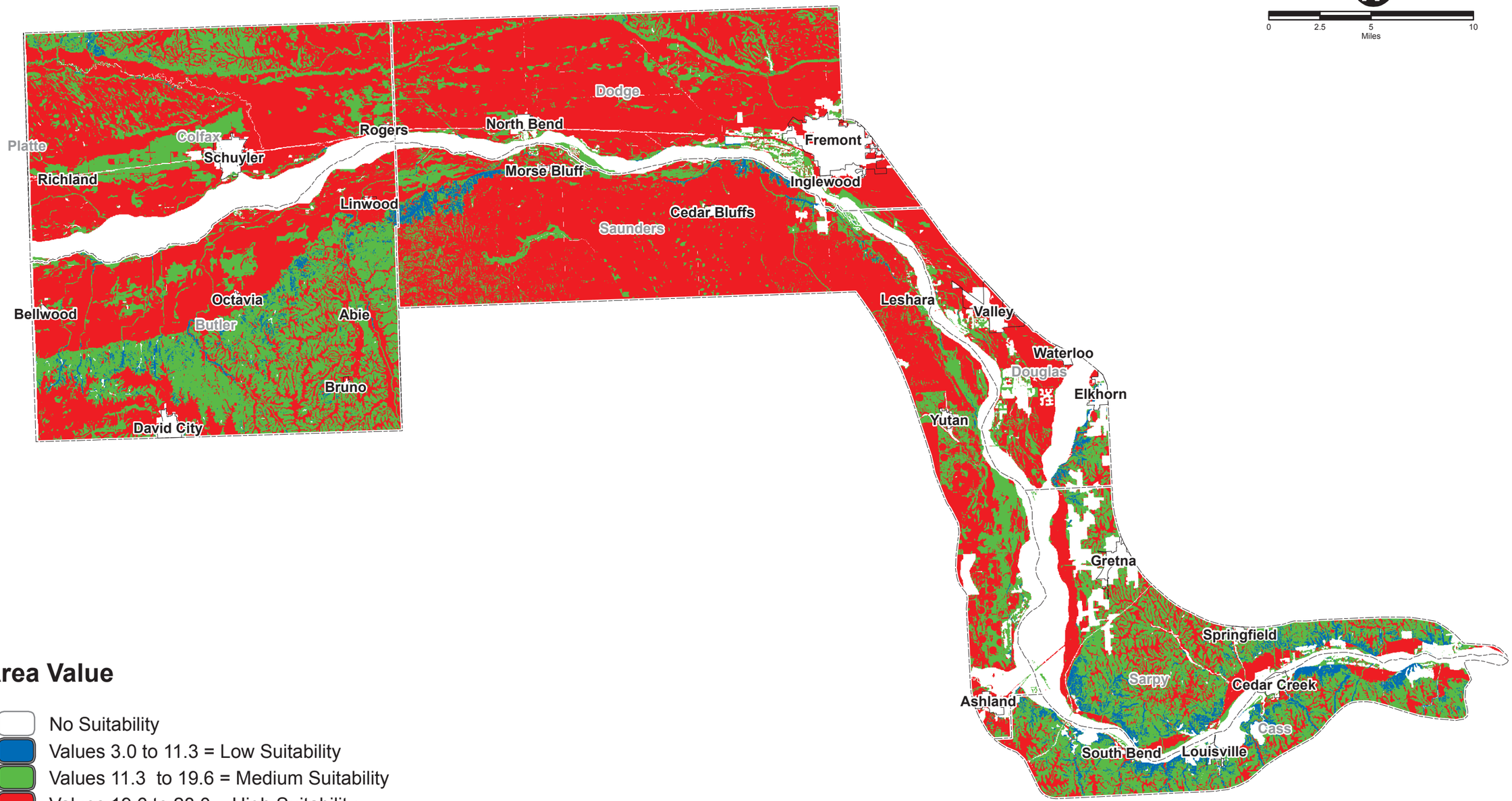
Lower Platte Corridor Alliance Land Suitability Analysis

DATE

June 2011

FIGURE

A-9



Area Value

- No Suitability
- Values 3.0 to 11.3 = Low Suitability
- Values 11.3 to 19.6 = Medium Suitability
- Values 19.6 to 28.0 = High Suitability

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Draft Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

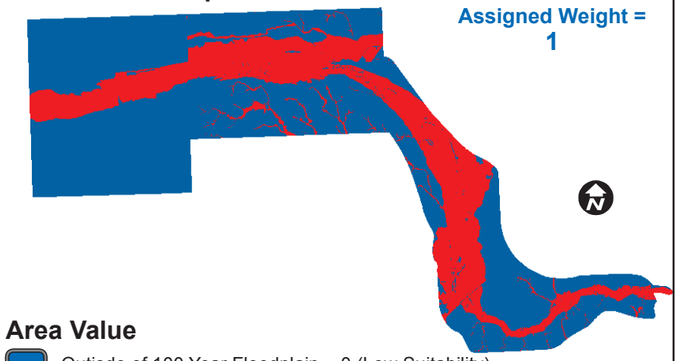
DATE
June 2011

FIGURE
A-10

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Agriculture\Report_Figures\Agricultural_Model_V1_Figure_2.mxd

100 Year Floodplain

Assigned Weight = 1



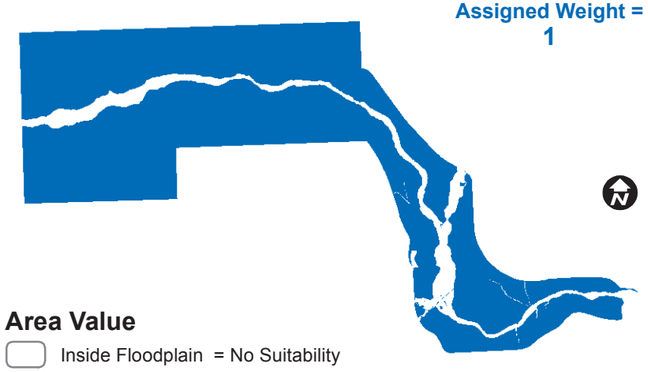
Area Value

- Outisde of 100 Year Floodplain = 0 (Low Suitability)
- Within 100 Year Floodplain = 2 (High Suitability)

+

Floodway

Assigned Weight = 1



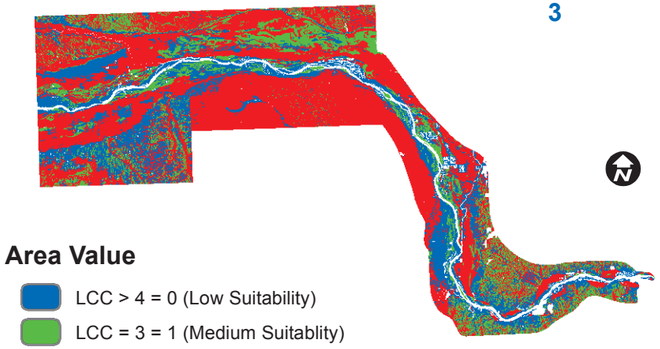
Area Value

- Inside Floodplain = No Suitability
- Outisde of Floodway = 0 (Low Suitability)

+

Land Capability Classification Reclassification

Assigned Weight = 3

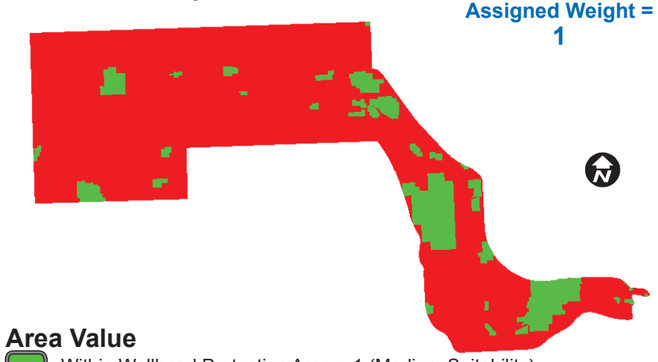


Area Value

- LCC > 4 = 0 (Low Suitability)
- LCC = 3 = 1 (Medium Suitablity)
- LCC = 1 or 2 = 2 (High Suitability)

Wellhead Projection Area

Assigned Weight = 1



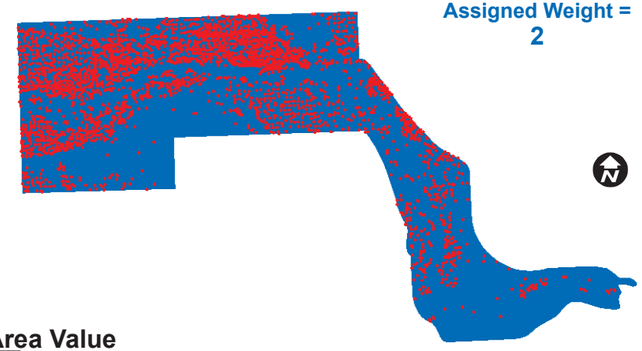
Area Value

- Within Wellhead Protection Area = 1 (Medium Suitability)
- Outside Wellhead Protection Area = 2 (High Suitability)

+

Irrigation Wells / Surface Diversions

Assigned Weight = 2



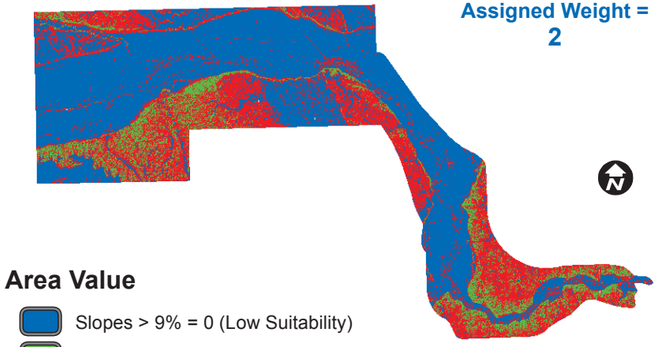
Area Value

- No Irrigation or Registered Well Within 1000 Ft. = 0 (Low Suitablity)
- Irrigation or Registered Well Within 1000 Ft. = 2 (High Suitablity)

+

Percent Slope

Assigned Weight = 2



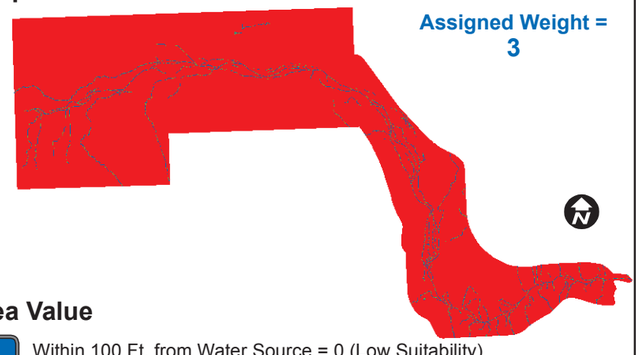
Area Value

- Slopes > 9% = 0 (Low Suitability)
- Slopes Bewteen 2 & 9 % = 1 (Medium Suitablity)
- Slopes = 1 or 2% = 2 (High Suitability)

+

Riparian Buffer

Assigned Weight = 3

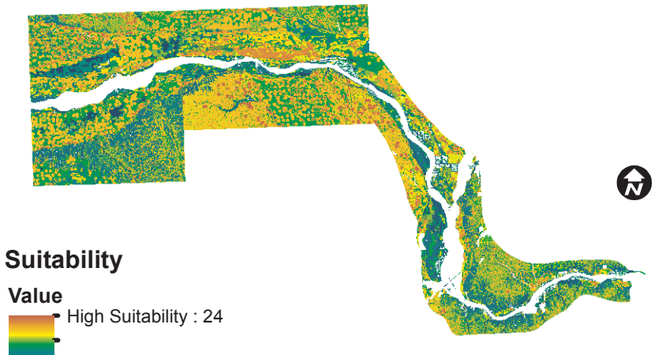


Area Value

- Within 100 Ft. from Water Source = 0 (Low Suitability)
- Between 100 & 150 Ft. from a Water Source = 1 (Medium Suitability)
- Greater than 150 Ft. from a Water Source = 2 (High Suitability)

=

Niche Agricultual Model Calculation



Suitability

Value

- High Suitability : 24
- Low Suitability: 1

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Environmental **Suitability Assessment**

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Niche Agricultural Land Suitability Analysis
Draft Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

DATE

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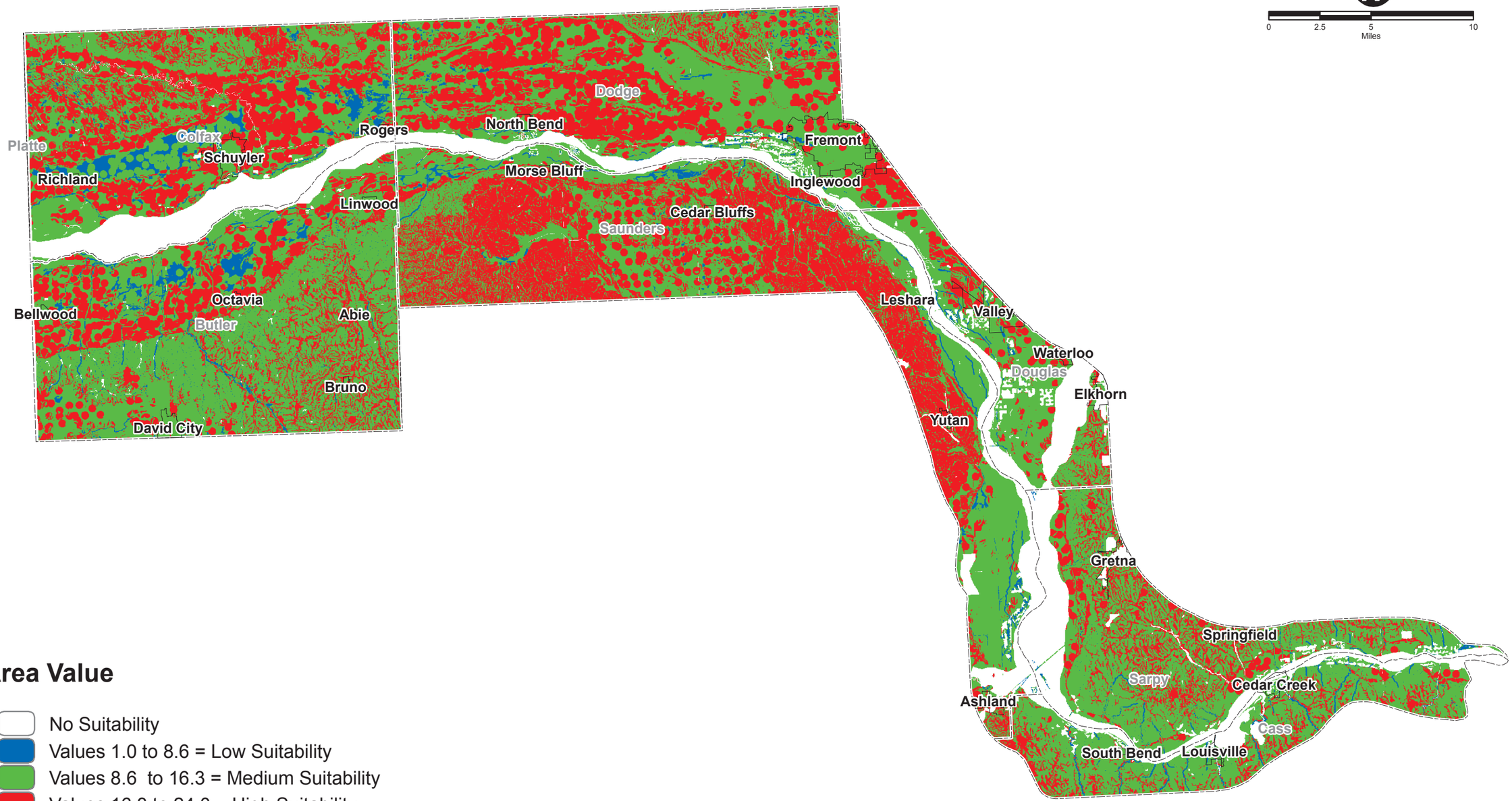
FIGURE

A-11

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Niche_Agriculture\Report_Figures\Niche_Agriculture_Fig_A1.mxd



Area Value

- No Suitability
- Values 1.0 to 8.6 = Low Suitability
- Values 8.6 to 16.3 = Medium Suitability
- Values 16.3 to 24.0 = High Suitability

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Environmental **Suitability Assessment**

HDR

Niche Agricultural Land Suitability Analysis
Draft Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
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FIGURE
A-12

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Niche_Agriculture\Report_Figures\Niche_Agriculture_Composite_Fig_A12.mxd

ATTACHMENT B

DRAFT MODEL SUITABILITY ANALYSIS TABLES AND RESULTS

Draft Model Suitability Analysis for Recreation- Water Based (boating, fishing)

The intent of the Feature: The Recreation- Water Based feature focuses on suitable areas for boating and fishing, providing the public with areas ideal for these activities.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Proximity to Water/Wetlands	5,000 feet and greater	1,000–5,000 feet	0–1,000 feet	2
Existing Land Use	Urban	Agriculture	Range, Forest	1
Proximity to Public Lands	Greater than one mile from public land		Within 1 mile of public land	2
Proximity to existing roadways/trails	Greater than one mile from existing roadways/trails	½ mile to 1 mile from existing roadways/trails	0 to 1/2 mile from existing roadways/trails	2
Public Access to Platte River	Not within 5 miles of an access to the Platte River	One access point located within 5 miles	Two access points located within 5 miles	3

Draft Model Suitability Analysis for Recreation- Land Based (camping, hiking)

The intent of the Feature: The Recreation- Land Based feature focuses on suitable areas for camping and hiking, providing the public with areas ideal for these activities.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Existing Land Use	Urban	Agriculture	Range, Forest	3
Percent Slope	0-3%	3-9%	>9%	1
Proximity to Public Lands	Greater than 1 mile from public land		Within 1 mile of public land	2
Proximity to roadways/trails	Greater than 1 mile	½ mile- 1 mile	0 - ½ mile	2

Draft Model Suitability Analysis for Water Quality Protection- Groundwater and Surface Water

The intent of the Feature: The Groundwater and Surface Water feature focuses on protecting areas that are vulnerable to water quality issues such as recharge areas for groundwater and surface water degradation.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Proximity to Water/Wetlands	Greater than 150 feet	100–150 feet	Less than 100 feet	2
Existing Land Use	All others		Forest, Water, and Range	2
Proximity to Well Head Protection	Outside of a well head protection area		Inside a well head protection area	2
Soil Erodibility	0.0-0.22	0.23-0.44	0.45 - 0.69	2
Groundwater Vulnerability (DRASTIC Index)	2-0	5-3	9-6	2

Draft Model Suitability Analysis for Land Preservation

The intent of the Feature: The Land Preservation feature focuses on protecting areas that are valuable habitats, cultural resources present, and possess a scenic quality that should be preserved.

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Proximity to Protected Lands	Inside of easement areas	Greater than 1 mile from protected land		Within 1 mile of protected land	2
Proximity to Water		Areas that do not meet the high suitability criteria		NHD Data Set Levels: Within 300' of Level 3 Within 250' of Level 4 Within 200' of Level 5 and 6 Within 150 Feet of Level 7	2
Existing Land Use		Agriculture, Urban		Forest, Water, and Range	2
Existing T&E Habitat		Outside of identified T&E range		Inside of identified T&E range	2
Historic/ Cultural Resources		Outside of ¼ mile of historic/cultural site		Within ¼ mile of historic/cultural site	2

Draft Model Suitability Analysis for Agriculture

The intent of the Feature: The Agriculture feature focuses on areas of farmland that provide sustainable production of crops, with an emphasis on row crops

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Floodplain		Area is outside the 100-year floodplain.		Area is inside the 100-year floodplain.	1
Floodway	Within Floodway				N/A
Existing Land Use	Urban	Forest/Water	Agriculture	Range	2
Proximity to Well Head Protection			Inside well head protection area	Outside of well head protection area	1
Irrigation Wells/ Surface Diversions			No irrigation or registered wells within 1,000 feet	Irrigation or within 1,000 feet of a registered well	2
% Slope		Slopes greater than 9 percent	2-9 percent slopes	Slopes less than 9 percent	2
Riparian Buffers		Within 100 feet from water source	Between 100 and 150 feet from a water source	Greater than 150 feet from a water source	3
Land Classification/ LCCs		> 4	3	1,2	3

Draft Model Suitability Analysis for Niche Agriculture

The intent of the Feature: The Niche Agriculture feature focuses on those areas that are best suited for crops such as vegetables, fruits, etc. that can provide adjacent communities with produce.

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Floodplain		Area is outside the 100-year floodplain.		Area is inside the 100-year floodplain.	1
Floodway	Within Floodway				N/A
Proximity to Well Head Protection			Inside well head protection area	Outside of well head protection area	1
Irrigation Wells/ Surface Diversions		No irrigation or registered wells within 1,000 feet		Irrigation or within 1,000 feet of a registered well	2
% Slope		Slopes less than 9 percent	Slopes greater than 9 percent	2-9 percent slopes	2
Riparian Buffers		Within 100 feet from water source	Between 100 and 150 feet from a water source	Greater than 150 feet from a water source	3
Land Classification/ LCCs		> 4	3	1,2	3
Proximity to Populations		Greater than 50 miles from city limits	30 to 50 miles from city limits	Less than 30 miles from city limits	2

ATTACHMENT C

FINAL MODEL SUITABILITY ANALYSIS TABLES AND RESULTS

Final Model Revisions of Model Suitability Analysis for Recreation- Water Based (boating, fishing) Deleted

Change to a layer base on Platte River Access. Based on existing locations, buffered by 5 miles (+/-_1 miles)The intent of the Feature: Determination of Logical Platte River Access and Amenity Locations. A suitability analysis for this feature was not determined, but rather an assessment of locations based on distance from access points. The end result is not a suitability map, but a map identifying logical access points and factors related to the points.

Criteria	*Description*
Distance Between Access Points	A distance of 5 miles was used as the desire distance between Platte River access points. This point was "buffered by 1 mile both upstream and downstream (access zone).
Public Road Crossing	This criteria was used to isolate locations of a public road crossing or location where a public road is within 500 feet of a river bank.
Adjacent Land Use	For each potential access zone, land use was reviewed to determine locations of land in a private easement, or under public ownership

Final Model Revisions of Model Suitability Analysis for Recreation- Land Based (camping, hiking)

The intent of the Feature: The Recreation- Land Based feature focuses on suitable areas for camping and hiking, providing the public with areas ideal for these activities.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Existing Land Use	Urban, Agriculture		Range, Forest, Water	2
Percent Slope	0-3%	3-9%	>9%	2
Proximity to Public Lands	Greater than 1 mile from public land		Within 1 mile of public land	1
Proximity to Linear Trails	Greater than 1 mile	½ mile- 1 mile	0 - ½ mile	2

Final Model Revisions of Model Suitability Analysis for Water Quality Protection- Groundwater and Surface Water

The intent of the Feature: The Groundwater and Surface Water feature focuses on protecting areas that are vulnerable to water quality issues such as recharge areas for groundwater and surface water degradation.

Factors	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria	0	1	2	
Proximity to Water/Wetlands	Greater than 1000 feet	1,000 -- 500 feet	Less than 500 feet	2
Existing Land Use	Barren, Roads, Urban	Forest, Water, and Range	Agriculture	1
Proximity to Well Head Protection	Outside of a well head protection area		Inside a well head protection area	2
Soil Erodibility	0.0-0.22	0.23-0.44	0.45 - 0.69	3
Groundwater Vulnerability (DRASTIC Index)	2-0	5-3	9-6	3

Final Model Revisions of Model Suitability Analysis for Land Preservation

The intent of the Feature: The Land Preservation feature focuses on protecting areas that are valuable habitats, cultural resources present, and possess a scenic quality that should be preserved.

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Proximity to Protected Lands	Inside of easement areas	Greater than 1 mile from protected land		Within 1 mile of protected land	2
Proximity to Water		Areas that do not meet the high suitability criteria	Within 150 Feet of Level 7	NHD Data Set Levels: Within 300' of Level 3 Within 250' of Level 4 Within 200' of Level 5 and 6	2
Existing Land Use		Agriculture, Urban		Forest, Water, and Range	2
Existing T&E Habitat		Outside of identified T&E range		Inside of identified T&E range	2
Historic/ Cultural Resources		Outside of ¼ mile of historic/cultural site		Within ¼ mile of historic/cultural site	2

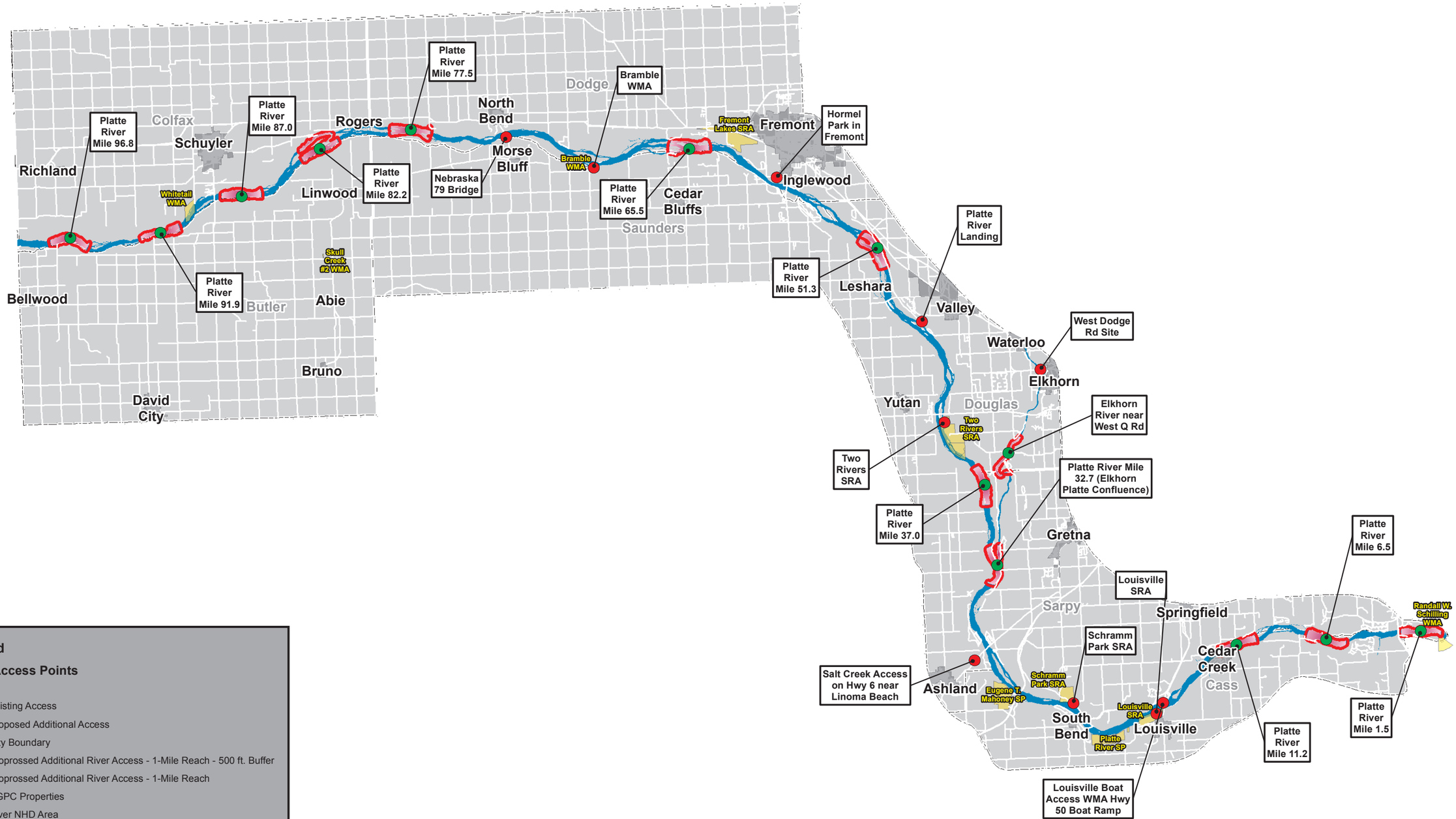
Final Model Revisions of Model Suitability Analysis for Agriculture

The intent of the Feature: The Agriculture feature focuses on areas of farmland that provide sustainable production of crops, with an emphasis on row crops

Factors	*No Suitability*	*Low Suitability*	*Medium Suitability*	*High Suitability*	*Assigned Weight*
Numeric Criteria		0	1	2	
Floodplain		Area is outside the 100-year floodplain.		Area is inside the 100-year floodplain.	1
Floodway	Within Floodway				N/A
Existing Land Use	Urban	Forest/Water	Agriculture	Range	2
Proximity to Well Head Protection			Inside well head protection area	Outside of well head protection area	1
Irrigation Wells/ Surface Diversions			No irrigation or registered wells within 1,000 feet	Irrigation or within 1,000 feet of a registered well	2
% Slope		Slopes greater than 9 percent	2-9 percent slopes	Slopes less than 9 percent	2
Riparian Buffers		Within 100 feet from water source	Between 100 and 150 feet from a water source	Greater than 150 feet from a water source	3
Land Classification/ LCCs		> 4	3	1,2	3

Final Model Revisions of Model Suitability Analysis for Niche Agriculture

The intent of the Feature: This feature was deleted due to the variability of type of niche agricultural and corresponding suitability.



Legend

River Access Points

Status

- Existing Access
- Proposed Additional Access
- City Boundary
- Proprossed Additional River Access - 1-Mile Reach - 500 ft. Buffer
- Proprossed Additional River Access - 1-Mile Reach
- NGPC Properties
- River NHD Area
- Counties
- Study Area

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Environmental **Suitability Assessment**

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Water Based Recreation Potential River Access Points

Lower Platte Corridor Alliance Land Suitability Analysis

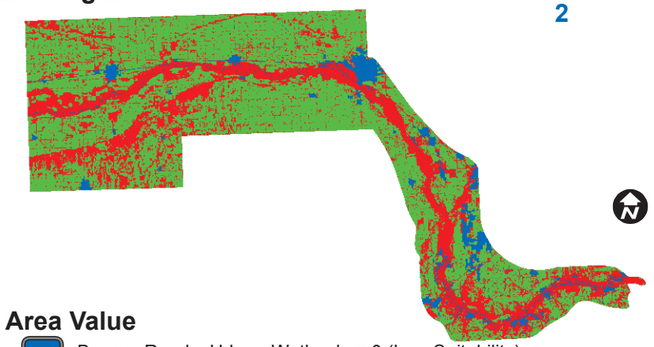
DATE
June 2011

FIGURE
C-1

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Water_Based_Recreation\Water_Based_Rec_features_Fig_C9.mxd

Existing Land Use Reclassification

Assigned Weight = 2



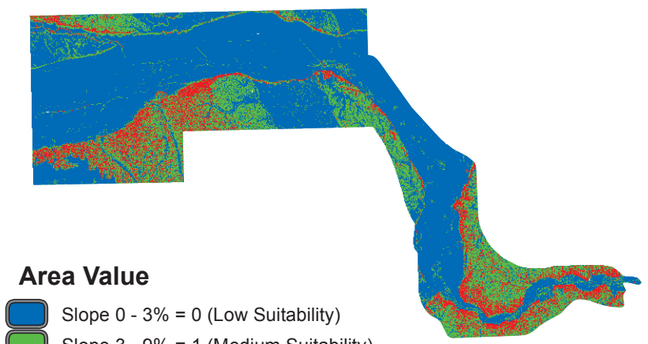
Area Value

- Barren, Roads, Urban, Wetlands = 0 (Low Suitability)
- Agriculture = 1 (Medium Suitability)
- Range, Pasture, Grassland, Water, Wooded/Riparian = 2 (High Suitability)

+

Percent Slope

Assigned Weight = 2



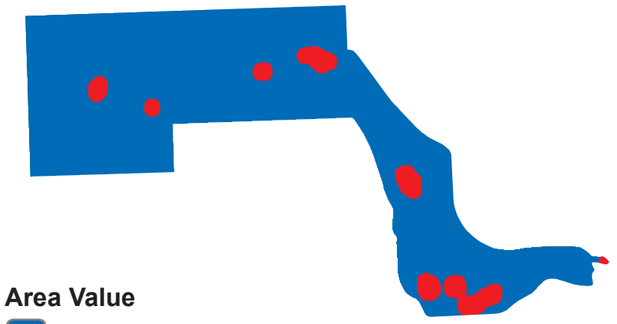
Area Value

- Slope 0 - 3% = 0 (Low Suitability)
- Slope 3 - 9% = 1 (Medium Suitability)
- Slope > 9 = 2 (High Suitability)

+

Proximity to Public Lands

Assigned Weight = 1



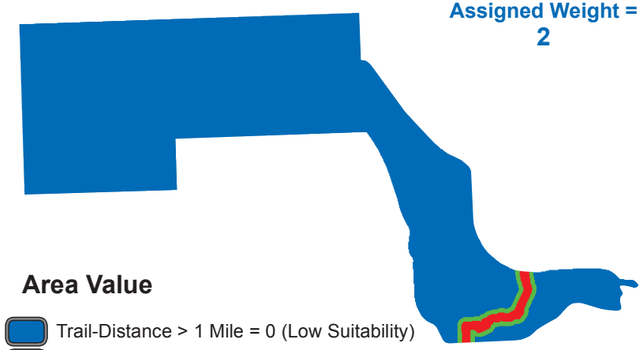
Area Value

- Protected Lands > 1 Mile = 0 (Low Suitability)
- Protected Lands < 1 Mile = 2 (High Suitability)

+

Proximity to Roadway / Trails

Assigned Weight = 2

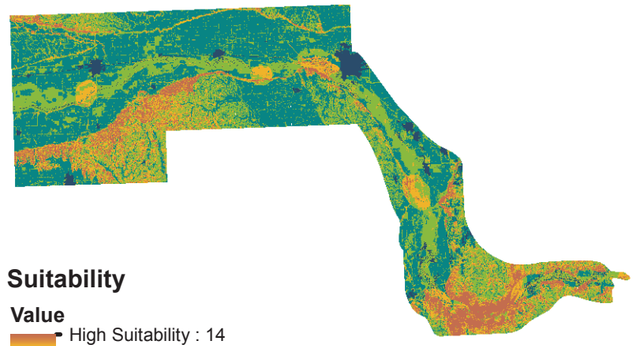


Area Value

- Trail-Distance > 1 Mile = 0 (Low Suitability)
- Trail-Distance Between 1/2 and 1 Mile = 1 (Medium Suitability)
- Trail-Distance < 1/2 Mile = 2 (High Suitability)

=

Land Based Recreation Model Sum



Suitability

Value

- High Suitability : 14
- Low Suitability: 0

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Environmental **Suitability Assessment**

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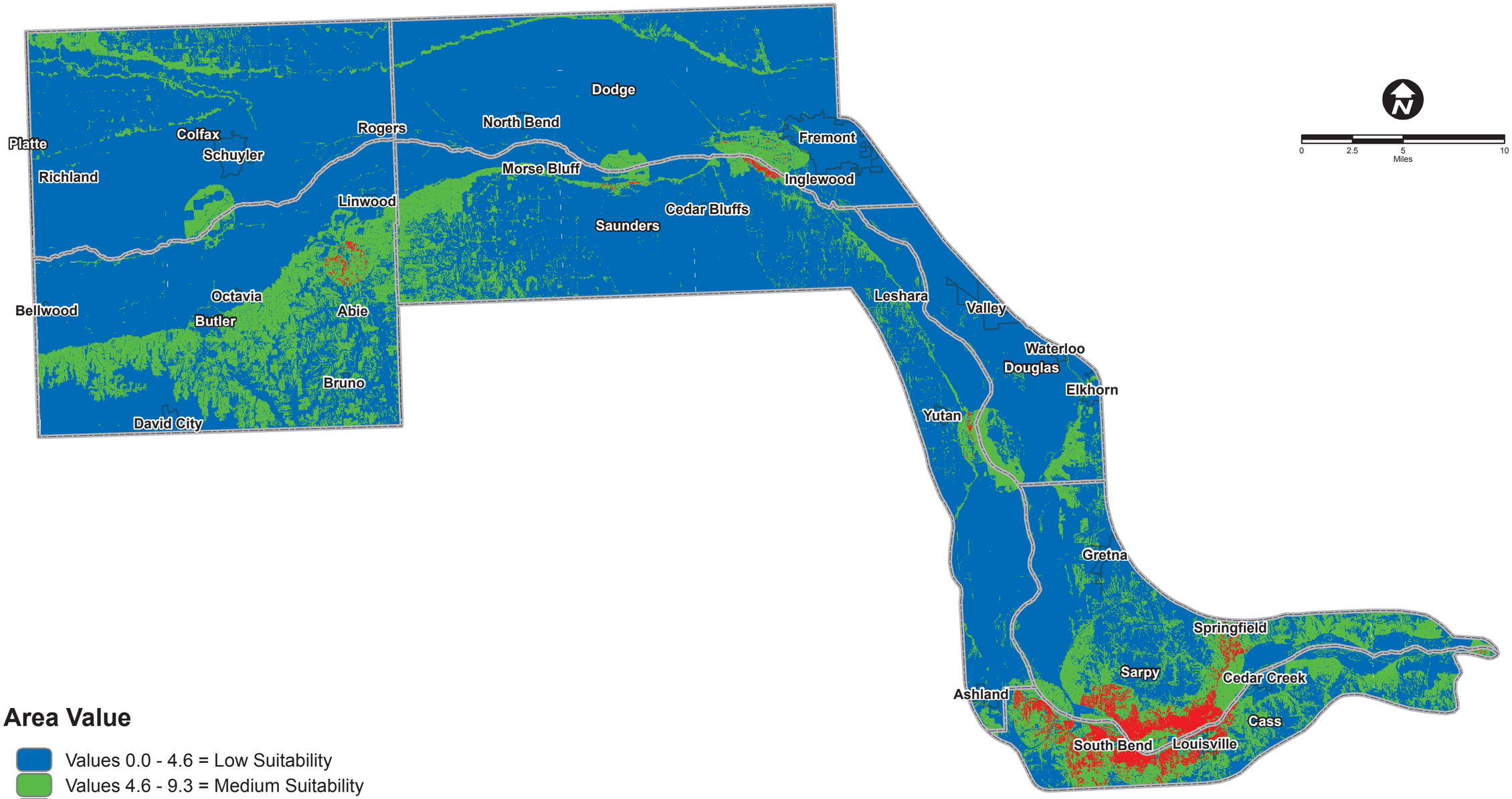
Land Based Recreation Suitability Analysis
Final Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
C-2

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Land_Based_Recreation\Report_Figures\Land_Based_Rec_V3_Fig_C3_V2.mxd



Area Value

- Values 0.0 - 4.6 = Low Suitability
- Values 4.6 - 9.3 = Medium Suitability
- Values 9.3 - 14.0 = High Suitability

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Environmental Suitability Assessment

HDR

Land Based Recreation Suitability Analysis
Final Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

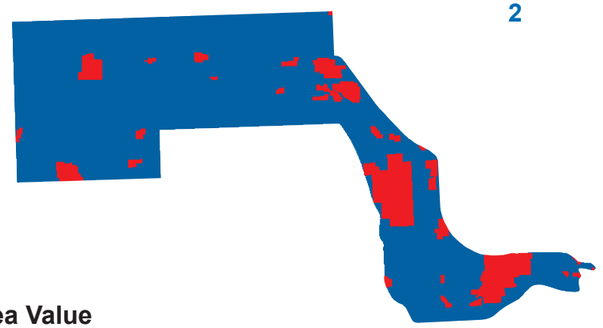
DATE
June 2011

FIGURE
C-3

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Land_Based_Recreation\Report_Figures\Land_Based_Rec_V3_Fig_C4.mxd

Wellhead Protection Area

Assigned Weight = 2



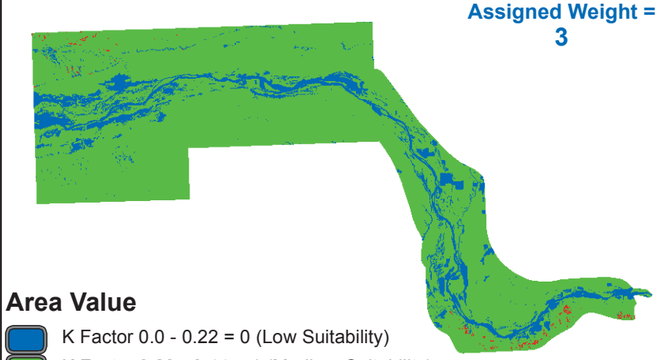
Area Value

- Outside Wellhead Protection Area = 0 (Low Suitability)
- Inside Wellhead Protection Area = 2 (High Suitability)

+

Soil Erodibility

Assigned Weight = 3



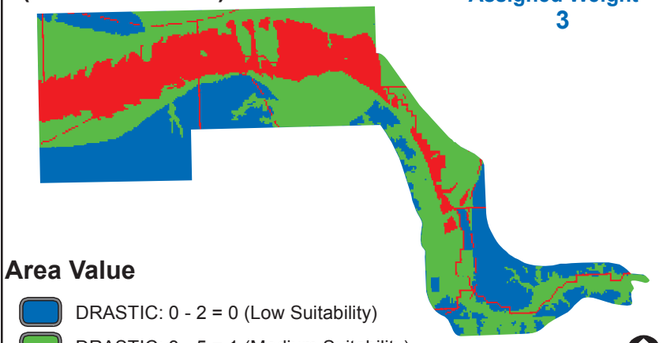
Area Value

- K Factor 0.0 - 0.22 = 0 (Low Suitability)
- K Factor 0.23 - 0.44 = 1 (Medium Suitability)
- K Factor 0.45 to 0.69 = 2 (High Suitability)

+

Ground Water Vulnerability (DRASTIC Index) Reclassification

Assigned Weight = 3



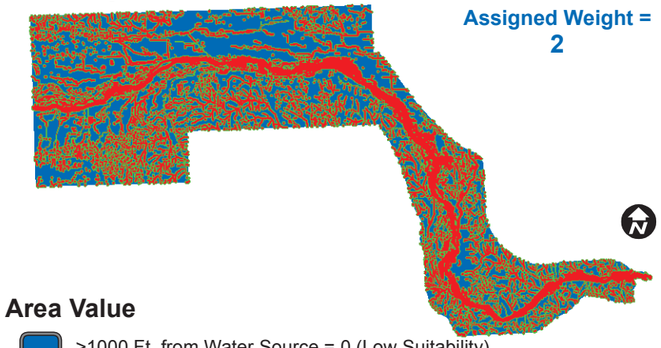
Area Value

- DRASTIC: 0 - 2 = 0 (Low Suitability)
- DRASTIC: 3 - 5 = 1 (Medium Suitability)
- DRASTIC: 6 - 9 = 2 (High Suitability)

+

Proximity to Water / Wetlands

Assigned Weight = 2



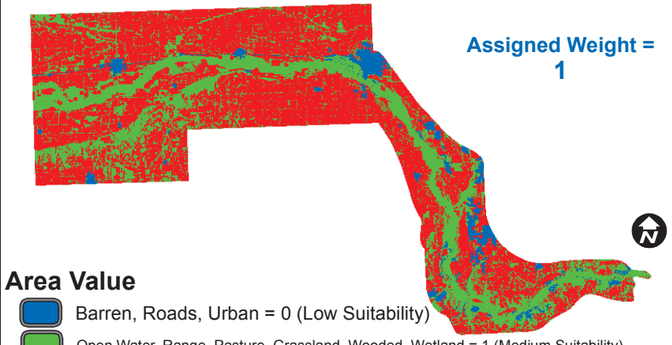
Area Value

- >1000 Ft. from Water Source = 0 (Low Suitability)
- Between 500 & 1000 Ft. from a Water Source = 1 (Medium Suitability)
- <500 Ft. from a Water Source = 2 (High Suitability)

+

Existing Land Use Reclassification

Assigned Weight = 1

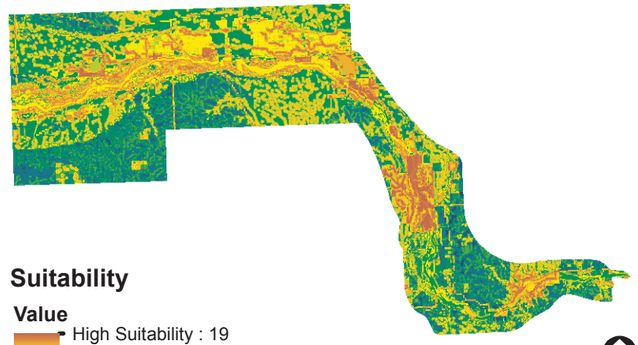


Area Value

- Barren, Roads, Urban = 0 (Low Suitability)
- Open Water, Range, Pasture, Grassland, Wooded, Wetland = 1 (Medium Suitability)
- Agriculture 2 (High Suitability)

=

Water Quality Protection Model Sum



Suitability

Value

- High Suitability : 19
- Low Suitability: 0

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Environmental **Suitability Assessment**

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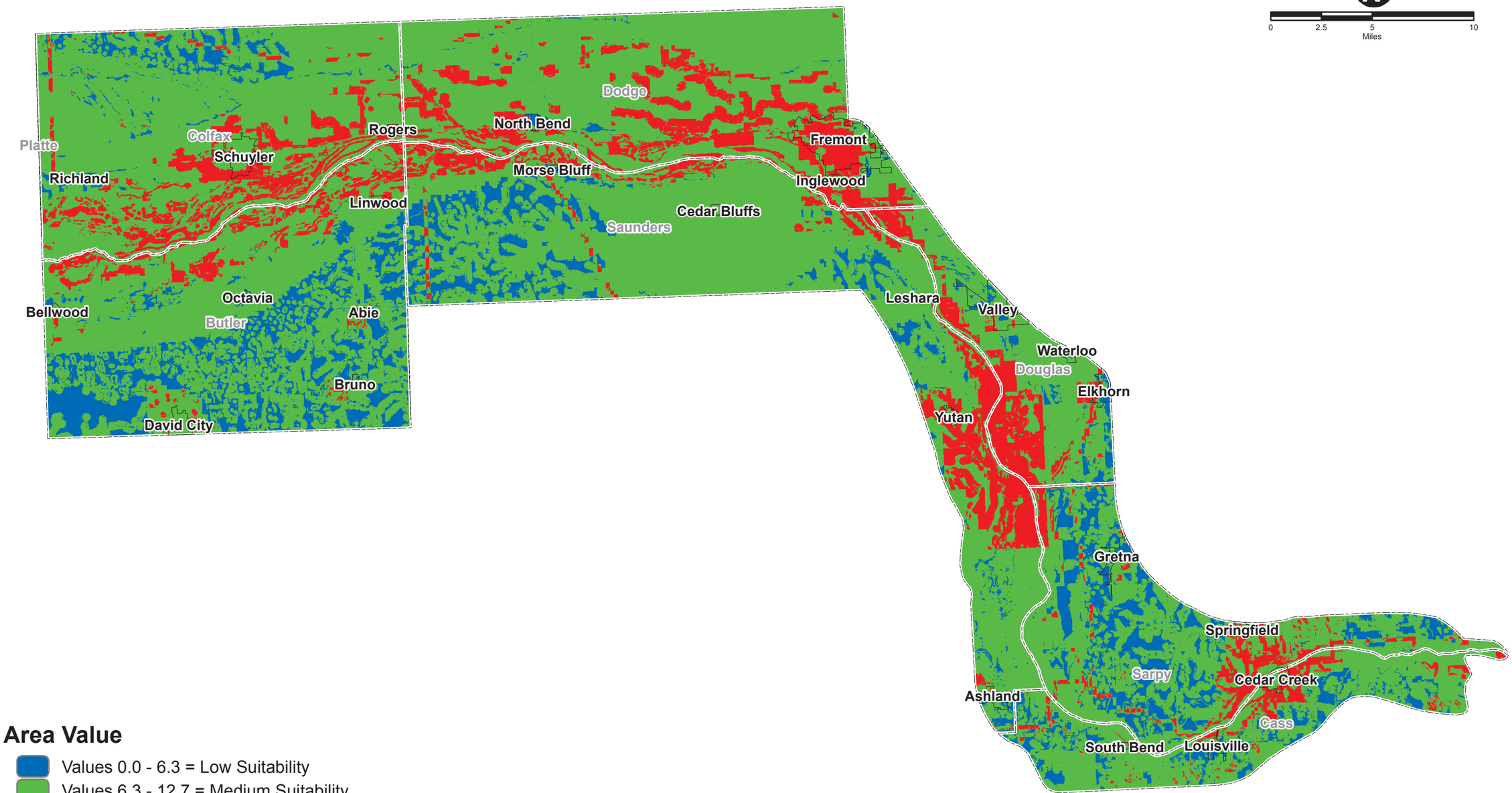
Water Quality Suitability Analysis
Final Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
C-4

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Water_Quality_Protection\Report_Figures\Water_Quality_Model_V3_Fig_C7.mxd



Area Value

- Values 0.0 - 6.3 = Low Suitability
- Values 6.3 - 12.7 = Medium Suitability
- Values 12.7 - 19.0 = High Suitability

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Environmental **Suitability Assessment**

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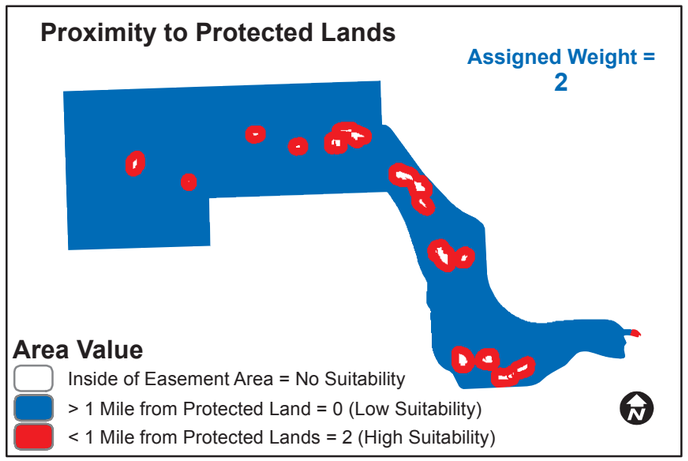
Water Quality Land Suitability Analysis
Final Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
C-5

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Water_Quality_Protection\Report_Figures\Water_Quality_Model_V3_Fig_C8.mxd



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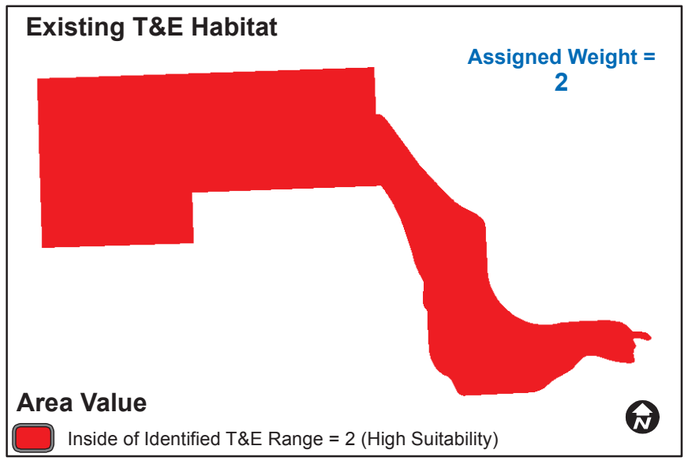

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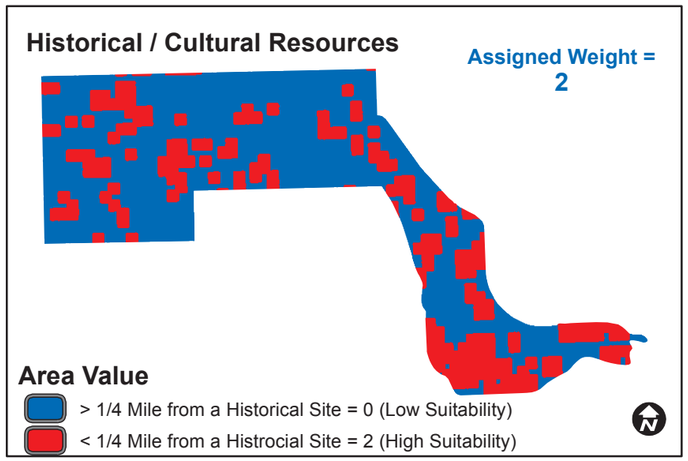

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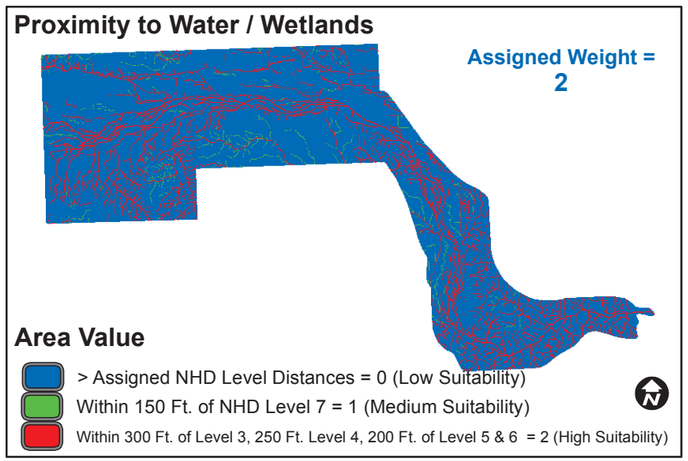

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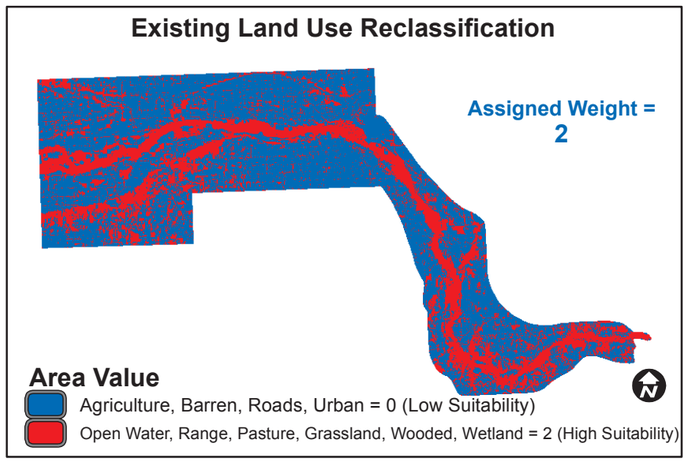

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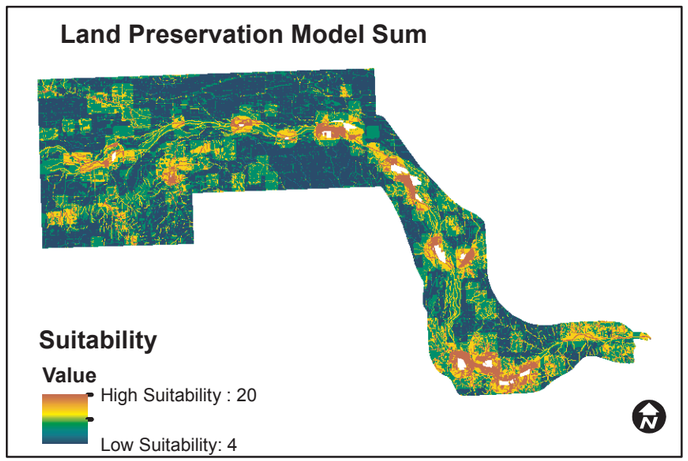

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Environmental Suitability Assessment

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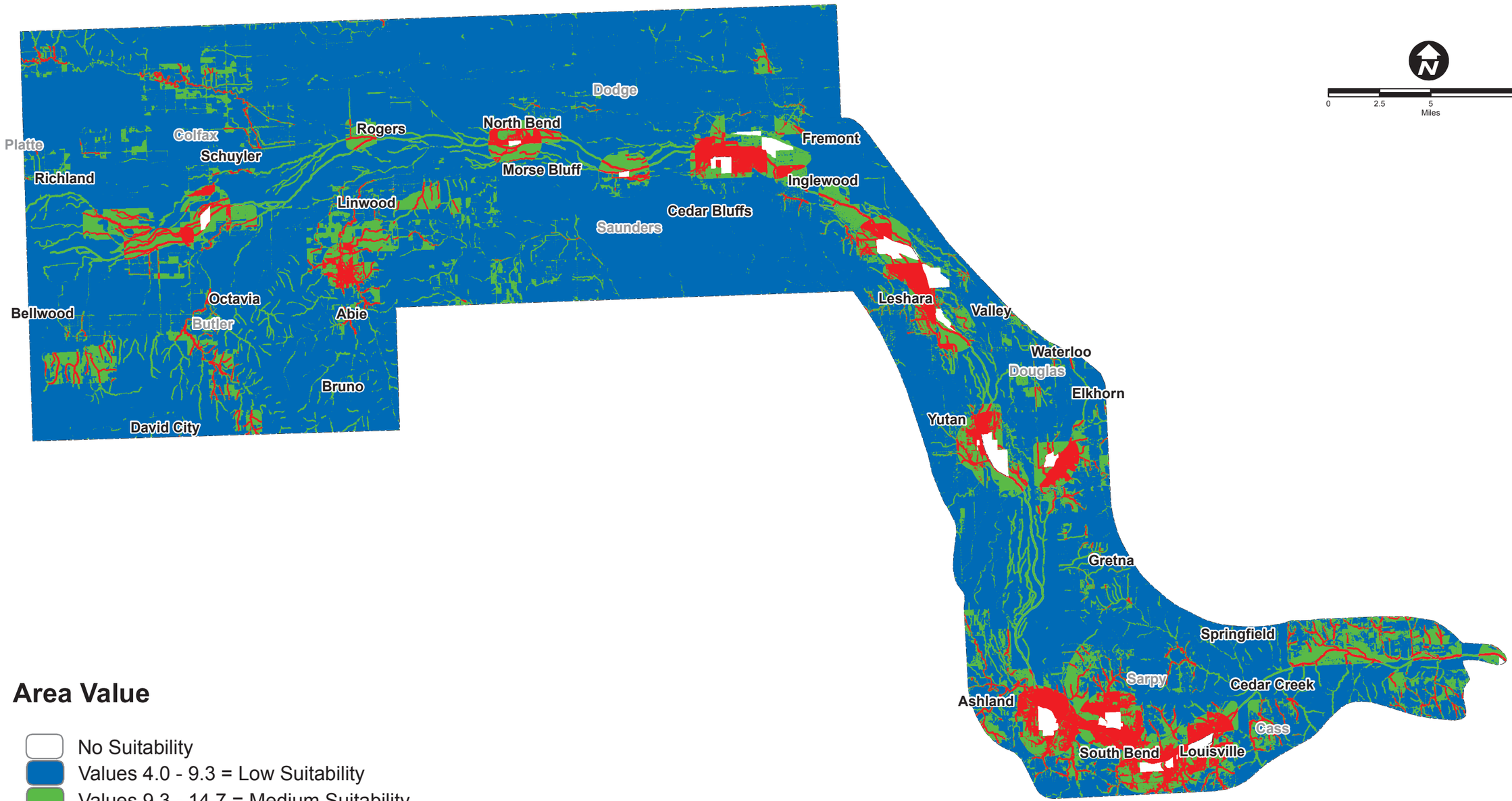
Land Preservation Suitability Analysis
Final Model Suitability Analysis
Factor Components

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
C-6

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Land_Preservation\Report_Figures\Land_Preservation_V3_Fig_C5.mxd



Area Value

- No Suitability
- Values 4.0 - 9.3 = Low Suitability
- Values 9.3 - 14.7 = Medium Suitability
- Values 14.7 - 20.0 = High Suitability

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Environmental Suitability Assessment

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Land Preservation Suitability Analysis
Final Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

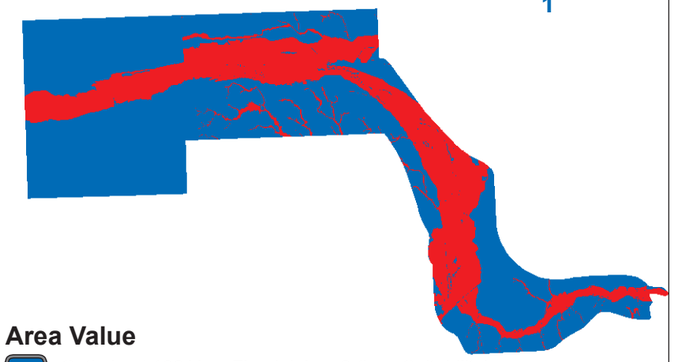
FIGURE
C-7

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Land_Preservation\Report_Figures\Land_Preservation_V3_Fig_C6.mxd

Z:\Projects\Lower_Platte_South_NRD\140156_Land_Suitability_Analysis\map_docs\mxd\Agriculture\Report_Figures\Agricultural_Model_V2_Figure_1.mxd

100 Year Floodplain

Assigned Weight = 1



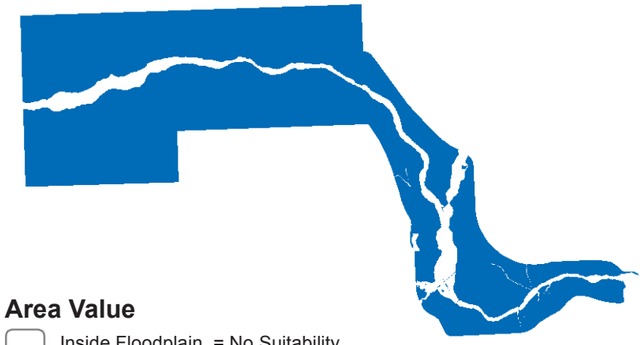
Area Value

- Outisde of 100 Year Floodplain = 0 (Low Suitability)
- Within 100 Year Floodplain = 2 (High Suitability)

+

Floodway

Assigned Weight = 1



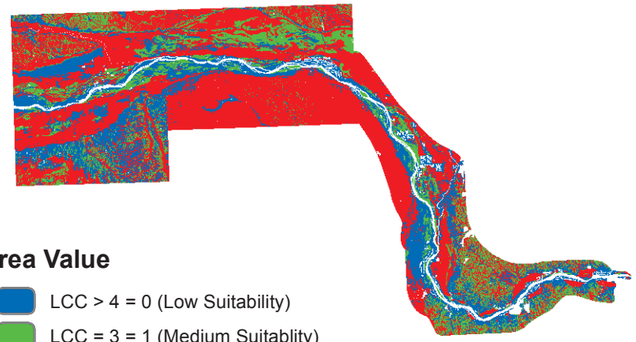
Area Value

- Inside Floodplain = No Suitability
- Outisde of Floodway = 0 (Low Suitability)

+

Land Capability Classification Reclassification

Assigned Weight = 3



Area Value

- LCC > 4 = 0 (Low Suitability)
- LCC = 3 = 1 (Medium Suitablity)
- LCC = 1 or 2 = 2 (High Suitability)

Wellhead Protection Area

Assigned Weight = 1

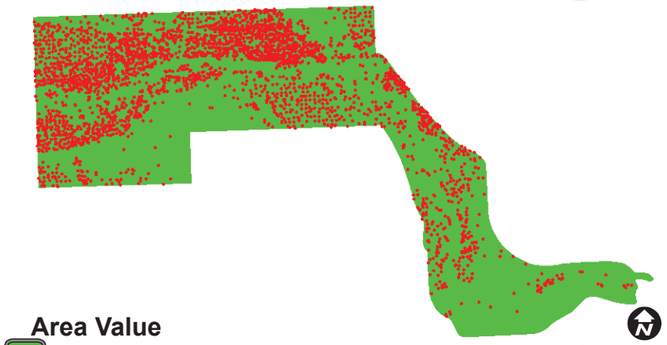
Area Value

- Within Wellhead Protection Area = 1 (Medium Suitability)
- Outside Wellhead Protection Area = 2 (High Suitability)

+

Irrigation Wells / Surface Diversions

Assigned Weight = 2



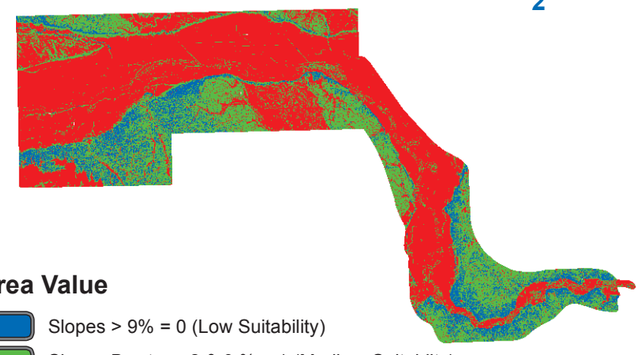
Area Value

- No Irrigation or Registered Well Within 1000 Ft. = 1 (Medium Suitablity)
- Irrigation or Registered Well Within 1000 Ft. = 2 (High Suitablity)

+

Percent Slope

Assigned Weight = 2

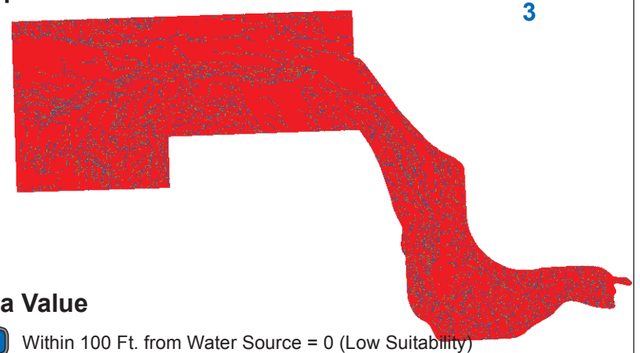


Area Value

- Slopes > 9% = 0 (Low Suitability)
- Slopes Bewteen 2 & 9 % = 1 (Medium Suitablity)
- Slopes = 1 or 2% = 2 (High Suitability)

Riparian Buffer

Assigned Weight = 3



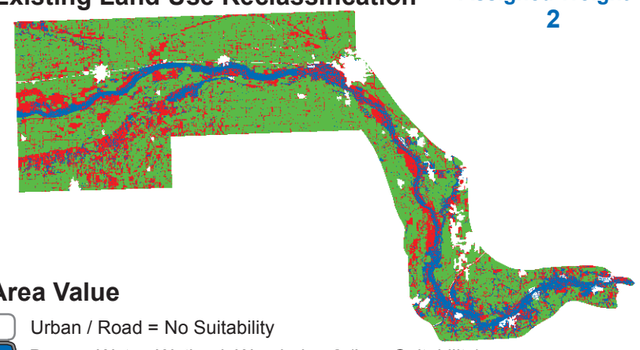
Area Value

- Within 100 Ft. from Water Source = 0 (Low Suitability)
- Between 100 & 150 Ft. from a Water Source = 1 (Medium Suitability)
- Greater than 150 Ft. from a Water Source = 2 (High Suitability)

+

Existing Land Use Reclassification

Assigned Weight = 2

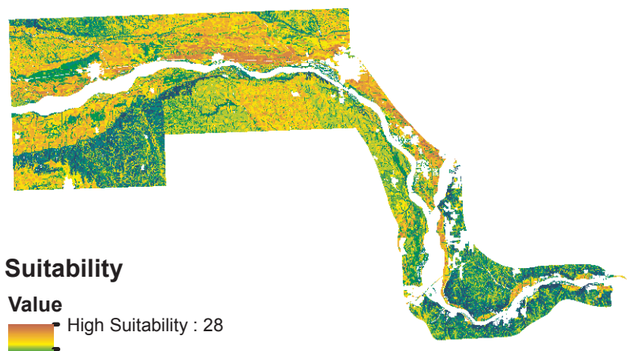


Area Value

- Urban / Road = No Suitability
- Barren, Water, Wetland, Wooded = 0 (Low Suitability)
- Agriculture = 1 (Medium Suitability)
- Range, Pasture, Grassland = 2 (High Suitability)

=

Agricultual Model Calculation



Suitability

Value

- High Suitability : 28
- Low Suitability: 3

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Environmental **Suitability Assessment**

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Agricultural Land Suitability Analysis
Final Model Suitability Analysis
Factor Components

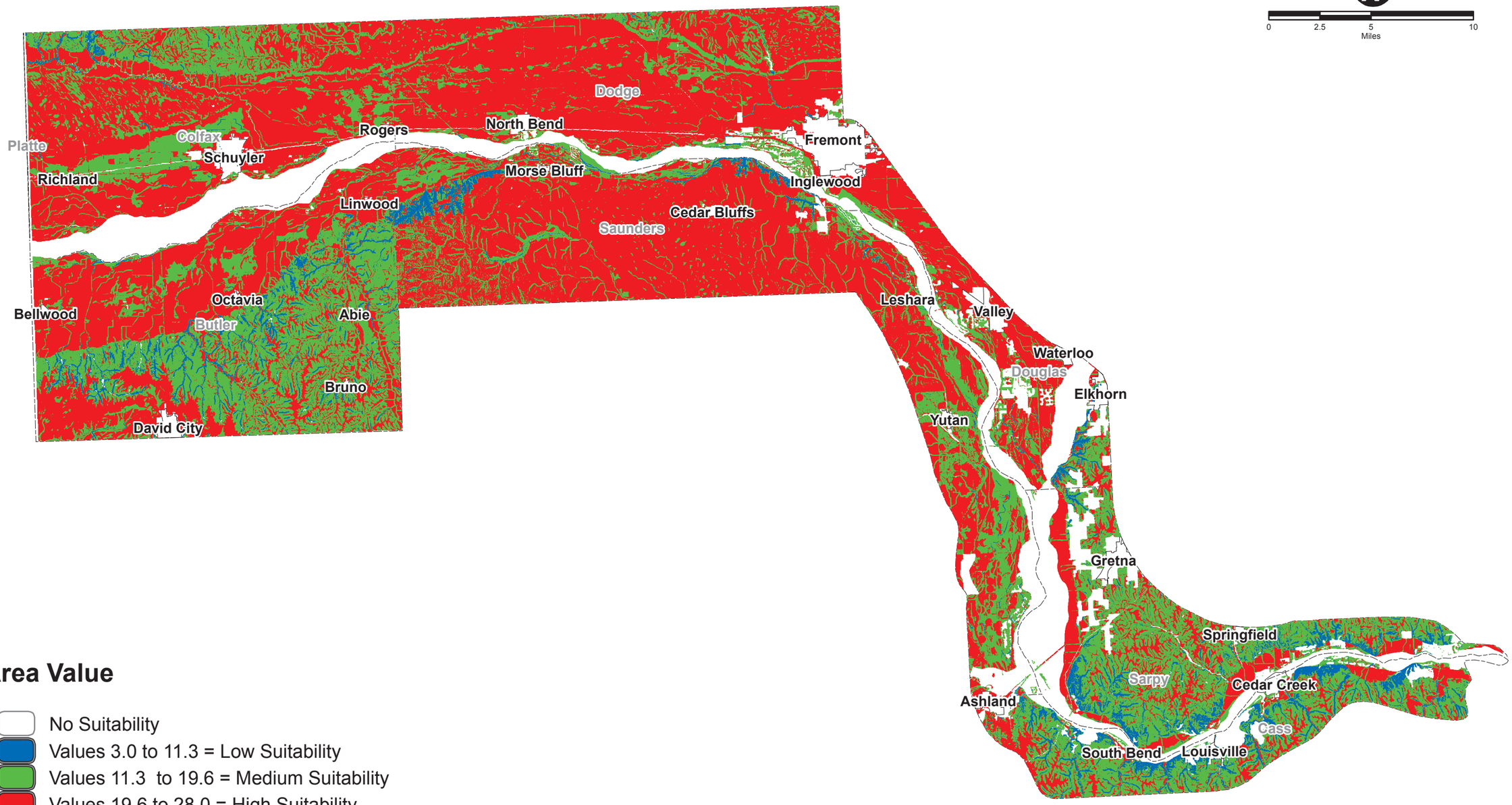
Lower Platte Corridor Alliance Land Suitability Analysis

DATE

June 2011

FIGURE

C-8



Area Value

- No Suitability
- Values 3.0 to 11.3 = Low Suitability
- Values 11.3 to 19.6 = Medium Suitability
- Values 19.6 to 28.0 = High Suitability

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Environmental Suitability Assessment

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Agricultural Land Suitability Analysis
Final Model Suitability Analysis
Composite Output

Lower Platte Corridor Alliance Land Suitability Analysis

DATE
June 2011

FIGURE
C-9

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