

# Middleton Review

Middleton's free community newspaper

Editorial: Rein in the mayor  
Photo essay: Battle of the Badges  
IN EVERY ISSUE:

## Business Directory

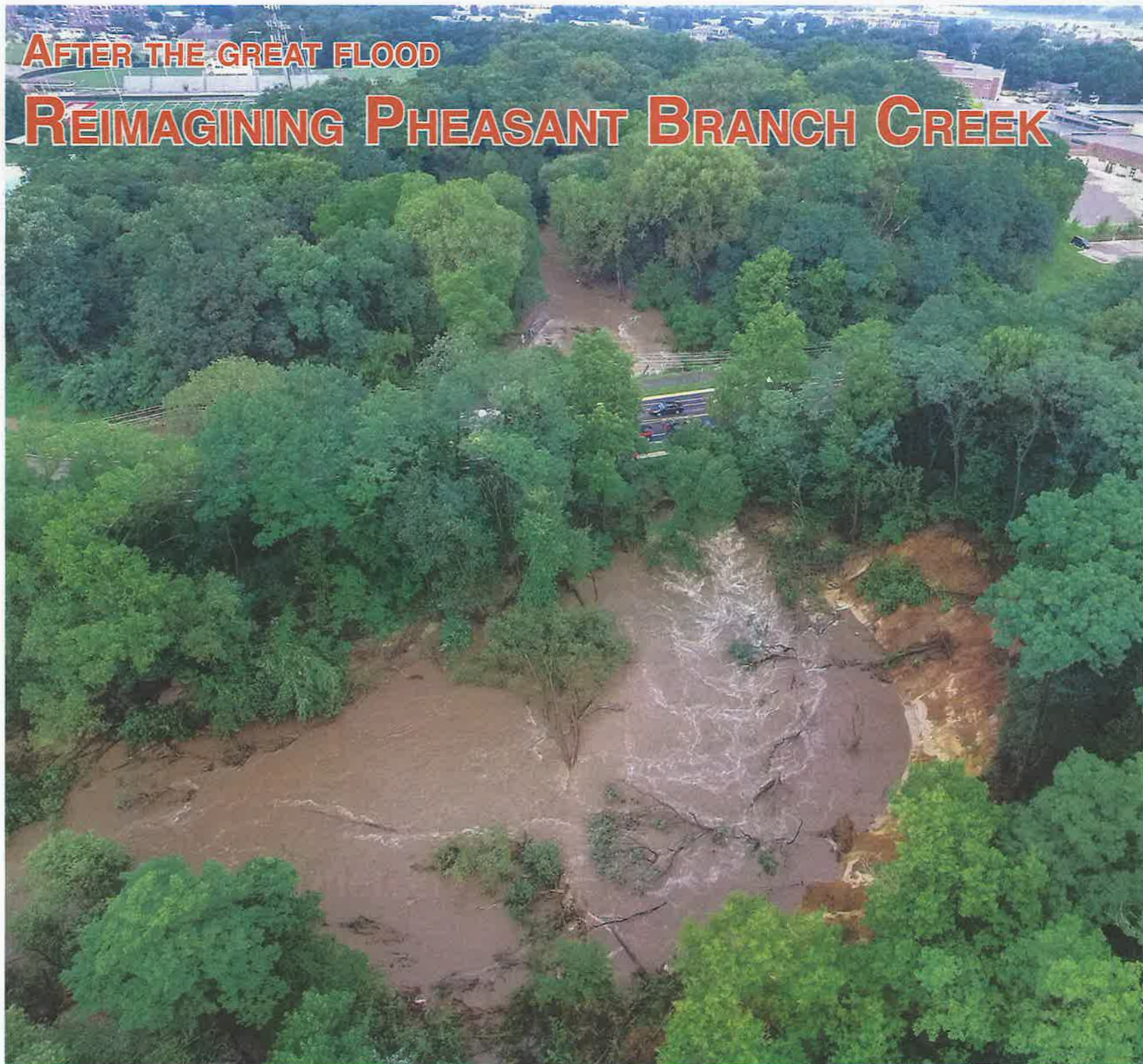
Community guide to Middleton's best  
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Issue 89

August 26 - September 8, 2019

**AFTER THE GREAT FLOOD**

**REIMAGINING PHEASANT BRANCH CREEK**







## AFTER THE GREAT FLOOD

# Reimagining the Pheasant Branch creek corridor

*The following article is adapted from the report 'Designing for Resilience: Reimagining the Unimaginable', a graduate-level course from the University of Wisconsin-Madison Department of Planning and Landscape Architecture. It analyzes the flooding of Pheasant Branch Creek and its consequences, and makes recommendations for the future. The bank-erosion survey maps and tables about streambank erosion and stabilization projects are from the 'Pheasant Branch 2018 Flood Damage Assessment and Five Year Plan' by Cardno. Both studies were done for the City of Middleton, and are available in full on the City's website.*

Adapted from 'Reimagining the Unimaginable' by students from the UW-MADISON DEPARTMENT OF PLANNING AND LANDSCAPE ARCHITECTURE, and the CARDNO STUDY

On August 20th, 2018, the City of Middleton experienced a flood event as a result of a historic rainfall of 11.63 inches in a 24-hour period.

The flooding of Pheasant Branch inflicted significant damage to the Pheasant Branch creek corridor and the buildings surrounding the confluence pond west of US Highway 12. The historic rainfall also caused the flooding of residential homes, as well as Esser Pond, Graber Pond, Stricker's Pond and Tiedeman Pond.

This report addresses the flooding along the Pheasant Branch storm water corridor (creek corridor).

The intent is to explore the nature of the Pheasant Branch watershed and how the community can recover from the August event and mitigate future events. The report is arranged into four separate but interconnected sections:

**I. Adapting Urban Infrastructure** identifies local ordinances and infrastructure practices that could help the City of Middleton better accommodate increased water flow and protect public health and safety.

Based on flood models generated by the Federal Emergency Management Agency, the currently federally recognized floodplain in

Middleton is significantly smaller than the recorded flooding from the August 20th event.

To ensure that businesses and residential areas remain resilient to future flood events, we recommend establishing a Floodplain Overlay Zoning district that expands the amount of land protected by flood-fringe ordinances. In addition to the new zoning, current ordinances should be updated to reflect the threats to public safety caused by the flood event.

We also propose infrastructure practices for businesses, residents, and future development that are

designed to ease burdens on urban stormwater management systems.

**II. Restoring and Recovering Vegetation** provides guidelines for replanting efforts along the Pheasant Branch storm water corridor.

Shortly after the August flood event, the City of Middleton contracted with Cardno to assess the extent of the damage along the Pheasant Branch creek corridor.

From the results of the Cardno erosion analysis, we recommend the corridor be replanted with vegetation from emergent marsh and sedge



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meadow habitats to ensure the vegetation is both successful in securing the stream bank and resilient to future flood events.

**III. Building a Community for Resilience** encourages the City of Middleton and the Middleton community to be more proactive in disaster readiness.

The 2018-2023 Conservancy Lands Plan and demographic information for the area around the Pheasant Branch creek corridor both indicate a need for the City of Middleton to establish more effective communication with traditionally underrepresented populations.

We recommend the City of Middleton forms a community of practice for the Pheasant Branch creek corridor. We additionally recommend the City of Middleton use tools to engage with Pheasant Branch stakeholders during future restoration efforts.

**IV. Managing the Pheasant Branch Watershed** assesses areas on the fringes of Middleton and surrounding municipalities to suggest locations for future water management opportunities.

We sought to identify successful strategies of slowing peak flow rates during severe precipitation events; areas in the Pheasant Branch watershed that have water storage capacity to reduce runoff; land use plans for urbanization and agriculture in the watershed; and funding programs to assist in land acquisition and wetland restoration.

We conducted Geographic Information Systems (GIS) analyses to identify potential storm water storage areas and potential storm water mitigation areas within the Pheasant Branch watershed.

From these analyses, we recommend the identified land which could be acquired and repurposed into land suitable for mitigating downstream flooding.

## OVERVIEW OF RECOMMENDATIONS

### I. Adapting Urban Infrastructure

- Implement a Flood Overlay Zoning District in the areas around the business park, confluence pond, and Esser Pond.



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Project No. 18-0111  
Map Scale: 1" = 100 feet  
Map Date: 10/1/2018  
Map Author: Cardno  
Map Reviewer: Cardno  
Map Project Manager: Cardno  
Map Client: City of Middleton  
Map Project Name: Bank Erosion Survey Map - North Fork of Pheasant Branch



## The fight against streambank erosion

Pheasant Branch has historically had problems with streambank erosion and suspended sediment driven by land-use changes within its watershed. Increased flood peaks and water volumes have degraded streambanks throughout the reach over time.

Sediment from bank erosion is also deposited within the channel reducing the channel's capacity and efficiency. Problems within the Pheasant Branch system ultimately lead to problems in Pheasant Branch Marsh as well as within Lake Mendota.

Since 1975, stormwater detention ponds, gabions, sheet piling, vane deflectors, and grade control structures have been installed to control channel erosion within Pheasant Branch. These stormwater management practices have been effective in mitigating the effects of increased urbanization within the watershed.

Yet, increases in annual precipitation and flood peak flows in the watershed have led to areas of significant bank erosion within Pheasant Branch over time.

Since 2007, the City of Middleton has been working with the Wisconsin Department of Natural Resources (WDNR) and the Federal Emergency Management Agency (FEMA) to repair severely eroded slopes within the Pheasant Branch corridor. (Table 1 on page 23, and map on page 25).

These efforts include nine construction projects, utilizing WDNR Urban Non-Point Source Stormwater Construction grants, WDNR Clean Water Fund grants, and FEMA grants to stabilize approximately 6,000 linear feet of eroded slopes and streambanks from 2007 to 2017.

(Cardno)

**Table 1: History of Pheasant Branch construction projects, 2007-2017.**

Year	Project	Total Cost	Grant Funded	City Funded	Grant Agency
2007	Pheasant Branch Slope Stabilization (Park St. to Century Ave.)	\$47,000	\$31,500	\$15,500	FEMA & WDNR NPS
2008	Pheasant Run Slope Stabilization (between Park St. and Century Ave.)	\$27,700	\$13,850	\$13,850	WDNR Clean Water
2009	Gabion Removal and Slope Stabilization (between Park St. and Century Ave.)	\$28,500	\$25,700	\$2,800	FEMA
2009	Rootwad Slope Stabilization (between Park St. and Century Ave.)	\$19,000	NA	\$19,000	NA
2010	Park St. to Century Ave. Streambank Stabilization & Habitat Enhancement Project	\$149,354	\$74,677	\$74,677	WDNR Clean Water
2012	Park St. to Parmenter St. Streambank Stabilization	\$154,100	\$77,050	\$77,050	WDNR NPS
2013	South Fork Pheasant Branch Streambank Stabilization	\$130,200	\$60,000	\$70,200	WDNR NPS
2015	Kromrey Middleton School Stream Realignment	\$109,000	NA	\$109,000	NA
2017	Pheasant Branch Streambank Restoration North of Century Ave.	\$220,812	\$110,406	\$110,406	WDNR NPS

- Require all structures within Flood Overlay Zoning District to maintain flood insurance, emergency response plans, and business continuity plans.

- Identify all potential sources of hazardous materials and perform adequate soil and water quality tests to identify risks throughout the watershed.

- Apply updated floodfringe city ordinances to the Flood Overlay Zoning District.

- Install curbside rain gardens and green roofs and provide incentives to encourage private property owners to construct them.

- Provide information to residents about retrofitting residential buildings to increase flood resiliency.

- Establish pocket green spaces in lower-lying areas of the city with good drainage.

- Include impervious surfaces, subsurface water storage, floating streets, and water lanes in future road work projects.

### II. Restoring and Recovering Vegetation

- Adjust creek corridor vegetation based on two distinct topographical sections.

- Utilize planting guide to restore native plants to the creek corridor and increase habitat resiliency.

- Implement recommended action steps to recover lost habitat along the creek corridor.

### III. Building a Community for Resilience

- Establish a Community of Practice (CoP) to develop a long-term vision for accommodating a wide range of users of the creek corridor.

- Develop a Pheasant Branch Restoration Communication Plan.

### IV. Managing the Pheasant Branch Watershed

- Conduct field studies and monitoring to confirm watershed analysis.

- Prioritize areas for restoration and conservation in the engineering analysis.

- Consider engineered water storage practices to augment existing watershed conditions.

- Develop more advanced methods and models for storm water volume estimations.

- Protect identified flood mitigation and water storage areas.

- Include the protection of water storage and flood mitigation areas in the Intergovernmental Agreement with the Town of Springfield.

### A BRIEF HISTORY OF PHEASANT BRANCH

The flooding on August 20th occurred as a result of a series of decisions that find their origin in the 1800s.

Before Middleton was established, marshland and prairie dominated the area west of Lake Mendota. Pheasant Branch at that time flowed out of a glacial lake and the springs in the Pheasant Branch Conservancy.

The current north and south watersheds were not part of the Pheasant Branch watershed. Settlers drained the marshland and prairies to access peat deposits and to cultivate for agriculture.

By building the north and south fork channels, the settlers expanded the Pheasant Branch watershed and increased the amount of water that regularly flowed through the creek.

Today, the Pheasant Branch watershed is estimated to be about 10-times larger than its original, pre-settlement size.

As Middleton grew, the community adjusted to meet changing demands.

A sanitary sewage line was installed along the corridor and a nearby landfill was converted into more usable land.

In the 1980s, the growing

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Middleton community actively sought economic growth. The city expanded westward, establishing business and industrial parks near the now-empty peat deposits.

In 2012, the City built the confluence pond into Pheasant Branch with the hopes of accommodating water flowing off the large parking lots nearby.

Before the flood, and still today, the corridor experienced heavy recreational use.

The trail in the creek corridor connects to the trail system within the Pheasant Branch Conservancy, and crosses several major roads in Middleton, making the trail easily accessible to a broad variety of users.

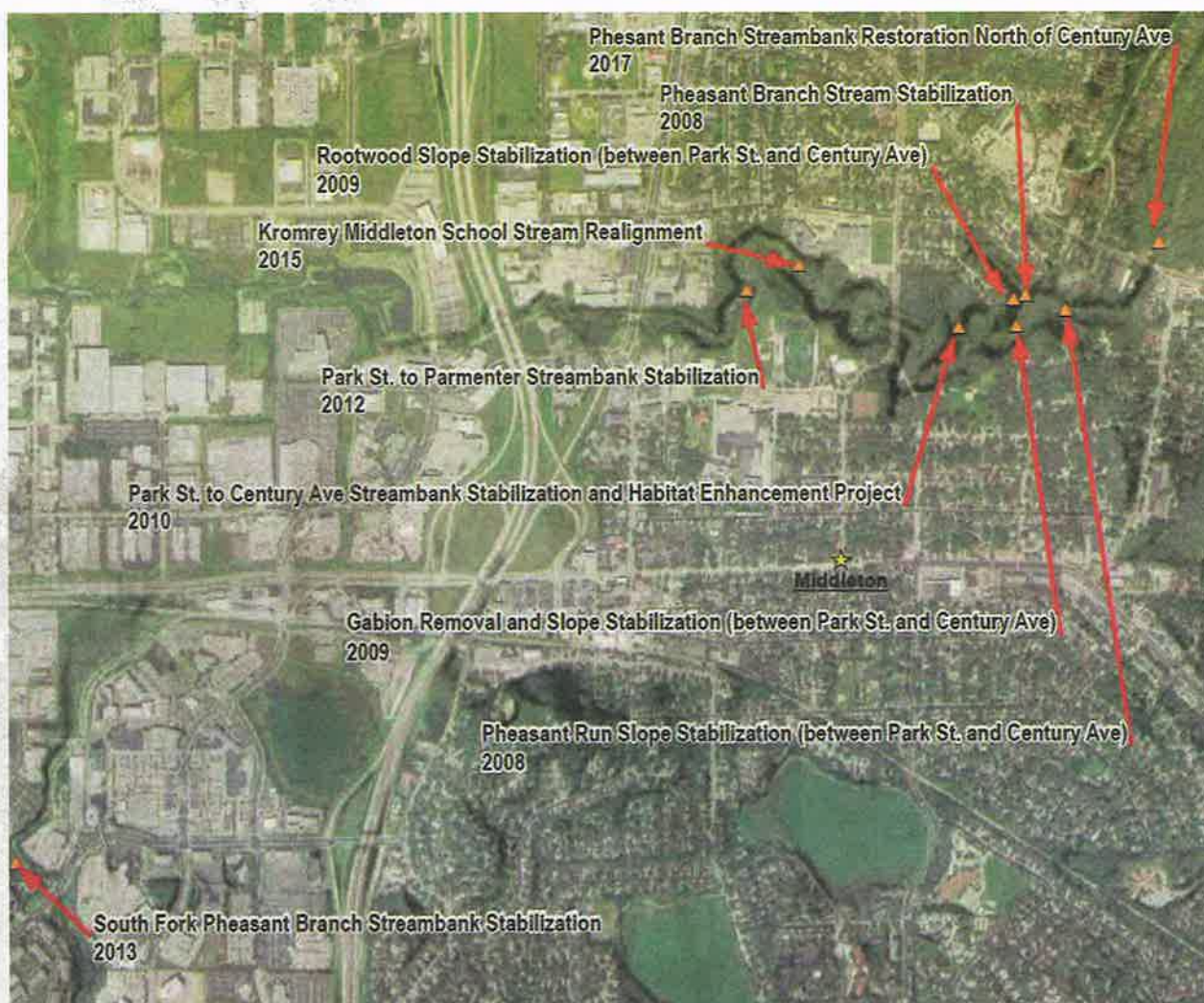
The creek corridor is also the primary means for water within the Pheasant Branch watershed to flow into the Conservancy, which flows into Lake Mendota.

## THE AUGUST FLOOD

On August 20th, 2018, the City of Middleton experienced a flood event that produced a historic rainfall of 11.63 inches in a 24-hour period. The rainfall amount came close to setting a record for the state of Wisconsin, and at the peak of the storm, rain was falling at 2 to 4 inches per hour (Johnson and Jones, 2018). The Pheasant Branch's north and south branches flooded their banks, as did Tiedeman and Esser ponds. Other areas of the city saw flooding from stormwater accumulation and from groundwater that seeped into basements. Businesses, mostly west of the Beltline (US Highway 12), accumulated over \$35 million in flood damages. Residential areas experienced at least \$4.7 million in damage. Public sector damage totaled over \$7 million, most of which was damage to the creek corridor from erosion, sedimentation, and damage to bridges and trails in recreational areas.

## ENTERING A NEW NORMAL

Engineering standards codified in policy are based on a reality that no longer exists. The forces behind the August flood event are expected to continue. Weather and climate



Channel erosion construction project locations within Pheasant Branch from 2007-2017.

trends indicate that weather-related hazards will continue to increase both in frequency and in severity. In order to best prepare for the future, communities need to begin to adopt standards where events such as the August flood are the new normal.

Choosing to follow traditional standards of practice will place Middleton at increasing economic and social risks. Businesses that experience repeated flooding damage will likely leave the area, creating losses in both local jobs and taxes. Flooding typically affects low-income neighborhoods in more significant ways than in other neighborhoods. Repeated flood damage in residential areas prevents individuals from recovering and preparing for the future, hampering Middleton's quality of life.

To ensure that Middleton remains a sought-after place to live and also a business-friendly community, we recommend that new engineering standards and environmental practices be codified to reflect a changed

environment.

## CURRENT URBAN WATER INFRASTRUCTURE IN MIDDLETON

The City of Middleton made significant investments in flood management infrastructure in recent years, but it did not contain this 1,000-year flood.

The city currently uses water retention ponds, culverts, a limited pumping system, and the natural wetlands of Pheasant Branch Conservancy to control flooding.

In the August flood event, the wetlands effectively slowed the water and allowed for infiltration and drainage. However, the confluence pond spilled into surrounding businesses, Esser Pond flooded, and Tiedeman Pond's conveyance system could not pump faster than the rainfall.

Based on historic rainfall numbers and flood maps from the Federal Emergency Management Agency (FEMA) and the Wisconsin Department of Natural Resources

(DNR), the infrastructure investments made by the City of Middleton might have managed a 500-year flood, but the city was unprepared for the historic August 20th rainfall.

According to the Environmental Protection Agency (EPA), average annual participation in the Midwest has increased 5-10% over the last 50 years, but the amount of rainfall on the four wettest days of the year has increased by 35%. These trends are expected to continue.

Wisconsin should expect more extreme rainfall events and an increased risk of flooding.

Middleton is likely to experience more extreme flooding events than the August 2018 event in the future. Dane county received 15 Presidential disaster declarations between 1976 and 2016, amounting to roughly one every three years.

The subsequent declaration after this August event fits this trend and



climate change will likely accelerate this pattern.

The City should prepare its infrastructure and its population for the effects of climate change on the environment.

## THE CHANGING NATURAL ENVIRONMENT

Pheasant Branch is comprised of habitats including wetlands, marsh, wet prairie, prairie, shrub communities, lowland forests, and oak savanna.

The differences between these habitats involve the type of soil or substrate, amount of settled water, access to sunlight, bank angle and location of the vegetation in relation to the stream, and density of trees. These habitats are home to a multitude of mammals, insects and birds, some of which are under threatened or endangered conditions.

According to the Birds of Pheasant Branch Conservancy Guide, over 191 bird species have been spotted along the Pheasant Branch creek corridor and in the Conservancy. The creek corridor is important for pollinators, with over 58 species of butterflies recorded in the area. Mammals are another essential part of this ecosystem and need a ranging variety of habitat.

Pheasant Branch contains most of these habitats; however, urban development has drastically reduced the amount of the native vegetation.

Oak and prairie habitat acreage have been drastically reduced by agriculture and development to less than 0.1% of the original community size.

Wetlands have also been destroyed, drained, and tilled for agricultural use. The wetlands can no longer fulfill their original purpose to act as water storage and seepage grounds in the event of flooding. Invasive species and the changing landscape push out native plant species in these areas.

In the wake of the August 2018 flooding, both native and invasive species washed away from the stream corridor.

Erosion led to the loss of over 2,000 pounds of sediment from the stream. The stream bank just east of



### Bank Erosion Survey Map - South Fork of Pheasant Branch

Pratt and Branch Bank Development  
Dane County, Wisconsin



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While some of the localized stabilization methods held during the August flood event, damage to the banks that received a higher stream flow impact is clearly visible and will be more difficult to reconstruct and stabilize.

A remaining challenge is conceptualizing the corridor landscape with the expectation of similar floods occurring more often than ever before.

### UNDERSTANDING THE PHEASANT BRANCH WATERSHED

The Pheasant Branch watershed covers approximately 24 square miles within four different municipalities: the Town of Springfield, Town of Middleton, City of Madison, and City of Middleton.

Historically, much of the Pheasant Branch watershed contained scattered wetlands in glacial depressions, and rainwater drained to a large wetland system that previously existed at the current site of the Middleton Municipal Airport.

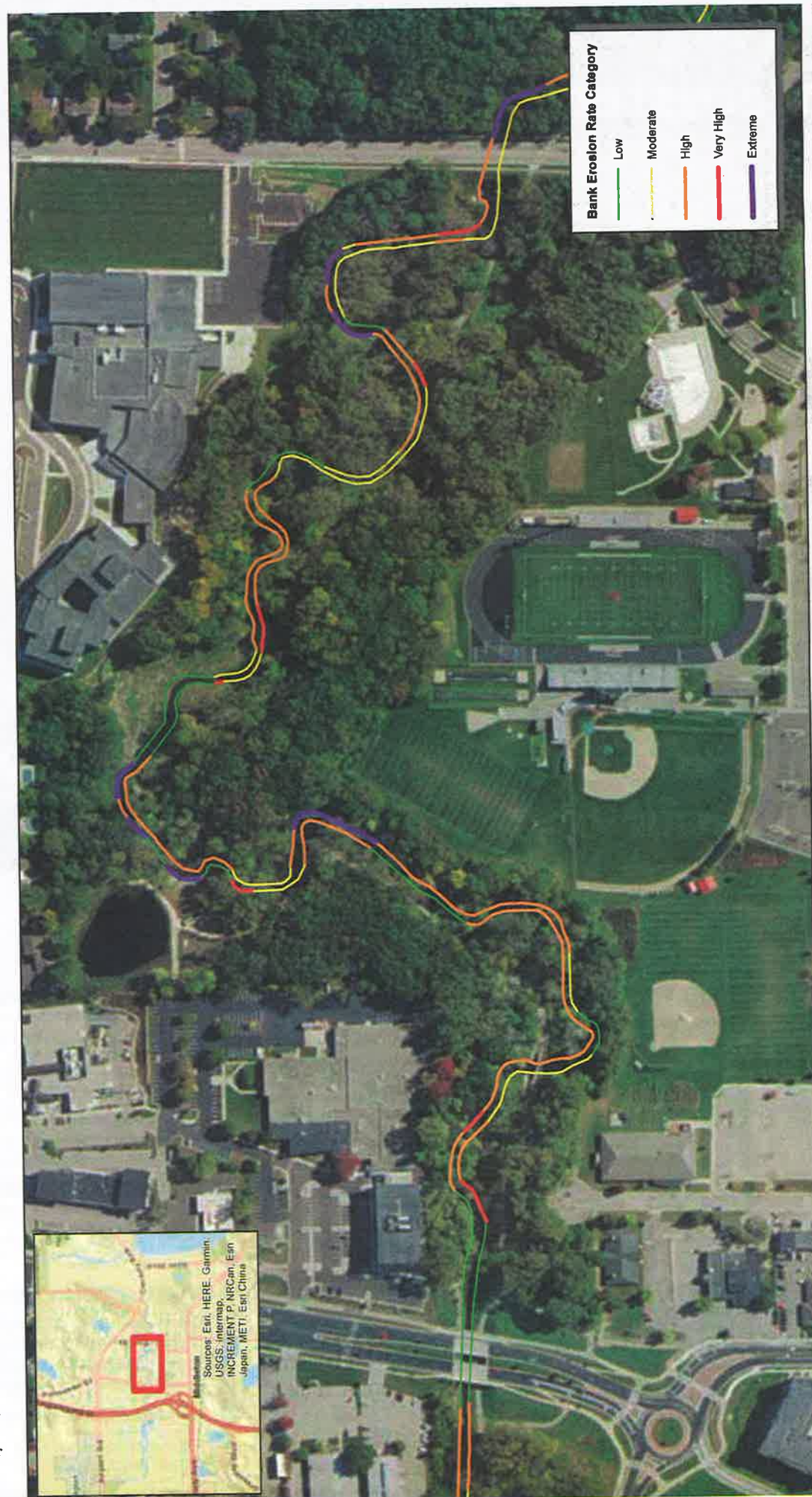
In the 1800's, early settlers altered the landscape to make it more suitable for farming by draining these wetlands and channelizing the stream to create what is now the North Fork of Pheasant Branch. This channel allowed the settlers to harvest peat from the glacial lake bed.

The combination of modern urbanization, agricultural tiling, and the engineered channels greatly altered Pheasant Branch hydrology.

Today, the drainage network is larger due to channelization and the connection of internally drained areas to the watershed. The watershed lost significant filtration and water storage, which increased stormwater runoff and increased the risk of downstream erosion and flooding.

West of the main creek corridor, where the majority of the damage occurred, the watershed is divided into two portions: The North Fork and South Fork sub-watersheds.

Land use in the North Fork sub-watershed is largely agricultural with an extensive network of drainage ditches that empty towards



Bank Erosion Survey Map - Mainstem of Pheasant Branch from Parmenter to Park Street

Pheasant Branch Bank Assessment  
Dane County, Wisconsin



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Bank Erosion Survey Map - Mainstem of Pheasant Branch from Park Street to Century Ave



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This book is a hardcover edition of the paperback edition published in 1997.

the North Fork channel. Farmland in this portion of the watershed is among the best and most productive in the world.

Land use in the South Fork sub-watershed is almost entirely urban and suburban. The South Fork channel acts largely as a stormwater drainage ditch, with little baseflow but flashy peak discharge during storm events. The North and South Fork channels converge just west of US Highway 12 into a man-made confluence pond, from which water drains eastward through the Pheasant Branch Creek main corridor towards Lake Mendota.

Historically, the City of Middleton has focused its stormwater management efforts on implementing water quality and erosion control structures along and near the primary Pheasant Branch corridor.

In the past 40 years, the City implemented over 100 stormwater management best practices including the confluence pond, detention basins, and gabions. These structures are successful in reducing suspended sediment and erosion during most rain events.

The August 2018 event indicates a need for upland land management practices to reduce the volume and velocity of flow entering the corridor during large rainfall events.

The addition of water storage basins and wetlands are meant to serve as long-term mitigation against recurring extreme flooding.

## CONCLUSION

Middleton's flooding problem is straightforward; we need to limit the amount of water flowing into the corridor and slow the water down when it flows through the corridor. However, the solution is not as simple as the problem.

The Pheasant Branch watershed and creek corridor need to undergo significant changes to increase their water storage capabilities, requiring a process that needs thoughtful, evidence-based plans, significant investment, and time.

