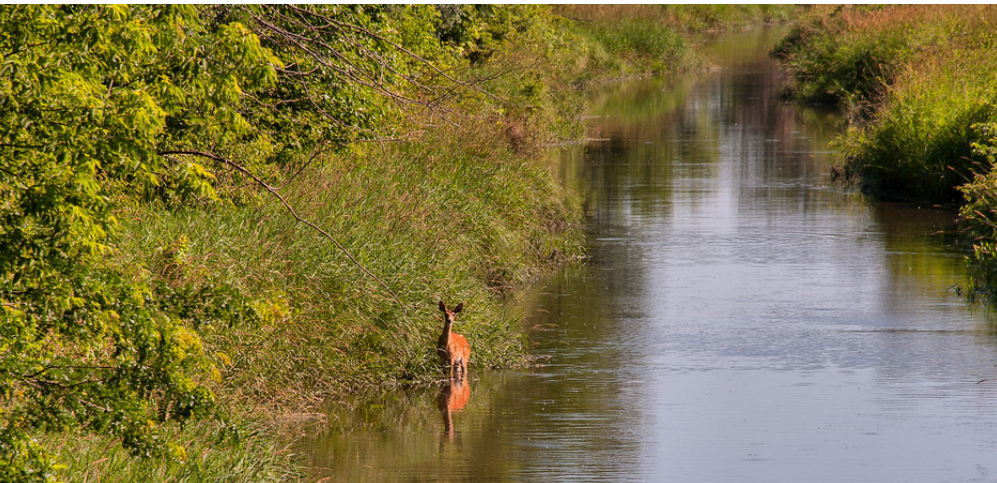




Chapter Eight: **Natural Resources**

Natural Resources

Overview

Chapter Purpose

The intent of the Natural Resource Chapter is to provide an overview of the relevant natural resources and stormwater issues that will impact development and growth of Bondurant. It includes a review of the existing natural features and a discussion about possible mitigation or conservation efforts for each. A brief overview of the public input related to natural resources is provided.

A review of the recently completed stormwater master plan and its best practice recommendations is also included. Lastly, a series of goals, policies, and action items were created to help Bondurant grow responsibly and sustainably while protecting its most important natural features.

Chapter Structure

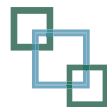
The Natural Resources Chapter follows the following format:



Summary of public input received on natural resources



Review of natural resources in Bondurant today



Stormwater master plan discussion + best practices



Natural Resources Goals, Policies, & Action Items

Public Input Themes

Natural Resource-Related Input

Natural Resource Public Input

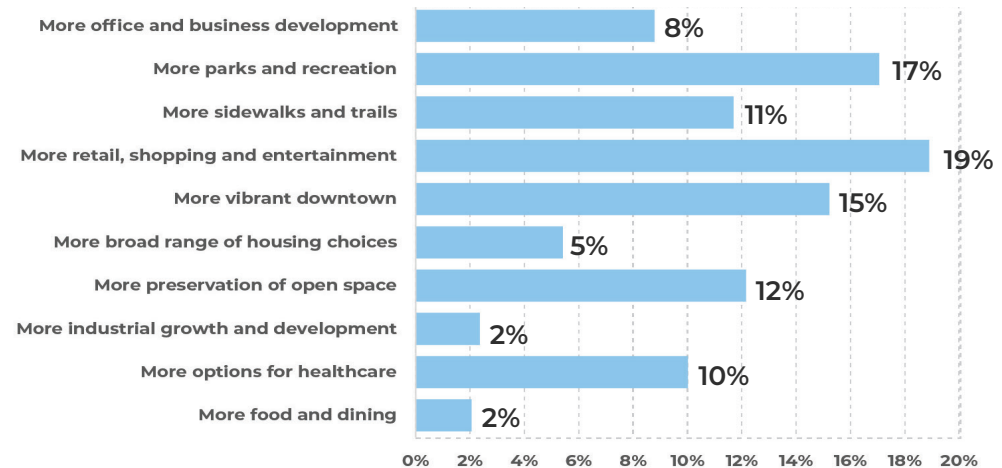
While natural resources did not come up in public engagement as much as other topics such as housing, there were some key takeaways from the input, especially the online survey.

Two questions (#3 and #6) within the online survey related to natural features.

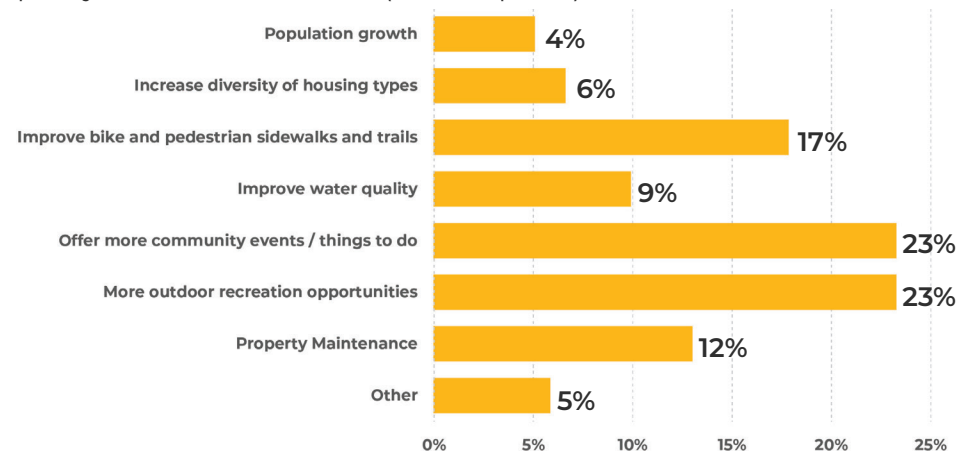
More preservation of open space was the fourth most popular selection for what Bondurant needs more with 12% of respondents selecting this option. A related priority, more parks and recreation, was the second most popular selection.

As for changes that would improve quality of life, more outdoor recreation opportunities was tied for the most popular choice. While not directly related to natural features, it does support the idea of merging natural resource conservation and recreation opportunities whenever possible.

Question 3: Bondurant needs more of the following. Select all that apply.



Question 6: Please indicate the changes you think would improve the quality of life in Bondurant? (Select up to 3)



Natural Resources Today

Existing Conditions Review

Existing Natural Resources in Bondurant

While much of the land surrounding Bondurant is agricultural, there are several important ecological features present throughout the planning boundary.

Floodplain runs through Bondurant along the Mud Creek and Santiago Creek. There is also a significant floodplain / natural resource area in the northeast edge of the planning boundary where it meets the Chichaqua Bottoms Greenbelt along the South Skunk River.

The three main watersheds running through Bondurant's planning boundary are Four Mile Creek, Calhoun Creek-Des Moines River, and the Sugar Creek-South Skunk River.

Most of the area's natural tree cover can be found along the branches of nearby streams, especially along Santiago Creek and the Chichaqua Valley Trail.



Natural Resources Today

Floodplain

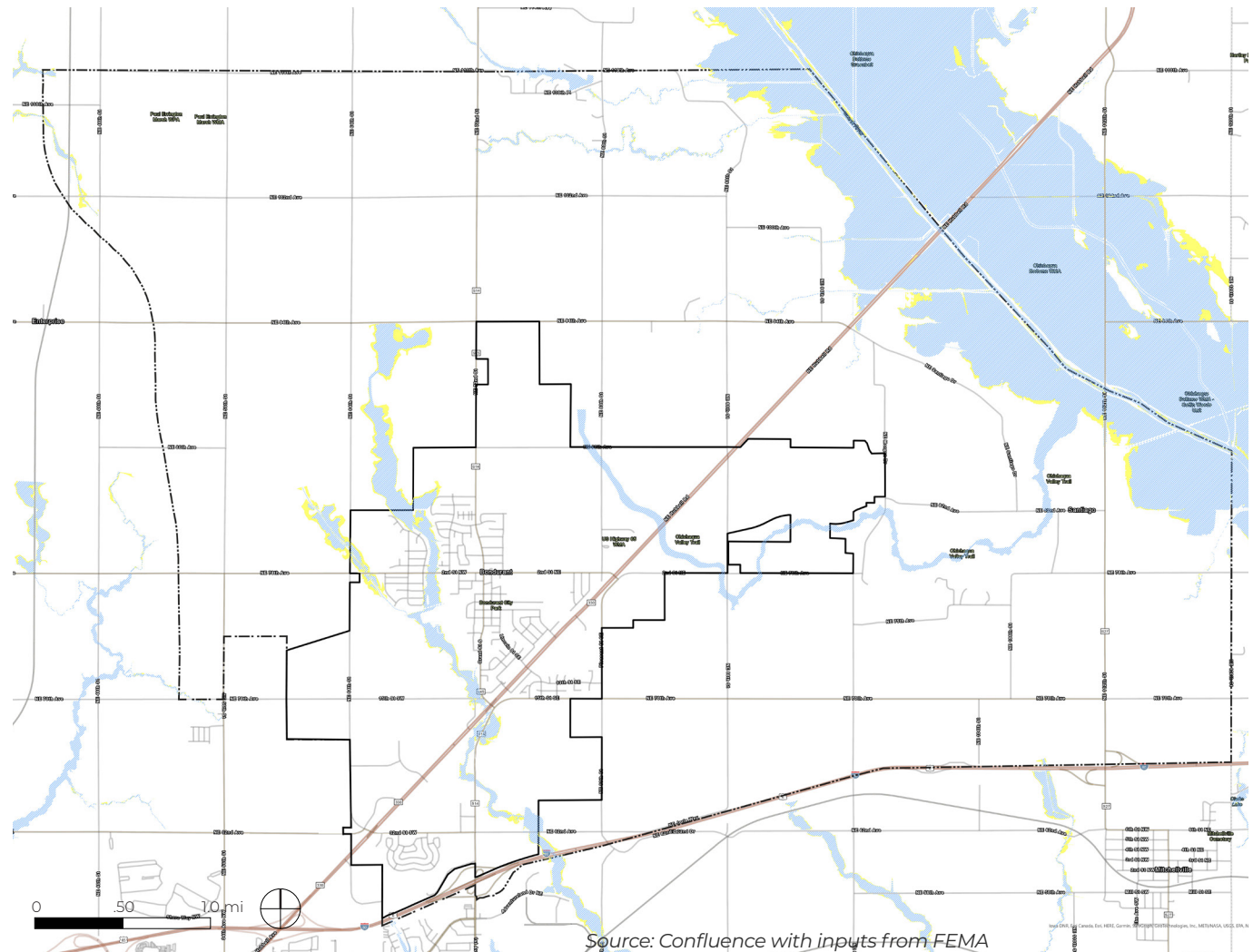
Bondurant's Floodplain

Figure 8.1 shows Bondurant's 100- and 500-year floodplain boundaries. Bondurant's floodplain follows the stream paths of both the Mud and Santiago Creeks. The floodplain surrounding Mud Creek includes Eagle Park and the Collison Soccer Park. Both are large open spaces of land that help mitigate flood hazards.

Within the northeast edge of the planning boundary, a large area of floodplain around the Skunk River Valley / Chichaqua Bottoms Greenbelt can be found.

Typically, these areas should be left undeveloped with minimal structures or paved surfaces. By keeping these areas more natural, Bondurant can prevent unnecessary destruction of property or potential loss of life due to flooding. Flooding is often less severe in areas left natural.

Figure 8.1 Floodplain Map



Natural Resources Today

Floodplain

Floodplain Mitigation

Bondurant code currently regulates development within special flood hazard areas through its Building and Property Regulations within the Code of Ordinances.

Per regulations, all development within the special flood hazard areas should meet the following criteria:

- A. Be consistent with the need to minimize flood damage.
- B. Use construction methods and practices that will minimize flood damage.
- C. Use construction materials and utility equipment that are resistant to flood damage.
- D. Obtain all other necessary permits from federal, state and local governmental agencies including approval when required from the Iowa Department of Natural Resources.

All new or substantially improved residential and non-residential structures must have the lowest floor, including basement, elevated a minimum of one (1) foot above the base flood elevation. Non-residential structures need the lowest floor (including basement) elevated a minimum of one foot above the base flood elevation, or together with attendant utility and sanitary systems, be floodproofed to such a level.

Flood control structural work, such as levees or flood walls, must provide, at a minimum, protection from a base flood with a minimum of three (3) feet of design freeboard and must provide for adequate interior drainage.

The FEMA Letter of Map Revision (LOMR) is an additional option developers may consider as a flood control measure. In this effort, developers elevate the ground level in which they are building upon to position

it entirely above the floodplain, allowing the structure to safely exist and cohabitate with the natural environment.

Recommendation

Bondurant should continue to regulate and promote keeping all areas of floodplain within the planning boundary free from new development. This should help to reduce the frequency and severity of flooding during high water or snowmelt events. Undeveloped floodplain better allows natural ecological functions to occur. Floodplain can also be an important habitat for flora and fauna. Conservation areas on floodplain can also serve a dual benefit of providing additional access to nature for residents and visitors seeking a more tranquil environment.

Natural Resources Today

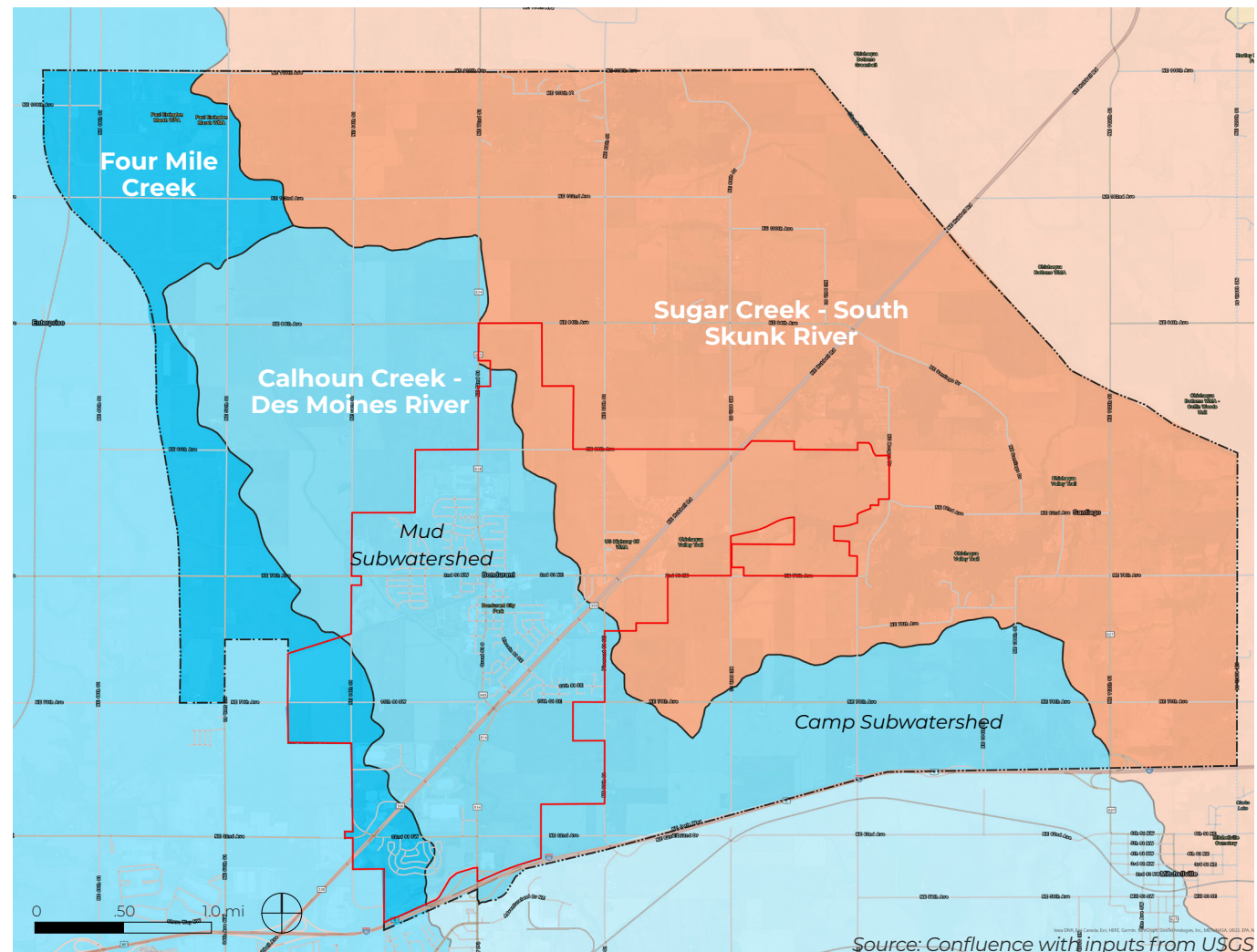
Watersheds

Watersheds in Bondurant

Watersheds are the boundaries in which all water flows to a common source. There are many level of watersheds identified by the USGS ranging from regional basins (which can span across several states or countries) to subwatersheds (generally range between 5,000 and 45,000 acres). The main watersheds in the Bondurant planning boundary are shown in Figure 8.2 and include Four Mile Creek, Calhoun Creek-Des Moines River, and the Sugar Creek-South Skunk River.

Within Figure 8.2, three watershed boundaries are highlighted in solid black outline. This includes the Four Mile Creek Watershed and the Mud and Camp subwatersheds. These watersheds are part of regional watershed management entities typically referred to as watershed management authorities (WMAs).

Figure 8.2 Watershed with Key Subwatersheds Map



Natural Resources Today

Watersheds

Watershed Management Authorities

Bondurant participates in two main watershed management authorities:

- Four Mile Creek
- Mud Camp Spring

The purpose of watershed management authorities is to engage two or more jurisdictions or organizations that want to work together to engage in watershed planning and management. Responsibilities include assessing flood risk, water quality, and options for improving water quality. Monitoring and education are also key components.

Watershed management is best completed at regional or state levels because actions upstream impact areas downstream, requiring a concerted effort to make real change or improvements.

Four Mile Creek WMA

The Four Mile Creek WMA covers 76,600-acres of both urban and agriculture land. Currently, around 80,000 people live within its boundary. The northernmost extent begins near Slater, Iowa. The largest area of the watershed is located in Polk County and covers portions of the cities of Sheldahl, Alleman, Elkhart, Ankeny, Bondurant, Altoona, Des Moines, and Pleasant Hill.

Four Mile Creek and its tributaries run for over 40 miles before draining into the Des Moines River. Four Mile Creek has a history of flooding, erosion, and poor water quality. To address these issues, the watershed management authority (WMA), the first of its kind in the state, was formed in 2012. This WMA focuses on collaborative work to address flooding and water quality.

The Four Mile Creek Watershed Management Plan was completed in 2014 and outlines

a series of watershed goals aimed at reducing flooding and improving water quality. Implementation focused on improving monitoring and assessment, partnerships between and strategies for urban and rural partners, adopting a greenway system, consistent regional guidelines and standards, the employment of performance based measures, and continued education and outreach.

Mud Camp Spring WMA

The Mud Camp Spring WMA was formed in 2014 and covers over 64,000 acres. The creeks and their tributaries cover 50 miles before entering the Des Moines River. Jurisdictions located within the watershed include Mitchellville, Runnells, Pleasant Hill, Altoona, and Bondurant. The landscape has historically been mainly agriculture, but urban growth has been increasing. Both agricultural and urban areas create unique issues that impact both water quality and

flooding. The WMA is focused on facilitating partnerships and collaboration to both improve water quality and reduce flooding across the watershed.

A watershed plan was completed in 2016. The main implementation goals included developing consistent policies, increasing community support and awareness, enhancing natural resources character and function, and the identification and addressing of soil and water issues.

Recommendation

Bondurant should continue to actively participate in watershed management authorities to promote healthy watersheds. Special importance should be placed on water quality control measures to support region-wide initiatives.

Natural Resources Today

Streams

Streams by Type

Three main stream types identified on USGS maps are types 1, 2, and 3, which are also referred to as perennial, intermittent, and ephemeral streams. Figure 8.3 shows the location of type 1 and 2 stream within the Bondurant planning boundary.

Type 1 - Perennial Streams

Type 1 perennial streams are the most permanent type and include those streams with continuous flow throughout the year except for in case of extreme drought.

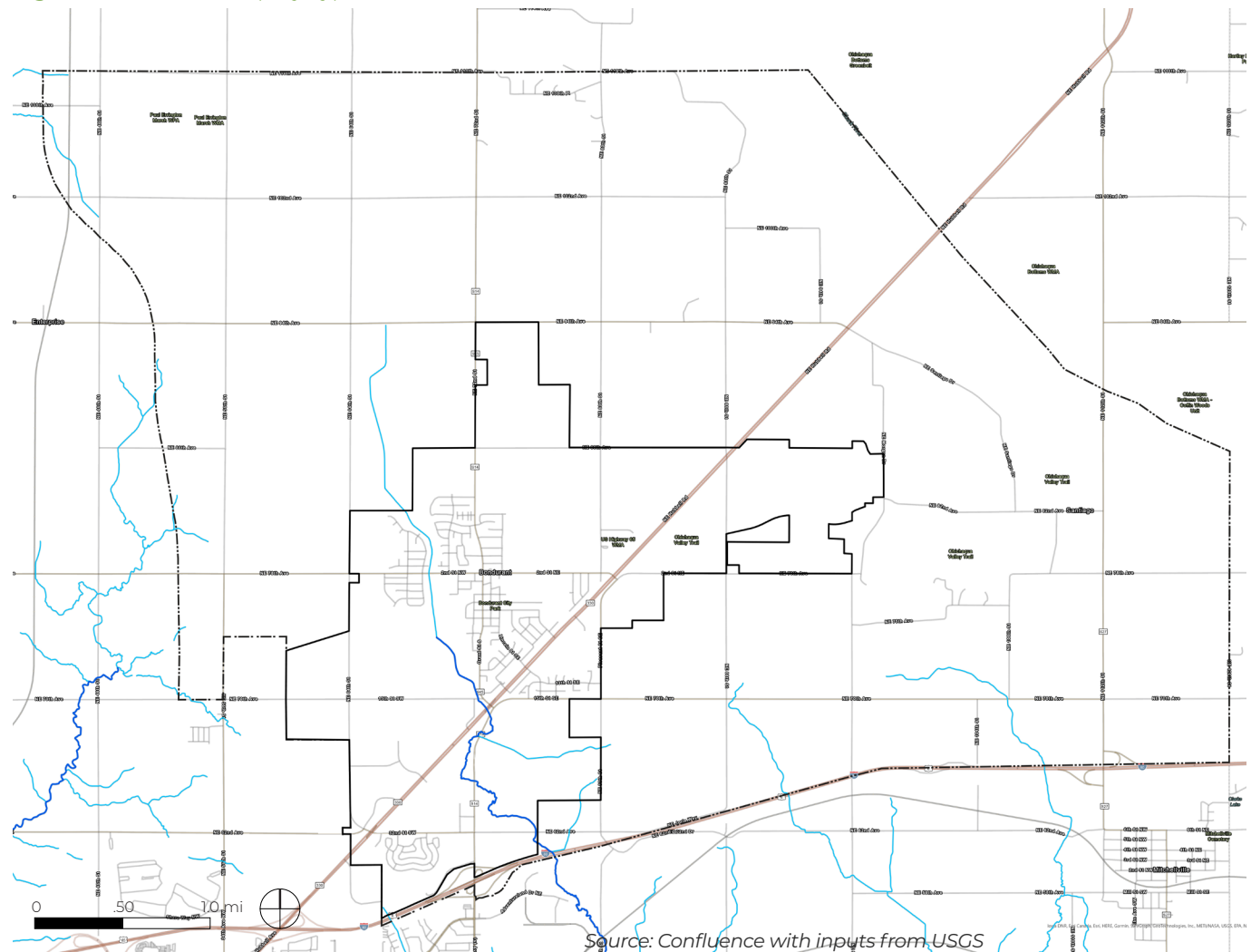
Type 2 - Intermittent Streams

Type 2 intermittent streams are those streams that contain water flow during the wet seasons of the year.

Type 3 - Ephemeral Streams

Type 3 ephemeral streams are those channels formed by water during or immediately after precipitation or snowmelt.

Figure 8.3 Streams Map by Type



- Planning Boundary
- Bondurant City Limits
- Type 1 - Perennial Stream
- Type 2 - Intermittent Stream

Source: Confluence with inputs from USGS

Natural Resources Today

Streams

Stream Buffer Mitigation

Bondurant code currently requires stream buffers along certain stream types. A stream buffer consists of native vegetative strips extending along both sides of a stream and its adjacent wetlands, floodplain, or slopes. The stream buffer width is adjusted to include adjacent sensitive areas, such as steep slopes, or erodible soils, where development or disturbance may adversely affect water quality, streams, wetlands, or other water bodies.

City code establishes minimum requirements for the design of buffers to protect the streams and creeks that are within the community. These design requirements help to protect the water quality of the creeks, streams and other significant water resources that are within the city and those that are downstream as well.

The city is responsible for the management and maintenance of the stream buffer only when the stream buffer area is under

City of Bondurant ownership, which typically includes wetlands and floodplains of Type I and II streams.

Type III stream management and maintenance is subject to drainage area and development goals. If management and maintenance of the Type III stream buffer is private, then a management plan must be developed by the owner.

Certain activities are prohibited within the stream buffer area including the removing of existing vegetation, disturbance of soil, draining the area, or the use of pesticides (unless supported by Polk County Soil and Water Conservation District).

Recommendation

The city should continue to enforce the stream buffer requirement as the community grows. Ideally, many of these buffers could be suitable locations for conservation land, greenways, or trail right-of-way. Trails along streams are an easy way to provide dual benefits of conservation while also meeting an important recreation priority.

Table 8.1 Stream Buffer Requirements by Feature

Required Minimum Stream Buffer Width	Acres	
Where Floodway Exists	Floodway plus 50 feet	
No Floodway	Iowa DNR Method	
All Others	30 feet	

Stream Type	Additional Width of Buffer	Sides of Buffer
Type 1 - Perennial	Floodway plus 50 feet	Both
Type 2 - Intermittent	20 feet	Both
Type 3 - Ephemeral	15- 20 feet	One Side

Natural Resources Today

Wetlands

Bondurant Wetlands

Figure 8.4 shows the known wetlands within Bondurant's planning boundary categorized by type, defined below.

Freshwater Emergent

Freshwater emergent wetlands are characterized by plants growing in water such as a marsh, fen, swale or meadow.

Freshwater Forested / Shrub

Freshwater forested / shrub wetlands are characterized by woody vegetation that is 6m tall or taller.

Freshwater Pond

Freshwater ponds are a small body of still water.

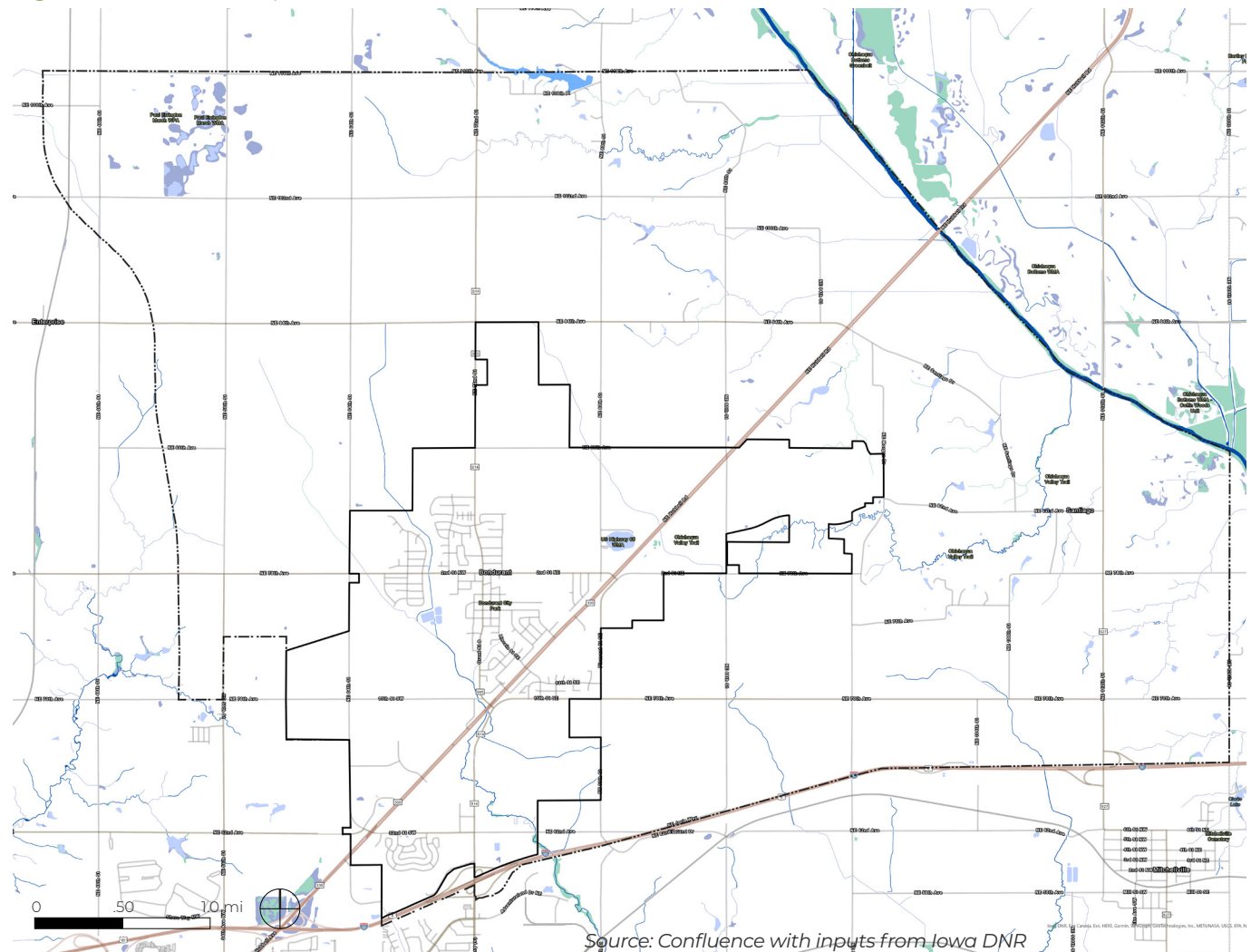
Lake

Lakes are a large body of water surrounded by land, deeper than a pond.

Riverine

Riverine wetlands have flowing water through a natural or artificial channel.

Figure 8.4 Wetlands Map



Source: Confluence with inputs from Iowa DNR

Natural Resources Today

Wetlands

Bondurant Wetlands

Wetlands are environmentally significant natural resources that help promote a healthy ecosystem and water supply. For many years, wetlands were drained for development or agriculture. According to the Iowa Department of Natural Resource's Wetland Program, Iowa has lost between 90-95% of its original wetlands.

Wetlands are now well known for the numerous environmental, economic, and social benefits they provide including:

- Recharge groundwater
- Reduce flooding
- Improve water quality
- Recreation and culture
- Wildlife Habitat
- Filter Stormwater

The State of Iowa provides protection for designated wetlands, which includes land designated as a protected wetland by the U.S. Department of Interior or the Department of Natural Resources.

State law also requires the Iowa Department of Natural Resources to inventory the wetlands and marshes of each county and designate those wetlands that constitute "protected wetlands."

All other wetland environments are evaluated under the U.S. Army Corps of Engineer's Manual, which outlines wetland delineation policy for the U.S. Clean Water Act.

Within the Bondurant planning boundary, there is one state and nationally recognized designated wetland, the Paul Errington Marsh Wildlife Management Area. Another major wetland area within the planning boundary is the Chichaqua Bottoms Greenbelt.

Recommendations

Bondurant should continue to avoid development in wetland areas and should seek to integrate high-quality wetlands as an amenity or design feature whenever feasible. Wetland within the planning boundary should serve as conservation land.

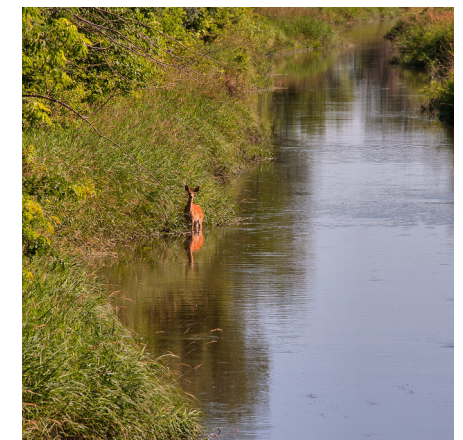
Paul Errington Marsh Wildlife Management Area

The Paul Errington Marsh Wildlife Management Area a 305-acre marshland located in the northwest corner of the planning boundary. By law, no animal feedlot can be built within 2,500 feet of this designated wetland. The WMA allows for non-toxic shot hunting of pheasant, waterfowl, and doves.



Chichaqua Bottoms Greenbelt

The Chichaqua Bottoms Greenbelt is a over 8,000 acre wildlife area that contains wetlands, prairies, woodlands, and old Skunk River oxbows. The greenbelt is also a popular hunting spot. The park also provides campsites, picnic areas, nature trails, canoe rentals, wildlife viewing platforms, and shelters.



Natural Resources Today

Tree Cover

Tree Cover in Bondurant

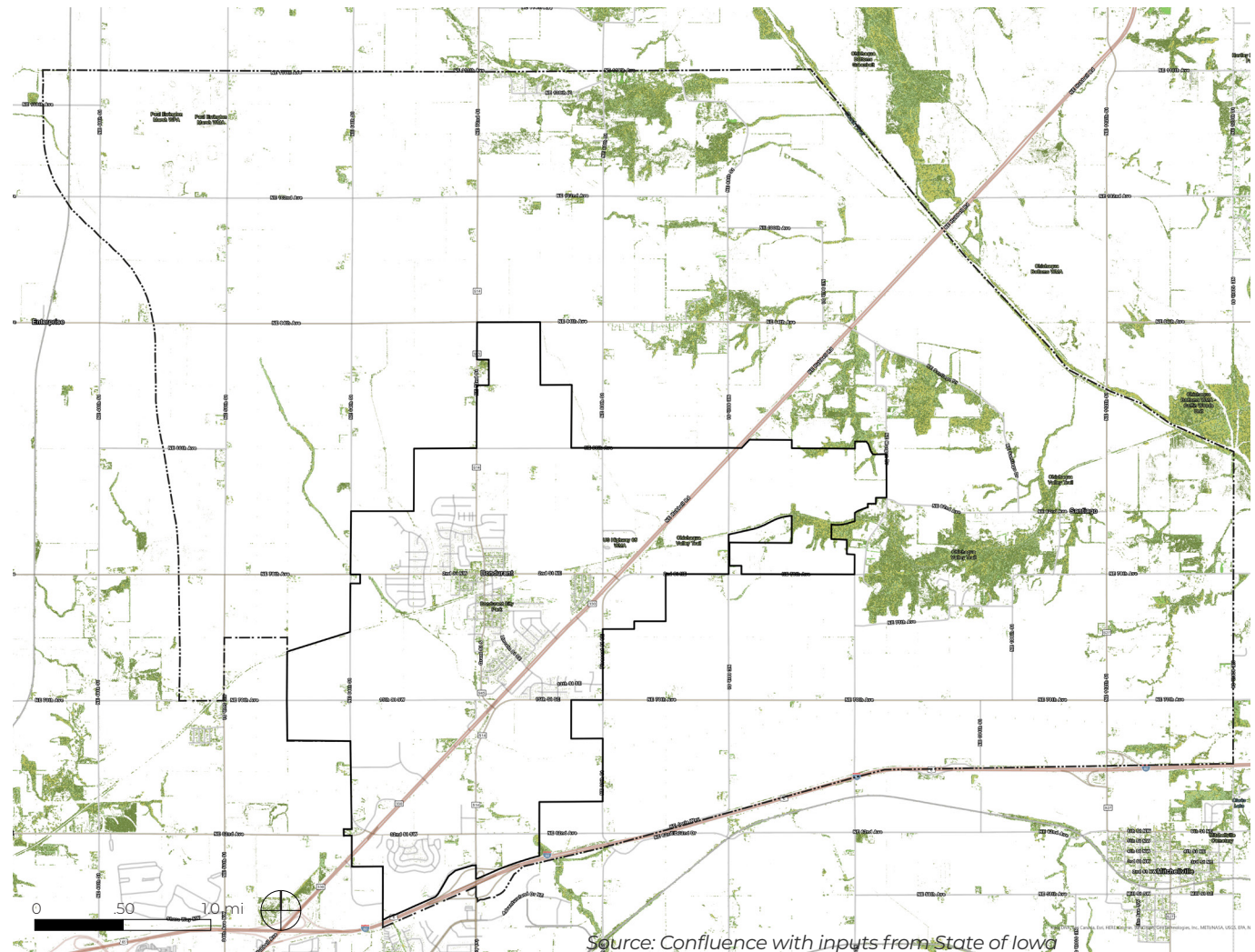
Figure 8.5 shows the estimated tree cover for the Bondurant planning boundary. This dataset was extracted from a 2009 Landcover dataset created by the State of Iowa using LiDAR data. This LiDAR data is currently being redone.

Trees provide a variety of environmental, economic, and societal benefits including

- Reduce urban heat island effect
- Improve air quality
- Increase property values
- Enhance stormwater management
- Support diverse habitat and wildlife

Much of Bondurant's recent and future growth areas are former agricultural land areas. As such, natural tree cover is minimal in most places. The exception to this includes areas along stream corridors and along the Chichaqua Valley Trail.

Figure 8.5 Tree Cover Map



Source: Confluence with inputs from State of Iowa

Natural Resources Today

Tree Cover Policy

Tree Cover Protection in Bondurant

Bondurant regulates tree cover through its Open Space Requirements, which requires within the front yard setback one tree per 50 feet of frontage or one tree per six parking spaces with various location requirements.

The preservation of existing trees on a site is encouraged when they are in good condition. For instance, credit of 2 trees toward the required number of trees shall be given for each existing tree that is over 10 inches caliper measured 6 inches above the immediate ground level.

City Tree Board

Bondurant has a City Tree Board, which consists of five members appointed by City Council for four-year terms. The Bondurant Tree Board is responsible for the care and maintenance of the trees in the community. The board suggests locations for the planting of

new trees and assists with the maintenance and protection of existing trees.

Recent Efforts to Increase Urban Tree Canopy

In 2021, to help grow the urban tree canopy, the City Council approved an ordinance to allow for planting of street trees if a permit is approved. Also in 2021, the City planted 90 trees to help kickstart the street tree program and to address trees lost as a result of the 2020 derecho and the Emerald Ash Borer disease.

Recommendations

Bondurant should continue to promote the addition of new urban tree cover within the existing and new growth areas of the community. Grants and other funding opportunities should be sought to help assist. Areas with significant tree cover within the planning boundary should be kept as open space to protect this important natural resource.

The City Tree Board should review current tree policy and subdivision regulations to identify possible amendments that would better promote tree cover in Bondurant. The city should continue to incentivize tree preservation in all new development.

Natural Resources Today

Slope Analysis

Slope Analysis

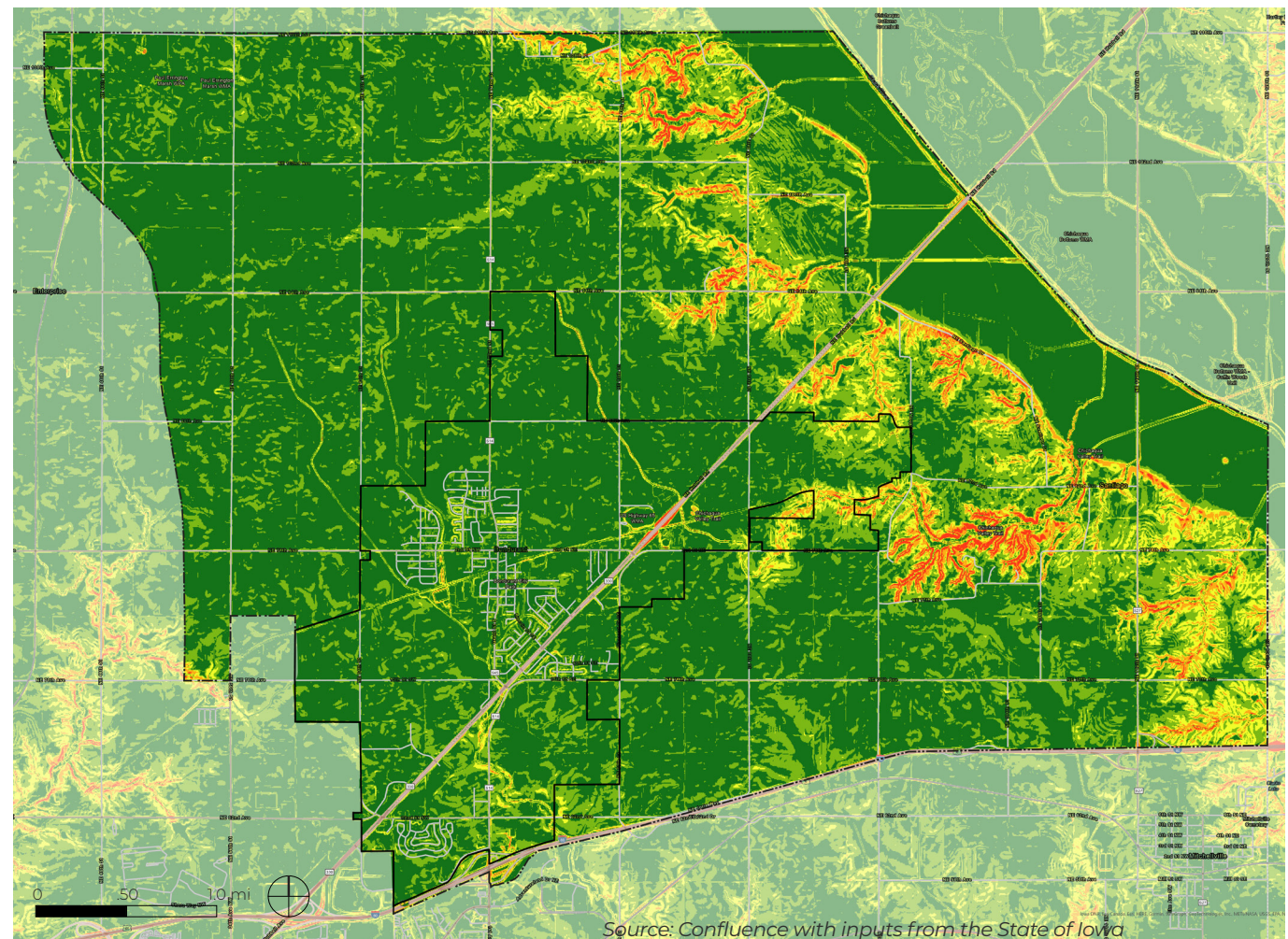
Figure 8.6 shows the estimated slope derived from LiDAR data for Polk County. Dark and light green represent low slopes of between 0 to 5.9%. Orange and red represent areas with higher slopes of 11.7% or higher. Much of the planning boundary is green, indicating it is a fairly flat area except for land near streams in the northeast and southwest.

Generally, steep slopes will not be a major issue in the northwestern / southeastern development of Bondurant. The flat topography of these areas may pose issues for stormwater runoff and management, which is discussed in greater detail in the following pages.

Recommendations

Bondurant should consider adopting a slope preservation ordinance to help protect those limited areas of steep slope within the planning boundary. Additionally, Bondurant should move forward with all identified stormwater management goals to help reduce runoff.

Figure 8.6 Slope Map



Stormwater Management

Impervious Surfaces

Stormwater Runoff + Impervious Surfaces

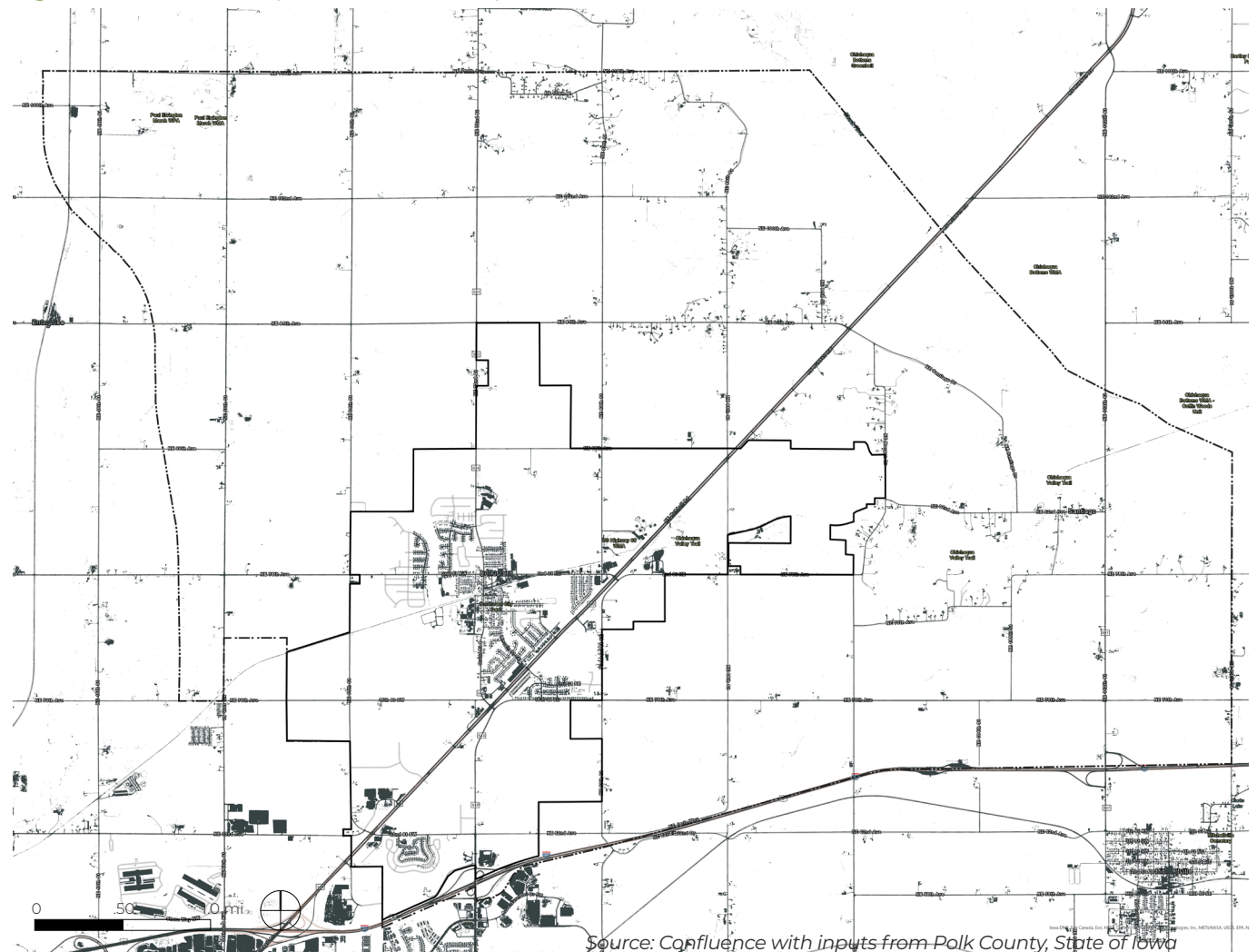
Flat topography along with impervious surfaces can lead to high rates of stormwater runoff during rain or snowmelt. Stormwater runoff occurs when water flows across streets, sidewalks, lawns, or fields. As water flows, it picks up pollutants and carry them into storm drains or nearby waterbodies such as lakes or streams.

Stormwater runoff is a major source of both urban and rural water pollution. Water quality issues now plague most waterbodies in the United States and Polk County / Iowa are no exceptions to this trend.

Impervious surfaces exacerbate stormwater because water cannot filter back into the ground and can move faster, which makes the severity and duration of flooding even worse.

Figure 8.7 shows the estimated location of impervious surface in the Bondurant planning boundary.

Figure 8.7 Estimated Impervious Surface Map



Stormwater Management

Stormwater Master Plan Overview

Stormwater Master Plan

In 2020, Bondurant hired EOR to complete a stormwater master plan for the community with the purpose of creating a guide for action with respect to stormwater infrastructure. This included collecting and summarizing existing conditions, identifying existing problems, and recommending and prioritizing future improvements.

The plan outlines and models various strategies and plans for improving stormwater management within the community. This includes implementation of a series of regional detention ponds throughout Bondurant's growth boundary. These strategies should continue to be implemented as development occurs.

Stormwater Management Program

In addition to the stormwater master plan, Bondurant maintains a stormwater management program per federal regulations, which includes:

- Inspection of construction sites and post-construction stormwater facilities to reduce sediment loss
- Opportunities for public involvement and participation and outreach on stormwater impacts and water quality management
- Discharge detection and elimination program to allow only unpolluted stormwater to enter the municipal storm sewer system
- Pollution prevention and good housekeeping program aimed at preventing or reducing pollutant runoff from municipal operations

The city also provides some links to resources online about the installation of best management practices on private property, the benefits of native turf and soil quality restoration.

Recommendation

Bondurant should continue to implement the strategies included within the stormwater master plan. Regional detention should be pursued in accordance with the plan to help take proactive control over stormwater management within new growth areas.

Additionally, Bondurant should continue to promote measures currently included within the stormwater management program. Specifically, green infrastructure solutions should be promoted at the public and private sector level within Bondurant.

Stormwater Management

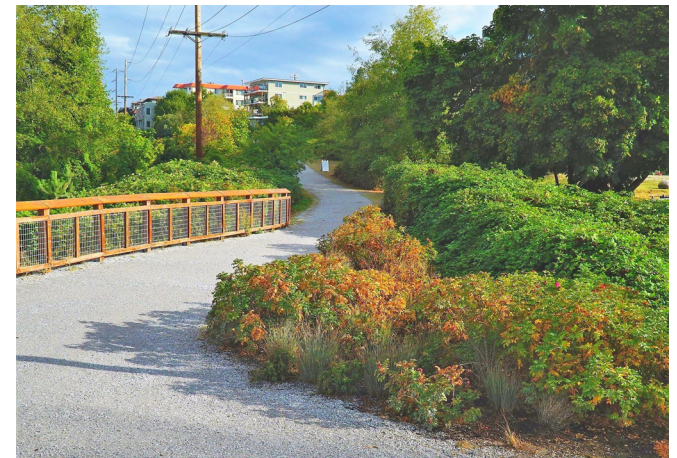
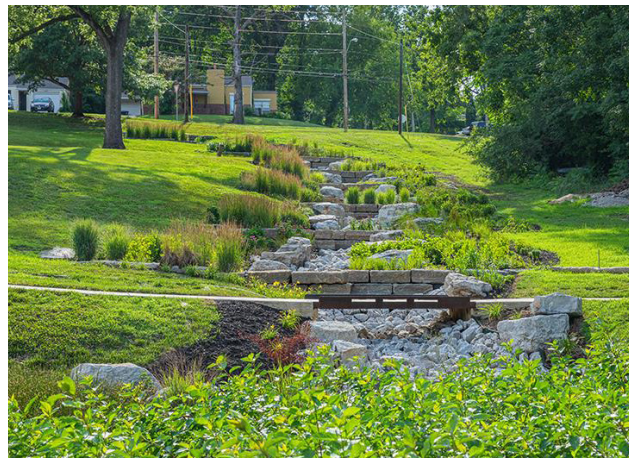
Best Management Practices

Best Management Practices

There are many best management practices for stormwater management. One especially environmentally beneficial strategy is the use of green infrastructure.

Green Infrastructure

Green infrastructure refers to the use of landscape design to treat stormwater on-site by mimicking the function of the natural water cycle such as infiltration. Examples of green infrastructure solutions include permeable pavement, rain gardens, bio-retention cells, green roofs, or green parking lots. Integrating green infrastructure into parks is an excellent way to enhance the look and feel of a park while improving its functionality and adding an amenity.



Natural Resources

Implementation

A series of goals, policies, and action items have been created for Chapter 8 - Natural Resources.

Goal

Goals are objectives or aims which may be broad or specific.

Policies

Policies represent on-going principles by which the City should adhere when approving new development or planning future investments.

Action Items

Action items are specific steps and activities the City should take.

These goals, policies, and action items were created to further promote the guiding principles and vision statement of the Building Bondurant Comprehensive Plan.

In Chapter 12 - Implementation, a series of matrices will be provided that include each chapter's goals, policies, and action items. In this later chapter, the guiding principle(s) being supported by each policy or action item will be highlighted. Additional items such as priority or potential partners will also be added.

Figure 8.8 Building Bondurant Guiding Principles



Natural Resources

Implementation

Goal 18

Preserve sensitive environmental features as Bondurant grows

Bondurant already has several effective environmental protection and hazard mitigation measures in place to protect natural features within the community. Bondurant should continue to prioritize positive land stewardship within its growth areas by discouraging growth within or near to sensitive features, preserving features whenever possible, and participation in regional watershed management efforts.

Policy 18A

Continue to discourage development or impermeable surfaces within the floodplain or designated stream buffer areas

Floodplains and stream buffers work best when they are free of development and with minimal areas of impermeable surfaces. Bondurant should continue to implement the measures currently in place.

Policy 18B

Preserve wetlands within the study area and utilize high-quality wetlands as amenity features whenever possible

Wetlands are a critical natural habitat that promotes water quality and reduces flood severity. Bondurant should preserve these features and encourage developers to integrate high-quality wetlands into site design as an amenity.

Policy 18C

Continue to expand the urban tree canopy within Bondurant as well as to promote conservation of existing quality tree stands in the growth area

Bondurant should continue with its efforts to expand urban tree canopy within the community. Any funding or grant opportunity should be strongly sought. Existing tree cover within the planning area should also be preserved.

Policy 18D

Continue to actively participate in current watershed management authorities and pursue additional opportunities for involvement as is made available

Watershed management is best approached through regional cooperation and collaboration. Bondurant should actively participate in and follow recommendations presented by each WMA in which they are apart.

Natural Resources

Implementation

Goal 18

Preserve sensitive environmental features as Bondurant grows

Bondurant already has several effective environmental protection and hazard mitigation measures in place to protect natural features within the community. Bondurant should continue to prioritize positive land stewardship within its growth areas by discouraging growth within or near to sensitive features, preserving features whenever possible, and participation in regional watershed management efforts.

Policy 18E

Discourage intense development surrounding key environmental areas within the planning boundary such as the Paul Errington Marsh or the Chichaqua Bottoms Greenbelt

Within Bondurant's planning boundary are several regionally important natural resource areas. The areas surrounding these natural areas should not be intensely developed as shown and supported by the Future Land Use Plan.

Policy 18F

Continue to implement the recommendations included within the stormwater master plan to improve drainage, flooding, and water quality

Recommendations listed within the stormwater master plan should continue to occur including the Central Park and other planned regional detention facilities. This also includes continued implementation of the outreach and educational campaigns to promote best practices for stormwater management.

Policy 18G

Continue to encourage the use of green infrastructure on public and private property throughout Bondurant

Green infrastructure is a low-impact and environmentally sensitive method of dealing with stormwater on site. These landscape forms are designed to naturally mimic natural functions all while serving as an attractive amenity for public areas, such as parks or streetscapes, as well as privately owned property, such as homes or businesses.

Natural Resources

Implementation

Goal 18

Preserve sensitive environmental features as Bondurant grows

Bondurant already has several effective environmental protection and hazard mitigation measures in place to protect natural features within the community. Bondurant should continue to prioritize positive land stewardship within its growth areas by discouraging growth within or near to sensitive features, preserving features whenever possible, and participation in regional watershed management efforts.

Policy 18H

Continue to install green technology when feasible with public improvement projects

Bondurant is proactive in their efforts to establish a green and sustainable community. Already having installed electric vehicle (EV) charging stations and solar panels soon to come at City Hall, the City should continue to install green technology when feasible with public improvement projects.

Action Item 18A

Consider adopting a sustainability or climate action plan for Bondurant

Bondurant should heavily consider adopting a sustainability or climate action plan to provide the community with clear best practices and standards for developments coexisting with the natural environment.

Action Item 18B

Consider having the City Tree Board review any tree policies to identify areas of improvement within city ordinances or subdivision regulations

Bondurant should actively utilize the City Tree Board to perform a review of city code and ordinances to identify possible ways to promote increased tree cover in new and existing areas of Bondurant.

Natural Resources

Implementation

Goal 18

Preserve sensitive environmental features as Bondurant grows

Bondurant already has several effective environmental protection and hazard mitigation measures in place to protect natural features within the community. Bondurant should continue to prioritize positive land stewardship within its growth areas by discouraging growth within or near to sensitive features, preserving features whenever possible, and participation in regional watershed management efforts.

Action Item 18C

Consider adopting a slope preservation ordinance to protect steep slopes within Bondurant's planning boundary

While much of Bondurant's current city limits are relatively flat, there is more steep slope areas within the larger planning boundary. To protect these sensitive landforms, Bondurant should consider adopting a slope preservation ordinance that regulates development once certain slope percentages are met.

Action Item 18D

Consider creating an incentive or grant program for adding green infrastructure to private property

To help encourage green infrastructure, Bondurant should consider identifying funds or grant money to help provide financial support to expanding green infrastructure on private property.

Action Item 18E

Add low-impact trails to city-owned stream buffers to provide the dual benefits of environmental protection and recreation

Stream buffers make for excellent locations of new trails because they are already under public ownership, provide a tranquil or attractive environment for users, and provide dual benefits of environmental protection and recreation.