Chichaqua Bottoms Greenbelt

Master Plan

POLK COUNTY CONSERVATION


Swamp White Oak

Acknowledgments

We would like to thank the members of the Chichaqua Bottoms Greenbelt Master Plan Planning Advisory Committee and Polk County Conservation Staff.

We would like to thank members of the public who participated in focus groups, interviews, and attended workshops and public meetings in support of this planning effort.

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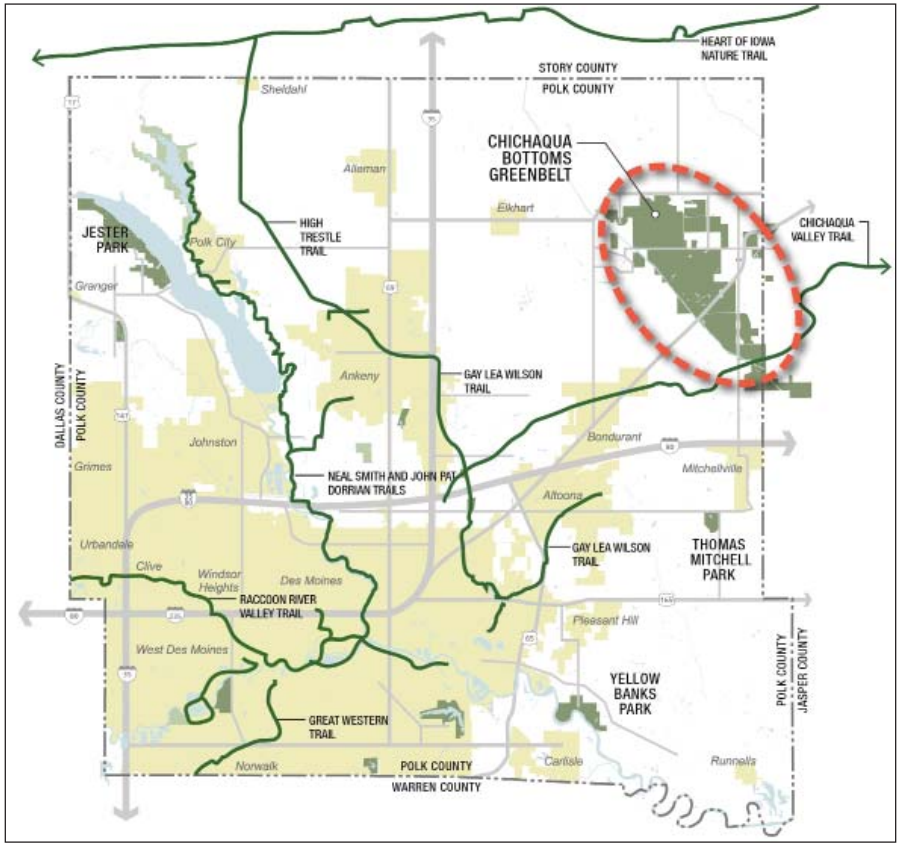
Chichaqua Bottoms Greenbelt Master Plan helps guide investments for Chichaqua's future but it must not be confused with an ecology/management plan. The development of a management plan is the top recommendation of this document as ecological restoration has been and will continue to be the driving force at Chichaqua – far into the future. We have worked here to identify facilities and activities at Chichaqua that should prove compatible to its ecological restoration mission. At all times, that mission comes first. If, at any point, recommendations made here compromise that mission, they should be disregarded or adapted to fit.

Overview

Introduction

This Master Plan for Chichaqua Bottoms Greenbelt (Chichaqua) provides a clear vision for this dynamic corner of Northeast Polk County. This document is intended for use with an ecology/management plan for Chichaqua (see priority recommendation, at right), that will underpin all decision-making. Every effort has been made to anticipate facilities and activities at Chichaqua that will be compatible with ecological management, but if in conflict, ecology comes first.

The year-long planning process began in June 2013. Due to administrative changes, the Plan was put on hold, with the Final Plan produced Fall 2015. The Plan has involved the public, Polk County Conservation Board staff and consultants and a Chichaqua Planning Advisory Committee (representing diverse federal, state and local agencies, as well as private interest groups). Staff and the public have been engaged through public workshops, working sessions and/or ongoing meetings.



Location of Chichaqua in Polk County

Program Initiatives/Recommendations

This Master Plan recommends the following initiatives:

- Ecology/Management Plan—note this is recommended as the top priority for Chichaqua
- Ongoing land protection through buffering and in-fill
- Interpretive/Education Plan
- Wayfinding and Signage Plan

Several significant improvements are recommended in the Master Plan. The highlights include:

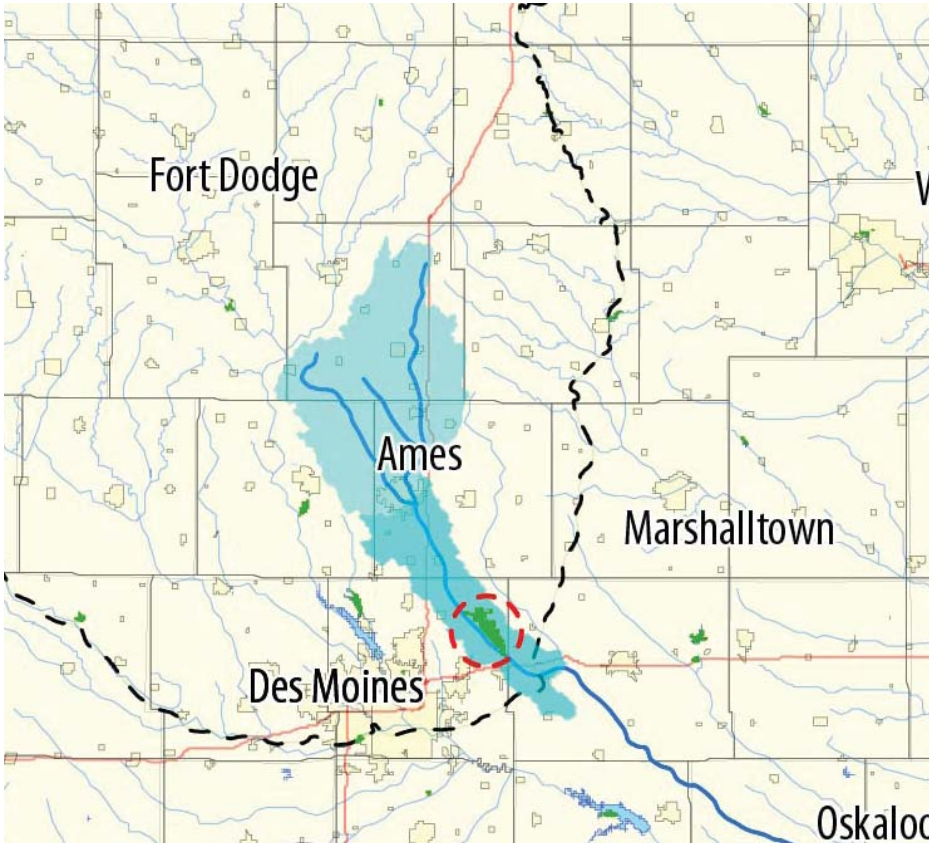
- Establish a Welcome Portal including Chichaqua Station (a primary education center), which will accommodate education, ongoing scientific research, and an introduction to Chichaqua
- Dispersed Education Hubs—locations in the landscape, dispersed throughout Chichaqua, again supporting education and research
- Bike Oasis—a new connection to the existing multi-use Chichaquq Valley trail, offering an additional entry portal to Chichaqua
- Improved and expanded pathways for the public (e.g., water and nature trails, multi-use paths, a back-country challenge trail)
- Improved traffic routing and control along with road modifications/ access to support continuous habitat
- Improved, distributed parking options allowing for personal access
- Lodging to support unique experiential camping
- Moving structures out of the flood plain or designing for flood resilience, i.e., adapting to life in the floodplain
- Welcome Information Hubs to welcome the public to Chichaqua, provide orientation and support wayfinding
- Improved youth camping opportunities

Additionally, this plan recommends a new era of partnership, protection, and connections for Chichaqua through a series of strategies appearing in this plan (see Facilities Map, page 33).

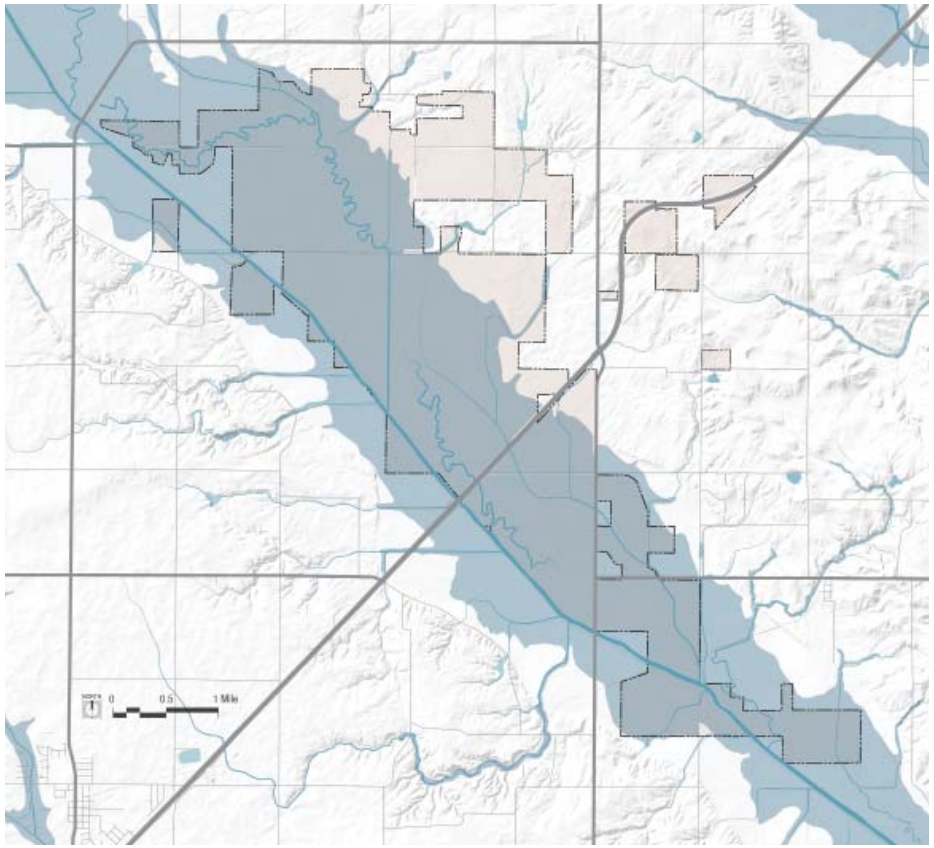
Water Quality/Quantity Summarized

Plan Recommendation: improve water quality and manage quantity, in order to enhance the ecological and recreational value of Chichaqua's hydrologic systems.

- Partner with landowners in at least one sub-watershed to implement best management practices and demonstrate the effectiveness of responsible water management.
- Without negatively impacting upstream landowners, seek opportunities to restore the flow of water through historic Skunk River meanders and oxbows.
- Improve ecological function, reduce sediment transport, and stabilize erosion in upland draws.
- Create new resources of permanent deep-water habitat.
- Establish a water quality monitoring program to demonstrate the efficacy of Chichaqua's water management methods.
- Restore natural hydrology on future acquired lands through the breaking of existing drain tile networks and removal of ditches, where practically and legally feasible.
- Acquire properties when available, to create additional hydrologic connections and further opportunities for wetland habitat.



The watershed of the Southern Skunk River

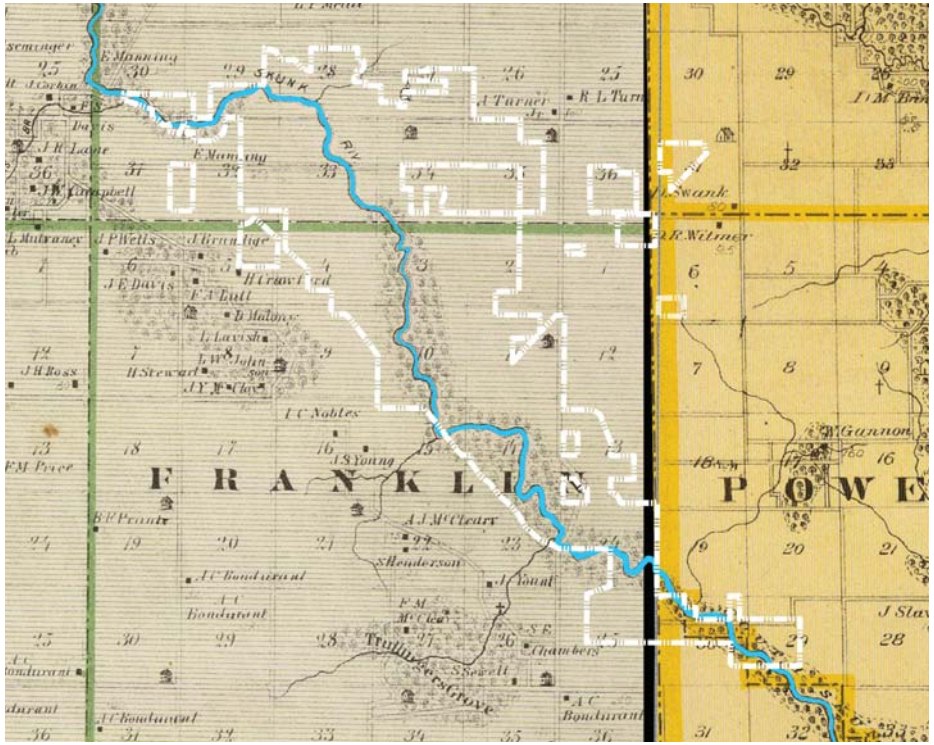

The 100-year floodplain

Overview and Ownership

The Chichaqua Bottoms Greenbelt (Chichaqua) is located in northeastern Polk County, 10 miles from the corporate limits of the City of Des Moines and two miles from the corporate limits of the City of Bondurant. From Des Moines, Chichaqua is most readily accessed via two routes:

1. US Highway 6 (Hubbell Avenue) to US Highway 65, which bisects Chichaqua. This is the fastest route to Chichaqua, but it does not expose the traveler to many of Chichaqua's developed facilities.
2. Interstate 35 to the Elkhart exit, then east via NE 126th Avenue, NE Yoder Drive and finally NE 134th Avenue, which provides access to developed facilities at Chichaqua's northern edge.

Chichaqua is a mostly-contiguous patchwork of public land totaling 9,100 acres, of which 7,300 acres are located in Polk County. Most of the Polk County acreage is owned by the Polk County Conservation Board (PCCB), with the Iowa Department of Natural Resources (IDNR) owning a smaller fraction. Additionally, many areas owned by PCCB are subject to permanent easements administered by the Natural Resources Conservation Service (NRCS). These easements were authorized by the Wetland Reserve Program (WRP) and Emergency Wetland Reserve Program (EWRP), and are thus governed by all the requirements and restrictions of those programs.



Skunk River circa 1875 with current Chichaqua boundary shown in white

Restoration

For many people, the word "restoration" denotes the perfect return of an original state. If we think carefully, however, we will see such restoration is not possible. When one "restores" a piece of antique furniture, one understands the new finish is not the same as the old. But, when done well, restoration puts forth a new thing that is powerfully reminiscent of the old. A good restoration rejuvenates an old thing, showcases its form and function, and thus gives it new life in the present. *Ecological restoration seeks to develop ecosystems that deliver as many of the features and functions of the historic landscape as possible.* Some of these features include resilience to disturbance, a diversity of native species and, of course, wild beauty. Some of the key functions include flood mitigation, water quality enhancement, production of fish and game, and the pollination of human crops. In short, we seek to create and maintain a sturdy and bountiful ecosystem that honors our natural heritage.

Chichaqua and Wilderness

The history of the Chichaqua Bottoms Greenbelt mirrors the course of the original Skunk River—winding, meandering, full of turns. From about 1,000 acres in the early 1990's, the Greenbelt's many partners have amassed a tract of more than 9,100 acres through hard work, wise resource use, and strategic acquisitions.

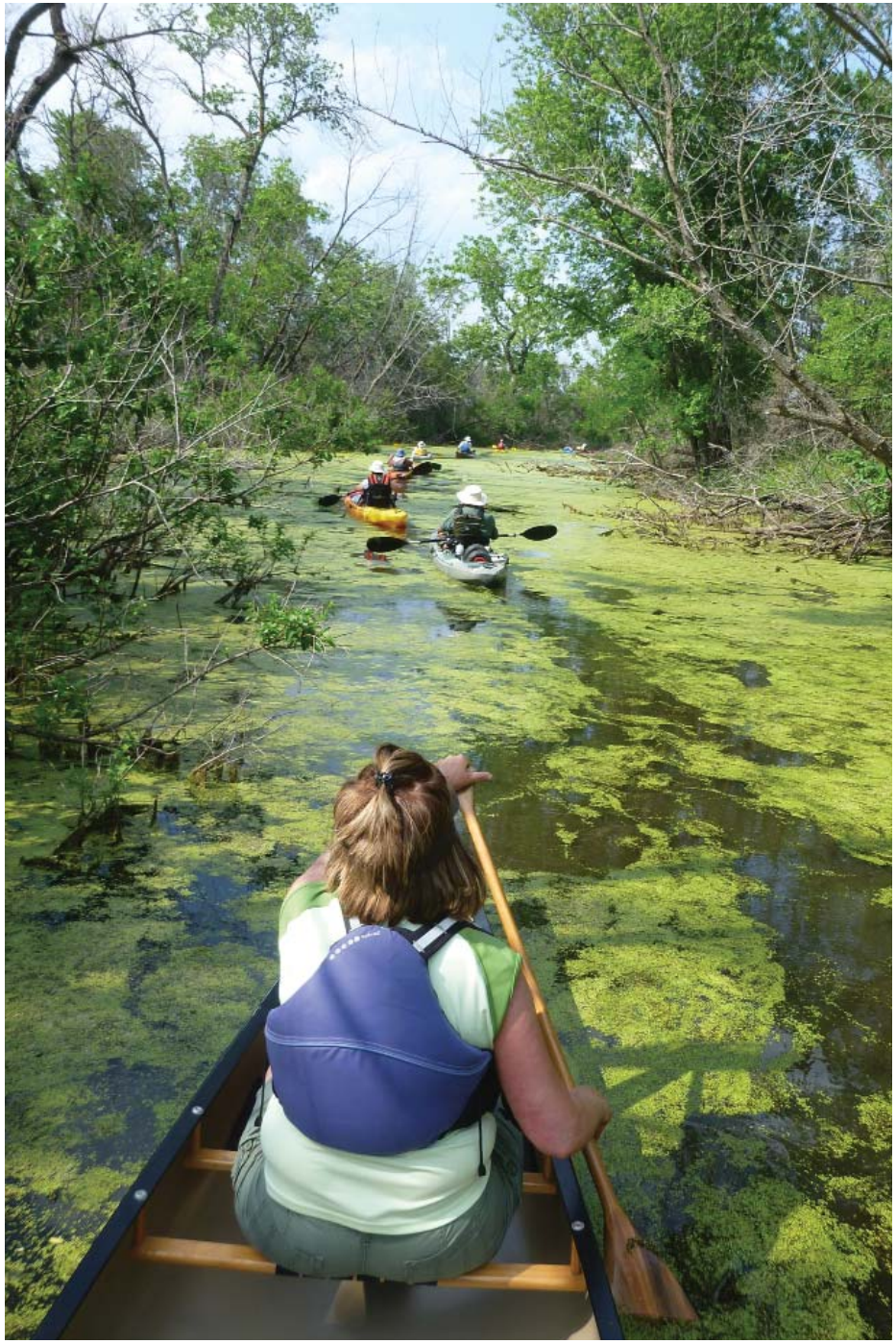
With such a mass of land comes new opportunities for Chichaqua to exceed early assumed limitations. Any natural area is noteworthy, but the proximity of Chichaqua to an urban center and its immersion in an agricultural landscape make Chichaqua all the more significant. The rare confluence of city, farm and wild lands positions Chichaqua as a model for restoring damaged natural systems and recapturing lost values through landscape-scale reclamation under challenging circumstances.

The vision that turns this challenge into opportunity comes through the many partners involved. These partners include hard-working neighbors, governmental agencies, public and private universities and a broader public holding a passion for this place. All recognize the value of moving beyond the wants of any single user group to embrace a wide variety of desires that find common ground at Chichaqua. Through this Master Plan, the partners also speak to the need to restore the natural functions of our native landscapes for wildlife and future generations.

Chichaqua is a once-again wild place of sandy hills, fertile bottomlands, fragments of South Skunk River meanders and straightened drainage routes to support agricultural neighbors. Spring flooding occurs most years and the occasional, more extensive flooding influences the facilities and activities that can be provided.

How wild is Chichaqua?

We simply do not know whether to call Chichaqua wilderness or almost wild. Why? It depends on your perspective. The hydrology has been dramatically altered. Many of its acres were once cropped, and some still are. But Chichaqua often feels quite wild by urban standards. To an ecologist or researcher, however, we've simply made progress in restoration but have a distance to go. Chichaqua has opportunities to be restored to an ever wilder state. This plan supports that work while at the same time guiding us in welcoming newcomers to Chichaqua—many of whom will get their first taste of something wilder-than-usual here.



Blanding's Turtle

CHAPTER 1

About the Plan, Process and Strategy

Introduction and Background

Flying over the Chichaqua Bottoms Greenbelt, a migrating bird can see the past and the present side-by-side.

The present is a straight drainage ditch running southeasterly. Engineers excavated the South Skunk River channel with steam shovels in the early part of the 20th century. Their ambitious project made possible the production agriculture that now occupies much of the valley. They cut a neat stripe of sand between earthen levees, which is now the only South Skunk River many people know. This ditch is the official river, marked with a green sign where it crosses beneath U.S. Highway 65.

The past can be seen off to the east, as the historic channel of a 24-mile labyrinth of oxbows and meanders which the river reluctantly abandoned when it moved to the new place men made for it. All wildlife favor the old channel, but will use the excavated channel during periods of low water.

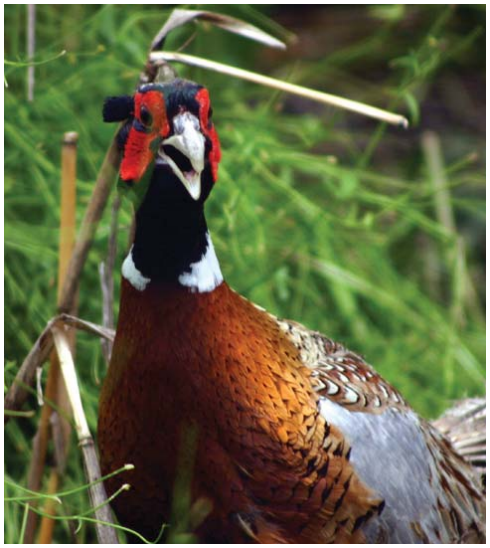
Modern agriculture and natural Iowa are also manifest at ground level. Western fringed prairie orchids and 200-year-old swamp white oaks can be found within a short walk from corn and soybeans.

The Chichaqua Bottoms Greenbelt—simply "Chichaqua" to locals—is a unique and compelling place, where modern people enjoy rare access to an ancient landscape. Many of those people, from all walks of life, have contributed to this Master Plan.

Purpose

This Master Plan has two crucial aims:

1. To establish a guiding vision, mission statement and core objectives for Chichaqua.
2. To identify, quantify and prioritize any changes to Chichaqua that may be needed to achieve the core objectives, fulfill the mission statement and realize the vision.



Process

Stakeholder, Staff Involvement and Public Engagement

This Master Plan was developed with extensive involvement from a wide range of stakeholders. Stakeholder involvement was incorporated through five primary venues:

- Strategy Sessions
- Focus Group and Individual Interviews
- Public Workshop
- Staff Input
- Planning Workshop

Details of the stakeholder involvement process are provided in Chapter II, Public Involvement.

Research and Modeling

Concurrently with the public engagement process, the consultant team conducted research, modeling, assessment or simple review of three major factors affecting the Master Plan: ecology, hydrology and archaeology.

ECOLOGY

A habitat suitability model was completed for Chichaqua and its immediate surroundings by Dr. Keith Summerville, ecologist from Drake University. Summerville's study focused on six species of conservation concern as indicators of ecosystem health.

However, this Master Plan did not seek to evaluate current management practices. That task will be taken up in a subsequent ecology/management Plan. Developing that plan is this report's top recommendation.

ARCHAEOLOGY

In 2003, the Office of the State Archaeologist (OSA) conducted a geo-archaeological assessment of Chichaqua to identify areas with the highest probability for archaeological significance. That study determined nearly 75 percent of Chichaqua has archaeological potential of "low to moderate" or higher. This plan stays mindful of the need to sustain this archaeological resource.

HYDROLOGY

HR Green delineated the sub-watersheds that comprise Chichaqua. For each sub-watershed, hydrologic modeling was completed to evaluate runoff potential. This helped to identify the sub-watersheds which are most in need of runoff management practices. Additionally, HR Green developed cross-sections of the Chichaqua valley from available LiDAR data, in order to assess the feasibility of diverting water from the new South Skunk River channel (Ditch 25) to the old river oxbows at Chichaqua. This assessment determined such a diversion was not feasible.

Strategic Planning Framework

The interactive planning process used here was informed by science, stakeholders and the public. Its result is a Strategic Planning Framework consisting of a list of guiding principles, a vision for the future, a mission statement and a brief list of over-arching goals for Chichaqua. This framework forms the foundation of the Master Plan.

Guiding Principles

- Finding a balance among social, economic and environmental factors is crucial to the future of Chichaqua. However, ecological restoration shall govern decision making. The primary focus of Chichaqua is restoration of the native landscape.
- The many partners, ranging from individual landowners to the federal government, need ongoing mechanisms for involvement in Chichaqua's future. Their perspectives are essential and they influence each and every decision.
- Chichaqua's landscape-scale research and learning opportunity distinguishes this place from countless other "wild lands" set-asides.
- Exploring the intersection of urban, agriculture and wild land holds exceptional value for the future of our understanding of natural resources, social needs and economic vitality.
- The stories of Chichaqua's cultural history must not be lost, but celebrated.
- This landscape lends itself best to diverse, not exclusive, uses.
- Science and research of the recovering landscape are critical at Chichaqua. Science-based decisions move Chichaqua forward more than isolated anecdote.
- Chichaqua should serve Central Iowa as an example of how to reclaim a natural area within a working landscape.
- Chichaqua has value as a wild place. We must be watchful of over-development that would compromise restoration goals.

Vision: Imagining Chichaqua's Future

In the future, Chichaqua will be a local, state and national model of the healing of once wild lands. Chichaqua will engage its agrarian and urban neighbors in research, education, and recreation.

Mission: Leadership in Wild Lands Reclamation

To repair and restore the native landscape at Chichaqua through leadership in habitat reclamation, science and education, strategic expansion, public/stakeholder partnerships, and landscape-sensitive recreation.

Note: Where we cannot restore, we hope to repair. For example, we cannot likely restore Chichaqua's pre-settlement hydrology, but we hope to repair its hydrologic function. Repair implies for us "built," hardscrape or technological fixes. Restore implies use of nature-based systems, less obviously involving man's direct hand.

Over-arching Goals

Reclaim this landscape's pre-European settlement qualities as much as practical by establishing a mosaic of functional habitat types.

Create a restorative model that can be replicated throughout the state, region, and nation, achieving a balance between social, economic, and environmental interactions.

Increase the public's general understanding of the work involved in reclaiming wild lands and the benefits of natural systems and biodiversity.

Build awareness of the value of Chichaqua specifically as a reclaimed "wild" landscape close to the urban landscape.

Enhance and improve public access and awareness without compromising Chichaqua's ecological value.

Bobolink

CHAPTER II

Public Involvement

Involvement

This Master Plan was developed with extensive involvement from a wide range of stakeholders. Stakeholder involvement was incorporated through five primary venues:

- Strategy Sessions
- Focus Group and Individual Interviews
- Public Workshops
- Staff Input
- Planning Workshop

Strategy Sessions

The Chichaqua Master Plan process began with the recruitment and convening of a Planning Advisory Committee including a science advisory team. The Advisory Committee includes representatives of Chichaqua's various landowners and neighbors, as well as user groups and a broad-based public of interested residents. Among others, an invitation to participate was extended to the following organizations and individuals:

- Polk County Conservation Board
- Jasper County Conservation Board
- Iowa Department of Natural Resources
- United States Fish & Wildlife Service
- Natural Resources Conservation Service
- Iowa Natural Heritage Foundation
- Audubon Society
- Sierra Club
- Izaak Walton League
- Pheasants Forever
- Ducks Unlimited
- Drake University
- Des Moines Area Community College
- Area landowners with potential interest in ongoing participation
- State Historical Preservation Office

Strategy Sessions lasted approximately three hours each, and were held at the office of HR Green, Inc. in Johnston. These sessions were held on the following dates:

May 3, 2013—Kickoff: Aspirations, Opportunities & Obstacles

August 7, 2013—Topics: Recreation & Education

October 2, 2013—Topics: Ecology & Hydrology

November 19, 2013—Strategic Plan, Vision & Goals

September 15, 2015—Input on Draft Master Plan

Focus Group and Individual Interviews

Additionally, a Focus Group was assembled for a two-hour meeting to discuss issues relating specifically to recreation and education. This group met at the Altoona City Hall on July 29, 2013, and represented a broad range of stakeholders, including: Cities of Altoona and Bondurant, Des Moines Public Schools, Iowa Rivers Revival, private and public fish and game organizations, cycling and birding interests, adjacent landowners and others. This focus group provided meaningful insights and advice to the Master Planning team.

The focus group was further supplemented through a series of individual interviews conducted through early Fall 2013, particularly focused on the perspective of private landowners and ecological concerns.

Public Workshops

A well attended public workshop was held on October 24, 2013, at the Bondurant Public Library. An open house format was used, providing community members an opportunity to talk freely with PCCB staff and consultants as well as provide written comments through a suggestion box and other interactive features. An open house, with a brief presentation of the draft Master Plan, was held on September 8, 2015, at the Chichaqua Longhouse. Forty-plus persons were in attendance.

Staff Engagement

In addition to ongoing meetings with a smaller team of staffers, a broad-based staff input session was held in early November of 2013. A follow-up staff engagement session was conducted on October 21, 2014 where approximately 15 staff members focused on key concepts of the Draft Chichaqua Bottoms Greenbelt Plan. Staff reviewed what had been drafted and made suggestions for improvement. The staff discussed a variety of topics:

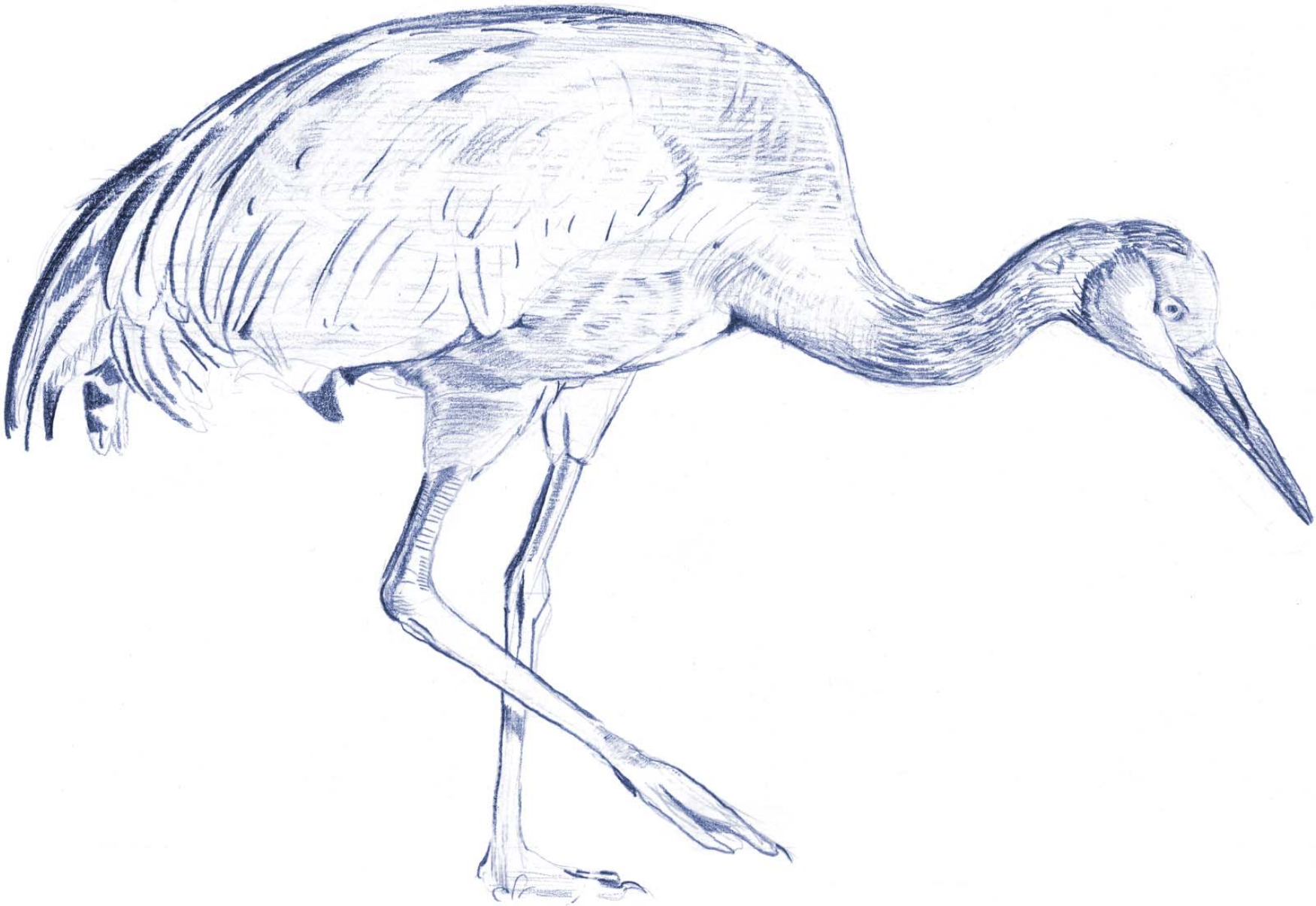
- Preservation vs conservation
- Pumping water into Chichaqua
- Land acquisition
- Farming practices
- Archeology
- Gateways/wayfinding
- Facilities/amenities

Planning Workshop

The Planning Advisory Committee met on November 19, 2013 to discuss a draft vision, mission statement and objectives prepared by the consultant team in response to this input.

Draft Plan Review

In addition to the public open house on September 8, the Planning Advisory Committee reviewed and convened for additional feedback on the draft plan September 15, 2015.



Sandhill Crane

CHAPTER III

Background/Current Conditions—Water, Land, People, Place

Water

Hydrology/Assessment

The first task of hydrologic assessment was to clearly describe and assess the existing hydrology of the site, including a delineation of sub-watersheds.

Next, a hydrologic assessment of Chichaqua did not begin with a "blank slate." Rather, the planning team was guided by PCCB staff's intimate knowledge of the area, and their assessment of existing hydrologic challenges. According to PCCB staff, two primary hydrologic challenges exist at Chichaqua, which have profound ecological and recreational implications:

1. Water quality in Chichaqua's wetlands is influenced by sediment and nutrient inputs from watersheds along the east side.
2. Existing soils and drainage networks cause an expedited hydrology that is disadvantageous from an ecological and recreational standpoint. Simply stated, water often seeps or drains away from the surface at Chichaqua too quickly to provide optimum habitat for wildlife or recreational opportunities for people.

Hydrologic assessment was thus guided by three primary aims:

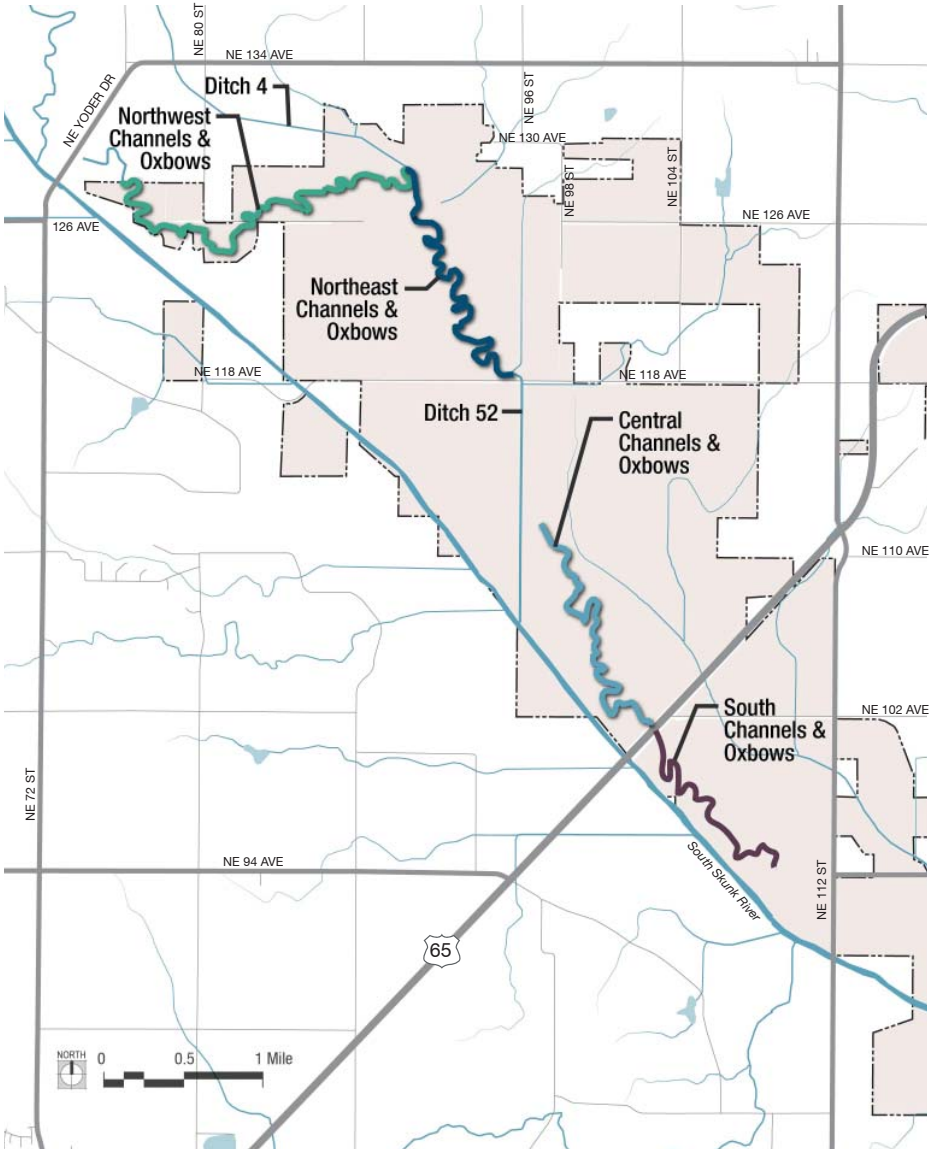
- Identify the locations at Chichaqua that are most prone to erosion and nutrient inputs, and establish the peak flow rates (cubic feet per second) for Best Management Practices (BMPs) required to control erosion in those locations.
- Identify key "points of hydrologic interest," where surface waters may be managed and controlled for recreational and habitat improvement.
- Identify locations where existing drainage ditches, including the South Skunk River, may be "borrowed" to rehydrate the old river channels without adverse impact on drainage of upstream agricultural lands.

The results of hydrologic assessment were then used to establish the hydrologic improvements recommended later in this Master Plan. Extensive hydrologic modeling was not conducted. The accuracy of modeling in a wetland/floodplain/drainage conveyance environment would depend on detailed survey and extensive modeling, beyond the scope of this Master Plan.

THE OLD RIVER

The original purchase of public lands at Chichaqua was centered on the old river channel. The old channels and oxbows of the former Skunk River provide wooded wetland habitat when adequate water is available. Four distinct sections of channels and oxbows exist as follows:

- **Northwest channels & oxbows.** The Northwest channels & oxbows are the best-known at Chichaqua. They are located near the roadway of NE 126th Avenue, and are easily accessible from the existing ranger station and Chichaqua Longhouse area. These channels are also some of the widest, deepest and most extensive at Chichaqua. Approximately 4.7 miles of continuous channel exist here, not including dead-end loops, braided side channels or landlocked oxbows. However, the Northwest channels do not have a flow-through connection to the aforementioned drainage ditch network, and therefore function as ephemeral or semi-permanent still-water wetlands.
- **Northeast channels & oxbows.** The Northeast channels run from the outlet of Ditch 4 to the beginning of Ditch 52 at NE 118th Avenue. These channels are an integral part of the drainage ditch network described above, and are thus the only channels through which current regularly flows. They are also some of the shallowest and narrowest at Chichaqua. Approximately 3.2 miles of continuous channel exist here, not including dead-end loops, braided side channels and landlocked oxbow segments.
- **Central channels & oxbows.** Lying between NE 118th Avenue and US Hwy 65, the Central channels are characterized by relatively deep, well defined channels. Approximately 3.6 miles of continuous channel exist here, not including dead-end loops, braided side channels and landlocked oxbow segments.
- **South channels & oxbows.** This short, isolated section comprises approximately one mile of continuous channel, located south of US Hwy 65.



The Old River—Channels and Oxbow

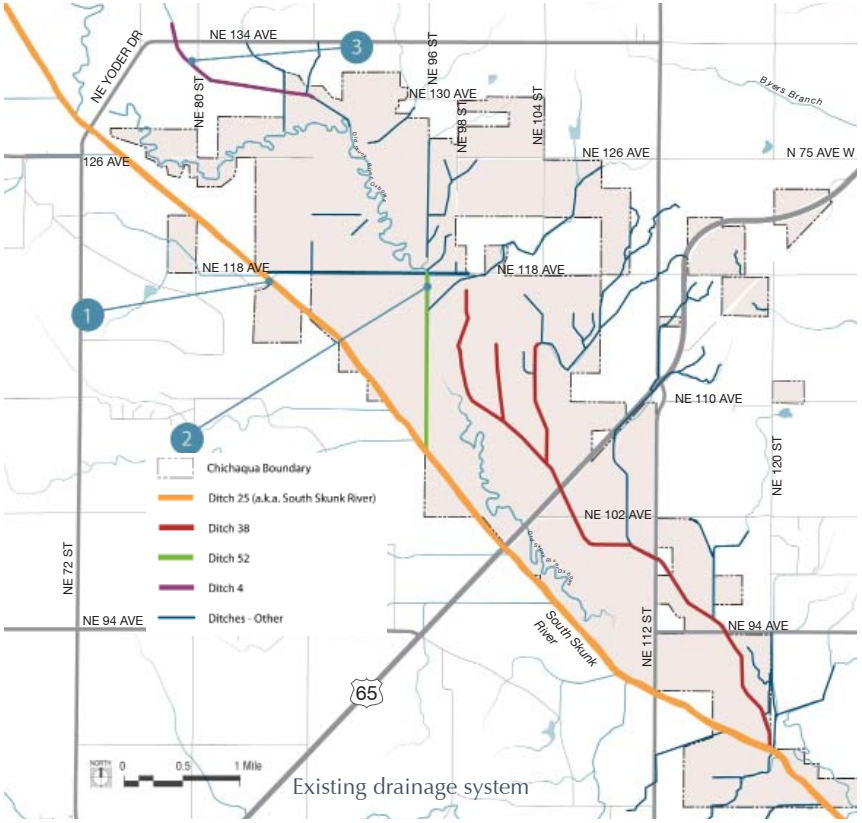
WATERSHEDS

Chichaqua comprises nine distinct sub-watersheds within the South Skunk River watershed. Adjacent land uses have an impact on water quality in Chichaqua's wetlands, especially along the northeastern fringes of Chichaqua. The sub-watersheds labeled A through F, and especially sub-watershed C, are problematic from a water quality standpoint. These sub-watersheds contain intensively cultivated areas with highly erodible soils, and have the most significant ground slopes. Consequently, they often produce runoff laden with sediment and nutrients. (See map, Chapter 4, page 38)

DITCH NETWORKS

Much of Chichaqua lies within the 100-year floodplain of the South Skunk River. Nevertheless, due to a constructed network of drainage ditches, most of the valley drains readily during normal precipitation patterns. This network conveys runoff from Chichaqua and adjacent private lands to the excavated South Skunk River channel. The network is built around four primary ditches as follows:

- **Ditch 25.** Also known as the South Skunk River, this regional drainage canal bisects Chichaqua from northwest to southeast. Nearly 700 square miles of land upstream from Chichaqua are drained by the South Skunk River. An additional 25,000 acres (39 square miles) drain to that segment of the river which flows through Chichaqua. Most of that acreage lies west of the river.
- **Ditch 4.** Ditch 4 drains more than 4,600 acres (7.3 square miles) of farmland north of Chichaqua, and enters Chichaqua northwest of the existing ranger station complex. From there, Ditch 4 proceeds easterly to a control structure at the entrance to a narrow, meandered section of old river channel. Drainage then meanders through the old river channel, eventually discharging to the Ditch 52 system.
- **Ditch 52.** Ditch 52 is an L-shaped system. Its east-west leg is the road ditch of NE 118th Avenue. Flow in this leg can proceed in either direction, depending on the level of the South Skunk River. At very high river levels, water enters Chichaqua flowing eastward. As the river recedes, water drains



South Skunk River

Ditch 52

Ditch 4

Northwest oxbows

back toward the river, flowing westward. The north-south leg begins at the NE 118th Avenue crossing over the old river channel. Drainage from Ditch 4 enters here and flows due south, discharging eventually to the South Skunk River. The north-south leg of Ditch 52 is among the deepest and most prominent of all ditch segments at Chichaqua. It supports limited aquatic life and holds water even during prolonged periods of dry weather. In addition to the area drained by Ditch 4, which enters it, Ditch 52 drains an area of 4,300 acres (6.7 square miles), nearly all of which is owned by PCCB.

- **Ditch 38.** Ditch 38 is a branched system with several south-flowing tributaries converging near the intersection of NE 102nd Avenue and NE 112th Street. Ditch 38 drains an area of approximately 3380 acres (5.3 square miles), and its northern reaches run through the heart of the old river meanders. The majority of Ditch 38 lies within the boundary of Chichaqua.

GROUNDWATER

The natural systems at Chichaqua are ultimately groundwater-driven. All restoration relies on the movement of water through permeable soils and existing drainage infrastructure. Beneath the surface, groundwater flows laterally across Chichaqua from east to west, percolating through sand deposits toward the South Skunk River. When the groundwater table is high, this lateral percolation is intercepted by the various drainage ditch systems. In an exceptional drought, surface water flow may all but disappear from these ditches, and even from the river bed itself.

WETLANDS

Numerous shallow ephemeral wetlands exist throughout Chichaqua. Some of these have been established by plugging existing drainage tiles or constructing earthen berms to retard the flow of water from these wetlands and extend the residence time of water within them. Permanent, deep-water wetlands are rare, since Chichaqua is so effectively drained by the network of ditches and by the glacial sands underlying the Group B and B/D soils. Additionally, several wetlands have been constructed, or are currently underway, to mitigate impact elsewhere.

A controlled waterfowl hunting area provides an additional 400 acres of seasonal and semi-permanent wetland habitat. This area is enclosed by levees, and water levels are maintained by pumping from a groundwater well source.

Controlled waterfowl area


Photo courtesy of Carl Kurtz

Land

Story of Habitat and Ecology

- More than 40 years of expansion and restoration have created a patchwork of habitats of varying quality at Chichaqua.
- Significant expanses of lowland and upland habitat now exist throughout the valley.
- Notable gaps remain between zones of similar quality.

Ecology and Wildlife

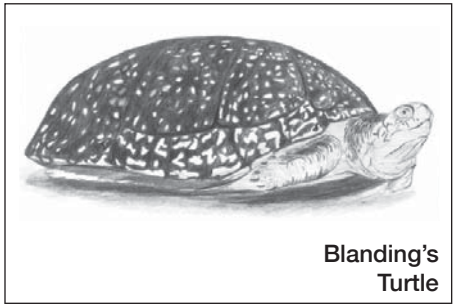
Restoration efforts at Chichaqua have re-established extensive areas of tallgrass prairie grasses, sedges and forbs. This prairie complex is pocked with many small, ephemeral wetlands. Bottomland deciduous forests exist along the Old River, and the presence of sandy, water-deposited or wind-blown soils in some areas creates unique habitats that exist in few other places in Iowa. As a result, Chichaqua has become a focal point for biological and ecological research.

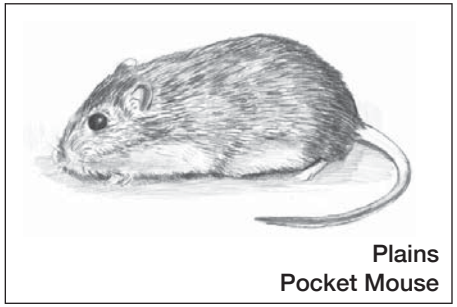
Chichaqua is a popular destination for hunters. Plentiful and popular resident game species at Chichaqua include whitetail deer, Eastern wild turkey, ringneck pheasant and cottontail rabbits. Migratory game can also be found in seasonal abundance, including Canada geese, mourning doves and a wide variety of duck species.

Non-game species also thrive at Chichaqua, and are of increasing interest to birders and wildlife viewers. The majority of Iowa wild life species are not hunted. Non-game species are given equal consideration and native species shall have priority over non-native species. Chichaqua is not only a year-round habitat for resident wildlife, but it is also a crucial stop on the journey for many trans-continental and even inter-continental migrants.

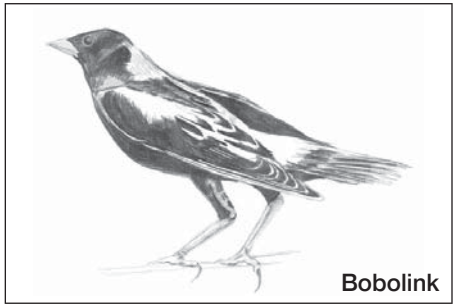
Ecology Research/Understanding Progress

A habitat suitability model was completed for Chichaqua and its immediate surroundings by Dr. Keith Summerville, ecologist from Drake University. Summerville's study focused on six species of conservation concern as indicators of ecosystem health:

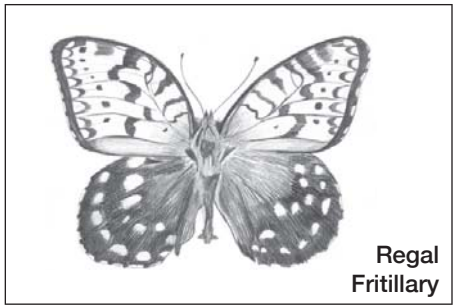

Blanding's Turtle


Plains Pocket Mouse


Henslow's Sparrow


Bobolink


Sandhill Crane


Regal Fritillary

Summerville's subjects

These species use a broad range of habitat types at Chichaqua, and they represent a wide range of animals: mammal, insect, bird and reptile. More importantly, the presence, absence and relative abundance of these six species

are good indicators of wetland and xeric prairie health—two of the most valuable ecological communities from a conservation perspective at Chichaqua.

However, this Master Plan did not seek to evaluate current management practices. That task will be taken up in a subsequent ecology/management plan, which is beyond the scope of this Master Planning effort. Rather, Summerville examined the background conditions of the landscape—ground slope and aspect, soil type, water depth, etc.—in order to identify the areas where each of these species could thrive with proper management. Consequently, some areas identified by the model as potential habitat are at present under cultivation, and therefore devoid of these species. Therefore, the model's identification of these areas indicates potential habitat, extension of existing habitat, or connections between isolated habitat islands that may exist if current land uses change.

Soils

Pioneer tales from the area speak of the dreaded Skunk River bottoms, where no horse could gain a foothold because of swampy conditions. That all changed when the South Skunk River channel was excavated in the early part of the 20th century. Certainly Chichaqua's muddy past is evident whenever the South Skunk River and its associated groundwater table are high. But when the river recedes, so does the water throughout Chichaqua.

The landscape at Chichaqua is composed almost entirely of hydrologic soil group B in the upland fringes, and B/D in the floodplain areas.

- Hydrologic Soil Group B includes silt loams or loams with moderate infiltration rates.
- Hydrologic Soil Group D includes clay loam, silty clay loam, sandy or silty clays with very low infiltration rates. Examples include scattered areas of Zook clay soils, which are noted for their capacity to hold water on the surface for long periods.
- Hydrologic Soil Group B/D includes soils that exhibit B-type properties when drained, and D-type properties when thoroughly wetted.

These are the soils which gave the Skunk River bottoms their dreaded reputation as an impassable swamp. However, at Chichaqua these soils extend only a few feet below the ground surface, and are underlain by fine-to-medium glacial sand and gravel deposits extending all the way to bedrock. Chichaqua lies just inside the southern end of the Des Moines glacial lobe, a few miles north of the lobe's terminal moraines.

Additionally, some soils at Chichaqua are the result of wind-blown sand deposits (dunes). A notable example is the Sandhill area, but smaller dune formations are also scattered throughout the floodplain on the east side of the old river meanders.

The Importance of Disturbance

"We think of ecological restoration as a destination, but it's a bus stop. Species come and go. They might leave on a short trip to someplace else and return. Or leave altogether and never come back."

~ Loren Lown, Natural Resources Specialist, Polk County Conservation

Our purpose should be to establish a matrix of suitable habitat patches that provide refuge for sensitive species to visit and then return when conditions are proper. In an ocean of agricultural land there is often no other suitable habitat. At the same time, we must recognize that Chichaqua's conservation lands work in concert with others in the area. We provide a suitable habitat so that, together with other conservation areas in the landscape, species have a reasonable probability of regional persistence. We cannot make the false promise that there will always be Bell's Vireo on sandhill prairie.

Grassland restoration in Iowa, or at Chichaqua, is not a one-size-fits-all proposition in terms of goals or process details. We typically seek a complex mix of plants to support wildlife, but we can just as readily target simple systems to support a particular species. Yet all grasslands require disturbance. Without disturbance, the trajectory of land cover in a "wet" state like Iowa will be trees. We may hay, mow, graze or burn, but at Chichaqua we need room for disturbance.

Plants, animals and insects need a local safehouse during fires, floods or school hikes. Otherwise, species hop on the bus during this interruption in their lives and may never return.

Surrounded by an ocean of agriculture and urbanizing lands, species don't have far to go before reaching inhospitable habitat.

People

History and Cultural Background

As one stakeholder noted during the Master Planning process, "we are not the first people to think Chichaqua is a very special place." More than two dozen archaeological sites have been discovered and recorded within the boundaries of Chichaqua, and subsurface sediments in many areas probably contain artifacts of Paleo-Indian through Woodland period cultures. American Indians made extensive use of Chichaqua's rich resources, and made their presence felt on the landscape through fishing, hunting, small-scale cultivation and timber harvest and habitat management methods like controlled burning.

European settlement of the Chichaqua area began in the early 1800's. An exhaustive survey of settlement history is beyond the scope of this Master Plan. However, this history is rich and surprisingly diverse. An example is the Holy Cross Catholic parish, a 160-year-old community founded by Irish immigrants whose thriving church is adjacent to Chichaqua. Some of its members have been instrumental in the growth of Chichaqua.

The rise of modern, mechanized agriculture has likely had the greatest historical impact on the lands of Chichaqua. After 1900, the landscape and its hydrology were extensively modified. Through drainage projects, the South Skunk River bottoms were transformed into a high-yield producer of corn and soybeans. Consequently, most of today's prairie and wetland habitats at Chichaqua are the result of active restoration efforts since the 1960's.

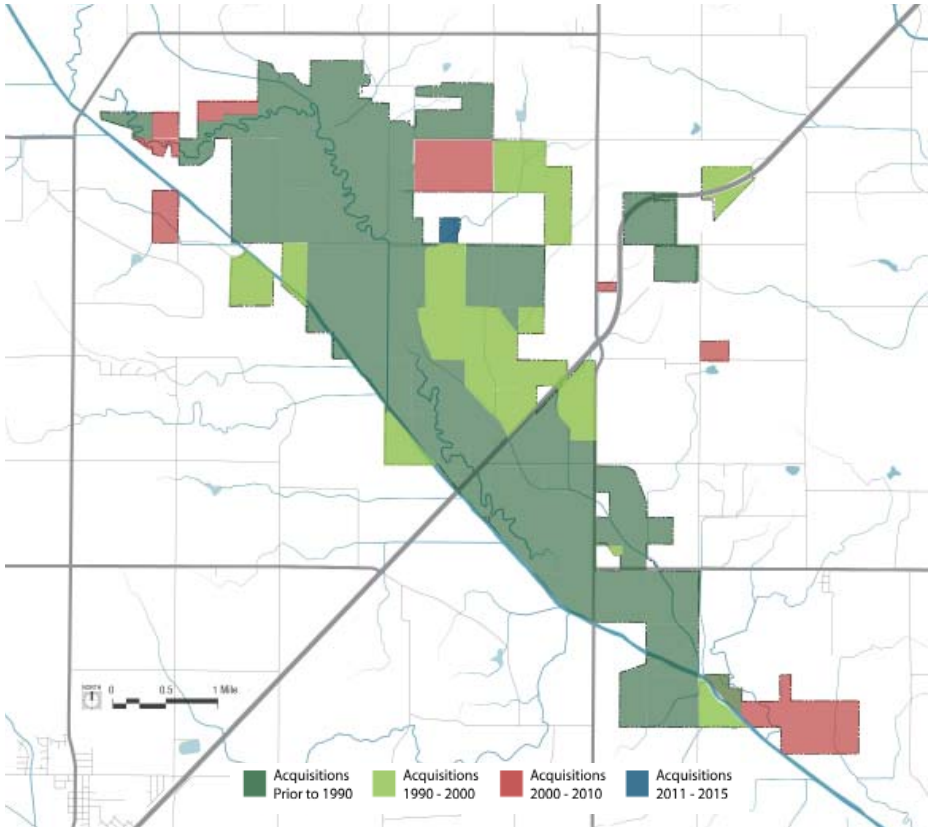
The PCCB first began acquiring the property that would become Chichaqua in the 1960s, amassing 1,161 acres by the end of that decade. PCCB has continued to purchase land from willing sellers ever since, but Chichaqua's growth was given a boost by the flood of 1993. This flood caused severe damage to agricultural areas in 20 states. In response to the flood, Congress created the Emergency Wetlands Reserve Program (EWRP). Unlike the Wetlands Reserve Program (WRP), this new program was not restricted to farmed wetlands and thus could be used to create permanent easements to preserve wooded riparian habitat. Property owners along the South Skunk River enrolled in the program, and then subsequently sold their properties to the PCCB.

In many of these purchases, the Iowa Natural Heritage Foundation (INHF) played a key role. At times when PCCB lacked the initial capital to acquire available properties, INHF purchased the land and then re-sold it to PCCB on a financing schedule.

Archaeology

In 2003 the Office of the State Archaeologist (OSA) conducted a geo-archaeological assessment of Chichaqua to identify areas with the highest probability for archaeological significance. That study determined nearly 75 percent of Chichaqua has archaeological potential of "low to moderate" or higher.

The locations most likely to contain archaeological resources are not depicted in this Master Plan in order to protect their integrity. However, their probable locations were considered in the development of this plan's recommendations for recreational improvements, which have been sited to minimize impact to the most probable archaeological sites.



History of Chichaqua acquisitions

Social Environment

The main activities at Chichaqua include hunting, scouting, dog training, paddling, camping, birding, hiking, cross-country skiing and use of the multi-purpose Chichaqua Valley Trail. PCCB naturalists provide ongoing programming for school groups or families and individuals. Not counting use of the Trail, Chichaqua's peak activity (by people) occurs during hunting season, but year-round use continues to grow.

While Chichaqua does not currently draw the same level of day-to-day use as other facilities in the Polk County Conservation system, a strong case can be made that its values simply cannot be measured by the means used to assess a traditional park. Chichaqua provides a great way for young and old alike to explore a wild landscape on a grand scale. Users are afforded an opportunity for immersion experiences. It's a place to remove baggage of social constructs, work-a-day stressors and urban pressures.

Chichaqua serves a potentially unique niche in all of Iowa's park systems, as one of the largest contiguous publicly held land masses in the state, immediately adjacent to Iowa's largest urban center. It affords opportunities to deliver on the promise of the Iowa Parks Foundation's Strategic Plan—to bring exceptional places and experiences into the everyday lives of Iowans. As a potential place for promoting physical and mental health, restoring wild spaces, connecting to community (physically and socially) and delivering great experiences to wide-ranging users, Chichaqua may be unparalleled in Iowa in providing the opportunity for Iowans to understand what "wild Iowa" was pre-settlement.

Chichaqua is a juxtaposition of wild lands, modern agriculture and an approaching urban interface. Chichaqua offers a legacy of wild places—a deep-rooted connection to its farm neighbors and to the larger regional complex that includes the Neal Smith National Wildlife Refuge and many communities surrounding Des Moines.

Overnight stay, including camping, is a growing recreational trend at Chichaqua.

Education and interpretation opportunities are abundant at Chichaqua.

Place

Facilities

The ongoing work of Chichaqua as a place to "heal wild lands" comes with few traditional built facilities, like those one might see in a manicured park. Instead, Chichaqua includes several wetland mitigation projects and ongoing habitat restoration projects. Chichaqua is likely best known to the hunting and birding communities within central Iowa, but increasingly paddlers, hikers and others have begun to discover its appeal. Chichaqua is one of Iowa's initial Bird Conservation Areas with more than 200 bird species documented.

Chichaqua holds few built facilities, but they are important to the advancement of its mission. Research is now well underway at Chichaqua through a variety of institutional partnerships. This work currently takes place in facilities designed for other purposes. Still, Chichaqua has facilities worth noting, most of them concentrated at the Greenbelt's north end.

RECREATIONAL FACILITIES

Recreational facilities at Chichaqua include the following:

- 11 electric (50-amp) and 15 non-electric campsites, plus a youth group campground and water trail campground (three primitive sites)
- Restroom and shower house
- Bird blind
- Canoe rental
- Picnic areas
- Rental lodge known as the Longhouse (a popular spot for meetings, weddings and scout groups)
- Four hiking trails (ranging from 0.2–2.6 miles in length, all considered "easy" hiking)
- Trap shooting range and controlled hunting facilities

MANAGER'S RESIDENCE

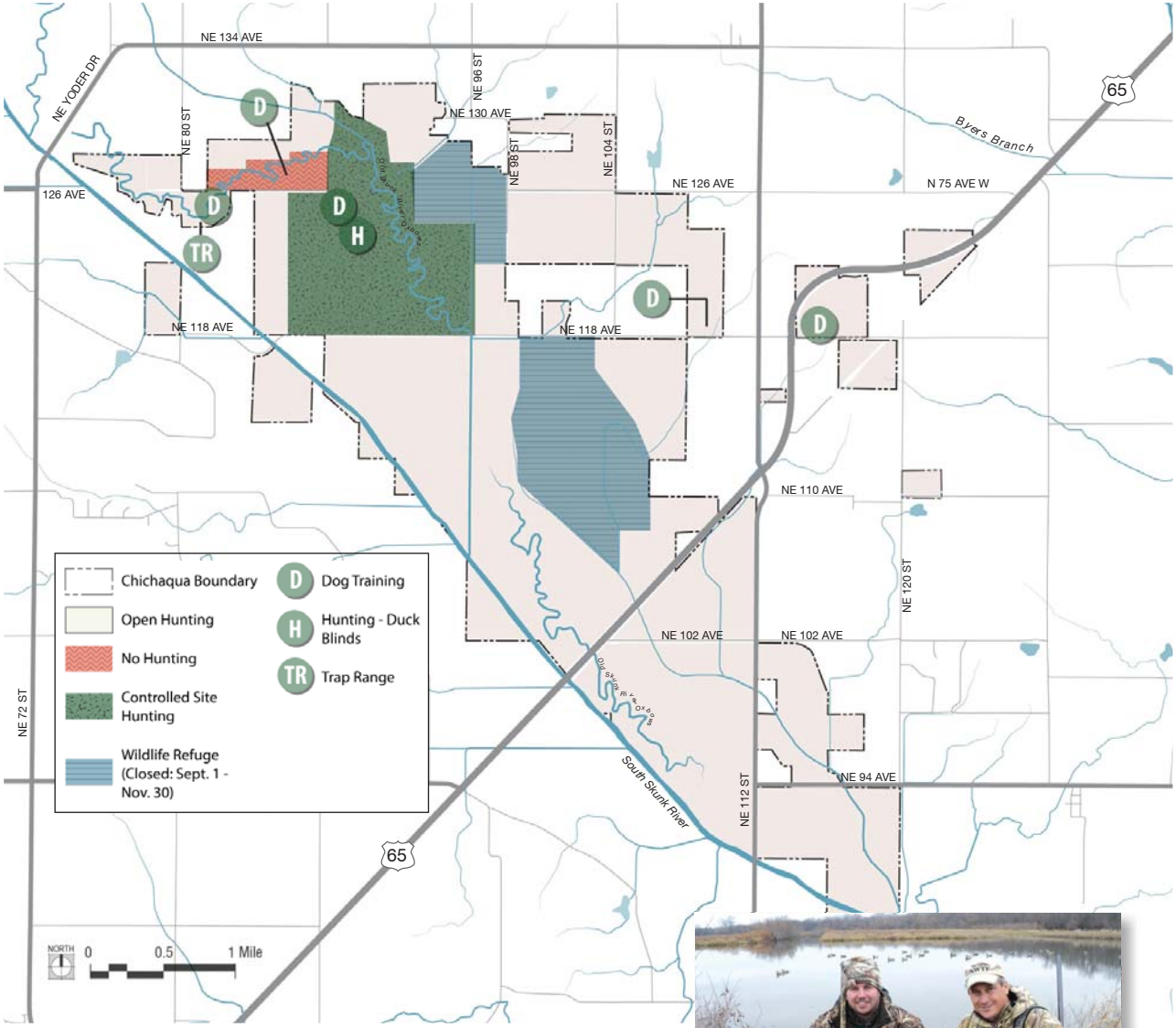
A private residence for the Chichaqua manager is located near the Longhouse, campgrounds and maintenance facilities. This provides relatively easy access for oversight, but the current location is flood-prone. This Master Plan suggests moving the residence to a new location.

MULTI-PURPOSE TRAIL

Chichaqua contains a segment of one of Central Iowa's most popular trails—the Chichaqua Valley Trail (CVT) linking Baxter to Bondurant, on to Berwick and I-80, including a new connection to the Gay Lea Wilson Trail. The CVT Trailhead is currently located at Northeast 88th Street, South of Highway 65 and one mile east of Bondurant. A portion of the trail cuts through the southern third of Chichaqua, but has no access points to the larger greenbelt. With this current new link to the Gay Lea Wilson Trail, public access opportunities have greatly increased, providing new opportunities to connect a cycling public to Chichaqua.

Chichaqua Longhouse

Hunting and Fishing at Chichaqua—Current Management Zones



Existing hunting facilities

Hunting remains a vital force on the Chichaqua landscape—helping to maintain predator-prey relationships and meeting an ongoing recreation demand. Appropriate management is fundamental to successful hunting at Chichaqua. Facilities play a lesser role.

Hooks & Bullets

Managing "consumptive use" at Chichaqua

The earliest human residents of the South Skunk River valley took their sustenance from the land's rich resources. It is appropriate that humans continue to consume the wild delights that Chichaqua has to offer. However, proper management balance is needed as follows:

Hunting
Hunting always has been, and should continue to be an integral part of Chichaqua land and recreation management. At the same time, the recreational profile of Chichaqua must become increasingly multi-dimensional. Chichaqua must be more than "public hunting ground." The real safety of the non-hunting public is of paramount importance, and so is the perception of safety by non-hunters who long to connect with wildness. The very sound of gunfire may prevent some people from embracing Chichaqua as fully as desired by the stakeholders of this planning effort. Chichaqua must be managed in a way that balances hunting with the needs of non-hunters.

Fishing
Polk County has an abundance of quality public angling opportunities outside Chichaqua. Due to a relative scarcity of permanent deep-water habitat, Chichaqua is not currently a popular fishing destination. Moreover, it is not likely that dependable fisheries can be cost-effectively restored to the historic riparian corridor. Improvement of angling opportunity was not identified by the stakeholders as a key need at Chichaqua. However, as permanent deep-water habitat is established for other ecological purposes, appropriate fisheries should also be established as an additional amenity.

Ecology first
All consumptive uses, whether of game or fish or edible plants, must be managed in a way that protects the ecological integrity of Chichaqua. Any activity that threatens the ecological stability or sustainability of the resources of Chichaqua shall be limited or shall cease until the resource is secure.

Commercial Harvest
Commercial harvest of any plant or animal species is forbidden with exception of land management activities directed by management personnel.

Henslow's Sparrow

CHAPTER IV

Recommendations—Strategy and Facilities

Strategic Recommendations

One of Chichaqua's greatest contributions to American life should be to help us transcend the polarities of Agriculture vs. Nature, or City vs. Wilderness. An opportunity exists here for harmonious integration of natural interests with developed landscapes. Chichaqua could thus become a living example of countryside at peace with its neighboring communities.

The process of identifying the current and future needs of Chichaqua involves a synthesis of the information received throughout the process. This information was gathered through the Planning Advisory Committee, public meetings, input from other governmental agencies, natural resource assessments and additional data obtained by the staff and consultants. As a result, a clear picture of the needs of Chichaqua emerged. These needs fall into the categories discussed here.

Expansion & Interconnection

Grow and connect Chichaqua through partnerships and expanded protections.

We have already noted the historic growth of the public holdings that now constitute Chichaqua, and the significance of its current size as wild land in close proximity to agrarian and urban landscapes. The size of Chichaqua has been controversial. A minority public voice has questioned the acquisition and restoration, citing the conversion of farm land and the loss of property tax revenues.

Nevertheless, the project stakeholders concur on the need to *expand Chichaqua's influence,* and this may necessitate further geographic expansion. However, not all geographic expansion must occur through direct acquisition. Other kinds of partnerships that *interconnect Chichaqua with its urban and agricultural contexts* are crucial to fulfilling the stakeholders' vision for Chichaqua.

For example, the South Skunk River and its associated watershed exert tremendous impact on the Chichaqua experience. The water flowing through Chichaqua faces water quality challenges (excess sediment and nutrient loading). High-speed flows reaching Chichaqua cause erosion. Without good water quality, Chichaqua faces sediment-filled wetlands, damage to wildlife and habitat and dramatically reduced recreation opportunities. This situation challenges the future of Chichaqua (indeed, all of Iowa) since it is not reasonable to expect total control of the watershed through acquisition. It's impossible to ignore the influence of a developed landscape and the major influences that development has on "natural" areas.

Therefore, Chichaqua needs a renewed effort to interconnect with partners up and down the watershed. These partners include private landowners, developers and local, state and federal agencies. The stakes are high. Polk County Conservation Board, working with many partners, hopes to mitigate future impacts. The intent here is to express the need for public advocacy and the involvement necessary for Chichaqua to be a sustainable and valued natural area in the future.

The over-arching need to expand the influence of Chichaqua requires some or all of the following strategies:

- Develop a standing Chichaqua Bottoms Greenbelt Technical Advisory Committee.
- Establish a Friends of Chichaqua initiative to supplement technical expertise and provide advocacy for Chichaqua, including targeted philanthropy to create restricted dollars for research and management for Chichaqua.
- Through partnerships, maintain Chichaqua's integrity with watershed-scale protection initiatives, as well as Chichaqua buffering and vegetation management.
- Develop a community trail system engaging urban, rural, agricultural and Chichaqua partners.
- Brand the Chichaqua Valley Community to build recognition for the many neighbors.
- Develop an understanding that restoration and recovery of damaged ecosystems is possible even in the most damaged or altered landscape.
- Support and expand research opportunities focused on restoring/reclaiming historic functions of the Iowa landscape.
- Working with a host of partners, explore the viability of prairie as both protective and productive working landscape.
- Expand Chichaqua through voluntary land partnerships, easements and acquisition, for infill, buffering and connecting to Neal Smith National Wildlife Refuge and Lake Red Rock.
- More specifically, acquire lands, easements or cooperative agreements to the north and east to support expansion of habitat, to the south and west for buffer and additional public recreation/education opportunities.
- Support the development of an ecological corridor through partnerships with both private and public sectors, incorporating principles of conservation biology to make these connections.
- Update the Chichaqua ecology/management plan in accordance with this Master Plan and existing easements, and at least once every 3–5 years thereafter.
- Expand documentation of Chichaqua's existing conditions as an improved benchmark for measuring a range of successes.

Circulation

Improve visibility, access, wayfinding and safety at Chichaqua without diminishing the untamed experience it has to offer.

Vehicular

1. Improve signage and directional/wayfinding
2. Enhance public safety through the use of technology for monitoring and ample lighting that still maintains "dark skies"
3. Identify primary Welcome Portal and education/orientation station
4. Develop secondary welcome/information hubs
5. Improve parking access
6. Simplify vehicular roadways/network
7. Provide a continuous paved route to the primary Welcome Portal (Chichaqua Station).

Trails and Pathways

1. Expand accessibility
2. Improve aquatic access and develop paddling routes
3. Connect Chichaqua paved trail users to the greater greenbelt landscape for stewardship, education and expanded recreation
4. Connect trail systems and develop trails south of Highway 65
5. Enhance/expand footpaths and soft paths, including loops of varied lengths
6. Develop trailheads
7. Prohibit harmful activities such as motorized recreation

Entry portal

While we look to modify some of the roadway system through Chichaqua over time, we do not envision a future for Chichaqua of one singular point of entry. Instead, we see primary and secondary portals, intending to give a strong sense of "you have arrived." That element is largely missing from the Chichaqua experience today.

But these portals provide more than a good feeling. They're intended to educate Chichaqua-goers about:

- Events and recreation opportunities
- Science advancements and research
- Self-directed and supported activities
- The role of hunting in the landscape and user safety
- Access points to landscape features and built facilities
- Ongoing "environmental literacy" information—from water to wildlife, climate to backyard conservation
- The larger Polk County Conservation system
- Chichaqua's role in Polk County, Iowa and Regional landscapes

And, perhaps most important, they're intended to help visitors find their way.

Wayfinding and Destination Signage

Chichaqua faces a dearth of directional signs. Attempting to find Chichaqua for the first time plagues the user with doubt ("I must have missed it somehow"). This reinforces a public perception that Chichaqua is a long way away. Once you have arrived at Chichaqua, the situation does not particularly improve.

An early "win" for this plan will come with the development of a comprehensive signing scheme for Chichaqua coupled with energetic execution of that plan. The size and scope of Chichaqua makes wayfinding critical for successful adventures.

At the same time, the wayfinding, such as for roads and trails, must enhance the experience and not pollute the visitor's ability to explore. Finding the right balance between safety through signage and uninterrupted immersion in the landscape requires careful system design and development.

Recreation

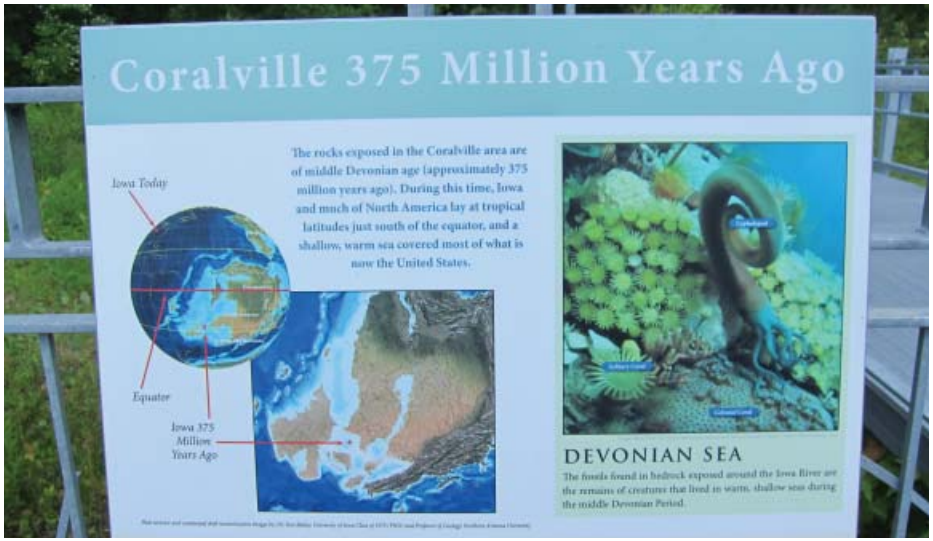
Reconnect the urban public to the intrinsic values of experiences in wild lands (also see "Trails and Pathways" above).

1. Develop recreational opportunities to fit the landscape
2. Develop unique overnight opportunities
3. Expand wildlife viewing and other recreation opportunities that leverage Chichaqua's biodiversity and outdoor skills-building
4. Encourage the use of Chichaqua as a resource that allows quiet self-reflection and is an artistic inspiration
5. Create a build-your-experience Chichaqua Bottoms Greenbelt App
6. Consider additional hunting regulation strategies—such as weapons restrictions where appropriate—to improve safety for the non-hunting public

Cultural Heritage and Preservation

We are just the latest generation to find this area alluring. Native American life, rural and agrarian interests and the history of an engineered river converge here.

1. Consider the following key heritage preservation components for education and celebration:
   - American Indian
   - Early European influences
   - Early farming and other industries
   - The manipulation of the Skunk River and Chichaqua's water management history
   - The story of rural life and Holy Cross Church
2. Integrate cultural celebration with experiential education at Chichaqua



Interpretation example

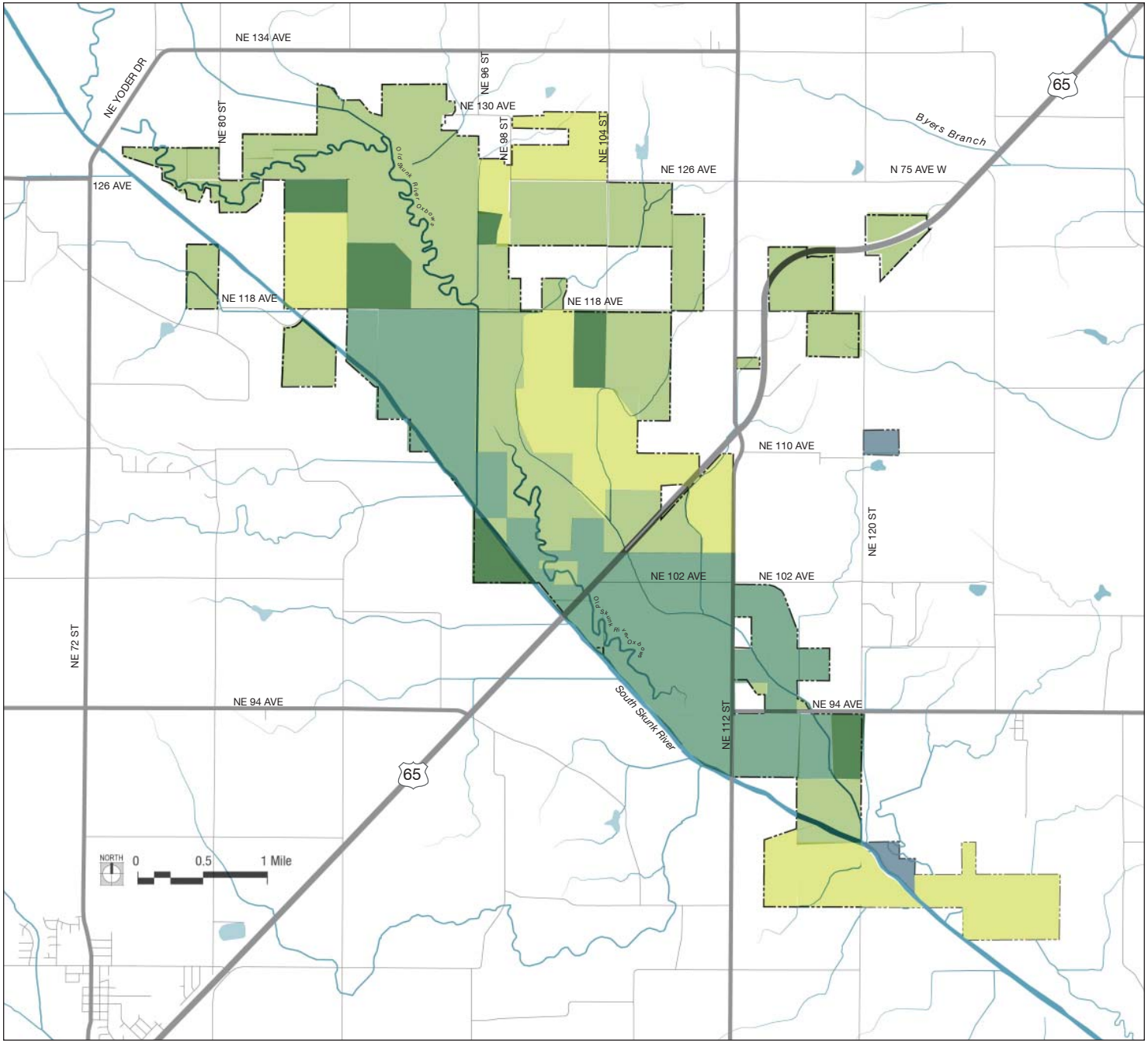
Interpretation, Education and Research

Provide unparalleled opportunities for ecological education, from immersive learning for elementary school children to meaningful research for doctoral candidates.

In addition to the cultural pieces identified in the previous section, a host of opportunities to interpret nature exist here:

- Landforms and Geologic Composition of the Des Moines Lobe
- Area Flora and Fauna
- Water Quality and Water Quantity
- Climate Change
- Environmental Trends
- Recreational Experiences
- Wildlife
- Habitat
- Outdoor Skills-Building
- Invasive Species

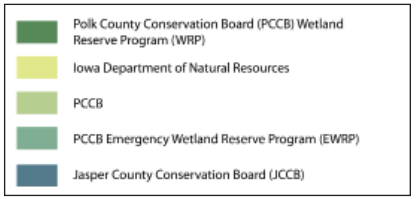
1. Continue and bolster partnerships with colleges & universities, private NGO's and agencies at all levels as a means to further strengthen the science and natural area management research occurring at Chichaqua
2. Promote learning through volunteer stewardship opportunities in support of habitat restoration
3. Emphasize the water management educational opportunities ever-present at Chichaqua, in light of water quality and flooding challenges
4. Employ technology (smart phone apps, electronic guides, etc.)
5. Use the creative arts to strengthen the human / nature relationship
6. Promote Chichaqua as a resource of economic and ecological value



Existing ownership partners

Improve and Expand Partnerships

- Chichaqua serves as a study in partnerships, both internal and external. Multiple agencies own land or easements at Chichaqua.
- Agency goals and functions may not always be consistent, but a cooperative spirit largely thrives here.
- Similarly, landowners/ neighbors often strive to support Chichaqua's conservation efforts.
- Still, Chichaqua faces an ongoing need for these various partners to understand each other. They must accept potentially conflicting goals, identify win-win collaborations and work toward consistent management.



Hydrology and Water Management:

Improve water quality and manage quantity, in order to enhance the ecological and recreational value of Chichaqua's hydrologic systems.

1. Partner with landowners in at least one sub-watershed to implement best management practices and demonstrate the effectiveness of responsible water management.
2. Without negatively impacting upstream landowners, seek opportunities to restore the flow of water through historic Skunk River meanders and oxbows.
3. Improve ecological function, reduce sediment transport, and stabilize erosion in upland draws.
4. Create new resources of permanent deep-water habitat.
5. Establish a water quality monitoring program to demonstrate the efficacy of Chichaqua's water management methods.
6. Restore natural hydrology on future acquired lands through the breaking of existing drain tile networks and removal of ditches, where practically and legally feasible.
7. Acquire properties when available, to create additional hydrologic connections and further opportunities for wetland habitat.

Facilities/Master Plan Recommendations

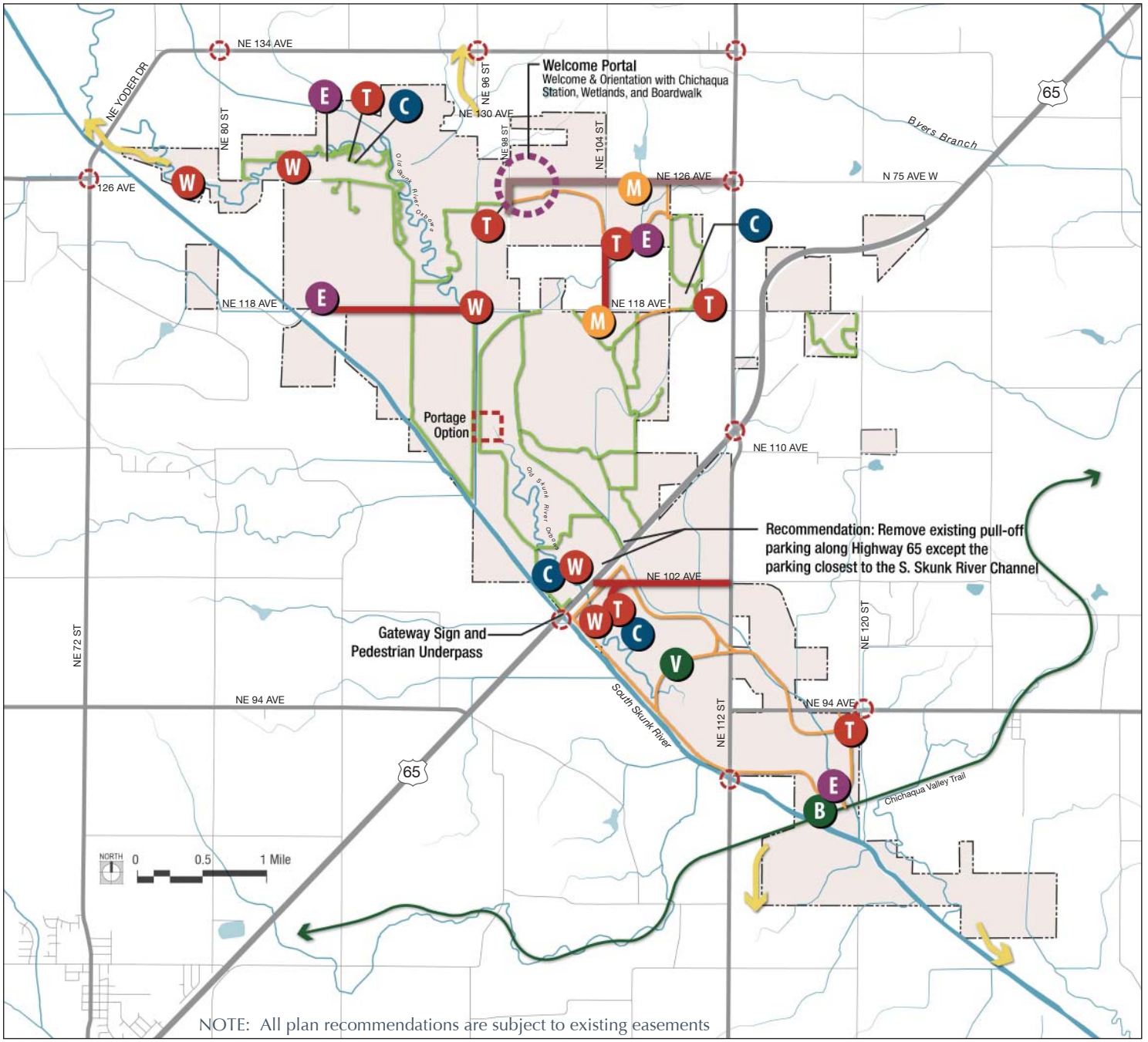
The strategic facility recommendations listed here are further demonstrated through the series of maps and commentary following.

Facilities

1. Establish Chichaqua Station—a primary education and research center with flexible, multi-use spaces. This facility will integrate education, site, research lab, access to arts and social connections and provide a point of welcome to Chichaqua.
2. Disperse education hubs. These hubs should echo the aesthetics and expand program options presented at Chichaqua Station.
3. Expand footpaths for hiking, birding, cross-country skiing and snow-shoeing.
4. In particular, establish back-country walks of various lengths, as well as links and loops that do not sacrifice ecological integrity (see below) Note: Such a facility will need excellent wayfinding/signage.
5. Expand footpaths for connections to key geologic features, select wetlands, hunting and viewing blinds, paddling course(s) and incoming education/ research facilities.
6. Locate a gateway portal/bike oasis from the current Chichaqua Valley Trail as it passes through Chichaqua, directly connecting paved trail users to the larger greenbelt landscape.
7. Develop access without further fragmentation of habitat.
8. Remove or modify roadways that break continuous habitat.
9. Create lodging/support for unique experiential camping and riverside campgrounds.
10. Address/adapt the current built footprint of Chichaqua—the current site is well-used, but located in a zone prone to flooding. Secure additional land for future development so that facilities do not intrude on restored lands.
11. Establish a close-in, distinctive Welcome Portal, preferably in combination with Chichaqua Station (see #1, above).
12. Create appropriate-scale recreation destinations, e.g., expanded/accessible viewing/photo blinds and platforms, boardwalks and footpaths, labyrinths, fishing access, wildlife monitoring cams, elevated overview site(s), etc.
13. Improve and potentially expand scattered parking options.

Overview of Proposed Facilities Recommendations

Existing and proposed facilities



Circulation Overview

Chichaqua's circulation system relies heavily on the farm-to-market roadways primarily using the car for connection. This access is not always compatible with Chichaqua's goals to return to a more wild character.

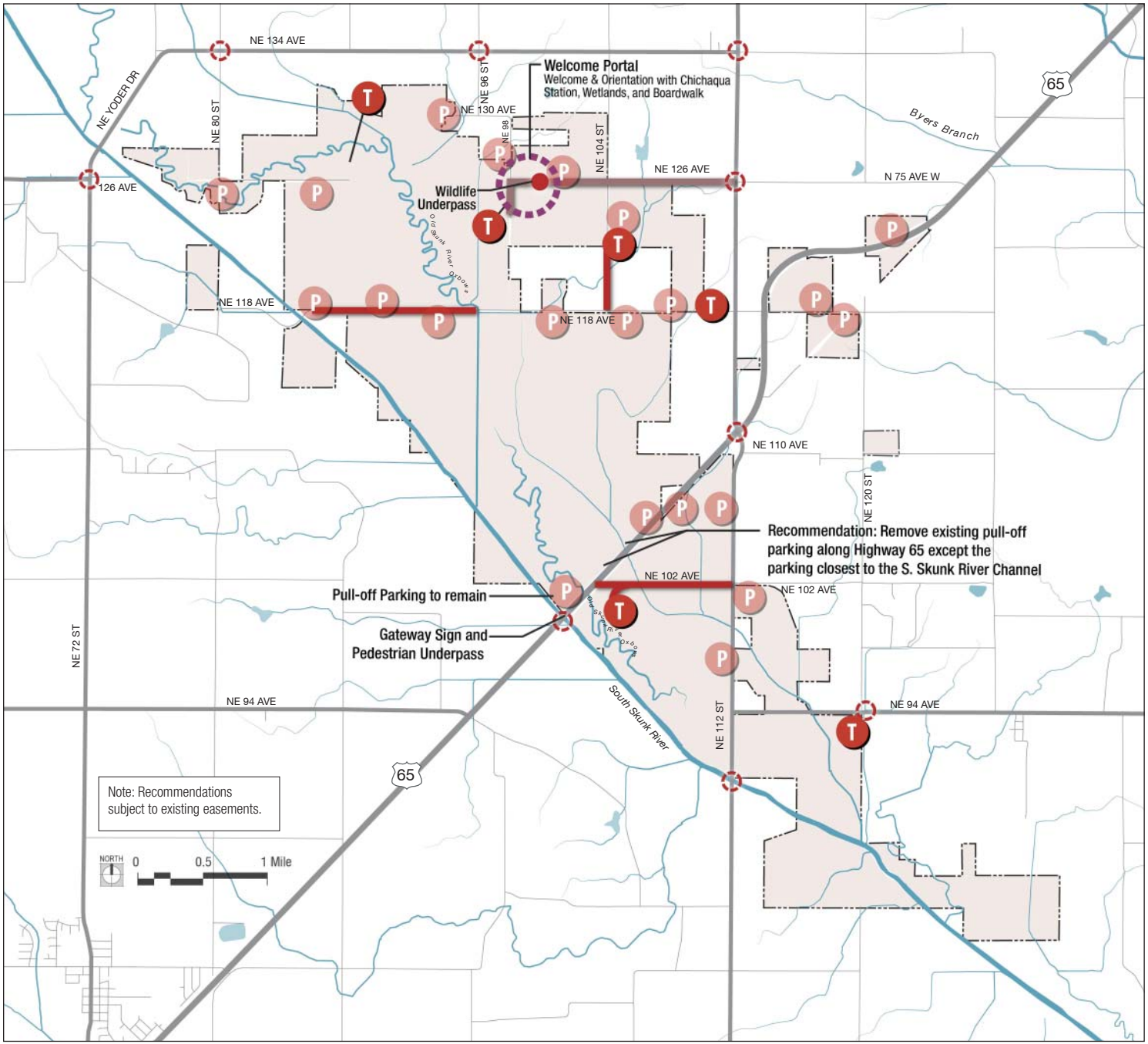
Fortunately, Chichaqua has also been at the forefront of the state's growing trails movement. The Skunk River water trail routinely delivers paddlers along Chichaqua's western fringe. The Chichaqua Valley Trail similarly takes pedals and pedestrians across the Chichaqua landscape.

In both instances, however, these pathways have not led to exploration of Chichaqua's interior. Instead, paddlers stay on the edge, while woodland buffers stop the cyclist from seeing the lands surrounding, let alone providing access.

The circulation system proposed here finds a more appropriate balance between auto, footpath, multi-use trail and waterways, while promoting pathways for exercise and exploration.

At the same time, we must set limits to accessing Chichaqua that protect the resource.

- ATV's or other off-road mechanized means are prohibited except when needed and pre-approved for ADA accommodation.
- Equestrian use is prohibited.
- Bicycles are only allowed on specified pathways.



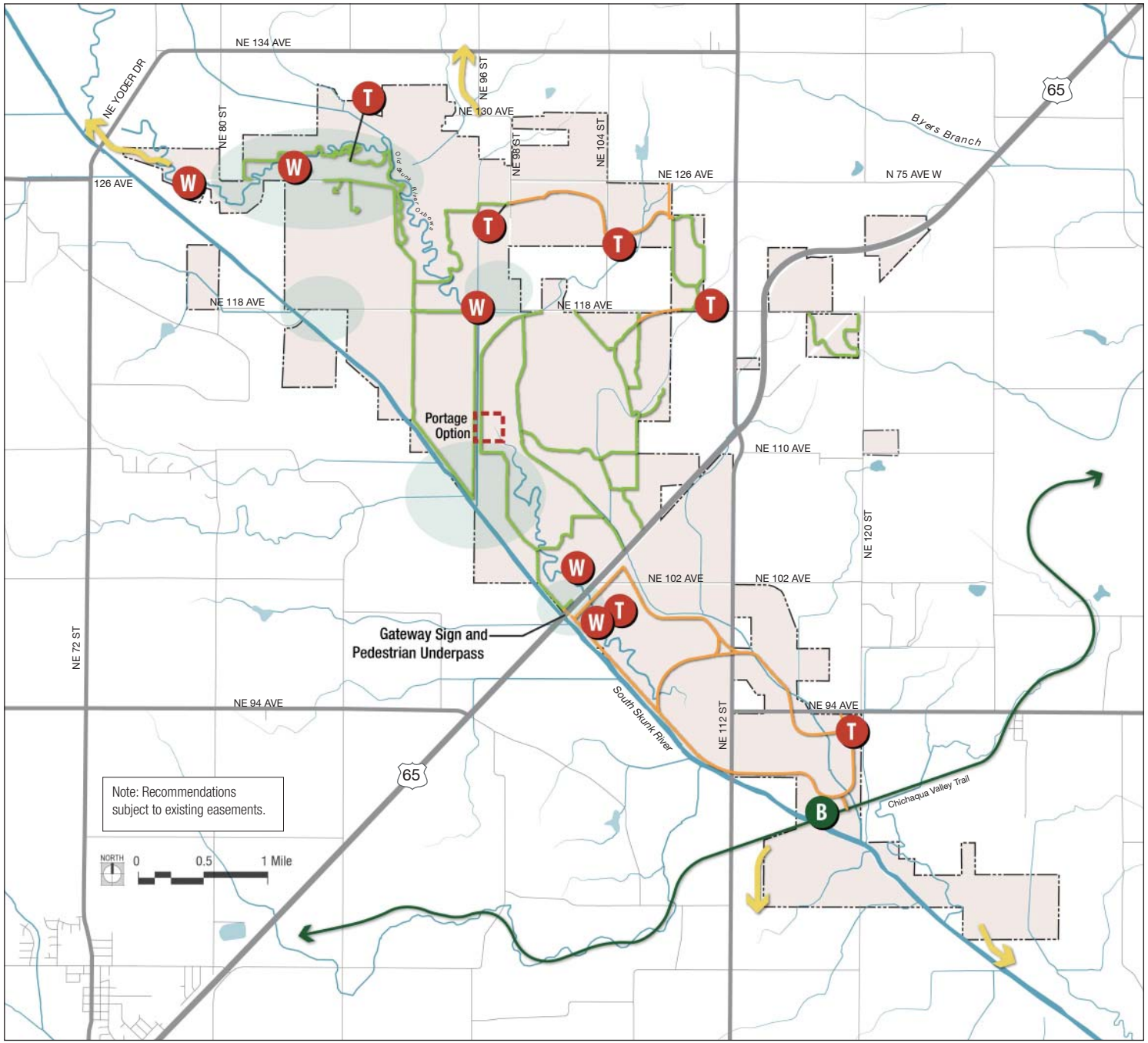
Proposed vehicular circulation

Vehicular Circulation

Recommendation:

Long-term roadway management or modification to increase the mass of habitat tracts

- Greater access to Chichaqua from outside its boundaries through improved portals of varying scales, increased in number
- Improvements in existing parking areas, including associating them with an increased number of trailheads/footpaths
- Use of primary portals to achieve a sense of arrival and inform the user's overall experience
- All recommendations must heed ongoing concerns over the safety of the public and wildlife. This plan's proposed modifications of 102 Ave., for example, are not intended to promote greater development along this route which could lead to increased wildlife morbidity.



Proposed trail circulation

Trail Circulation

Recommendation:

Develop a series of loops for increased safety and exploration of Chichaqua's interior

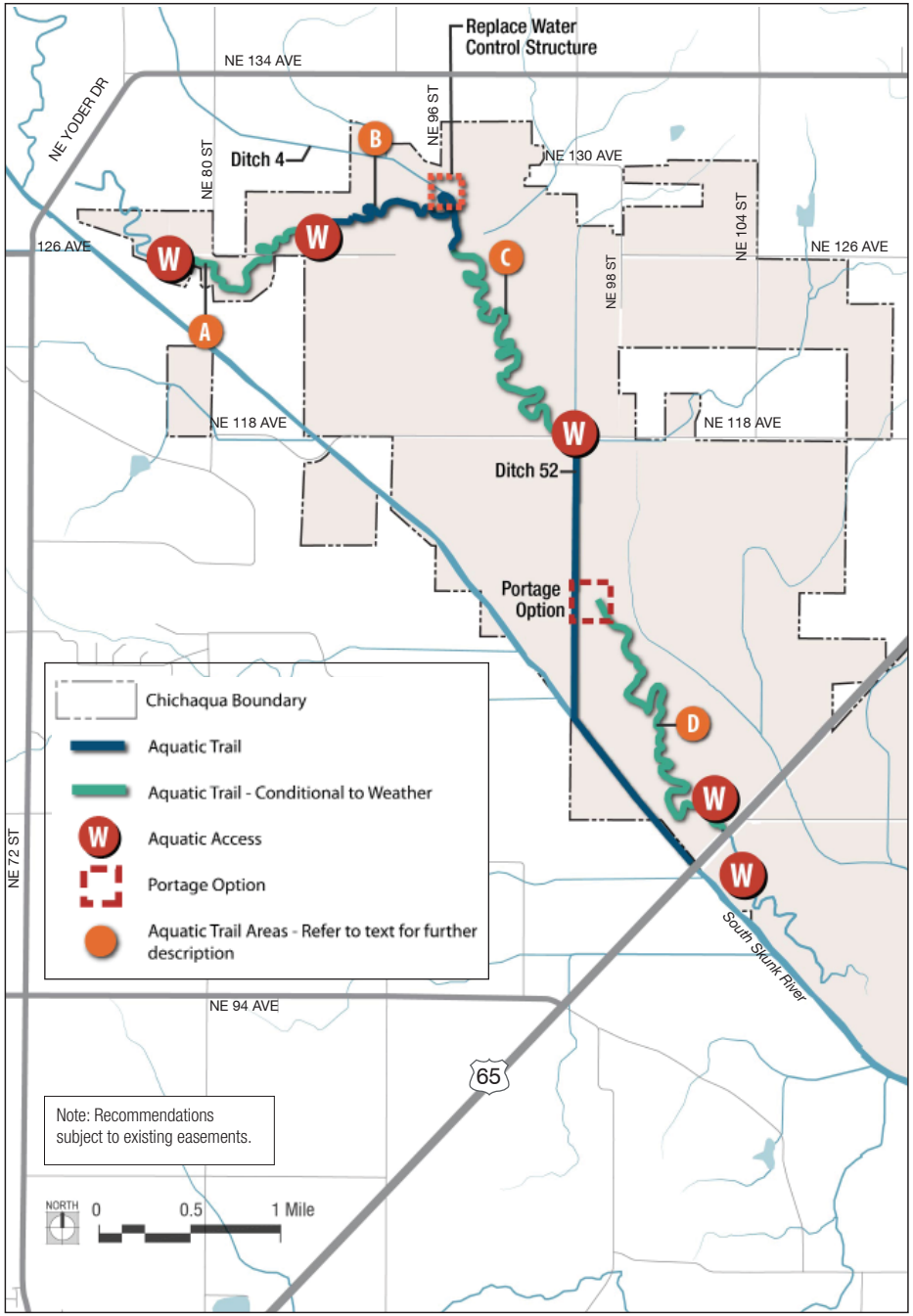
- Connect pedestrian paths to dispersed education sites and Welcome Portal
- Link footpaths and trailheads to enhanced parking sites (see Vehicular Circulation)
- Connect current Chichaqua Valley Trail users directly to the Chichaqua landscape for exploration and recreation
- Improve access to Chichaqua's interior for water trail users/river campers
- Fill-in "missing links" between existing footpaths
- Prepare to connect Chichaqua by multi-use trail to additional external trails
- Provide for improved/expanded trail crossings over waterways
- Connect north and south "halves" of Chichaqua through footpath under Highway 65
- Trailheads include appropriately scaled parking

Existing Features

- Chichaqua Boundary
- Existing Footpath
- Bicycle Trail (Chichaqua Valley Trail)

Proposed Features

- Pedestrian Trail
- Future Bicycle Route
- T Trailhead
- W Aquatic Access
- Portage Option
- B Bike Oasis
- Trail Crossing Improvements



Proposed aquatic circulation

Aquatic Circulation

Paddling opportunities are limited at Chichaqua. Most of the old river channels are greatly diminished by siltation and obstructed by fallen trees. Some sections are too narrow for paddling, while others are a labyrinth of unconnected, dead-end oxbows. Area B, on the map at left, is presently the only paddling opportunity at Chichaqua. This area has been excavated and maintained for paddling. Although current does not flow through it, Area B offers about two miles of out-and-back paddling when water levels are sufficient. In dry years, even Area B may be devoid of water.

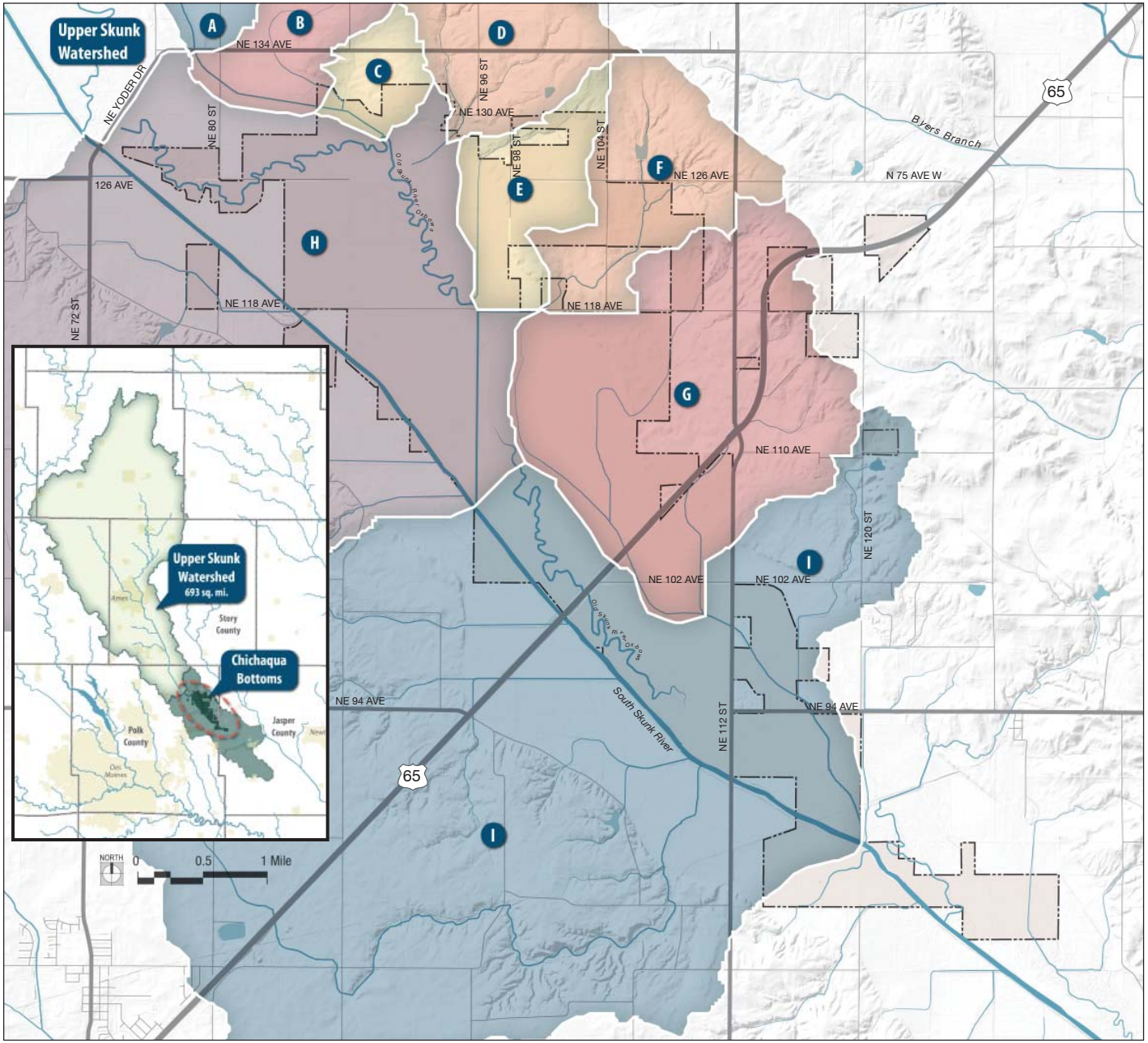
NEAR-TERM RECOMMENDATIONS

- Expand paddling opportunities in Area B with minor excavation and clearing in select locations. This could provide up to a mile of additional paddling, and provide paddlers with better access to wooded sections of the historic river bottom.
- Replace the water control structure between Area B and Ditch #4. This structure is currently in disrepair, and may allow water to escape too freely from Area B.
- If a deep-water habitat area is constructed north of Area B, provide a short excavated channel to connect it with Area B.

LONG-TERM CONSIDERATIONS

- The re-meandering of the South Skunk River through its ancient channels is practically and politically unfeasible.
- In areas labeled A, C and D, significant excavation and clearing are needed to restore the old channels as a viable and continuous paddling route. This work would be costly, and the resulting paddling route would require active long-term maintenance.
- Areas C and D could be linked via Ditch #52 if a water diversion structure and portage route were constructed as shown on the map.

Even with these improvements, paddling opportunities at Chichaqua will remain seasonal and dependent upon fluctuations in the water table.



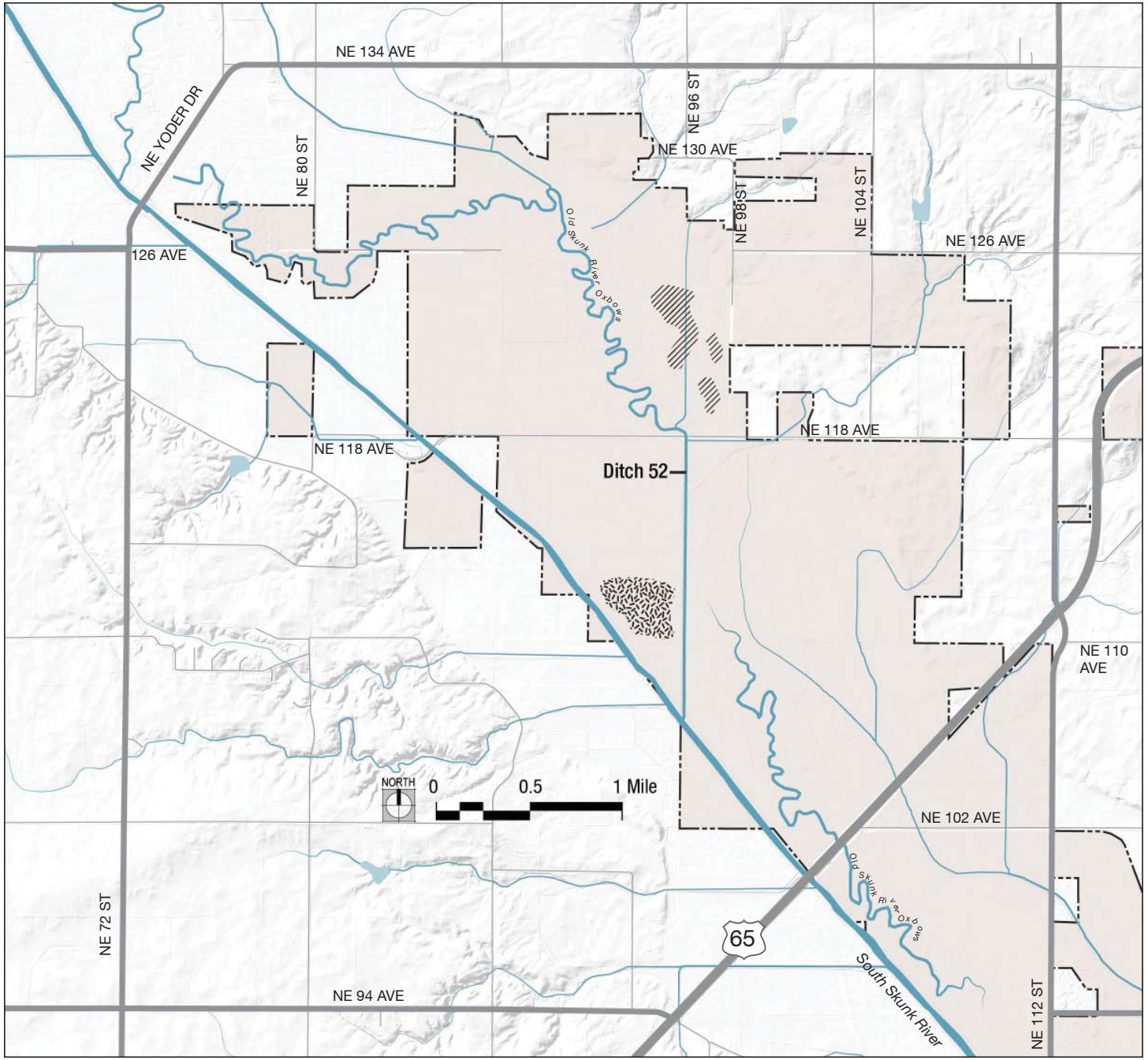
Water quality

Water Quality

Chichaqua receives runoff from nine watersheds, here labeled A through I. Soil erosion in these watersheds adversely impacts water quality entering Chichaqua.

Recommendation:

- Establish partnerships with landowners in at least one watershed to implement best management practices and demonstrate the effectiveness of responsible watershed management.
- Watersheds C and D are the areas of greatest need, but partnerships in any of watersheds A through F would be beneficial.
- Restore natural hydrology on future acquired lands, as much as possible without adverse impact on upstream landowners.



Water quantity

Water Quantity

Drainage ditch networks and permeable soils limit the availability of water for wildlife habitat at Chichaqua.

Recommendation:

- Without an adverse impact on upstream landowners, use water from the existing drainage ditch network to improve wetland habitat in the historic river channels. For example, it may be possible to divert a portion of flow from Ditch 52 east into the adjacent channels of the old Skunk River, and west to shallow wetlands.
- Excavate deep-water habitat in Zook silty clay soils.
- Focus future wetland mitigation projects in areas of clay soils, in order to increase drought resiliency.
- Proposed excavations are subject to archaeological review.

Chichaqua Boundary

Possible site for deep-water habitat (Excavated in zook silty clay soils)

Possible site for shallow wetland improvement (Diverting flow from Ditch 52)

Education

Welcome Portal with Chichaqua Station

This plan recommends a Welcome Portal to the whole of Chichaqua that will orient the public to its exceptional:

- Habitat and recreation efforts
- Hydrologic status and history
- Cultural, social and archaeological story
- Recreation/exploration opportunities

At the same time, we see this portal also showcasing Chichaqua's education and research mission through Chichaqua Station.

Chichaqua Station

We recommend a primary research and education facility here to parallel Chichaqua's potential for world-class stature. Chichaqua intends to lead in context-sensitive restoration. Simple but effective facilities must support that potential. Science and restoration of the altered landscape is essential to Chichaqua's success. Chichaqua already serves major universities well as a research site, but with no facilities designed to support these efforts, Chichaqua cannot fulfill its promise as a research and education resource.

We envision a facility built for:

- **Flexibility.** Research and education needs change with the assignments and the progress of Chichaqua over time. We picture movable furniture and equipment, adjustable storage, and infrastructure that anticipates growth and changes in technology.
- **Endurance.** At some point the mess of hands-on outdoor research and education gets tracked indoors. This facility will need to be accommodating and "built tough" with mud rooms and washable labs for washable kids.
- **Committed Workers and Interns.** Overnight stays of AmeriCorps teams or passionate researchers must be accommodated here. This also affords opportunity for artist residencies or other creative means of telling the Chichaqua story and providing educational options.
- **Technology.** Of the present and future. See Flexibility above.
- **Complementary Design.** This center proves most effective when it's developed to complement the K-12 environment and other research/education institutions in the area. It's conceived as the apex of an education triangle within the PCCB system (Jester Park and Easter Lake facilities anticipated) while also complementing labs, K-12 and other education/research institutions in Central Iowa.
- **Educational Site.** Chichaqua Station rests in a network of education-oriented wetlands/diverse habitats, boardwalks and viewing platforms.

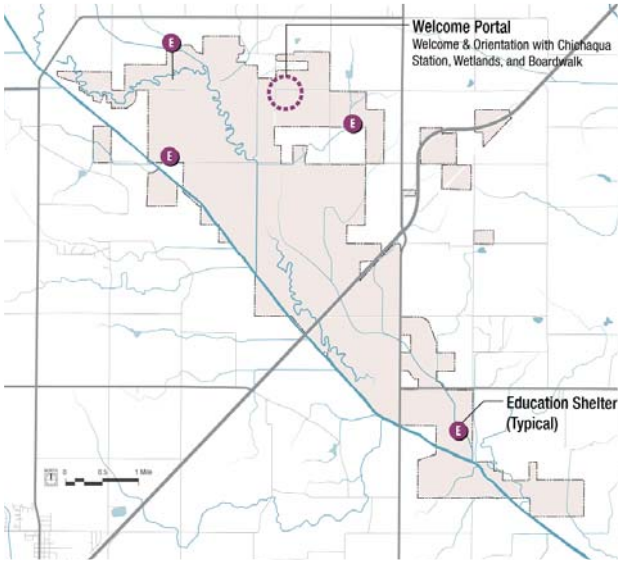
Chichaqua Welcome Portal and Chichaqua Station concept

Chichaqua has a diverse topography from wetland to dry sand prairie. Education about the diverse native landscape should take advantage of this wealth of outdoor learning environments.

Dispersed Education

The Welcome Portal with Chichaqua Station is intended as a focal point—a true "You are Here!" indicator for the Chichaqua visitor and as a hub to satellite education sites dispersed throughout Chichaqua. With Chichaqua's many ecological highlights, the whole education experience cannot be captured at one site. We recommend a series of secondary education hubs throughout. These can be used by classroom teachers and naturalists, scout leaders, other informal educators, resident artists and any visitors. With the advent of technology and interpretive signage at Chichaqua, this will give visitors of the future an enriched, comprehensive approach to knowing their Chichaqua.

Education Hub concept



Proposed Education and Welcome Portal Site

Camping

Overnight Stay

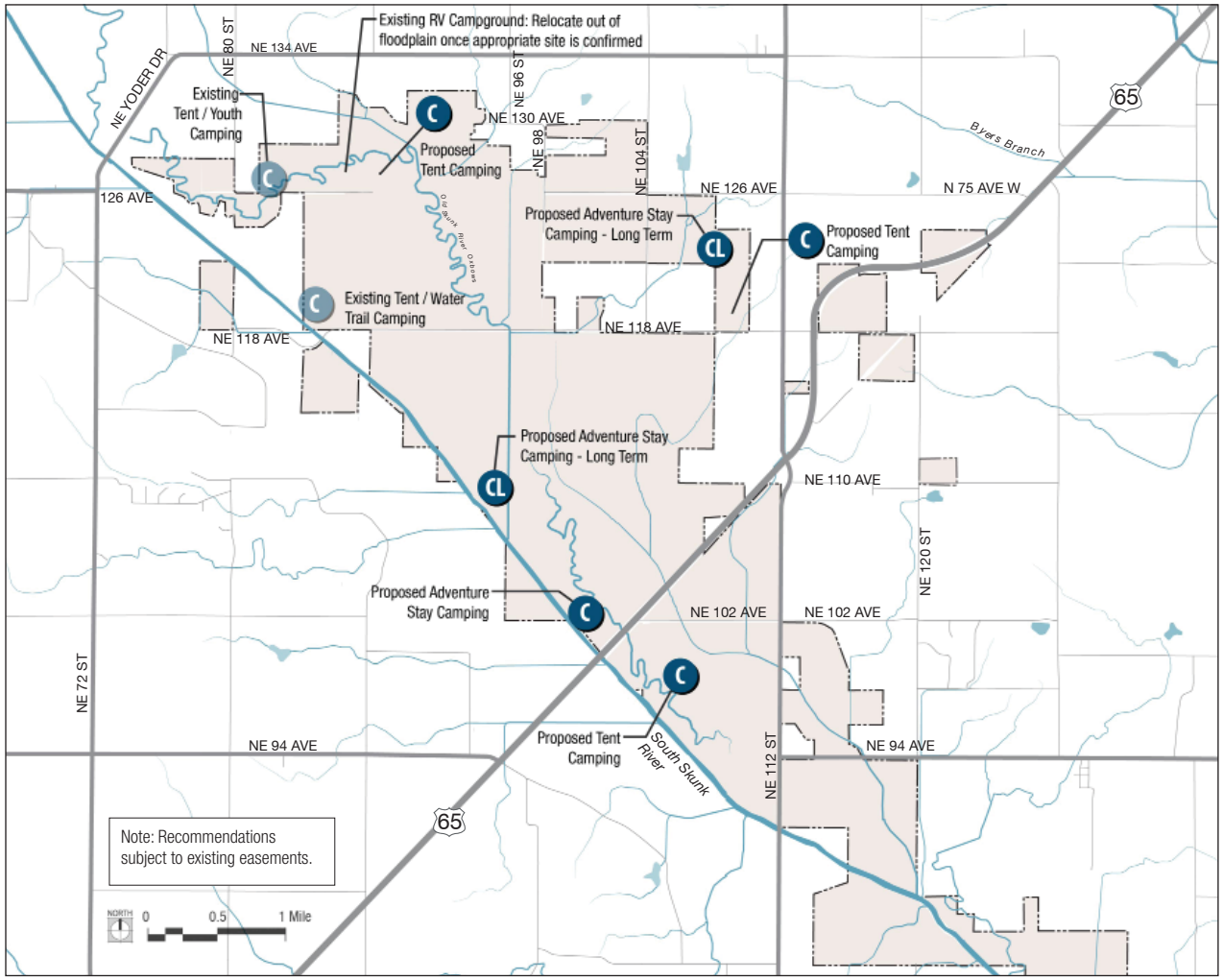
We anticipate relocating the current RV Campground due to flooding. This plan also recommends exploring more unique and culturally sensitive opportunities for overnight stay at Chichaqua, to complement the standard RV excursion. We envision true adventure stay here. While, as always, sensitivity to landscape damage must remain the primary driver, adventure stay certainly shows great potential along some of the remnant meanders of the original South Skunk river and along Chichaqua's edge without necessarily interfering with the more pristine habitat tracts.

Youth Camping

Chichaqua of the future provides a focus on youth in a concentrated area. Despite an obvious youth "zone," the scale of Chichaqua allows us to bring youth together without restricting their options for adventure. Instead, we increase the safety of hiking, paddling, camping and exploring Chichaqua for scouts, school groups, service clubs and others.

Recommendation:

- Relocate RV campgrounds and maintenance facilities to sites that free them from the flood plain and that are developed in a manner that is supportive of the natural and restored landscape
- Create a focal point of youth activity at Chichaqua's northwest corner, repurposing flood-prone facilities to support youth camping
- Add adventure camping into the experiential mix
- Proposed excavations are subject to archaeological review



Proposed camping diagram

Adventure Camping—structural element/concept

CHAPTER V

Proposed Priorities and Cost Estimates

Chichaqua Implementation

Part One: Description and Cost Estimates for Phase One Projects

This implementation section focuses on an initial set of improvements that should help achieve the following:

- Increased awareness of and access to Chichaqua through enhanced directional signage and wayfinding
- Recognition of a "sense of arrival" at Chichaqua, including greater orientation and interpretation through an "early Welcome Portal" in the vicinity of the proposed Chichaqua Station site
- Increased ***interior*** access to key points within Chichaqua through road/parking improvements and trail access, initial wayfinding improvements and interior directional/on-course marker signage

While these elements are important, this early phase also improves experiences for both people and wildlife using Chichaqua. The means to that end include:

- Habitat improvements through implementing an ecology/management plan (referenced below) and deep-water excavation
- Recreation enhancements to camping, canoeing and exploration/hiking
- The first installation of an education shelter to assist naturalists in bringing school groups, families and others into the landscape (four such shelters are envisioned all together in addition to Chichaqua Station)

The items listed here to achieve those goals have been budgeted with some detail based on current thoughts related to the work and materials required but these numbers should be vetted when concepts gain greater clarity and design/engineering gets underway. These are early target numbers only.

Finally, Phase One work intends to improve the overall land and cultural management of Chichaqua by completing two key planning efforts:

- The ecology/management plan, and
- A Cultural Resource Management Plan.

Note: It's important that the Cultural Resource Management Plan precede (or at least parallel) the deep water excavation project. Chichaqua managers need full confidence the excavation site will not conflict with cultural preservation.

PHASE ONE FACILITIES AND ANTICIPATED COSTS:

Item	Description/Elements	Quantity	Low Cost	High Cost
Deep-water habitat	Pond excavation, waste handling; clearing and grubbing; wetland/native seeding; water control structures; contingency	1.5 acres	139,000	152,000
NE 126th Avenue improvements	Mobilization, surfacing, shoulder and sub-bases, pavement markings, culvert replacement, driveway culvert clean and reset, ditch shaping and seeding	1.75 miles	440,000	484,000
Area B Channel improvements (aquatic circulation, paddling)	Class 10 channel excavation, waste; clearing and grubbing; wetland/native seeding; removing/replacing water control structure	See aquatic circulation map	100,000	110,000
Information hubs/kiosks	Per State Park Design Guidelines; associated with trail heads; Phase One anticipates 4 installed; price range 10-40K per (current DNR costs 15K)	4	40,000	160,000
Information panels	Basic interpretive element; 4-6K per	4	16,000	24,000
Regulatory/wayfinding signs	Phase One signage addresses perimeter, directions to welcome portal and education hub; Phase One estimate accounts for ten signs, $500-800 each	10	5,000	8,000
Adventure camping	Support structure; cost range reflects variety of configurations, conditions, materials	2	8,000	40,000
Educational shelter	Shelter facility and associated at-site interpretation; stone seating, crushed aggregate paving; associated landscaping	1	15,000	40,000
Early welcome portal	Quality of materials and anticipated longevity impact costs greatly; estimate anticipates potential to remodel existing on-site grain storage unit; requires structural and foundation enhancements; furniture/fixtures/equipment; crushed aggregate site paving; landscaping	1	60,000	80,000
Subtotals			823,000	1,098,000
Additional services	35% estimate for design, engineering, permitting, survey, geotechnical, and construction contingency		288,050	384,300
TOTAL		N/A	**1,111,050**	**1,482,300**

Additionally, two priority studies are recommended for Phase One:

- Ecology/management plan: $10–12,000.
- Cultural Resources Management Plan (scope requires additional definition for cost estimate).

Part Two: Measuring Success

The full story of the success of this master plan will be told over time with a series of measures honing in on the partners' capacity to meet the vision and mission outlined in the strategic framework of this document. This plan recommends PCCB and its partners focus on a discrete suite of indicators, tracked over time, to understand Chichaqua's progress in terms of restoration, recreation, education and overall services.

RECREATION AND PUBLIC SERVICES MEASURE:
TRACKING USE OF AND ATTITUDE TOWARDS CHICHAQUA

Monitor use through drop box surveys, installed counters and/or random intercept studies. Work with social research experts (e.g., ISU's CARD) to identify qualitative and additional quantitative measures for tracking use and appreciation. Track seasonal changes in use. Focused qualitative work with current primary and incoming users (hunters, birders, scouting groups and educational field trips) can provide an excellent foundation for ongoing understanding.

Additionally, we want to track Chichaqua's impact on neighbors and nearby communities (e.g., Bondurant, Farrar) to help ensure Chichaqua remains sensitive to the surrounding context.

RESTORATION/HABITAT MEASURES:
SPECIES PORTFOLIO, DISTURBANCE MONITORING, WATER QUALITY MONITORING

PCCB is already taking the lead county-wide on developing water quality monitoring data for incoming watershed management authorities. PCCB's expertise can be extended to PCCB lands, particularly Chichaqua. The ecology/management planning process should fine-tune this portion of the measurement scheme, but it makes sense to build on the work Keith Summerville has already started and potentially develop a portfolio of species to assess at the landscape scale. At the same time, more practice-based or "output" measures can aid in interpreting progress. For example, random sites could be monitored for the number of disturbances achieved over a five-year period or distribution of different habitat types can be analyzed. These measures, however, are likely weaker than the more outcome-based measures of understanding the vitality and populations of a variety of species on the landscape – or in the general region.

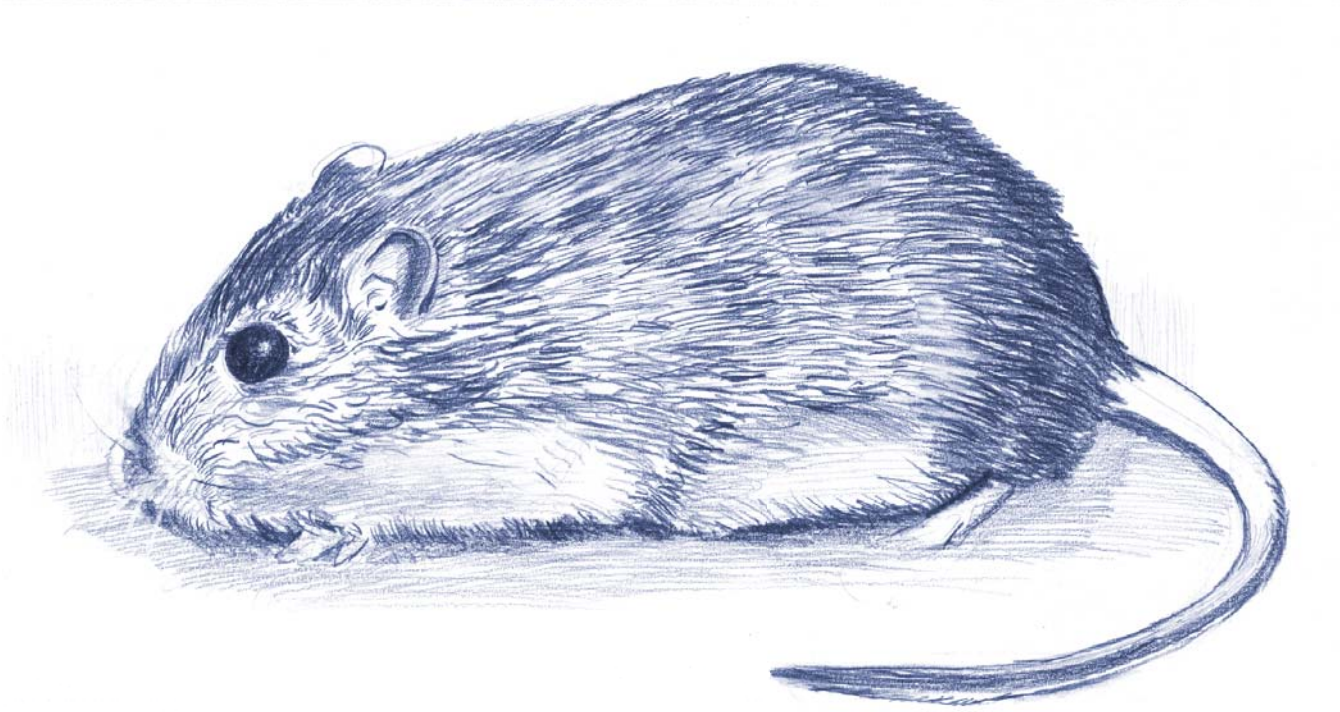
RESILIENCE MEASURES:
GROWTH IN CHICHAQUA'S WATER-HOLDING CAPACITY

This is again a practice/output-based measure, but it speaks directly to expanded habitat, overall improved landscape-scale management and enhancing Chichaqua's ability to withstand climate and development pressures.

This might take the form of models addressing questions like how much water can Chichaqua hold and how long can it hold it? 100 year events? 500 year events? What needs to be done to restore the system to reduce down-watershed impacts of 500 year events? These measures will not only demonstrate progress at Chichaqua but should help inform eventual water quality and quantity management studies/approaches.

EDUCATION MEASURE:
ENHANCED ADVOCACY/AWARENESS OF PROGRAM PARTICIPANTS

From March 2008 to March 2009, PCCB's environmental education (EE) program conducted a cost-effective online survey to measure EE program impacts on participant attitudes, advocacy and behavior. EE can conduct a similar study (or studies) in the future, assessing the impact of programs at Chichaqua on participants and perhaps in comparison to other PCCB programs. Growth in Chichaqua's EE programs and participation overall serves as a baseline output measure.



APPENDIX

Habitat Suitability Modeling

Habitat Suitability Modeling for Six Species of Conservation Concern within Chichaqua Bottoms Greenbelt, Polk County, Iowa

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Introduction

Chichaqua Bottoms Greenbelt (CBGB) is a 3,000 ha grassland and wetland nature preserve located in south-central Iowa near the Wisconsin glacial terminus, or the Des Moines Lobe physiographic region (41o46'22N 93o23'06W). Recent glacial history dramatically influenced the geomorphology of the region; CBGB occurs within a landscape of poorly drained, shallow wetlands adjacent to broad alluvial bottomlands. Floodplains within CBGB are virtually level lowlands of alluvial soils deposited by glacial melt water and, more recently, the Skunk River which flows along the western boundary of the preserve. Prior to settlement, the vegetation of CBGB was primarily mixed prairie, with mesic grasslands favored in glacial kettles and lowlands and more xeric prairie communities found on sandier soils or aeolian deposits.

Draining of wetlands and mesic grassland habitats for row crop agriculture resulted in a loss of 98% of the original vegetation within CBGB after settlement, and most prairie habitats currently present at the site reflect active restoration efforts to decrease cover of cool season grasses such as *Bromus inermis* and *Phalaris arundinacea* and increase the prevalence of conservative Tallgrass prairie grasses, sedges, and forbs (Chichaqua Bottoms Greenbelt Comprehensive Conservation Plan 2004). Wetland habitats throughout the preserve are also the product of restoration activities, including active removal of tile lines, alteration of surface water drainage patterns, and construction of open water wetlands through mitigation. Prescribed burning is the dominant form of disturbance used to manage the vegetation of CBG, with an average of 750 ha burned annually over the last decade. In general, few parcels are burned in consecutive years.

The goal of this project was to develop a series of habitat suitability models that (i) identified patches of habitat that are highly suitable for each of six rare species within Chichaqua Bottoms Greenbelt and (ii) predicted locations of additional suitable habitat outside the boundaries of CBGB. Identifying critical habitat within the boundaries of Chichaqua Bottoms is critical to the construction of a site Master Plan and a more strategic management plan. In addition, identifying areas of critical habitat outside the boundaries of the preserve is critical to developing acquisition or outreach efforts that enhance the conservation efforts of Polk County Conservation Board.

Selection of Species

Six species were selected for habitat suitability modeling: Plains Pocket Mouse, Henslow's Sparrow, Bobolink, Blanding's Turtle, Regal Fritillary, and Sandhill Crane. These species represent a range of ecological niches and have been described as indicators of habitat quality (e.g., Schlict et al. 2007, Summerville et al. 2011). The species also possess different dispersal abilities, ranging from the Sandhill Crane, which likely passes through most habitats at Chichaqua Bottoms Greenbelt to the Henslow's Sparrow, which is restricted to Tallgrass prairie patches with thick thatch and a relatively disturbance-free management history. Each species is described briefly below.

Plains Pocket Mouse (Perognathus flavescens)

The plains pocket mouse is a heteromyid rodent species that occurs on grassland systems of midwestern North America It ranges from southwestern Minnesota and southeastern North Dakota to northern Texas east of the Rockies, and from northern Utah and Colorado to northern Chihuahua west of the Rockies (Geluso 2009). They are adapted to patches of habitat with bare ground and very sandy soil. The mouse's diet is restricted to seeds and, occasionally, the foliage of grasses. Some food found in their cheek pouches are: seeds of needle grass (*Stipa*), bind weed, sandbur grass, a small bean (probably *Astragulus*), and sedge (*Cyperus*). Even those caught in corn or bean fields usually have their pouches filled with weed seeds. Their breeding season is July - August and the females tend to have 4 offspring per year.

This species is considered endangered in the state of Iowa. There are historic records of plains pocket mouse from the collections of Dr. Jim Christensen dating to the early 1980's. Summerville discovered a single individual on Sandhill Prairie in 2008. The larger distribution throughout Chichaqua Bottoms Greenbelt is unknown. In Nebraska, plains pocket mice can be found in roadside medians as long as soils are sandy (Geluso 2009). Thus, even small patches of suitable habitat may be appropriate for this species.

Blanding's Turtle (Emys blandingii)

Blanding's Turtles is a medium-sized, hard-shelled turtle indigenous to Iowa's wetland and river complexes throughout the central and eastern parts of the state. The species has a unique phenotype. The shell is rounded and hump-shaped and, occasionally, speckled with yellow dots. The neck and throat are bright yellow. Blanding's turtles are mostly predaceous, feeding on insect larvae, snails, leeches, small fish and frogs.

Preferred habitat for Blanding's turtle is wetlands – both permanent and ephemeral, although habitat use becomes restricted to deeper freshwater impoundments during droughts. Streams and river channels are also used, but Blanding's turtles appear to avoid areas with high current. Marshes and wetlands with thick emergent vegetation and some downed logs are highly valued for protection and basking, especially by juvenile turtles. Importantly, wetlands covered by cattails are avoided by Blanding's turtles.

Blanding's turtle home range varies from 1.5 ha to 63 ha and most individuals will move > 500 meters every couple of weeks. The species population structure thus fits classic metapopulation expectations, with individuals occupying a single wetland impoundment for only a short time before moving to a new wetland. This process repeats itself over the summer; individuals can move up to 7 kilometers over a few months' time. Within

a wetland complex, however, Blanding's Turtles display a high level of philopatry (e.g., Barker and King 2012). During dispersal, flooded woodlands and oxbows are used for feeding and resting.

Summerville has recorded Blanding's turtles in controlled wetlands adjacent to the main office at Chichaqua Bottoms, in prairie pothole wetlands on and south of Sandhill prairie, and along ditch 52. Blanding's turtles were not seen at all during the droughts in 2012 when wetland drawdown removed most freshwater habitat throughout the preserve. Rupiper document basking juvenile Blanding's turtles in several wetland potholes on Sandhill Prairie in June and July 2013. The species is considered threatened in Iowa.

Henslow's Sparrow (Ammodramus henslowii)

An inconspicuous and rare emberiizid, the Henslow's Sparrow breeds in grasslands of the east-central United States. Its population numbers have declined steadily over the past few decades, largely because of habitat loss (Kent and Dinsmore 1996). Ideal habitat is large, flat prairies with no woody plants. Dominant vegetation is tall, dense grass (e.g., *Andropogon; Sorghastrum*), a dense litter layer, and standing dead vegetation (Pruitt 1996). Nesting occurs in an open bowl of loosely woven dry grasses, placed in layer of grass litter just off the ground. Henslow's Sparrow has been identified as the highest priority for grassland bird conservation in eastern and Midwestern North America by Partners in Flight (PIF), a cooperative effort of many organizations dedicated to bird conservation (see also Jackson et al. 1996).

Summerville et al. (2011) detected Henslow's sparrow in a number of habitat patches across Chichaqua Bottoms Greenbelt, especially Sandhill Prairie, Mountain Farm, and areas of unburned prairie east of state route 65. There is a clear inverse correlation between grassland seral state and abundance of Henslow's sparrow (USDA 2003). Management activities that reduce thatch, thin vegetation, or promote shrubby / tree recruitment will diminish the value of habitat for Henslow's sparrow. This species is considered threatened in Iowa.

Bobolink (Dolichonyx oryzivorus)

The Bobolink is another bird restricted to grassland systems in the Midwestern and Eastern United States, but its habitat requirements are near opposite of Henslow's sparrow (e.g., Jackson et al. 1996). Adult males are easily recognized because it is black underneath and white on the back. This coloring makes the male stand out while he is performing his displays. The species breeds in open grasslands and hay fields, but tends to avoid areas with overly thick thatch and tends to select fields with a more balanced grass:forb ratio than does Henslow's sparrow (Kent and Dinsmore 1996). The diet of bobolinks is seeds, with both grass and forb species utilized. Nesting is close to the ground in a cup constructed from available vegetation.

Bobolinks are regular migrants through Chichaqua Bottoms (Summerville et al. 2011), but numbers of this bird increased annually on Bolton-Hay prairie as a result of the introduction of grazing management. Ideal breeding habitat is 10-30 hectares with little woody edge. Management of grassland patches through burning, mowing, or grazing should be done on a 3-6 year rotation in order to limit woody vegetation and provide adequate amounts of mid-successional grassland (USDA 2003). Bobolinks tend to next a little later than many migratory birds, so planned disturbances should be avoided until after July 15th (which is consistent with regulations governing actions such as haying NRCS easements).

Sandhill Crane (Grus canadensis tabida)

The Sandhill Crane (*Grus canadensis*) is among the largest of all crane species, ranging across North America and into northeastern portions of Russian Siberia. Adults are marked with a characteristic plumage: gray body, white cheek feathers, and a reddish wash to the forehead. In the Midwestern United States, Sandhill Crane migrations are massive events, with upwards of a half million birds arriving in the Nebraska Sandhills and Platte River valley each year. These migration events are popular among bird enthusiasts and nature lovers. During breeding season, Cranes prefer to feed in open grasslands, meadows, and wetlands, with nesting occurring in partially emergent wetlands with ample habitat cover. In these habitats, birds feed on a wide range of food items, including amphibians, insects, grains (including crops such as corn and, to a lesser extent, soybeans), and occasionally small rodents (see Archibold and Meine 1996).

The greater Sandhill Crane (*Grus canadensis tabida* L.) was a common nesting species in Iowa prior to the onset of human settlement in the mid-1800's, but the species was extirpated from the state by 1900 (Dinsmore 1994). The rapid loss of breeding populations of Sandhill Cranes has been variously linked to unregulated hunting practices, conversion of grassland habitat to agriculture and widespread draining of wetland habitats where nesting occurs (Tacha et al. 2006). Since 1980, the Sandhill Cranes gradually have begun to recolonize the state; first as the occasional migrating group used Iowa's wetlands as a stopover location and later as breeding pairs began to return to northeastern and east-central Iowa counties (e.g., Poggensee 1992, Jackson et al. 1996). Sightings of Sandhill Cranes in Iowa have now been confirmed from ≈ 2/3 of Iowa's counties, with nesting documented in northeastern Iowa for the last decade (Dinsmore and Kent 2002).

Regal Fritillary (Speyeria idalia)

The Regal Fritillary is a nymphalid butterfly found among restored and remnant tallgrass and mixed-grass prairies in the east-central United States. Flight occurs from approximately June to September and adults tend to be swift in flight, coasting close to the ground (Schlict et al. 2007). The larval food source for the regal fritillary is violets (*Viola* spp.) (Selby 2007). The violets are an extremely important component of habitat sustainability for the regal fritillary and there is a correlation between the number of violets present and the number of butterflies found in a given area (Kelly and Debinski 1998). Violet species that the larvae feed on include *Viola pedata* (bird's-foot violet), *V. pedatifida* (blue prairie violet), *V. papilionacea* (common blue violet), *V. lanceolata* (lance-leafed violet), *V. nuttallii* (Nuttall's Violet) (Kelly and Debinski 1998), *V. sagittata* (arrowleaf violet), and *V. tricolor* (Johnny Jumpup) (Selby 2007). Adults feed on a variety of nectar plants and their availability throughout the summer flight time can be as important as the presence of larval food plants in determining whether an area can support populations of butterfly species (Selby 2007). Milkweeds, thistles, coneflowers, blazing-stars, bergamots, clovers, goldenrods, and ironweeds are some of the most important nectar sources for adult regal fritillaries.

This species is considered special concern in Iowa and has been found on Bolton-Hay,

Sandhill, and Mountain Farm prairies at Chichaqua Bottoms Greenbelt. In 2012, regal fritillaries were found in large numbers (> 40 individuals detected in June and July), but most annual observations are restricted to a single or a few individuals per year (e.g., see Elmer et al. 2012).

CONSTRUCTION OF GIS MODELS

All models were constructed using habitat assessments published in the primary literature, Iowa DNR GIS data, and field observations made during the spring-summer 2013 season. All models were created with the same initial step. We began by constructing a base map that consisted of high resolution land cover data. This high resolution land cover product was derived from three dates of aerial imagery, and from elevation information derived from LiDAR elevation data. It has a spatial resolution of one meter, and a class resolution of 15 classes. The target year for the interpretation of the classification is 2009. The Imagery sources are the 2008 NAIP imagery, the 2009 NAIP imagery, and the Four band Spring imagery collected in 2007, 2009 and 2010. Three dates were used because previous experimentation had shown that using fewer dates lacked sufficient spectral information to produce a reasonably consistent classification at the level required (Iowa DNR metadata).When two land cover classes graded into each other, we used a weighing algorithm to create ecotones between cover classes. In addition, we developed weighting rules to prioritize specific aspects of a species microhabitat preference. For example, when a species will utilize both the southern and western aspects of a hill, but prefers the western, greater weight was placed on that aspect. This allows for intermediate habitat to be scored as marginally suitable for each species (a strictly binary habitat model it would classify marginal habitat as unsuitable).

The first species habitat suitability model presented in this report is the plains pocket mouse (*Perognathus flavescens*). Three primary environmental attributes were utilized in the construction of this model, percent sand within soils, hill aspect, and vegetative land cover. The first pass of the model took the existing high resolution land cover and removed any attribute not associated with cool and warm season grasses. After separating the target land cover types a 3 meter digital elevation model was utilized to produce an aspect layer. This layer isolated southern and western faces of the topography within a 1 mile buffer of existing park boundaries. Primary literature describes *P. flavescens* as consistently maintaining an affinity toward primarily the southern aspect, while utilizing the western aspect, albeit less frequently.

The final model filter for the study area, in regards to plains pocket mouse, is soil type. This data set consists of georeferenced digital map data and computerized attribute data. The map data are in a 3.75 minute quadrangle format and include a detailed, field verified inventory of soils and nonsoil areas that normally occur in a repeatable pattern on the landscape and that can be cartographically shown at the scale mapped (Iowa DNR GIS). Surgo soil polygon files were sorted into a binary system referencing the percent sand within the surface horizon. Soils with >%45 sand were maintained, discarding the remaining polygons. After polygon selection and elimination, the existing shapefiles were converted to raster data in order to perform the final analysis.

The resulting layer file was then assessed for error and corrections were made in order to remove over estimations within existing agriculture land. Fencerows, road right of ways, and field terraces meeting the requirements above were maintained in the model due to the potential utilization of these small discontinuous habitat areas. There was a distinct pattern in spatial arrangement from this model with the northern and eastern reaches of CBG and the surrounding area displaying potential suitable habitat, while the southern and western reaches showed little to none.

Each additional habitat models will follow the same initial coarse filter landcover removal steps, but will vary in fine filter attribute selection.

The second species assessed in this habitat suitability model was the Blanding's turtle (*Emys blandingii*). This model used a scoring system developed by Barker and King (2012) for wetland complexes. Barker and King approach modeling building for Blanding's turtle using orthophotos to weight habitat attributes using four variables: wetland area (larger wetlands receive a higher ordinal score), percent emergent vegetation (higher values receive lower ordinal scores), percent vegetation around the perimeter of a wetland (higher values receive higher ordinal scores), and number of basking sites (more site receive higher ordinal scores). Habitat suitability is then calculated for each wetland as the numeric average of the four habitat values.

Henslow's sparrow (*Ammodramus henslowii*) and regal fritillary (*Speyeria idalia*) are presented together due to their affinity for similar habitat structure (e.g., see Beilfuss and Harrington 2001; USDA 2003). In order to maintain viable populations both species require unburned, ungrazed, grasslands with a maintained litter depth of at least 3 cm. These models included areas of warm and cool season grasses 3-5 years post burn, with 50 meter buffers from standing woody vegetation. Henslow's sparrows and regal fritillaries will adapt more readily to restoration practices than some other grassland birds and butterflies, such as bobolinks and upland sandpipers. Studies to determine regal fritillary larval host food preference are ongoing, with the current assumption that, Iowa, the species prefers ovipositing on prairie violets (*Viola peditifida*) under question (Selby 2007). In 2012, Rupiper experimentally planted prairie violets on Sandhill Prairie to assess Regal Fritillary foraging. The location of this site is annotated on the resulting habitat suitability map.

The bobolink (*Dolichonyx oryzivorus*) habitat suitability model consists of two primary elements; one spatial and one management history. The first filter was a 50 meter buffer from woodlands, roads, and permanent standing water (open ponds and rivers). Bobolink abundance is generally negatively correlated with woody vegetation, forested areas, and heavy forb cover and positively correlated with percent canopy cover of grass and litter presented 1-3 years post burn. The second filter omitted land cover burned within the last year and more than 4 years past. While management practices are not the target of this study, the models produced will help target activities such as burning, vegetative removal and supplementation, and future construction of habitat.

Finally, the habitat suitability assessment for Sandhill Crane was developed by modifying the approach of Downs et al. (2008). The process is broken down into four separate steps. First, we broke the Chichaqua Bottoms basemap into a grid with 25 x 25 meter subunits so that each subunit could be analyzed separately. Second, we categorized each cell in the 25 x 25 meter grid based on whether that cell contained breeding habitat. After Downs et al. (2008) we used wetlands with emergent vegetation that were ≥ than 0.5 ha as breeding habitat (Tacha et al. 2006). Habitat subunits in the landscape

that meet this standard were scored a "1"; all others are scored "0". Third, we scored all cells based on whether they met the feeding, roosting, and cover preferences for Sandhill Cranes. For example, wetlands within 750 meters of nesting habitat are highly valued for feeding, as are corn fields within 1000 meters (Downs et al. 2008). Grasslands with vegetative cover > 1.5 meters tall provide important cover for young birds and adults (Tacha et al. 2006). Habitats that are wetland or Tallgrass prairie receive a "1"; corn fields receive a 0.5, and all other habitat types receive a "0". Fourth, we calculated a habitat suitability index value for each 25 x 25 meter subunit on the landscape grid. To do this, the following formula was used:

$$\text{Habitat Suitability Index Score} = \frac{(\text{Nesting Score} * 2) + \text{Feeding Score} + \text{Cover Score}}{3}$$

Nesting habitat score was given higher weight in the calculation than the other two habitat types because breeding success is the most limiting factor on crane recovery in the agricultural Midwest (Tacha et al. 2008). Because each subunit in the landscape map receives its own score, this method allows for easy visual identification of habitat that should be managed for Cranes.

GROUND TRUTHING THE MODELS

In August and September 2013, we used targeted site visits within and, especially, outside of the boundaries of Chichaqua Bottoms Greenbelt to try and validate some of the model predictions. For example, soils, slope, and aspect variables often indicated area of suitable habitat for species but existing land uses were inconstant with what ecologist would consider higher quality habitat. When we observed this variance in model prediction and field reality, we modified our maps to account for the error. In addition, soils and land cover classes are often mapped at a larger scale that actual field-level observation would confirm. Thus, we update land cover classes and other coarse scale data with field observations as appropriate. Field truthing these maps continues.

Additionally, simply because a habitat suitability map reveals patterns in distribution of quality habitat does not indicate that actual populations of the six species occur in an area. Consider effort will need to be made to document populations of these rare species, especially in the regions that lie outside of the boundaries of Chichaqua Bottoms Greenbelt. The largest two priority species for field sampling should be **Plains Pocket Mouse** and **Blanding's Turtle**. In the case of the mouse, the species is at the edge of its range in eastern Polk County and thus is likely characterized by a small population size with high inter-annual variability. Populations outside of the protection of CBGB should also be documented. In the case of Blanding's turtle, emphasis on regional inventory is important because (i) the species moves throughout the entire preserve and (ii) recent droughts have likely stresses extant populations as wetlands have been drawn down to near zero in 2012 and, to a lesser extent, 2013.

RESULTS

Below, we present the visual results of each habitat suitability model and discuss the major results for each species.

Plains Pocket Mouse

Habitat suitable for plains pocket mouse is limited to the northeastern and eastern fringes of CBGB where soils are sandy and exposure favors warmer microclimates. Considerable suitable habitat extends outside of the preserve in the form of wind-blown sands and glacial till. Overall, only about 7.6% of the current acreage within CBGB is suitable for Plains Pocket Mouse.

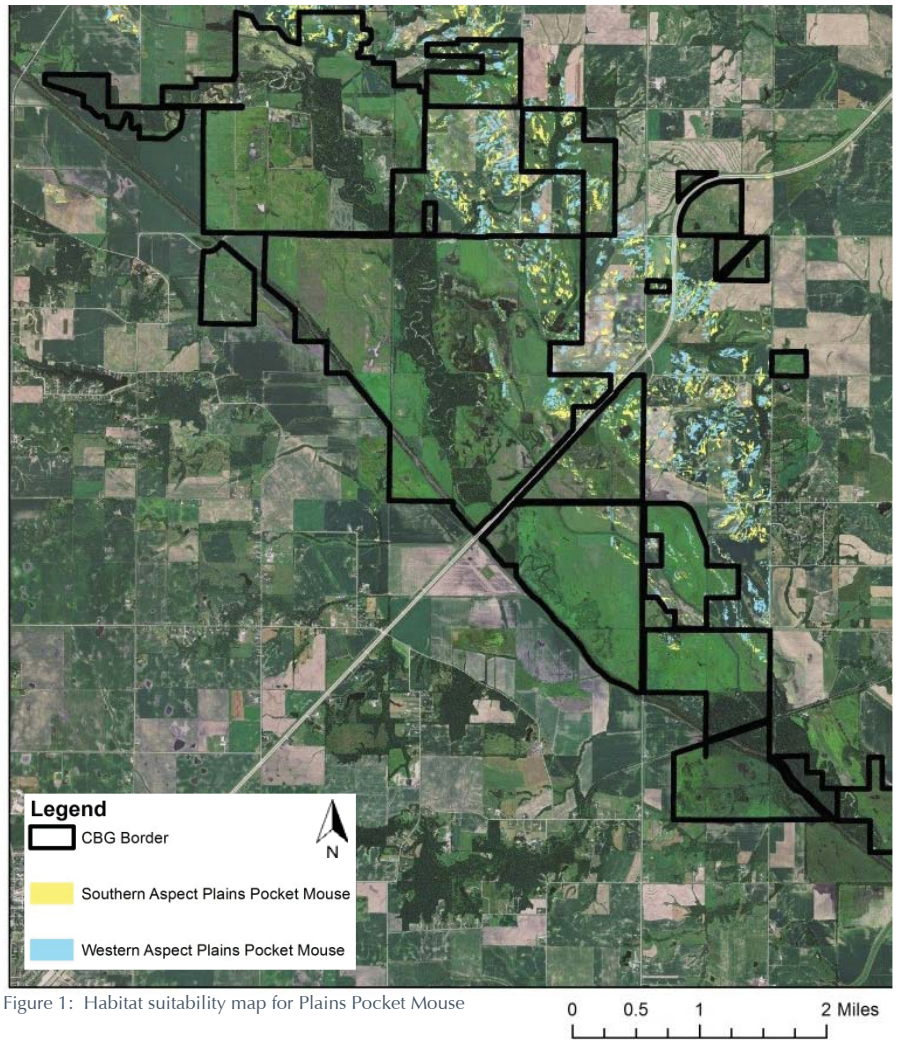


Figure 1: Habitat suitability map for Plains Pocket Mouse

Blanding's Turtle

The pond/wetland system within CBG scored relatively low across all instances due to a lack of basking sites (e.g., downed logs associated with wetlands to promote basking) and proper vegetative associations surrounding deep-water wetlands. These shortfalls could be easily addressed with targeted restoration practices. Pot-hole type wetlands that serve as Blanding's turtle habitat currently represent only 25% of the wetland cover classes across the CBGB system. Importantly, little suitable habitat exists outside of the CBGB boundary, so the long-term status of this species in the region will heavily depend on proper management of the CBGB system.

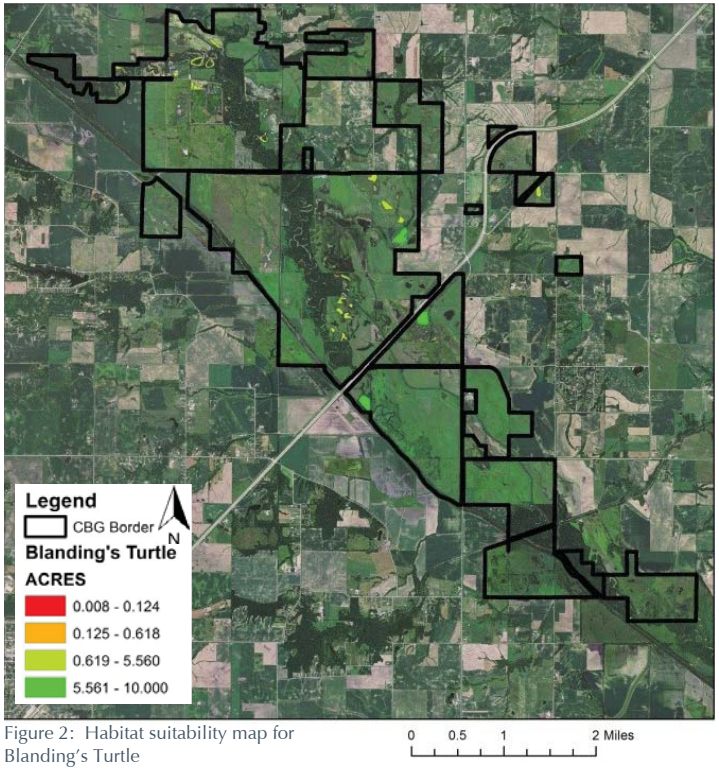


Figure 2: Habitat suitability map for Blanding's Turtle

Henslow's Sparrow and Regal Fritillary

Much of the habitat throughout CBGB is suitable for Henslow's Sparrow and Regal Fritillary. The soils (e.g., Clarion-Nicolette) and gentle topography favor native prairie vegetation and historic restoration efforts across the CBGB complex have created abundant habitat for each species. For both species, however, suitability of habitat in any particular year will be driven by management and development decisions. For example, burning rotations will both remove suitable habitat from the landscape (for a time) and will create the conditions that favor the successional development of suitable habitat in the future. The major threat to each species is habitat loss, so any land use change that removes tallgrass prairie from the CBGB complex will necessarily truncate the future distribution of each of these species. Because the distribution of suitable habitat for Henslow's sparrow and Regal Fritillary are so congruent, changes in habitat availability for one species will likely be correlated with changes in habitat suitability for the other.

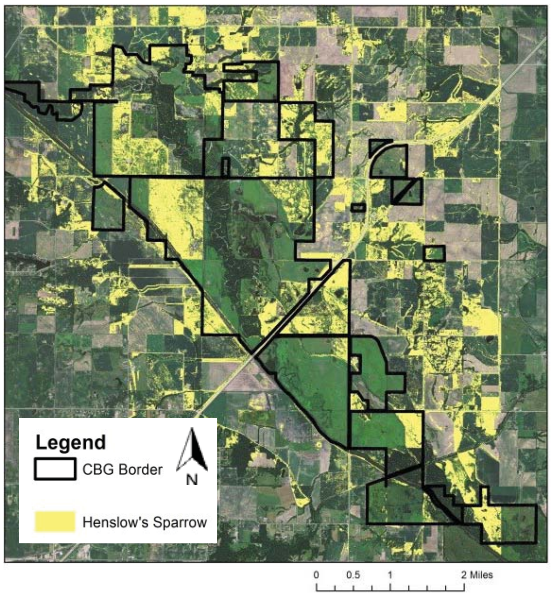


Figure 3: Habitat suitability map for Henslow's sparrow.

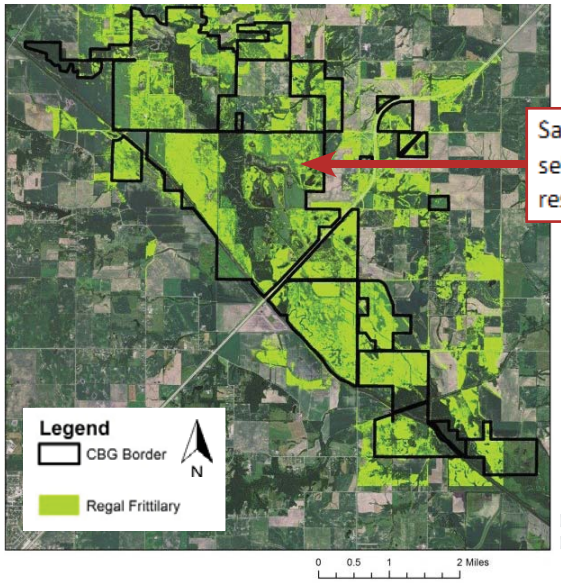


Figure 4: Habitat suitability map for Regal Fritillary

Bobolink

Bobolink's habitat is adequately provided by ongoing restoration and management within CBGB. Approximately 30% of the acreage of the prairie is currently suitable for the species, with most of the habitat provided along the southern reaches of the preserve. Little habitat is provided by the corn and soy fields that border the preserve, especially to the west and southwest of the Skunk River. Bobolinks seem to prefer the shorter prairie patches throughout the site as well as those with lesser thatch development.

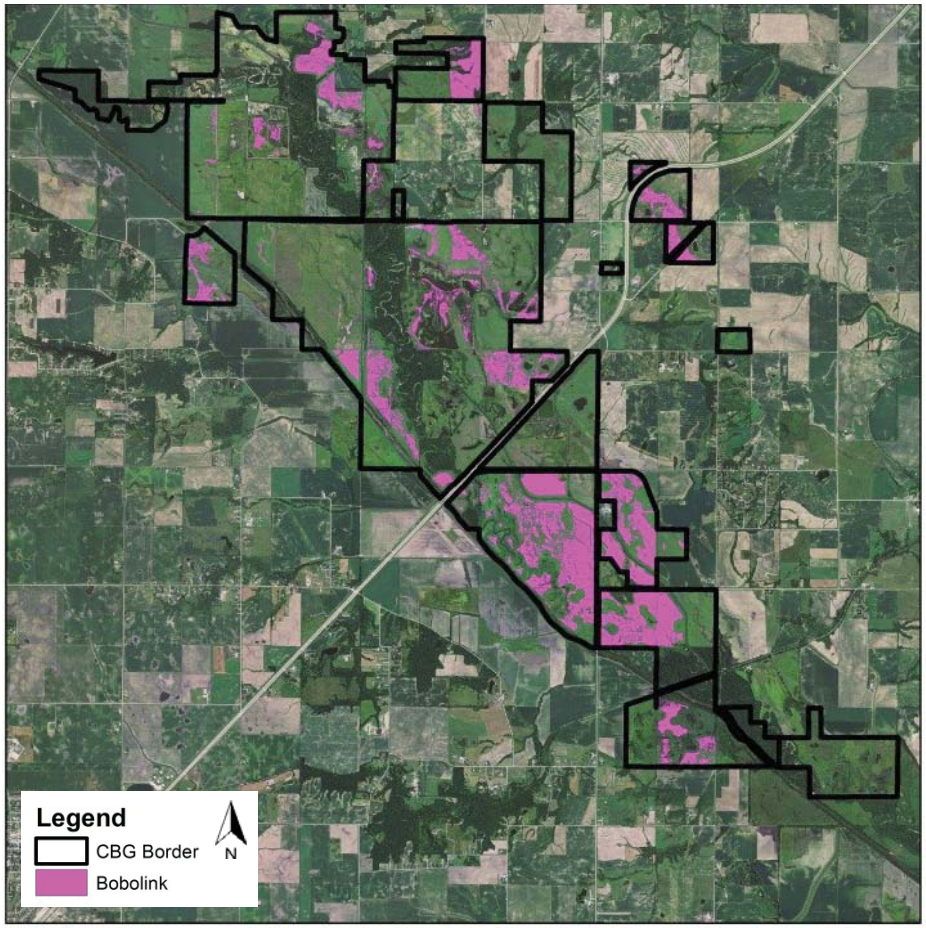


Figure 5: Habitat suitability map for Bobolink

Sandhill Crane

Sandhill Cranes fly and feed throughout the entire CBGB preserve, but our model suggests that little highly suitable breeding habitat occurs throughout the site. The reasons for the lack of breeding habitat are complex. Abundant ephemeral wetland habitats exist throughout the site, but the drought of 2012 killed most the emergent vegetation through the area. So while wetlands are present, they are not ideal for a large population of breeding cranes. The areas that were identified as highly suitable are precisely where nesting individuals likely occur each year.

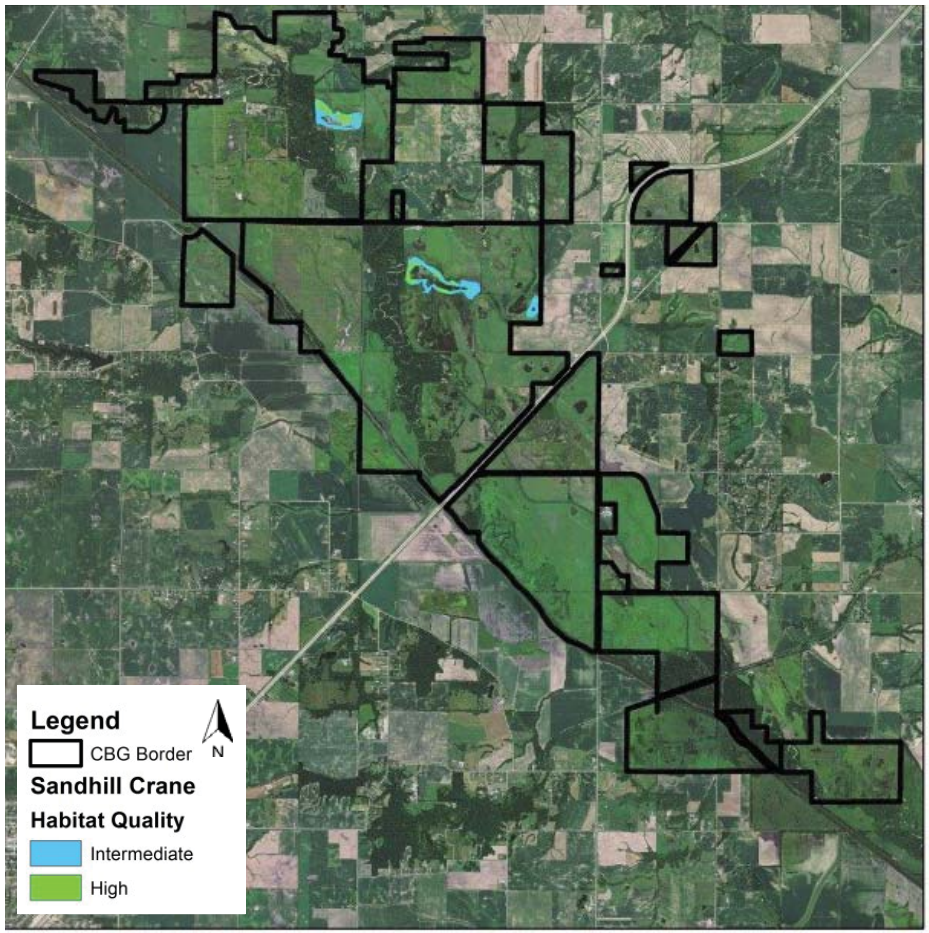


Figure 6: Habitat suitability map for Sandhill Crane

IMPLICATIONS FOR MASTER PLAN

The major implications for the Chichaqua Bottoms Greenbelt Master Plan are:

- Areas to the north and east of the preserve boundary contain the most potential for occurrence of the six species of modeled here. The soils and slopes associated with these areas are sandy (aeolian, glacial), which has created a system of gentle hillsides and small blufflands. These areas may have originally harbored (and may continue to do so still) all of the species modeled here except Blanding's Turtle. In contrast, areas to the south and, especially, west of the Skunk River appear less ecologically important to this subset of six species.

- Only very low impact recreation / research should be permitted in the areas identified using tan shading on the Integrated "Master" Habitat Suitability Map. These areas are mapped below (Figure 8). Each of the sensitive areas contain habitats suitable for at least four of the six species modeled in this study. To minimize potential edge effects associated with disturbance, each core area of sensitive habitat is buffered to 100 meters along the perimeter of a patch.

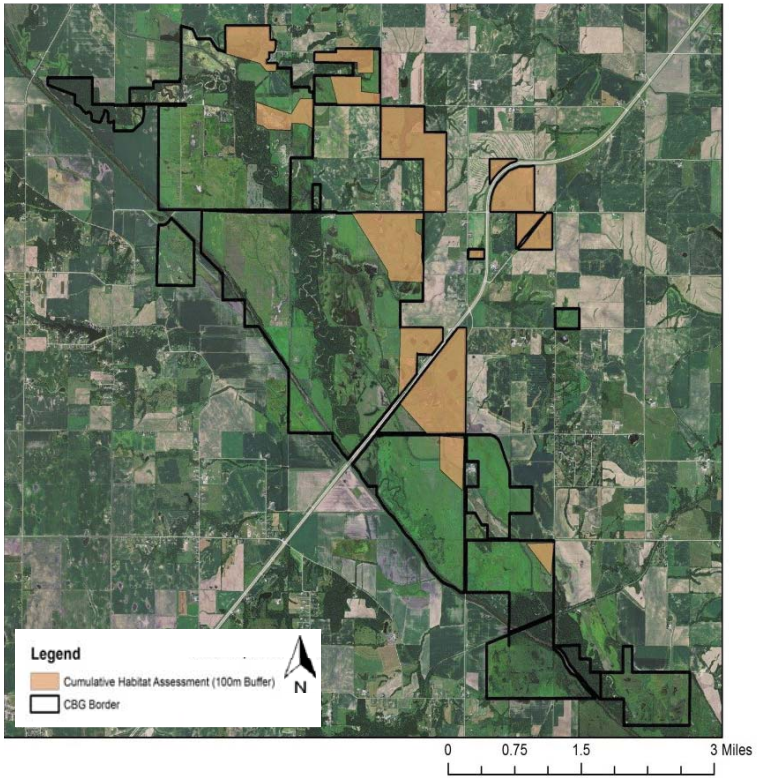


Figure 7: Integrated "Master" Habitat Suitability Map for six species of conservation concern. Areas that are illustrated in tan contain suitable habitat for ≥ 4 species and should remain low impact recreation / education / research. To minimize edge effects from adjacent disturbance into these sensitive areas, a 100 meter buffer zone has been added to all tan shaded areas. Note: additional areas at CBGB contain sensitive species / cultural resources and easement restrictions on development.

- The situation for Blanding's Turtle is slightly different. Chichaqua Bottoms Greenbelt is rich in wetland habitat but short on permanent deeper-water wetlands that will sustain this species though periods of abnormal drought. Central Iowa has experienced two recent drought events in 2012 and 2013 that illustrate the fragility of maintain a system of ephemeral wetlands for species conservation. In 2012, virtually 95% of the wetland acreage dried down. In 2013, a similar dry-down occurred though it was less severe. Blanding's turtles are a metapopulation-type species. They require multiple permanent wetlands in order to maintain a viable population. Thus, if land acquisition is to be part of a Master Planning process, priority should be extended to areas with muck class soils – e.g., Palms; Zook soils (e.g., near the planned Airport mitigation). These muck soils hold water, and will be promising for creation of more resilient wetland complex. Within the boundary of CBGB, Zook and Palms soils should be considered as focal points for future wetland mitigation efforts (e.g., as is being proposed by Stanley Consultants for a portion of the Airport Mitigation). Distribution of these soil types is illustrated below.

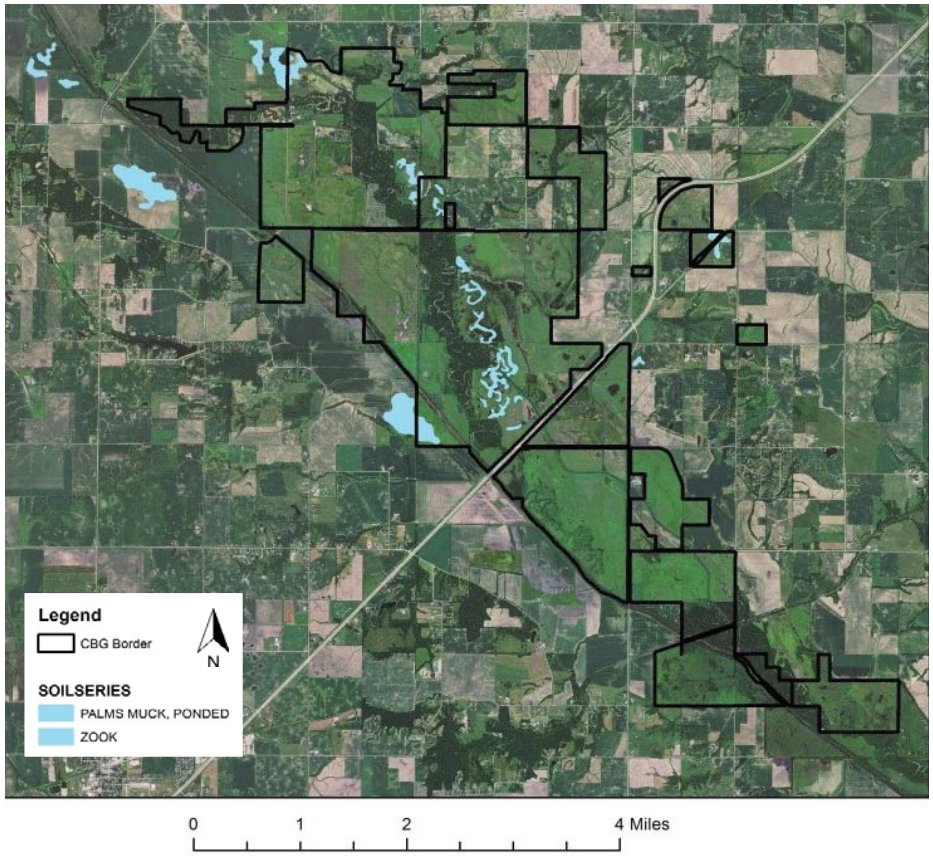


Figure 8: Distribution of soils with significant clay component (e.g., water holding capacity) throughout the Chichaqua Bottoms Greenbelt Preserve.

- Hydroperiod of extant wetlands will be one of the most important predictors of wetland species viability in years to come. Aside from the previously mentioned Blanding's Turtle, the presence of nesting Sandhill Cranes will be linked to presence of wetlands with emergent vegetation. If droughts such as 2012 and 2013 become the norm, then one of the most critical aspects of a Master Plan is to coordinate changes in such a way that adverse alterations to hydroperiod do not occur. This means that development south or west of CBGB might be more desirable than development immediately to the north. The long-term fate of the drainage district ditches is also a critical question because slowing the flow of water through CBGB will be critical to maintaining hydroperiods over time.

- Importantly, CBGB is also occupied by other species of conservation concern that are not mapped here: Western prairie fringed orchid, Graham's crayfish snake, Zabulon skipper, two- spotted skipper, smooth green snake and bull snake. The distribution of many of these species corresponds broadly to the oxbow wetlands in the old Skunk River channel, Turtlehead fen, and Engeldinger marsh. These wetland resources are too delicate to develop and are only suitable for low impact recreation. A population of ornate box turtles occurs on Sandhill Prairie. This site is highly valued by a number of species and should be protected from development.

- Ideally, any development adds alters land cover type increases access to large groups of people, or enhances the prevalence of invasive species should be restricted to the southern and western edges of the preserve or should be pursued on newly acquired land that has low potential for harboring significant biodiversity. This recommendation is derived from basic principles of conservation biology: (i) maintain integrity of a preserve's core, (ii) minimize edge effects, and (iii) aggregate disturbances in least sensitive zones. In the case of the CBGB landscape, much of the western floodplain of the Skunk River valley does not contain habitat suitable for rare, threatened, or endangered species. Building out recreation services on this type of land is least likely to impinge on the hydrology or biology of CBGB and thus is consistent with the conservation goals of Chichaqua Bottoms.

LITERATURE CITED:

Archibald, G., and Meine, C. 1996. Family Gruidae (Cranes) in del Hoyo, J., Elliott, A., and Sargatal, J. Handbook of the Birds of the World. Volume 3, Hoatzin to Auks. Lynx Editions: Barcelona, Spain.

Barker, R. and D.J. King. 2012. Blanding's turtle (*Emydoidea blandingii*) potential habitat mapping using aerial orthophotographic imagery and object based classification. Remote Sensing 4: 194-219.

Beilfuss, K.G. and J.A. Harrington. 2001. Distribution patterns of the Regal Fritillary (*Speyeria idalis* Drury) within a Wisconsin dry prairie remnant. Proceedings of the 17th Annual North American Prairie Conference 17: 191-196.

Downs, J.A., R.J. Gates and A.T. Murray. 2008. Estimating carrying capacity for Sandhill Cranes using habitat suitability and spatial optimization models. Ecological Modeling 214:284-292.

Elmer, A., J. Lane, and K.S. Summerville. 2012. Does low-density grazing effect butterfly colonization of a previously flooded tall grass prairie. Great Lakes Entomologist 45: 69-78.

Geluso, K. 2009. Final report: survey of *Reithrodontomys montanus griseus* and *Perognathus flavescens* in eastern Nebraska. Report to the Nebraska Department of Natural Resources, 49 pages.

Jackson, L.S., C.A. Thompson and J.J. Dinsmore. 1996. The Iowa breeding bird atlas. University of Iowa Press: Iowa City.

Kelly, L. and Debinski, D. 1998. Relationship of Host Plant Density to Size and Abundance of the Regal Fritillary *Speyeria idalia* Dury (Nymphalidae). Journal of the Lepidopterists' Society 52: 262-276.

Poggensee, D. 1992. Nesting Sandhill Cranes at Otter Creek Marsh, Tama County. Iowa Bird Life 62:112-113.

Pruitt, L. 1996. Henslow's Sparrow: status assessment. United States Fish and Wildlife Service. Bloomington, Indiana. 106 pages.

Schlict, D.W., J.C. Downey, and J.C. Nekola. 2007. The butterflies of Iowa. University of Iowa Press, Iowa City.

Selby, G. 2007. Regal Fritillary (*Speyeria idalia* Drury): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region, Species Conservation Project. US Fish and Wildlife Service, Washington, DC.

Summerville, K.S., J. Boyles, and L. Lown. 2011. The birds of Chichaqua Bottoms Greenbelt (Polk County, Iowa): patterns of habitat use and implications for management. Journal of the Iowa Academiy of Sciences 118: 8-15.

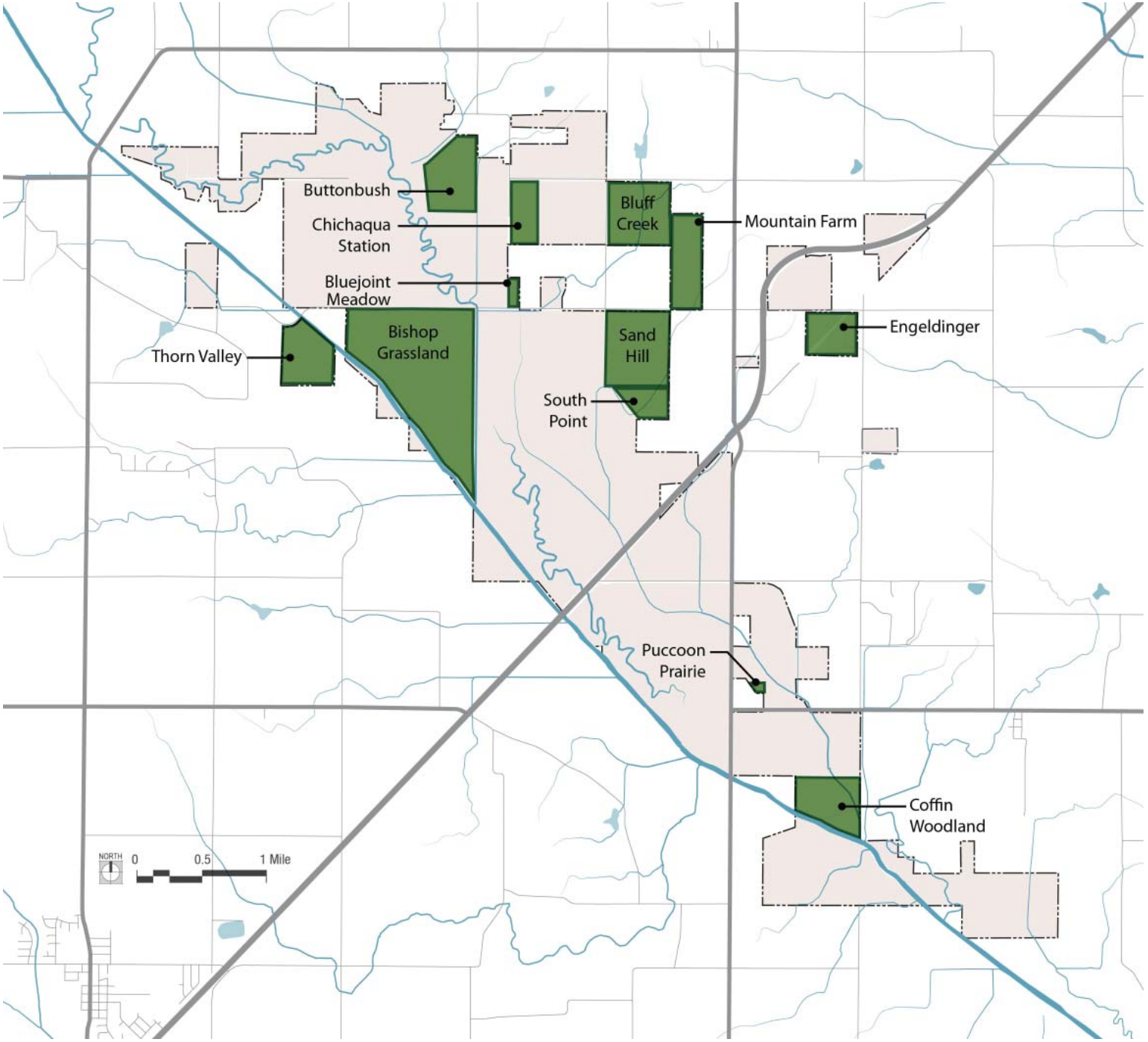
T.H. Kent and J.J. Dinsmore. 1996. Birds in Iowa. University of Iowa Press, Iowa City.

Tacha, T.C., S.A. Nesbitt and P.A. Vohs. 2006. Sandhill Crane (Grus canadensis), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America: *http://bna.birds.cornell.edu/bna/species/031doi:10.2173/bna.31.*

United States Department of Agriculture. 2003. Conservation assessment for Henslow's Sparrow (*Ammodramus henslowii*). Washington, DC. 11 pages.

United States Department of Agriculture. 2003. Conservation assessment for Bobolink (*Dolichonyx oryzivorus*). Washington, DC. 11 pages.

United States Fish and Wildlife Service. 1981. Standards for the development of habitat suitability index models for the use of habitat evaluation procedures. United States Fish and Wildlife Service: Washington, DC.



Current common area names

Document prepared by:

POLK COUNTY CONSERVATION

RDG PLANNING ● DESIGN

HRG HRGreen