



Maquoketa River


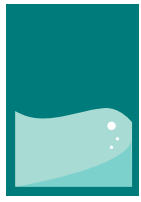
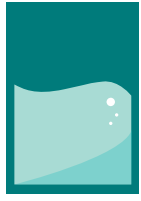
Watershed Management Plan

MAY 2021 (CONDENSED VERSION)

Prepared by Iowa Initiative for Sustainable Communities (IISC)
for Maquoketa River Watershed Management Authority (MR WMA)



CONTENTS

01		Summary	<p>Executive Summary Key Research Findings</p> <hr/>
02		Planning Process	<p>Planning Process Survey Themes and Findings Public and Community Engagement</p> <hr/>
03		The Plan	<p>Data Analysis Goal and Objectives Best Management Practices</p> <hr/>

EXECUTIVE SUMMARY

The Maquoketa River Watershed Management Plan is a regional community-driven plan with the goal to identify, prioritize, and address water-related issues such as water quality and flood mitigation. This plan serves as a guidebook and vision for the future for the member cities, counties, and Soil & Water Conservation Districts, offering a long-range perspective and ways to improve water quality and mitigate flooding throughout the watershed. The topics that the plan addresses include but are not limited to agricultural practices, water quality, present & future flooding, improved recreation, protection of the river ecosystem, and conservation practices.

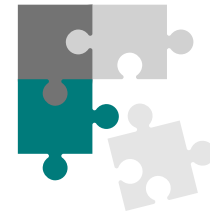
The Maquoketa River Watershed Management Authority (MRWMA)

The Maquoketa River Watershed is one of 11 tributaries to the Mississippi River, and drains water from 1,870 square miles within the Mississippi River Basin. The watershed is located at the eastern part of the state of Iowa and includes 80 townships and 9 counties (Delaware, Jackson, Jones, Dubuque, Clinton, Buchanan, Fayette, Clayton, and Linn Counties).

2010 Iowa legislation authorized the creation of Watershed Management Authorities. A Watershed Management Authority (WMA) is a mechanism for cities, counties, Soil and Water Conservation Districts (SWCDs), and stakeholders within an 8-digit Hydrologic Unit Code (HUC-8) to cooperatively engage in watershed planning and management. WMAs are governed by a Board of Directors and adopt by-laws. The Maquoketa River Watershed Management Authority (MRWMA) applied to the state in 2017 and was officially recognized on October 24, 2017.

In 2020 the MRWMA partnered with the Iowa Initiative for Sustainable Communities from the University of Iowa. Through this partnership, graduate students from the School of Planning and Public Affairs developed a watershed management plan that will lead the MRWMA towards achieving its goals.

PLANNING PROCESS

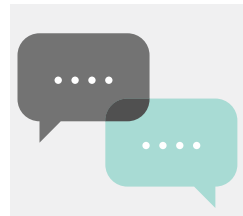


The planning process was divided into three key phases: research & data gathering, community engagement, and goal and objective setting. The first two phases informed the content and prioritization of the goals, objectives, strategies, and actions.

COMMUNITY ENGAGEMENT

The ability to create effective and lasting change starts with knowing the community's priorities, goals, values, and abilities, which can only be done by communicating and engaging with the community. This includes reaching out to all communities within the watershed and developing a number of options to exchange information. Because of several social distancing protocols established in the State of Iowa due to the Covid-19 Pandemic, communities and officials were contacted with minimum physical exposure.

Engagement was focused around the following key stakeholder groups: urban residents, rural residents, agriculture, urban leaders & watershed government, MRWMA members, and recreation. They were engaged through multiple strategies.



Stakeholder Survey

The Stakeholder Survey aimed to understand the respondents' values, beliefs, and experiences related to watershed issues. These results helped inform public participation and the goals, objectives, and strategies of the plan. The questions dealt with water quality, flooding, recreation, impacts on water issues, conservation, and farming. The survey remained open for informing the plan from December 2020 through March 2021. It was taken by over 400 respondents. These respondents were from many different areas of the watershed and provided a wide range of perspectives that informed the plan.



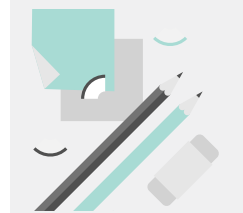
Focus Groups

Five focus groups were conducted to build a better understanding of stakeholder perceptions of water quality, water policy processes and decisions, and watershed management plan development. Focus groups were conducted for the following stakeholder groups: Recreation, Urban Leaders, Upper Maquoketa Agriculture, Lower Maquoketa Agriculture, and North Fork of Maquoketa Agriculture. These groups expanded upon results from the survey and provided depth to better solve watershed issues.



Photo Voice

An online platform was provided for communities to post photos and stories that reflect their connection to the Maquoketa River Watershed. During the development of this plan, 10 submissions were received in the website.



Public Input Meeting

The public was invited to give input and prioritize the goals and objectives of the plan. These comments helped reword and reorganize the goals and objectives to better suit the residents of the watershed.



Demographics

- The largest towns in the watershed are **Maquoketa** (6,026 people), **Manchester** (5,037 people), **Dyersville** (4,110 people), **Monticello** (3,835 people), and **Cascade** (2,078 people).
- The Maquoketa River Watershed has approximately **72,118** people as of 2018.



Land Cover, Topography, and Soils

- The watershed is covered primarily by **row crop** and **pasture** agricultural land. **95%** percent of the watershed is privately owned.
- Rock exposures, quarries, shallow bedrock, and steep bluffs are common characteristics of the watershed. **Karst topography** is common in the watershed, and sinkholes are scattered throughout the watershed, with the greatest concentration occurring in Jackson County.
- The infiltration abilities of soil determine how much water stays in the soil, trickles into groundwater supplies, and runs off into streams and rivers. With greater amounts of water run-off, soil erosion increases. Overall, **erosion due to runoff from cropland** accounts for **90% of soil erosion** in the area.



Hydrology and Flooding

- Across the Midwest, **intense precipitation** has increased substantially in recent decades. Although these factors increase the risk of flooding, studies have shown that the risk can be minimized by monitoring land cover changes and policy on natural drainage feature retention.
- The Maquoketa River Watershed's **runoff** levels show an increasing trend for the last eleven decades. There has also been a change in the difference between the highest and lowest runoff levels throughout the years, which signifies increasing **irregularity** and a higher **risk of flood and drought** events as well as soil erosion, sedimentation, and pollutant wash-off from urban surfaces.
- Major flooding events within the watershed occurred in **1925, 1944, 1947, 2002, 2004, 2008 & 2010**.



Water Quality

- In 2018, **16 streams and 3 lakes** were listed as **impaired** waters in the Maquoketa River Watershed. Among those, 15 streams and 2 lakes are listed as impaired requiring total maximum daily load regulation.
- In 2018, 'fish loss due to animal waste' was identified as a new cause of impairment for stretches of the following three streams: Whitewater Creek, Hickory Creek, and North Fork Maquoketa River.



Wildlife and Habitat

- 23 animal and 67 plant species** are listed as threatened, endangered, or of concern within the watershed.

GOALS AND OBJECTIVES



Goals and objectives of the plan focus around 5 key pillars of watershed management: Water Quality, Flood Mitigation, Ecosystem Protection, Community Education & Outreach, and Organizational Representation. These goals and objectives can be achieved through strategies and specific actions.



Goal 1 Improve water quality through techniques for nutrient management, erosion reduction, and increased infiltration



Goal 2 Improve watershed flood management



Goal 3 Increase watershed awareness and involvement among stakeholders



Goal 4 Preserve, protect and improve ecologically sensitive habitats and ecosystems in the watershed



Goal 5 Establish the WMA as a trusted community resource

PLANNING PROCESS TIMELINE

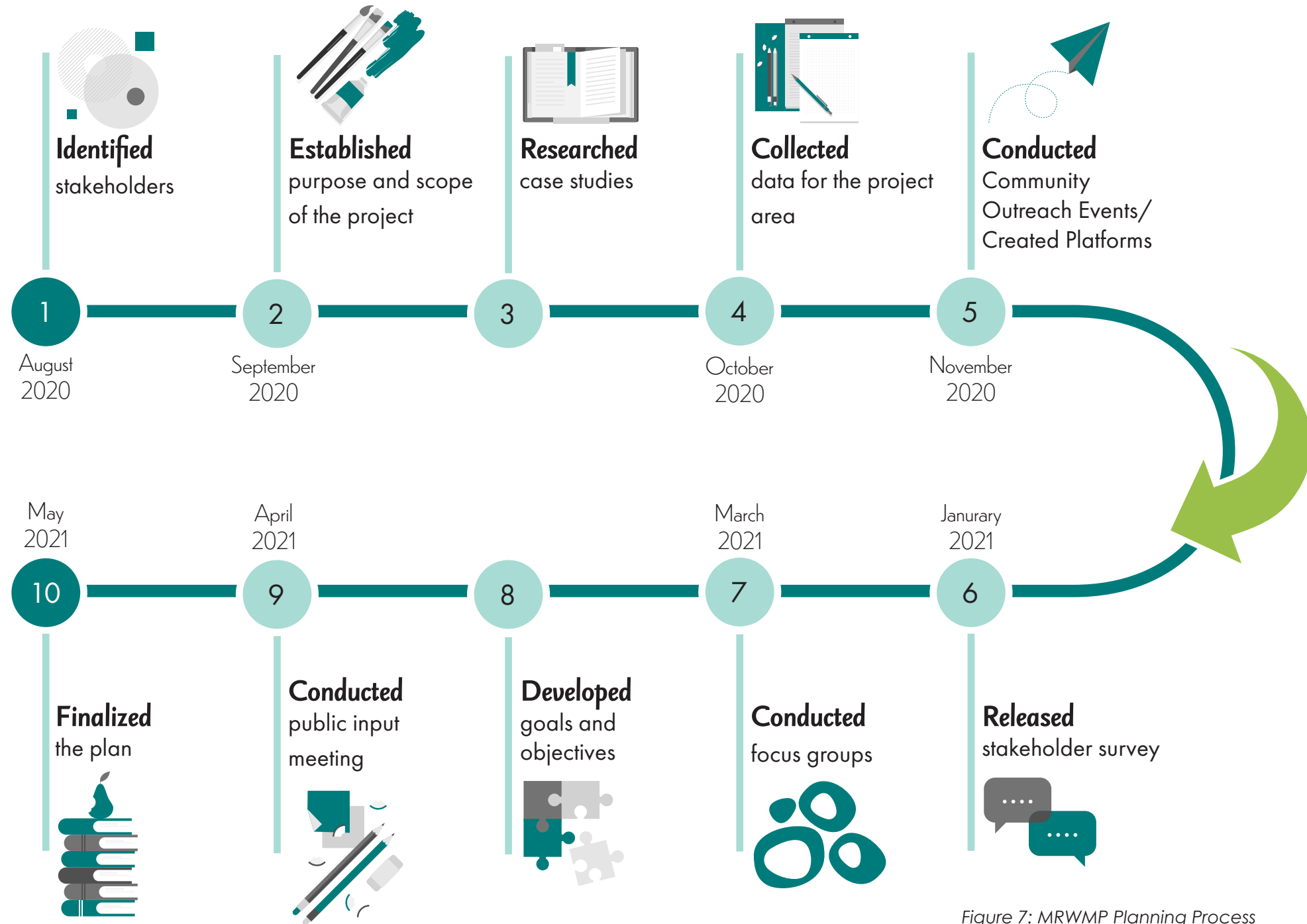


Figure 7: MRWMP Planning Process
Source: Authors





Recreation and Wildlife

The watershed is seen as a major recreational and economic asset to the region, where many respondents participated in watershed-related recreational activities.

88% believe it serves as an economic asset < **74%** believe it is a defining feature < **84%** believe that it serves as a recreational asset and destination for Eastern Iowa < **25%** of respondents use the watershed for its scenic beauty < **19%** canoe or kayak in the watershed < **19%** use the watershed for fishing or hunting < **74%** agreed that rivers and lakes for tourism/recreation should be improved < **66%** agreed that there should be more natural areas for hunting/recreation.

Many respondents want to protect and preserve ecosystems and habitats within the watershed.

48% were very concerned about the loss of wildlife habitat < **46%** were very concerned about the loss of aquatic habitat.



Education and Resources

The majority of respondents indicated a need and a want for increased education and resources related to watershed issues.

79% agreed that incentives for communities to protect soil and water should be increased < **76%** agreed that there should be more education for landowners on flood and water quality issues < **54%** agreed that regulation for landowners to protect soil and water should be increased < **43%** agreed and **25%** had no opinion that they would be willing to pay more to improve water quality and reduce flooding near them (ie. Taxes or fees).



Flooding

The majority of respondents have been affected by flooding and they believe WMAs need to be the most involved in mitigating flooding impacts.

76% of survey respondents have experienced a flood event < **60%** have been prevented from completing their daily activities or business due to flooding <

31% believe the WMA most needs to be involved to reduce flooding.



Water Quality

Half of respondents believed water quality to be “okay” throughout the watershed, and more thought it was good than bad. They believe both agricultural, rural, and urban sources to be the main water polluters. They believe WMAs need to be the most involved in improving water quality.

85% believe agriculture influences water quality < **83%** believe streambank erosion influences water quality < **83%** believe livestock influence water quality < **81%** believe illegal dumping/littering influences water quality < **76%** believe run-off from paved influences water quality < **31%** believe the WMA most needs to be involved to improve water quality.



Conservation Strategies

Many respondents already participate in conservation activities.

62% participate in assistance in disposal of household hazardous waste < **59%** minimal use of lawn & garden fertilizers/pesticides < **84%** fertilize based on soil test < **65%** used post-emergence herbicides < **63%** participate in no-till.



Public Engagement Strategies

Continuous stakeholder participation during data collection and analysis allows for the public to receive information and comment on the planning process. The outreach activities in studied plans were conducted through community-focused surveys, public hearings, public open houses, water testing demonstrations, workshops, and clean-up events paired with fun activities. Agricultural associations, farm consultants, and agricultural retailers were also used as data collection and distribution sources to maintain smooth communication between rural stakeholders and the planning team. During the promotion phase, advertisements on media outlets such as newspapers, radio stations, podcasts, websites, and social media sites, along with community-targeted-slogans, encouraged community involvement in the planning processes of the studied plans.

This plan adopted these outreach ideas, and utilized them via online platform - given the limitation set by social distancing protocols. We conducted community outreach via an online stakeholder survey, five focus groups on zoom platform, story-telling on a website, and a public input meeting on zoom platform. The advertisements and promotions were done via facebook page, MRWMA website, various agricultural association identified, and several press media and radio stations that operate within the watershed area.

Analytical Approach

Data analysis for the studied plans focused on identifying contaminant sources, hazard-prone areas, and priority sites requiring restoration. These plans focused mainly on potential bacteria and nutrient sources from concentrated animal feeding operations (CAFOs), failing septic systems, pets

or wildlife, and unsustainable agricultural practices. Some of the plans also utilized Agricultural Conservation Planning Framework software and flood probability toolkits to perform specific analyses. SWOT (Strength-Weakness-Opportunity-Threat) analysis was also conducted in various watersheds. As well, some of the Watershed Management Authorities identified hazard risk for vulnerable populations. In this plan, much of the analysis has been focused on community engagement data i.e. results from survey, focus group, story-telling project, and public input meeting.

SWOT analysis has been used to analyze story-telling project data. Other feasible analysis techniques have been recommended to be utilized by MRWMA while moving forward.

Policy Development and Implementation Plan

Formulating policy recommendations and planning for a healthy watershed requires clear rationale and implementation benchmarks to ensure their effectiveness. The recommendations in studied plans included community-based, cost-effective best management practices (BMPs), frequent field visits for communities, watershed stewardship programs, award programs for the most successful communities, annual meetings among city & county staff, and active engagement through community education on water quality monitoring and other watershed issues.

Most of these actions have been identified to be feasible and inducive to the goals and objectives identified for this plan, and hence have been recommended to be adopted and implemented by MRWMA accordingly.



ACRONYMS

CAFO: Concentrated Animal Feeding Operation

BMP: Best Management Practice



Photo Voice

Photo Voice is a platform for collecting information, traditionally from underserved communities, through photography and captions, generally revolving around a specific theme/issue. An online platform was provided for communities to participate by posting photos and stories that reflect their connection to the Maquoketa River Watershed. The platform is still left open to monitor resident perception regarding future activities in the watershed. During the development of this plan, 10 submissions were received in the website, among which recreational activities and scenic beauty were mentioned the most as being the connection that tied the participants with the watershed. Apart from that, being close to nature, water monitoring and volunteering activities were mentioned as the positive aspects and loss of businesses and Lake Delhi dam failure caused by extreme events of storm, flooding and rainfall were mentioned as the negative aspects of the watershed. A collage of the participation titled 'Maquoketa River Watershed Stories' can be found in the next page and the website can be visited at <https://mrwphotovoice.wixsite.com/mrwmaphotovoice/engage/maquoketa-river-watershed>.

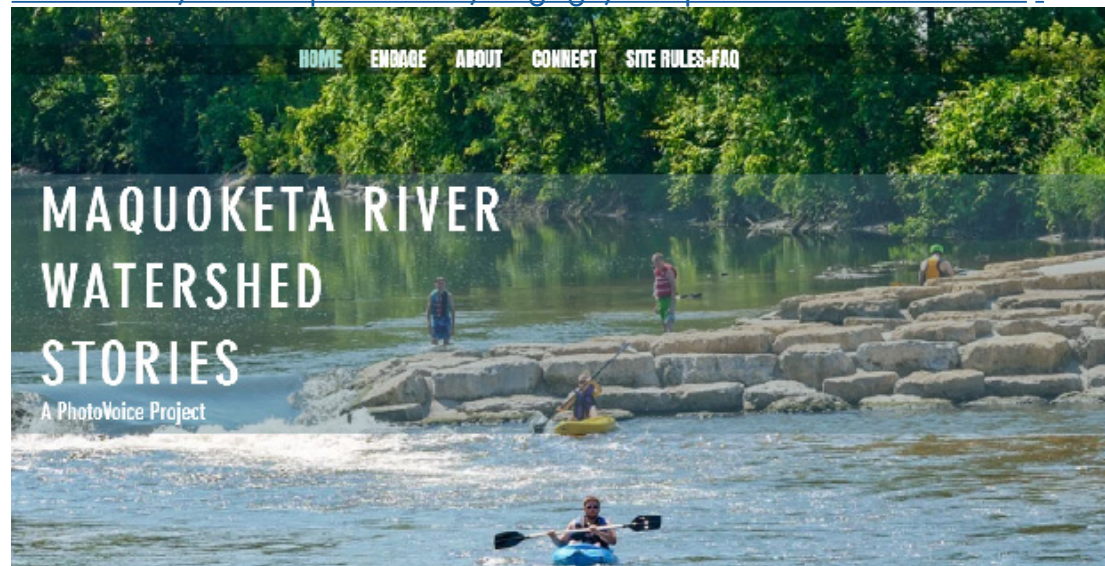


Figure 9: MRW Photo Voice website screenshot

Source: Authors

Focus Groups

The watershed management plan process used a variety of qualitative research gathering methods including the use of focus groups. The overall goal of the focus group study was to build a better understanding of stakeholder perceptions of water quality problems, water policy processes and decisions, and watershed management plan development. Three focus groups were held with rural residents and agricultural groups. The rural residents & agricultural groups were further divided into categories based on the three major sub-watersheds of the Maquoketa River Watershed: the Upper Maquoketa River, North Fork of Maquoketa River and Lower Maquoketa River. Similarly, two separate focus group meetings were conducted for urban residents and recreational groups, totalling five focus groups conducted by the planning team. The groups discussed stakeholder interests and opinions, identifying causes of conflict as well as area of common ground. Comments made across all three groups reflected the need to achieve a reasonable balance among the many complex tradeoffs involved in watershed management.

Public Input Meeting

The Planning Team held a final public input meeting on April 27th, 2021. Goals and objectives developed for the Plan were published and opened for comments and queries. The goals, objectives, strategies and actions have been prioritized based on the feedback from this meeting.

“Recreation is vital through this whole watershed – it starts in Backbone – goes through Manchester – gets a huge peak in Lake Delhi. It’s pivotal for all these areas to be here to support the local communities. - Recreation Focus Group



Community Engagement

Since addressing the issues of the Maquoketa River Watershed, and initiating activities for its protection and restoration depends significantly on changing the behaviors of residents who live in the watershed, it is paramount to involve the residents as well as all the stakeholders in the process of developing the management plan. A strong sense of commitment at the community level is required to address existing issues in our lakes and streams. Watershed assessment and planning should ideally be inclusive, with the public playing an active role since early phases of the planning process. Residents should be involved in framing the problem, developing solutions and taking responsibility for implementation. The ability to create effective and lasting change starts with knowing the community's priorities, goals, values, and abilities, which can only be done by communicating and engaging with the community. This includes reaching out to all communities within the watershed and developing a number of options to exchange information. Because of several social distancing protocols established in the State of Iowa due to the Covid-19 Pandemic, the planning team developed ways of reaching out to the communities and officials that require minimum physical exposure.

Community Groups

The Planning Team has identified five groups of stakeholders and have strategized unique levels of engagement to each of the groups to ensure effective communication.

- **Urban and Rural Residents** – People who are residing within the watershed boundary, and in an urban area (areas with 2,500 or more population as defined by US Census Bureau) are considered 'urban residents'. Likewise, people residing in areas other than urban are included as 'rural residents'. As residential areas are prone to land cover changes due to development activities, it is important to inform residents about the importance of surface permeability and environment-friendly development to maintain watershed health. Similarly, this sub-group's perception of and connection to the watershed is important in informing the planning process.

This group's input was collected via survey, focus group meeting and Photo Voice platform.

- **Recreational Groups** – The Maquoketa River Watershed provides several recreational opportunities to people from both the watershed and greater region. This group consists of people who partake in activities like canoeing, kayaking, swimming, fishing, hunting, and more. The Planning Team engaged with this group by providing educational resources, collecting information about their connection to and perception of watershed health, and collaborating to develop effective strategies. This group's input was collected via survey, focus group meeting and Photo Voice platform.
- **Businesses within the watershed** – Businesses within the watershed can determine the watershed's health both in indirect and direct ways. Factories and industrial activity, as well as other businesses present in the floodplains, may impact or be affected by natural surface water drainage areas, runoff levels, and flood risk. Similarly, businesses directly involved with the surface waters in the watershed like kayak services, play an important role in maintaining water quality in our watershed. This group's understanding, perception, and goals regarding the watershed is important to develop effective strategies. This group's input was primarily collected via our stakeholder survey.

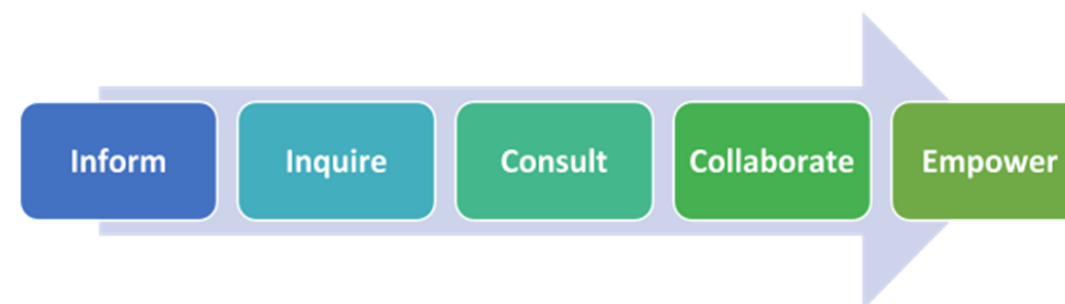


Figure 8: Community Engagement Levels

Source: Authors



- **Agricultural Group** – Crop and animal agriculture have a close relation with the watershed and play a crucial role in maintaining watershed health. Agricultural practices and their location have also been identified as an important pollutant source to surface waters. Because of the importance of this relation and the prevalence of agriculture in this region, the Planning Team engaged this group through a variety of activities. Farm consultants, agricultural retailers and agricultural associations like the Iowa Soybean Association, Iowa Corn Growers Association, Iowa Pork Producers Association, Practical Farmers of Iowa, Iowa Cattlemen’s Association, Iowa Dairy Association, and Iowa Farm Bureau were contacted by the Planning Team to gather input for the stakeholder survey as well as future outreach activities. This group’s input was collected via survey, three focus group meetings and Photo Voice platform.
- **MRWMA Project Partners** – The Maquoketa River Watershed Management Authority is one of the project partners for this planning process, and it is important to ensure consistency between the MRWMA’s and the Planning Team’s expectations. The Planning Team worked in close collaboration with MRWMA Project Partners – Lori Scovel and Jeff Tisl via ongoing regular virtual meetings.

Strategies

Virtual Meetings

The Planning Team communicated with MRWMA Project Partners via bi-weekly virtual meetings. The team met with Faculty Advisors each week via virtual meeting and each week additionally among themselves. Frequent communication was ongoing with our Alumni Mentor throughout the process .

Stakeholder Survey

The Stakeholder Survey aimed to understand the respondent’s values, beliefs, and experiences related to watershed and its issues. These results helped inform both continued public participation and the goals, objectives, and strategies of the plan. The survey was designed so that everyone could take it. It was meant for visitors to the watershed, landowners, renters, rural or urban dwellers, absentee owners, and a number of other populations that may interact with the Maquoketa River. The questions dealt with water quality, flooding, recreation, impacts on water issues, conservation, and farming.

Due to restricted in-person events during the COVID-19 pandemic, a large geographical area, and a limited budget for printing, the survey was distributed primarily online. Links to the survey were available on the MRWMA’s website and Facebook page. Advertising for the survey was completed through local radio stations, local newspapers, and physical community newsletters. As well, the survey was advertised through the Iowa Farm Bureau Spokesman and the focus groups conducted in February 2021. While the survey reached many people and gathered over 400 respondents, the sample is neither random nor entirely representative of the watershed. Because of its distribution, we were most likely to encounter people familiar with using technology or related to WMA activities.

The survey remained open for informing the plan from December 2020 through March 2021. While it closed for analysis in March, the survey remained open to continue to gather comments from stakeholders, which are scattered in the sidebars throughout the plan. At the time data was taken for analysis, the survey had been taken by 428 respondents. These respondents were from many different areas of the watershed and provided a wide range of perspectives that informed the plan. Information from the survey is integrated throughout the plan, but a full report is provided as an appendix. As well, the survey itself is included in the appendices.



ACRONYMS

MRW: Maquoketa River Watershed

Data Analysis

To ensure sustainable watershed management, optimum watershed interventions should be implemented while considering existing requirements of the ecosystems, agricultural systems, and watershed infrastructure. Hence, the methodology for this plan involves reviewing existing data of the Maquoketa River Watershed's characteristics in terms of its population demographics, land use and land cover, soils, hydrology, wildlife and habitat, and recreation and tourism. The key findings from the review are presented here, while the detailed findings can be found in Chapter 05 - Technical Report of this plan.

Population Demographics

The Maquoketa River Watershed has approximately

72,118
people living in it as of 2018

The largest towns in terms of population

- Maquoketa** (6,026)
- Manchester** (5,037)
- Dyersville** (4,110)
- Monticello** (3,835)
- Cascade** (2,078)

Land Use and Land Cover

The predominant land use in the Maquoketa River Watershed is **agriculture**, encompassing **80%**, made up of

54% row crops, **26%** pasture/hayland
12% forestland/natural areas, **17.7%** developed, **0.3%** water/wetlands



The elevation within the watershed ranges between 581 feet to 1,253 feet. The slope plays a critical role in how fast a drainage channel will convey water downstream, and, therefore, influences the sensitivity of a watershed to precipitation events. Since the land use in most of the watershed is agricultural, an average slope of 6% can have significant water quality impacts in the corn belt. Therefore, if rainfall is marked by high intensity and short duration, the watershed will respond very quickly with the peak flow occurring shortly after the onset of precipitation. Steep slopes tend to result in rapid runoff responses to local rainfall, culminating in higher peak discharges with flooding potential.

Topography

- Rock exposures, quarries, shallow bedrock, and steep bluffs are common characteristics of the watershed. **Sinkholes** are scattered throughout the watershed, with the greatest concentration occurring in Jackson County. Certain land uses and practices may also impact the presence of sinkholes. For example, the pumping of groundwater for drinking water supply and irrigation may increase the prevalence of sinkholes and their collapses in **karst topographies**.

Soils

- The infiltration abilities as well as the porosity of soil determine how much water stays in the soil, trickles into groundwater supplies, and runs off into streams and rivers. Soil loss poses both a problem for the health of the soil and the health of the watershed. With greater amounts of soil loss, there is the opportunity for more soil deposition in the streams and rivers and less infiltration on site. Overall, erosion due to runoff from cropland accounts for **90%** of soil erosion in the area.

the watershed has an average slope of

6%



Karst Topography

Karst topography is present when the bedrock is mainly composed of easily dissolvable rocks such as limestone or dolomite (a rock similar to limestone). When exposed to groundwater, the bedrock may dissolve allowing the creation of sinkholes, springs, and losing streams. While this topography gives the region and its bodies of water unique characteristics, it can also leave it vulnerable. Contaminants can travel quickly into the groundwater due to these open fractures, avoiding natural filtration through layers of soil.

Soil erosion remains above sustainable levels. To be sustainable, the loss needs to be reduced to the soil's natural replacement level, which varies from 1 ton/acre/year to 5 tons/acre/year.

Factors affecting soil:

- Soil Disturbance** Soil that is tilled or disturbed can flow easily in erosion events.
- Organic Matter** The presence of organic matter in the soil, such as decayed plant matter, can improve the nutrient retention of the soil.
- Chemical Properties** Chemical properties of the soil indicate the need for use of additives to increase soil productivity.
- Biological Properties** Earthworms and microbial organisms in the soil can impact the nutrient levels and the structure of the soil.
- Diversified Plantings** Rotating crops from one year to the next can replace nutrients used by the other, reducing the need for Nitrogen fertilizers. Above ground, plant coverage protects soil from erosion events, and underground root systems can hold soil in place allowing for greater infiltration.

Hydrology

- Across the Midwest, the occurrence of **intense precipitation** events has also risen substantially in recent decades. Although these factors

increase the risk of flooding, studies have shown that the risk can be minimized substantially by closely monitoring land cover changes and effective policy on natural drainage features retention.

- The Maquoketa River Watershed's runoff levels show an increasing trend for the last eleven decades. There has also been a change in the difference between the highest and lowest runoff levels throughout the years, which signifies **increasing irregularity** and a higher **risk of flood and drought** events as well as soil erosion, sedimentation and pollutant wash-off from urban surfaces.
- The discharge in Maquoketa river at Manchester is an example of the unnatural fluctuation withing the watershed. Increased discharge can also have a negative impact on the temperature and chemistry of water e.g., pH, dissolved oxygen, and toxicity, which may significantly lower habitat suitability for certain aquatic organisms.

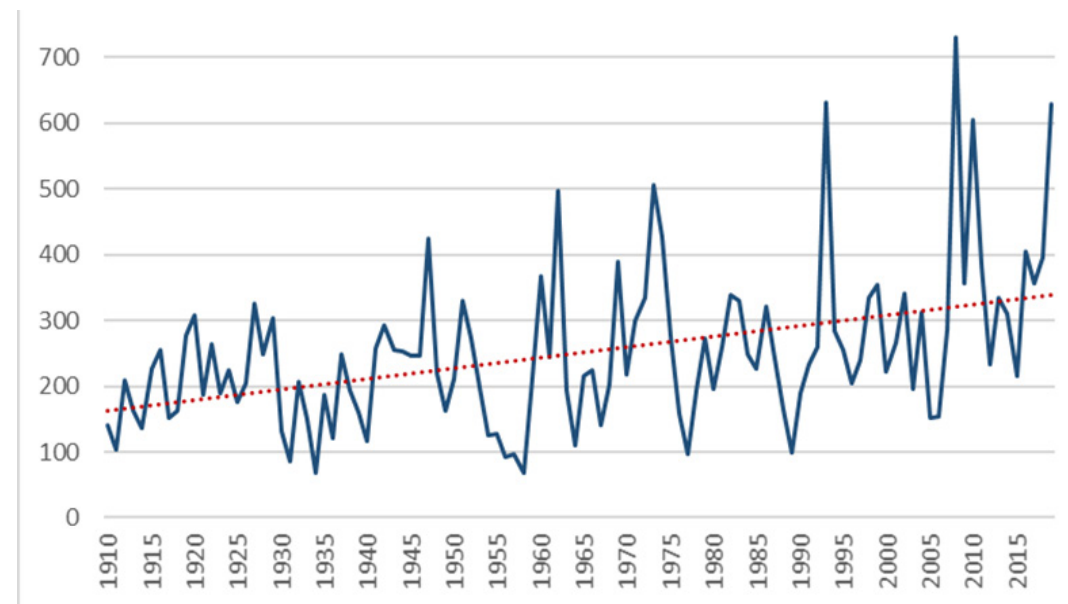


Figure 11: MRW Runoff Level in mm, Trend from 1910-2019

Source: USGS, 2020

“Every time it rains hard enough that there is going to be flooding, I always cringe at the soil loss. - Lower Maquoketa Focus Group



Water Concerns

- The Federal Clean Water Act (CWA) has established water quality standards based on parameters such as dissolved oxygen, water temperature, siltation, turbidity pathogens, and sedimentation for monitoring contaminants in the water bodies.
- In 2018, **16 streams** and **3 lakes** have been listed as impaired waters in the Maquoketa River Watershed.
- Among those, 15 streams and 2 lakes are listed as impairment requiring Total Maximum Daily Load regulation.
- In 2018, 'fish loss due to animal waste' was identified as a new cause of impairment for stretches of the following three streams: Whitewater Creek, Hickory Creek, and North Fork Maquoketa River

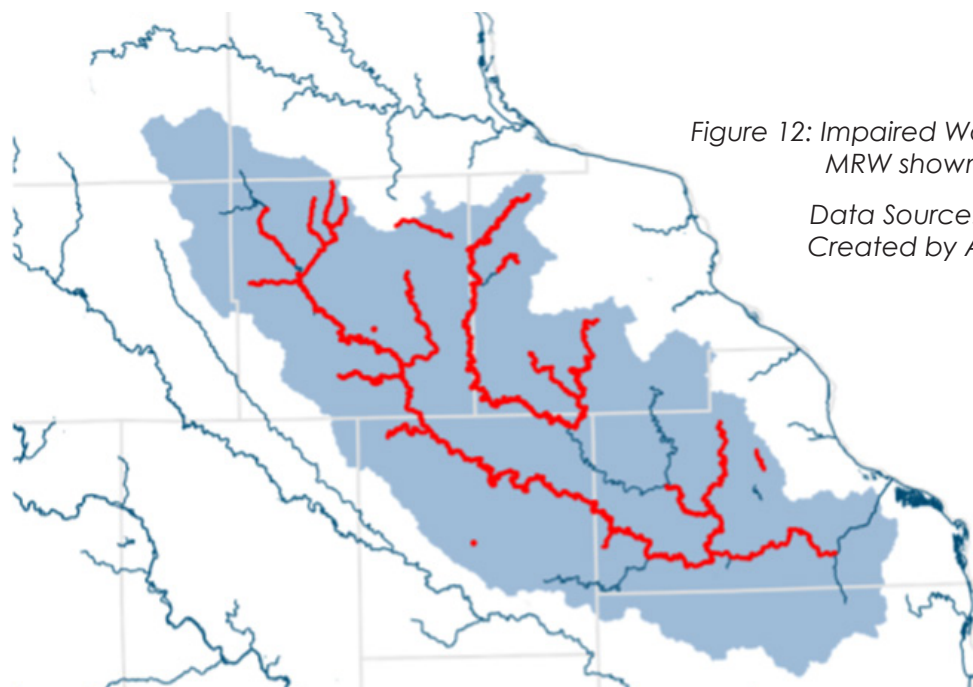


Figure 12: Impaired Waters in MRW shown in red
Data Source: USGS, Created by Authors

Wildlife and Habitat

- Within the watershed, there are a variety of state-considered threatened, endangered, or concern species. This list is comprised of **23** animals and **67** plant species. Many of the animals of interest are endangered or threatened, while a greater proportion of the plant species are of 'concern'. Concentrations of these species are spread throughout the watershed .

History of Flooding

- Major flood events in the watershed since 1925

Year	Major locations
1925	• Upper part of the Maquoketa River Watershed
1944	• Maquoketa River Watershed
1947	• Much of state of Iowa
2002	• Delaware, Dubuque, Jackson, and Jones Counties
2004	• Delaware County
2008	• Delaware County
2010	• Maquoketa River Watershed; caused Lake Delhi Dam breach

The Maquoketa River Watershed is constantly being monitored by the Long-Term Resource Monitoring Program Field Station at Bellevue, Iowa. The data from the above-mentioned station shows that compared to other tributaries of the Mississippi River, the Maquoketa River delivers **higher levels of suspended solids and crop nutrients**. The cumulative effect of the discharge from these tributaries has been the Zone of Hypoxia in the Gulf of Mexico below the mouth of the Mississippi, an area of nutrient concentration affecting fisheries and associated industries. The expansion of this hypoxia zone has led to calls for changes within the sub-watersheds of the Mississippi suspected of contributing to the condition.



Goals, Objectives, Strategies, and Actions



Goal 1

Improve water quality through techniques for nutrient management, erosion reduction, and increased infiltration

Goal 2

Improve watershed flood management

Goal 3

Increase watershed awareness and involvement among stakeholders

Goal 4

Preserve, protect and improve ecologically sensitive habitats and ecosystems in the watershed

Goal 5

Establish the WMA as a trusted community resource

Although there is no single component that defines success, there are several factors that, if implemented, would enhance the chances of a successful watershed implementation plan. These factors include setting measurable goals and objectives, the involvement of stakeholders in the planning effort, the support of local government agencies, a plan for monitoring and evaluating implementation strategies, and ongoing communication between organization members.

Creating this watershed management plan is the first step in a coordinated effort to ensure that Best Management Practices (BMPs) are implemented and integrated with monitoring and outreach efforts. Implementing the plan involves conducting informational & educational activities, continued monitoring, and sharing results with the community.



GOALS AND OBJECTIVES



01

Improve water quality through techniques for nutrient management, erosion reduction, and increased infiltration

- Objective 1.1: Engage with the agricultural community to encourage techniques that increase field infiltration and reduce soil erosion.
- Objective 1.2: Engage with the agricultural community to reduce and maximize efficiency of agricultural nutrient application.
- Objective 1.3: Encourage practices that slow the flow of urban stormwater to increase infiltration and reduce erosion.
- Objective 1.4: Encourage and increase bacteria management to reduce E. Coli and other bacteria levels.
- Objective 1.5: Encourage and increase the implementation of wetlands to filter water pollutants.
- Objective 1.6: Continue to document and report water quality indicators.

02

Improve watershed flood management

- Objective 2.1: Advance the mission and goals of the WMA by fostering partnerships between agencies, organizations, and political entities regarding flood prevention and recovery.
- Objective 2.2: Implement a comprehensive program of targeted activities designed to reduce flood risk and improve water quality in the Maquoketa River Watershed.
- Objective 2.3: Increase awareness related to water quantity and strengthen connections between land use management practices and flooding.

03

Increase watershed awareness and involvement among stakeholders

- Objective 3.1: Educate the local residents to make individual efforts and connections with the watershed.
- Objective 3.2: Ensure all stakeholders in the watershed are included in activities and programs.
- Objective 3.3: Expand WMA network within the watershed through outreach.
- Objective 3.4: Work to achieve an effective interagency corporation with the upriver and adjacent WMAs, the State, the County, the Local Municipalities as well as the Soil and Water Conservation Authorities in the region.

04

Preserve, protect and improve ecologically sensitive habitats and ecosystems in the watershed

- Objective 4.1: Prioritize natural resource sites in the watershed for preservation, protection and restoration
- Objective 4.2: Protect streambanks, shorelines, and buffer areas within the watershed
- Objective 4.3: Restore wetlands and riparian areas in the watershed
- Objective 4.4: Improve habitat conditions for native flora, fauna, and marine lives in the watershed
- Objective 4.5: Restore floodplain connectivity within the watershed
- Objective 4.6: Protect source water sites in the watershed

05

Establish the WMA as a trusted community resource

- Objective 5.1: Make the WMA representative of the people and interests in the watershed
- Objective 5.2: Connect communities with resources specific to the watershed
- Objective 5.3: Recognize and identify vulnerable populations in the watershed that may be affected by poor water quality and flooding.

With the watershed characterized and the issues analyzed, the team refined the preliminary goals to develop detailed objectives, targets, and indicators. Technical and social goals include identifying pollutant reductions needed to meet watershed goals and water quality standards, and determining which management practices should be used in critical areas to achieve those reductions. These water quantity and quality approaches and goals were refined based on data analysis.



Best Management Practices

No-till farming is extremely impactful in reducing erosion and increasing water infiltration in the soil. Tilling is the practice of digging, stirring, or overturning soil to prepare it for crops. While beneficial for planting, it can leave the soil loose and vulnerable to wind and water erosion. No-till practices leave the soil minimally or un-disturbed to reduce soil loss and increase water absorption. When the water stays on the field, less water, soil, and nutrients run into the surrounding streams and rivers. While there are costs associated with no-till (planters, pesticides), there are cost savings as well (no seedbed preparation). The total net-cost of no-till is \$8.45 an acre.

Cover crops provide another solution to reducing agricultural erosion and increasing field infiltration. Cover crops are crops planted in-between growing seasons, when the field would normally be left bare. The crop vegetation protects the soil from wind and splash erosion, and the crop roots allow greater infiltration of water into

the soil. Examples of cover crops include grasses, cereal grains, and legumes such as rye, wheat, or soybeans.

Filter strips along streams allow space for water to slow down, absorb, and filter through the ground and vegetation before entering the nearby stream, improving water quality, absorbing nutrients, and trapping sediment. As well, filter strips provide a buffer from flooding, ultimately reducing flood damages and reach. These areas consist of grass, shrubs, or trees planted along waterways. Filter strips are permanent solution and include a few costs. These include seeds and seedbed preparation, planting, equipment, labor, and loss of cropland. Cost estimates for filter strips are variable depending on choice of vegetation but may lie between \$84.40 and \$96.90 per acre.

Wind breaks can be used on crop or pastureland. Wind breaks consist of rows of trees or other vegetation that protects the land around it from direct wind. By breaking the wind, this strategy protects land from wind erosion. Costs to consider include seeds, seedbed preparation, planting, equipment, and labor. As well, it may take usable crop land. Cost estimates for this

strategy are approximately \$341.90 per acre. However, wind breaks can be strategically placed, and most costs are not recurring.

Rotational grazing consists of managing the planting of forage and rotating grazing across different areas of the pasture. This strategy can reduce erosion and runoff from pastureland, by allowing areas to remain vegetated. Some costs to consider include fencing costs, establishing a water source, seeds and planting of forage, equipment, and labor. To set up an area for rotational grazing, a cost estimate is \$390.44 per acre. However, there are additional benefits to implementing rotational grazing, such as improved livestock health, maintaining healthy forage, improved field health, and improved water quality

Nutrients can be applied during different seasons, from different sources, and using different methods. All of these factors have different implications for the growth, cost, labor, and nutrient loss for that growing season.

Timing: Some producers will complete their nutrient application in the spring (pre growing season), and some complete it in the fall (post

growing season). While fall application is typically cheaper and allows division of the work, fall-applied nutrients are more likely to end up in the water than remain in the field through a season of rain and snowmelt. Spring application is advantageous to reducing the loss of fertilizer, but lack of fertilizer supply may limit producers' ability to do so. Due to limited fertilizer supplies, increasingly wet springs, and efforts to spread out workload, producers should be encouraged to consider sidedressing their applied nutrients. Sidedressing consists of injecting liquid fertilizer along the rows of growing crops using a tractor and a tank (also called 'knifing')

Method: There are a couple methods besides traditional application which allow for greater absorption or reduced runoff of nutrients. The first is the aforementioned sidedressing of nitrogen fertilizers. This means that the fertilizer is applied after the crops have begun growing. This helps with nutrient loss in two ways. One, the application is pushed further out of the rainy season, where fertilizer could be easily washed away. Two, sidedressing is done post-emergence which means the plants are growing and ready to take the nutrients in. This method reduces the overall application as well, reducing cost. Secondly, the 'where' of application can be

changed to reduce run-off. Technical resources through agricultural and environmental agencies allow for farmers to identify spatial data on the productivity throughout their acreage. Producers can use this data to understand what parts of their land are unproductive and do not benefit from additional N and P fertilizers. These areas can be left out of application, reducing the overall use of fertilizer.

Sources: While manufactured N and P fertilizers are the most common sources of nutrients for crop growers in Iowa, overall nutrient could be maximized by using the existing manure created by hog and cattle operations. The watershed is home to both crop and livestock agriculture and connecting these two would allow for a sustainable transfer of nutrients from lot to field, without the addition of produced N and P fertilizers.

Nitrogen Fixing Crops and Crop Rotation, a key strategy to soil health, is one already practiced by many farmers. Many times, in Iowa, there will be a singular stalk of corn shooting up above a field of bushy soybean plants. This is because the field was previously planted with corn and is now being rotated with soybeans. Soybeans are part of the legume family, a variety of plants that host microbes that will take nitrogen from the air and 'fix' it into the soil in a form that the crop can use. So, a portion of the nitrogen that the previous year's corn crop depleted can be replaced by this year's soybean

crop. This lessens the need for additional N fertilizer application.

Crop Residue, meaning leftover plant matter from the previous harvest, is another way to increase soil health. Crop residue provides a source of nutrients and organic matter. Allowing the crops to decompose and release these compounds into the soil, replenishes lost nutrients and organic matter necessary for plant growth. As well, crop residue also helps prevent wind erosion when left on fields.

Deep Rooted Crops, or, crops with long, deep roots increase soil health by adding organic matter to the soil when they decompose and aerating and allowing greater infiltration by breaking up the soil.

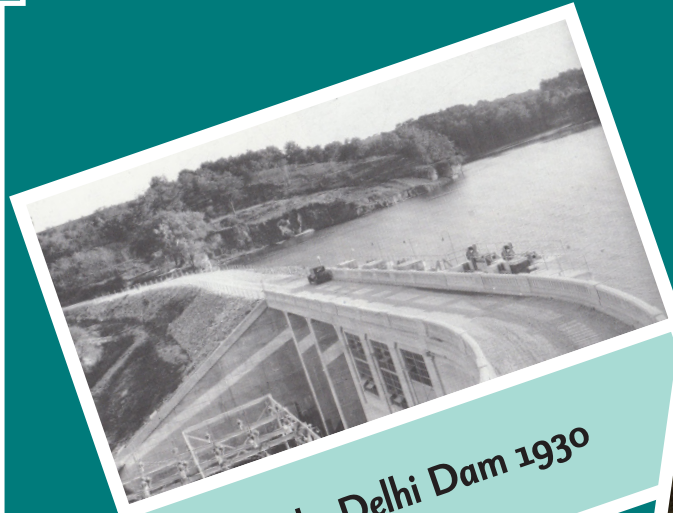
Rain Gardens and Native Landscaping employ deep rooted and native plants to provide an area for water to infiltrate in areas that may experience flash flooding. However, increased infiltration and slowing water flow leads to less erosion and less intense flood events, reducing streambank erosion. Priority should be placed on the promotion and assistance in implementing rain gardens and native landscaping to increase infiltration and reduce stormwater runoff. The survey showed that 34% of respondents already participate in this activity, 40% were interested but needed more information, and only 11% were not interested or it wasn't applicable. This is one

of the lowest percentages of respondents that responded indicating that the strategy wouldn't work, making it ideal for a first focused effort by the WMA.

Permeable Pavers, or, asphalt paving that contains pores for water to infiltrate allows spaces for water to infiltrate into the ground instead of traditional cement. There are multiple varieties of pavers available. Only about 12% of survey respondents use permeable pavers, but 38% were interested in learning more. However, about a fourth of respondents were not interested or pavers were not best suited to their situation. There is definite room for growth in the use of pavers, but resources should be targeted to interested and applicable respondents. Survey respondents from the Upper Maquoketa subwatershed showed the greatest interest in education on this strategy.

Maquoketa River Watershed

PHOTO VOICE



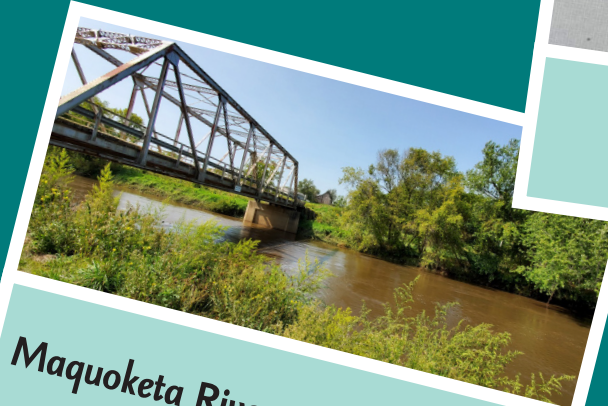
Lake Delhi Dam 1930



River Runner Regatta-Manchester



Backbone State Park



Maquoketa River - Jackson County



Manchester 1925 Flood



Maquoketa River Kayaking near Manchester



Taking a Moment at the Whitewater Canyon Overlook



A glimpse of Maquoketa's beauty



Beautiful Fall Sunset



MRWMA Water Monitoring