

The image features a scenic view of a river with people rafting. The river is in the foreground, with a large pile of driftwood on the left bank. In the background, there are green trees and a cornfield. The sky is blue with some clouds. A white map of Iowa is overlaid on the right side of the image, with the text 'WEST FORK DES MOINES WATER TRAIL PLAN' and 'EMMET COUNTY • IOWA 2019' placed on it.

WEST FORK DES MOINES WATER TRAIL PLAN

EMMET COUNTY • IOWA 2019

WEST FORK DES MOINES RIVER WATER TRAIL PLAN

2019

Acknowledgments

This Water Trail Plan was prepared by Mimi Wagner, Chad Hunter, and Lucas Buscher of Iowa State University. John Wenck of Iowa Department of Natural Resources, River Programs is solely responsible for Cultural and Historic Resources section of Chapter 1. Technical data used in chapters 1 and 2 were contributed by University of Iowa Office of State Archaeologist, Dr. James Pease and EarthView Environmental Inc. The City of Estherville and The Emmet County Water Trail Association provided leadership and local support of the project throughout the process. The project steering committee included:

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IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY



IOWA DEPARTMENT OF NATURAL RESOURCES

GOVERNOR KIM REYNOLDS
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August 7, 2018

One might think water trails are only for paddlers, but Iowa has learned that while paddling might be a good way to experience them, water trails benefit multiple user groups, municipalities, agencies, organizations, and the economy, improving the quality of life for Iowans across the state.

The DNR's work through water trail planning and development provides exciting opportunities that are ushering in a new legacy of enjoyment, respect, and care for the navigable waters of our state. It's rekindling the connection between people's interactions with the landscape and their respect and understanding of the water resource. We are connecting Iowans to the streams in their backyards and enhancing the appearances downtown riverside communities.

Once forgotten in years past, Iowa's navigable waters are beginning to take center stage. As they do, there is a need to bridge the divides among multiple user groups, offer opportunities for listening, brainstorming, and strategizing that results in sensible decisions for the waters that connect local communities. What works for one water trail might not work for another, and what works in one community might not work in another.

But that's what good planning does. Our strong commitment to local listening and our increased technical understanding of project feasibility will lead to plans that will serve to improve the quality of life of individuals and positively impact the local economies of Iowa communities for generations to come.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Bruce Trautman', is written over a faint, light blue circular stamp or watermark.

Bruce Trautman
Acting Director
Iowa Department of Natural Resources

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CHAPTER 1 EXISTING CONDITIONS

Paddling the West Fork Des Moines River at the Iowa – Minnesota state line is to experience some of the least disturbed landscapes in Iowa’s Des Moines Lobe ecoregion.

Visually, users see rolling pastured hills, pothole prairies, groundwater seeps and wetland vegetation on streambanks, soaring birds of prey and publicly owned undisturbed prairies. Less visible and known are the rich cultural and historic resources of the area. Interestingly, the ridges and hills of glacial moraines from two different time periods following the water trail from Minnesota downstream to Palo Alto County. The mostly rural route has a 125’ wide channel and provides an

approachable experience for users interested in seeing wildlife and vegetation resources up close. Estherville is the focus point of the water trail with a city-owned greenbelt with varied recreational resources along the river for its entirety within city limits. The West Fork Des Moines Water Trail is the first state water trail in Iowa with a local non-profit organization solely-focused on supporting its development and management. This water trail route stands on its own in terms of merit for recreation and conservation opportunities. It also offers a short-distance complementary day trip experience for visitors to the Iowa Great Lakes. This planning integrated regional interests and opportunities for conservation and recreation that support the West Fork Des Moines River, particularly existing users such as anglers, paddlers and campers.



An Introduction to Designated State Water Trails & This Chapter

Preparation of this existing conditions chapter included all of the most recent research related to recreation on the West Fork Des Moines River, current access and launch inventory protocols, and established cultural and historic resource data sets. Anecdotal information on river use and conditions were provided by members of the Emmet County Water Trail Association, the City of Estherville and local paddlers.

Rivers become known as water trails when people paddle on them and begin to organize amenities to support paddling such as parking areas and launches. Water trails, in turn, also support uses beyond paddling. River edge amenities also engage anglers, those relaxing near the river, hunters, and students studying the ecosystem. We know that river recreation also has a substantial impact on the Iowa economy. A 2009 study by the Center for Agricultural and Rural Development (CARD) at Iowa State University estimated overall economic impact from recreation on the fifty largest rivers in the state for the year. Results concluded that recreational river use by Iowans supported over 6,350 jobs, \$824 million in retail sales and \$130 million of personal income.

The status of “state-designated” is reserved for water trails that represent the best paddling experiences in each region of the state. Not every county in Iowa will have a state-designated water trail. A set of Iowa criteria established in 2010 is applied to guide classification of state designated segments. This experience classification system allows paddlers to match water trail routes with their ability level. These criteria also help water trail managers, sponsors and trail volunteers select a classification assignment for each segment based on their management resources and abilities.

The careful assignment of experience classification is one of the most important steps in water trail development. In addition to meeting paddler expectations, a segment’s experience classification is a driver for development and infrastructure funding. One of the most important outcomes of this Existing Conditions chapter is to establish the experience classification of the water trail as it exists today and recommend alternative strategies for the future of the water trail.

In addition to identifying a segment’s experience classification, it’s important to assess the skill level required (beginner, intermediate, advanced). A Gateway experience classification in an urban area might be paired with an advanced skill level, while a Recreational experience classification in a more rural area might be paired with a beginner skill level.

Development and management of this water trail is a collaborative effort between the City of Estherville and Emmet County Conservation. The water trail sponsor is the City of Estherville. The Emmet County Water Trail Association is a county-wide non-profit organization that advocates for the water trail and is an active part of planning for its development. The water trail sponsor and local steering committees will use the information included in this chapter to develop a vision for the future development and management and work together to implement this vision.

The River Itself

The West Fork Des Moines River is a tributary of the Des Moines River that begins in Cottonwood County, Minnesota. The headwaters is Lake Shetek, a large lake in southwestern Minnesota. The West Fork Des Moines River in Emmet County was classified a “non-meandered” stream in original public land surveys completed before Iowa received statehood. “Non-meandered” status states that the streambed and banks of rivers are considered part of the adjacent property. River users on these “non-meandered” segments may have only the right to float on the water surface, depending on ownership. Alternatively, “meandered” status generally allows river users access on-foot to channel bottoms and stream banks up to the ordinary high water mark. The geographic limits of this study include the river segment between the Petersburg Access in Jackson County and the Lammers Landing near Graettinger (Figure 1). This segment is 32.2 river miles in length and includes a small portion of the river channel in Jackson County in Minnesota and Palo Alto County in Iowa as well as all of Emmet County. The watershed area draining into the study segment of the West Fork Des Moines River is approximately 707 square miles.

The river is used for canoeing, kayaking, fishing and tubing. Water levels generally do not support the use of motor boats or jet skis but occasional use occurs during high water events. There are currently no liveries or boat rental businesses serving this portion of the West Fork of the Des Moines River.

According to the 2009 Iowa Rivers and River Corridors Recreation Study (Iowa State University 2010) the West Fork is heavily used for fishing. Slightly more than 50% of all trips to the river included fishing as an activity (Table 1). The importance of the West Fork Des Moines River for fishing is also recognized by local residents and officials. Residents and officials also report that the volume of canoeing and kayaking on the river has increased substantially over the past five years.

River Segment	Trips Reported to River in 2009	Fishing	Hunting	Boat with Motor	Kayak or Canoe	Swim, Tubing, Play in Water	Trails	Camping	Relaxing, Picnicking	Wildlife Watching
West Fork Des Moines from Minnesota / Iowa state line to Des Moines River Confluence	283	53.0%	19.4%	10.6%	24.4%	29.3%	45.9%	21.2%	56.5%	38.9%

Table 1
Recreational Use Reported on the West Fork Des Moines River*
*Source: Iowa Rivers and River Corridors Recreation Survey 2009 (Iowa State University)

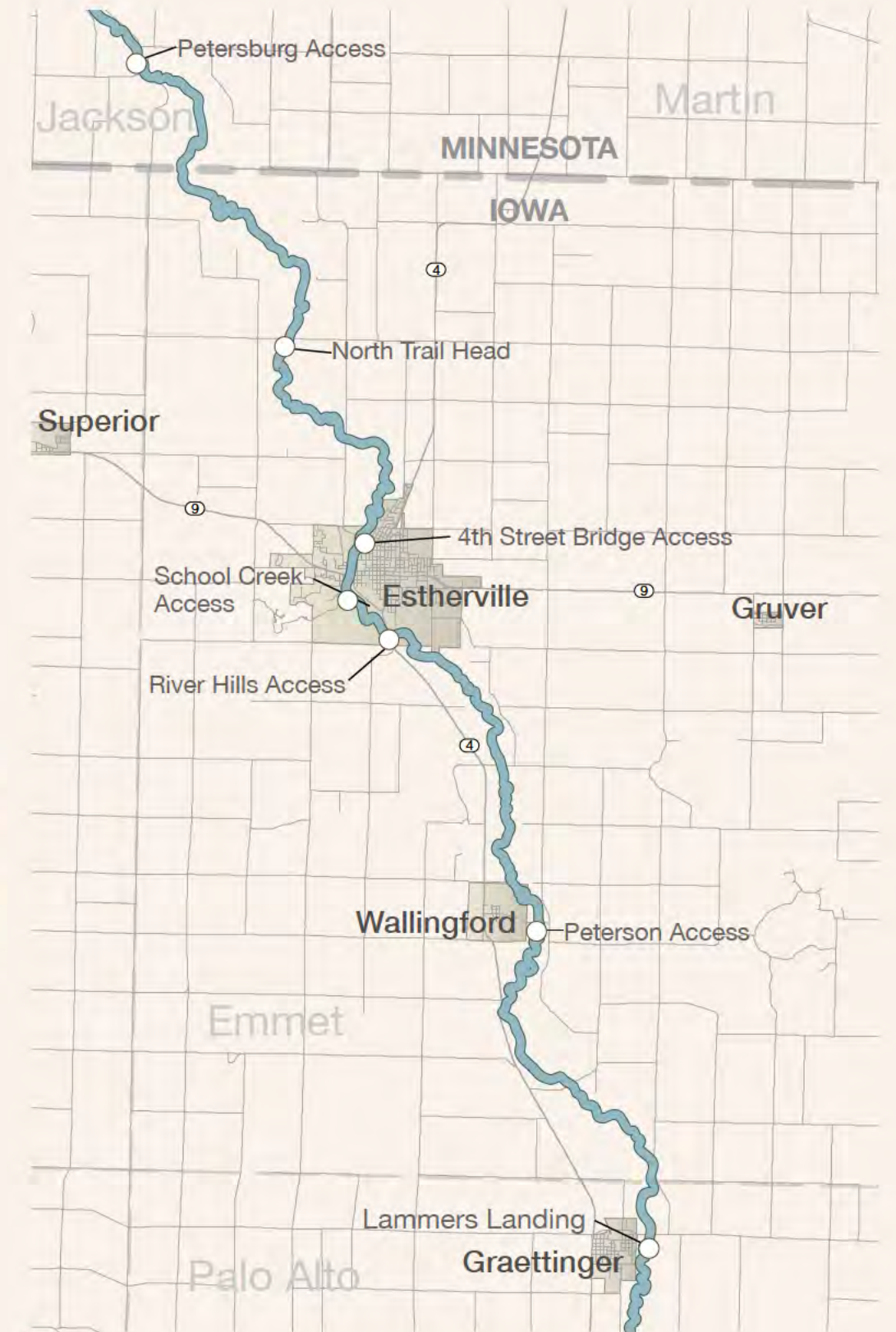


Figure 1
Accesses on the West Fork Des Moines River range from developed, urban parks to remote, stand-alone rural locations.

WATER TRAIL EXISTING CONDITIONS

The 32.2 miles of river is divided by river access points into five segments for the purposes of this planning (Table 2). The water trail passes through one city, Estherville, with a population of 6,360 (2010 U.S. Census) and ends just outside Graettinger (population 806, 2016 U.S. Census). River conditions are summarized in Table 2.

The river is sinuous with tight curves for nearly all of the study length. River users typically favor the type of experience found on the segment upstream of Estherville. The two segments between Petersburg and North 4th Street accesses have a particularly wild feeling. The channel is an average of 125' here. A 3.7 mile frontage on the Anderson Prairie Complex Wildlife Management Area occurs between the North Trailhead and the North 4th Street Access. Views of the rolling hills of these grassland areas are truly stunning as seen from the river. The river valley is more narrow and tight in this reach, intensifying the closeness of the hills. The most common land cover on the river banks on this segment is wetland vegetation and forests although some areas have pasture and row-cropped land right up to the top of the stream bank.

Paddlers will encounter several old river meanders on this segment which can be confusing as they are dead ends; these areas are heavily wooded and high amounts of downed trees, also known as large woody debris, are present. Although the presence of some large woody debris is typical and desirable for fish habitat on rivers, it can also function as a hazard for paddlers. The amount of wood encountered in the channel is usually related to recent flow levels. Sustained high water levels, which have been common in recent years, encourage large trees to fall into the channel because the streambank soils are super saturated. High water levels reposition the large debris, often creating blockages across the channels and accumulations on outside bends.

All developed services on the water trail exist inside Estherville. The river segment inside the City of Estherville is much less wild and curving. The river shoreline has been cleared of most trees and shrubby vegetation that would be

expected and many areas are mown up to the top of the streambank. The riverfront area is owned by the City and functions as open space with walking trails and the old city swimming pool. The existing low head dam is located slightly south or downstream of the Highway 9 / Central Avenue Bridge and a rubble riffle is upstream of the bridge. The low-head dam requires portage, as recirculating currents on the east side (river left) are very dangerous at most water levels. The area near the dam is very popular with anglers and people watching the water.

The channel and river valley widen out downstream of Estherville. The average channel width is 150 feet. Although the channel is nearly as sinuous compared to the upstream segment, the views are more open because the river valley is wider and more developed with agriculture. Traffic noise from Highway 4, which parallels the river on this segment, is audible. Large woody debris piles continue to be common downstream of Estherville. In low water conditions, portage around them can be necessary. There is more evidence of cattle grazing on this segment, in some cases cattle are allowed access to the streambanks and the channel. This segment passes by the community of Wallingford but the river is separated from the community. It also passes by Burr Oak Lake Wildlife Management Area (WMA) but there is no formal access to the WMA from the river.

Water Trail Access Points

Six existing public accesses were evaluated for water trail inclusion (Table 3). Two are located inside Estherville and the remaining are stand-alone accesses located in rural areas. One additional location, Riverside Hills Access adjacent to Highway 4 on the south side of Estherville, is identified on state maps as a river access. While this site is used for fishing, it is undeveloped and owned by the Iowa Department of Transportation. This site does not function as a boat launch and construction of a launch is not feasible due to streambank conditions. Riverside Hills Access is not included as a functional river access in this planning for these reasons.

The range of public facilities and use opportunities available at water trail access points on this water trail are quite limited (Table 4). School Creek Access is the only access within a developed recreation area. The remaining accesses lack development or amenities, including camping.

A signage inventory and plan has been completed for this water trail and is in the process of being implemented. Some way finding signs are present on highways. Bridge signage was purchased in the past but never installed; DNR and DOT signage standards have been updated since these signs were made.

Segment	Segment Distance	Hazards				Paddling Use Volume*	Beginner Friendly	Other Notes
		Dams	Logjams > 30%	Rapids	River-Wide Fencing			
Petersburg Access to North Trailhead	8.24				Yes	Low		1 barbed wire fence crossing, cattle had direct access to river
North Trailhead to 4th Street Bridge Access	6			Very few		Moderate		Log jams/woody debris, tires, minimal litter
4th Street Bridge Access to School Creek Access	1.1	1	1			Low		Minimal log jams/woody debris
School Creek Access to Peterson Access	8.7			Numerous		Low		A lot of log jams, tires and some litter
Peterson Access to Lammers Landing	8.26			Very few	Yes	Low		1 barbed wire fence crossing, electric utility cable in the water, cattle had direct access to river

Table 2
West Fork Des Moines River Water Trail Segments, Emmet County. Use volume estimates are relative only to other segments in the county and were generated by anecdotal observations.

*This data is provided for comparison purposes only. The presence of logjams blocking 30% or more of the river channel is based on river assessment conducted by ISU and Iowa DNR in July 2017. Logjam conditions are constantly changing.

Facility Where Access is Located	Access ID	Access Owner/Manager	Launch Type	Streambank Height
Petersburg Access	97	Minnesota DNR	Carry Down	8'
North Trailhead	88	Emmet CCB	Motorized Boat Ramp	8'
4th Street Bridge Access	82	Estherville	Motorized Boat Ramp	2'
School Creek Access	81	Estherville	Motorized Boat Ramp	8'
Peterson Access	73	Emmet CCB	Motorized Boat Ramp	8'
Lammers Landing	64	Palo Alto CCB	Motorized Boat Ramp	13'

Table 3
Water Trail Access Ownership and Basic Characteristics

RECREATIONAL CONDITIONS RELATED TO THE WATER TRAIL

Average vertical streambank heights on this water trail range between 2 and 8 feet at access points (Table 3). The portion of the river upstream of Estherville varies considerably compared to the portion downstream of Estherville. Upstream the river gradient is less and the planform of the river is very curving. Former channels are common and a great deal of forested wetland exists on the edge of the river. Downstream of Estherville the river is much wider and less curving. Agricultural land use is also more obvious downstream of Estherville.

The angle of 2 existing launches on this water trail pose a large concern for upkeep and maintenance (Table 5). The 4th Street Bridge Access and School Creek Access launches were constructed orienting upstream in the channel. This orientation is contrary to standard launch engineering and Iowa DNR water trail standards which suggest orienting launches 45 degrees from the downstream shoreline. The

upstream orientation causes large amounts of sediment and debris to be deposited on the launch surface (Table 6). This poses both a problem for trailers and boats trying to use the launch as well as continual maintenance attention to clear the sediment. While the slope of existing launch surfaces are not overly steep for boat launches, they are steep enough to prohibit use by wheelchairs and those with mobility limitations.

The width of existing non-mown, perennial vegetation between the top of river bank and the parking does not meet DNR water trail recommended width. A minimum of a 50' buffer is recommended. North Trailhead and Peterson Access come the closest to meeting this standard (Table 6).

River Management Conditions on the West Fork

Law enforcement adjacent to the water trail is conducted by a network of state, county and municipal agencies. Estherville has a city police department who are called to the accesses in the city, but all incidents on the river itself are considered county jurisdiction. Outside the community's boundaries, law enforcement is provided by Iowa State Department of Natural Resources conservation officers, Iowa State Patrol, Emmet County Sheriff's Department and Emmet County Conservation Board staff. Emergency services/rescue situations are assisted by the Emmet County Emergency Management Service and fire departments from Estherville and Wallingford.

Law enforcement and rescue personnel have recently begun to buy equipment and do training in water rescue. It is also understood that on-river rescues, when they occur, will likely require landowner assistance because much of the river is separated from public roads. There is also no standardized

locational ability available to report and respond to incidents on the river. Use of the national grid system, or something similar, would be useful in locating and accessing river users needing emergency assistance. A limited number of boating accidents and law enforcement incidents have been reported on this segment of the river. Trespass calls are the most common type of disturbance. Law enforcement does not regularly patrol the river with the exception of the accesses.

As stated earlier, aligning how a river is managed with the type and volume of water trail users is a key goal of the state water trails program. Generally, Iowa DNR finds that the greater the volume of use and the shorter the segment length, the greater need exists for management of people and river conditions. Both types of management are important and needed. River condition management may include a level of ongoing removal of large woody debris snags in certain scenarios and the maintenance

Facility Where Access is Located	Water Trail Access Number	Restrooms	Amenities at Launch	Distance from river to drinking water (ft.)	Camping	Other Points of Interest at Access
Petersburg Access	97	No	None		No	
North Trailhead	88	No	None	-	No	
4th Street Bridge Access	82	No	None	-	No	
School Creek Access	81	Yes	Tables, benches, shelter	550'	No	Walking Trails, Play-ground
Peterson Access	73	No	None	-	No	
Lammers Landing	64	No	None	-	No	

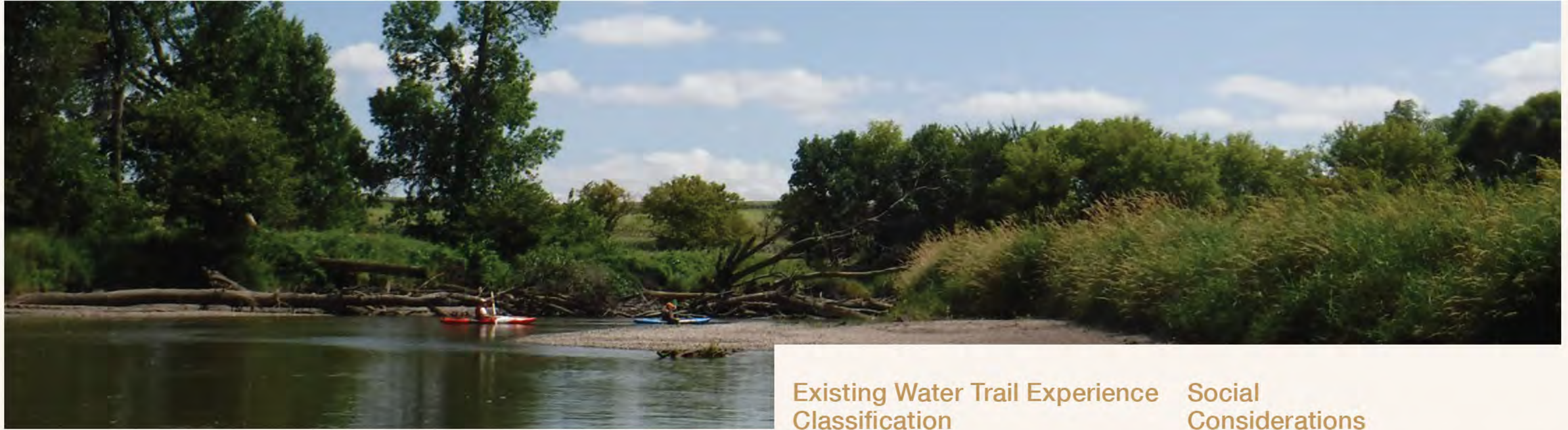
Table 4
Water Trail Access Amenities

Facility Where Access is Located	Access Number	Parking Stall Count	Distance Between Parking & River (ft.)	Vehicle Access to River is Possible	Launch Slope Max. %	Launch Angle to River (degrees)	Existing Experience Classification of Access
Petersburg Access	97	15	30	Yes	14	90	Recreational
North Trailhead	88	20	70	Yes	15	45, down-stream	Recreational
4th Street Bridge Access	82	30	84	Yes	15	45, up-stream	Recreational
School Creek Access	81	10	95	Yes	16	45, up-stream	Recreational
Peterson Access	73	10	58	Yes	10	45, down-stream	Recreational
Lammers Landing	64	30	72	Yes	15	45, down-stream	Recreational

Table 5
Water Trail Access & Launch Relating to Use and Maintenance
Cells highlighted in yellow indicate conditions where enhancement is desirable.

Facility Where Access is Located	Width of Vegetative Buffer Between Parking and River	Erosion Present at Access	Streambank Conditions Adjacent to Launch	Rip Rap Present at Launch	Elements of Concern
Petersburg Access	20'	No		Yes	
North Trailhead	25'	No	Severe Erosion	No	Deep sediment at bottom of loading launch
4th Street Bridge Access	10'	No		No	Siltation on launch
School Creek Access	10'	No	Severe Erosion	No	Extreme siltation on launch due to location on a confluence with a tributary
Peterson Access	20'	No	Severe Erosion	No	
Lammers Landing	2'	No		Yes	

Table 6
Facility Conditions Related to Water Trail Accesses



Existing Water Trail Experience Classification

Social Considerations

of launches. Appendix A aligns river management expectations relating to the four types of experience classifications on state-designated water trails. People management can include littering and disruptive behavior, as well as illegal activities such as vandalism, alcohol consumption while paddling, and trespassing.

Also mentioned earlier, matching the skill level of river users with river conditions is critical to successful water trail experiences. While rivers are understood to be dynamic systems with changing conditions, some segments are known to be inherently more difficult compared to others. Table 7 defines criteria for estimating and applying skill level ratings to river channel conditions.

Several issues relating to river use, safety and law enforcement have been identified through the water trail planning process.

These issues included the need for additional on-water rescue equipment and training, including cold-water rescue, the need to coordinate with land owners to develop emergency access routes to the river channel, and the need to inform county 911 and all responders of river access locations (both formal and emergency) and the need for more precise incident location ability.

Current river and people management of this water trail most closely aligns with the Recreational experience classification with the exception of one segment. One segment of the river in Estherville, from 4th Street Bridge Access to School Creek Access, is excluded from the state water trail route until the low-head dam in Mike Mickelson Park is mitigated. This segment also includes a rubble rapids and neither hazard are signed or have a portage alternatives to avoid them. The dam is breached causing a flow line on the river right side. Other than this, the water trail is neither overly difficult nor set up to match the criteria developed for beginning paddler experience, confidence, and/or those not physically strong and agile. Appendix B, Water Trail Experience Classification Summary, summarizes key elements from the classification criteria (Wagner and Hoogeveen 2010).

The City of Estherville is the official water trail sponsor for the West Fork Des Moines River. A local non-profit organization, Emmet County Water Trails Association, formed in 2007 to promote the development of water trails in the county. A board of directors represents diverse stakeholders in the county including local municipalities, public health, law enforcement, county conservation, parks, economic development, paddlers and anglers. The association meets monthly and has been fundraising and promoting state designation of the West Fork Des Moines as a water trail.

Public support for state designation of the water trail includes strong enthusiasm as well as concerns. Public meetings held in 2014 and 2015 included feedback on both sides of the issue. Concerns raised included the possibility of trespassing, liability, littering, vandalism, and potential criminal activity due to increased use of the river. After the second meeting, both Emmet County Conservation Board and Emmet County Water Trails Association decided to pursue state designation. The non-profit also cosponsored development of an informational brochure (Appendix C) with Iowa DNR in 2018 based on the concerns raised in these public meetings. The brochure explains the legal rights and rules surrounding use of the river for both river users and adjacent landowners.

Beginner	Intermediate	Advanced
<p>Segments are generally less than six miles. Hazards are few and easy to avoid in normally slow-moving currents. Users can easily access these segments from parking areas, and will not need to portage, except to walk a boat around some shallow riffles or make the going easier around an obstacle.</p>	<p>Segments are generally less than nine miles. Users should have the ability to recognize and avoid hazards in moderate river flow. The need to portage is rare, but users should be able and willing to carry boats and gear a short distance. Access to the river may involve a short portage, and the launch or take-out may be a bit difficult.</p>	<p>Segments may exceed nine miles. Hazards are likely and often occur in fast-moving water. The need to portage may be frequent or may involve carrying boats and gear a long distance. Access to the river may involve a long portage, and the launch or take-out may be from steeper banks or faster moving water.</p>

Table 7
Segment length, hazards present and ease of accessibility are included in skill level rating estimations.

PHYSICAL CONDITIONS ON THE WEST FORK

How a river moves over the landscape across time is of interest to landowners, historians, and researchers, as well as the general public. The West Fork Des Moines River in Emmet County has seen a great deal of change since survey records were first made in this area in the 1850's. The changes were both a result of natural channel evolution in response to land use and cover changes in the watershed as well as a result of deliberate straightening by the Works Progress Administration (WPA) and others in the 1930's. Despite these changes however, the channel today has returned to its meandering channel pattern and its behavior is controlled largely by natural river forces (Artz and Bettis 2015). Two types of data were included in this analysis including aerial photograph reconnaissance and a planform comparison of channel alignment changes in the past thirty years.

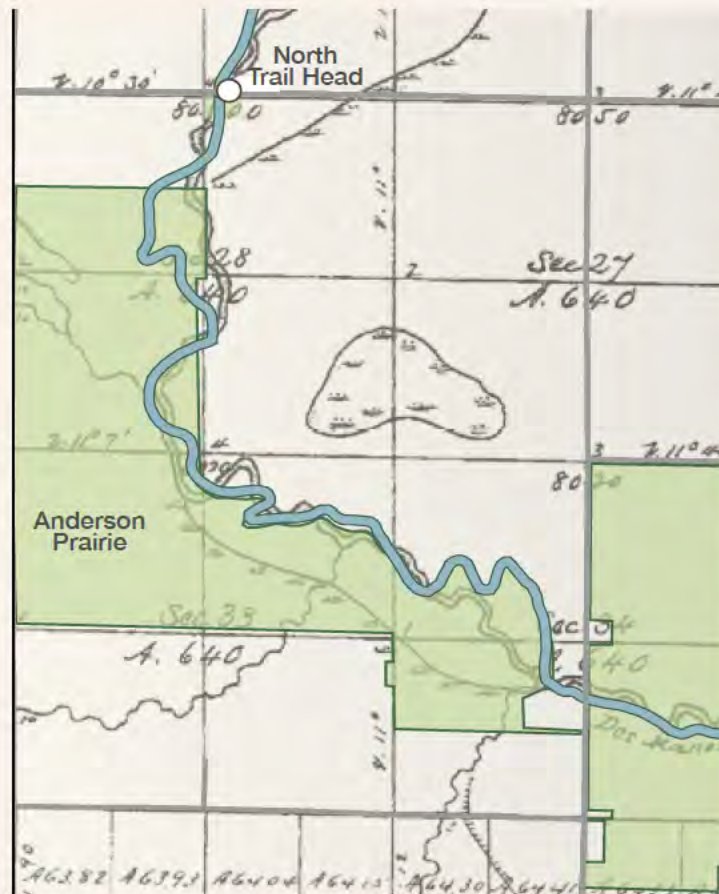


Figure 2
General Land Office (GLO) Survey maps illustrate a meandering channel pattern in 1855-56 throughout the entire county. A comparison is shown here in the area between the GLO map and the current river near what is today known as the Anderson Prairie Complex Wildlife Management Area.

Channel Conditions

Several quantitative methods for estimating channel change are available even with limited data. Historic maps provide the earliest suggestions of river alignment in Iowa. However, river alignment on early maps can't be quantitatively compared with later aerial photography because the maps were drawn with much different accuracy standards. For example, Government Land Office (GLO) surveyors of the mid-1800's as well as the 1875 Andreas Atlas preparers were required to verify the river crossing locations only at section lines. However, important generalizations can be made about historic channel shifts and the extent of modifications despite this comparison limitation.

The GLO mapping survey for Emmet County was completed between 1854 and 1855. River alignment on section lines from this survey was compared with those on the 1875 Andreas Atlas to provide context for changes during the first fifty years following Euro-American settlement. Aerial photography was used to compare channel alignment between 1939 and 2010. Lastly, the GLO and 1875 alignments were compared with 2010 aerial photography.

The character and form of the West Fork Des Moines River in Emmet County remains similar to that illustrated on the GLO survey from mid-1800 up to the present time (Figure 2). A majority of the study segment has been consistently represented as an actively meandering river in the data sets and historic aerial photos available for study. And although the channel has been continually meandering in the datasets available, its current location can vary from what is shown on historic maps. At least some of these shifts in channel location are likely due to river straightening, probably during the early 1900's although no records of this engineering are known to exist.

A majority of the river in Emmet County had recovered a meandering pattern from its early 1900's straightening by the time of the first aerial photos in the late 1930's. However, one obvious example of past channel change in Estherville is visible on historical aerial photos. At some point between the 1950's and 1970's, a 0.26 mile length of the river near 4th Street was realigned and relocated (Figure 3). A portion of the pre-1930's channel still holding water remains on the east side of the river adjacent to North 4th Street. The 4th Street alignment crossing the river was also shifted at the same time; today's location of is 465' downstream of the original location. Beyond this shift, there are few changes in alignment between the 1950's and today. More specific analysis on the channel between 1980 and today document that channel locations have been relatively stable, with only gradual changes over time.

There has been little change in sinuosity and length since 1980 (Table 8). The largest change since 1980 has been on the segment upstream of the 4th Street Bridge in Estherville. This segment increased in length by 5% in the thirty-year gap studied; the degree of sinuosity on this segment has also increased since 1980. These two factors are related to each other as a river segment that has lengthened must have also increased its amount of curvature in order to create this extra length. However, the total study length is only 0.24 miles longer today compared to its 1980 length. This suggests the river system is fairly balanced in terms of channel stability and properly located infrastructure is likely to remain stable.



Figure 3
By the mid-1970's the West Fork Des Moines River channel and the 4th Street Bridge had been relocated. One section of the former channel (circled) still retains groundwater.

Segment	Straight Line Length (mi.)	1980 Length (mi.)	2007 Length (mi.)	% change in length between 1980 – 2007	1980 Sinuosity	2007 Sinuosity
Petersburg, MN Access MN to North Trail Head	4.23	5.90	5.73	-3%	1.4	1.4
North Trail Head to 4th St Bridge	4.38	5.88	6.16	+5%	1.3	1.4
4th St Bridge to School Creek Access	1.08	1.11	1.12	+1%	1.0	1.0
School Creek Access to River Hills Access	1.05	1.21	1.22	+1%	1.2	1.2
River Hills Access to Peterson Access	5.96	7.90	7.73	-2%	1.3	1.3
Peterson Access to Lammers Landing	6.57	8.66	8.46	-2%	1.3	1.3

Table 8
River Channel Calculations for West Fork Des Moines River, Emmet County

Stream Assessment

Field assessment was conducted during summer 2017 by Iowa DNR and ISU personnel. Observations from this assessment add more detailed information to what is known about the river condition both from a water quality standpoint and from a recreational experience.

The general shape, depth and stability of the river channel was assessed at 5 locations on the water trail using the BEHI (Bank Erosion Hazard Index) method (Rosgen 2001). The BEHI method uses six metrics to describe the relative hazard of erosion at a particular location and is useful in prioritizing mitigation. Results document changes in typical conditions on the water trail from north to south. The channel becomes more incised and is more prone to erosion as it moves downstream to Graettinger as compared to upstream areas (Figure 4). Streambanks downstream also become steeper and contain less perennial vegetation compared to upstream sections. Additional information collected during assessment is organized into two categories, water quality and recreation-related.

BANK EROSION HAZARD RATING	
Rating	Index Total Score
Very Low	5-9.5
Low	10-19.5
Moderate	20-29.5
High	30-39.5
Very High	40-45
Extreme	46-50

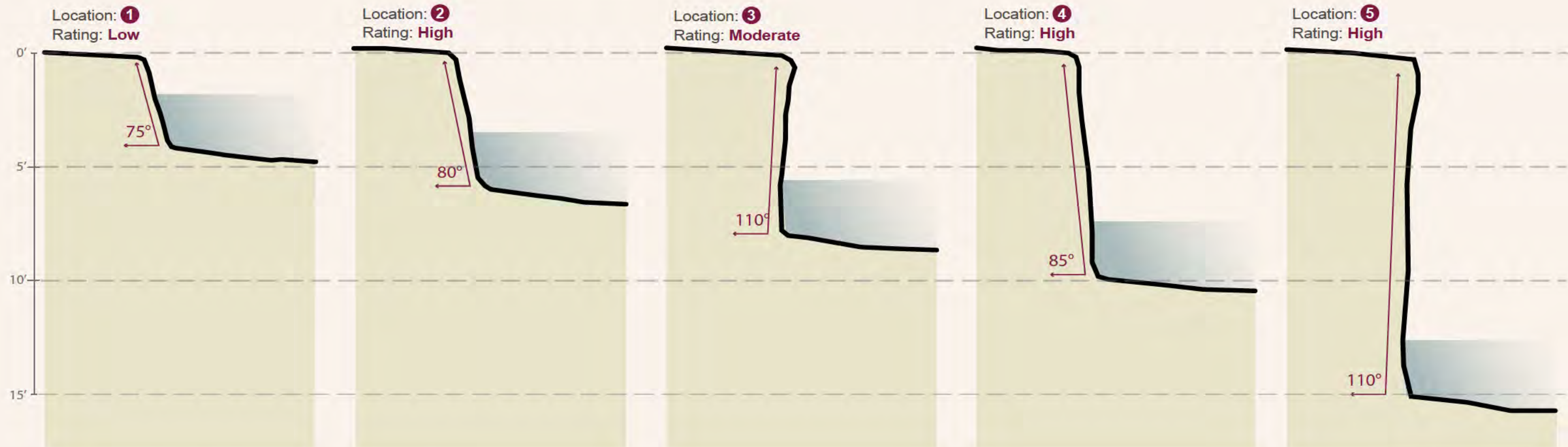


Figure 4

Stream bank characteristics change over the course of the water trail. Upstream segments typically are less steep and lower compared to typical downstream locations. These physical differences are interrelated to the stream bank vegetation with areas of perennial vegetation typically being more resistant to bank erosion and failure.



Water Quality-Related Results

Factors included in the stream assessment relating specifically to water quality conditions include the extent and severity of streambank erosion and access to the river by livestock. Both erosion and livestock contribute nutrients to the river as well as increased turbidity (cloudiness of water); animal waste also introduces bacteria to surface waters. Instances of streambank erosion were assessed and mapped for the entire reach using a rapid, qualitative erosion and sediment delivery tool developed by USDA NRCS.

Some streambank erosion is common and expected on meandering rivers such as the West Fork Des Moines. The most severe erosion identified in 2017 was limited to several specific areas, while less severe instances are common throughout the county (Figures 5, 6); these instances include segments upstream of the North Trailhead Access and between Peterson Access and Burr Oak Road. Instances of erosion upstream of Estherville are generally contributing to lateral channel migration or channel avulsion or shortening while erosion downstream of Estherville is generally contributing to channel widening. Often the most severe instances of erosion are found on segments of the river where livestock have free access to the channel, including the Minnesota portion of the water trail and just upstream of Burr Oak Lake WMA. Erosion near and inside the city limits of Estherville is some of the least severe on the water trail (Figure 7).

Five of the twenty-two tile and storm drain discharge pipes identified on the water trail are clustered in close proximity to the Highway 9 crossing in Estherville (Figure 7). Nearly all the remaining tile discharges are located downstream of Peterson Access. Both the shallow groundwater and surface runoff discharged by these pipes are known to contribute nutrients. At least two of the agricultural drainage tiles were broken and causing excessive erosion at the rivers' edge.

Recreation-Related Results

Factors included in the stream assessment that can be translated to recreational experience include channel blockages by large woody debris, the presence of stream-wide livestock fencing and areas of active channel avulsions. Channel blockages, while providing valuable fish habitat, can cause a hazard to river users, particularly beginners who lack the skills to navigate them safely. The greater the percentage of blockage, the more disruption is possible to river users. Paddlers can be required to portage around these blockages during time of low flow. The location and size of channel blockages is constantly changing based on precipitation and flow rates. At least one blockage of at least 70% of the channel is present on every segment of this water trail (Figure 8). Notable concentrations were identified in the Minnesota segment, near Anderson Prairie Complex WMA, and between 200th Street and Burr Oak Lake WMA in Emmet County. Only one instance of channel wide livestock fencing was observed in 2017; this was located on the Minnesota segment of the water trail.

The channel is in the process of avulsion, or shortening, at two locations upstream of Estherville. The locations are 1.2 miles apart beginning a few minutes (approximately 0.5 miles) downstream of the North Trail Head Access (Figure 9). Avulsion is a naturally occurring process where the channel shortens its distance by cutting off a meander bend. Where this occurs in forested areas, this results in large amounts of downed trees. When paddlers come across a channel condition that is split, such as an avulsion in progress, they are usually seeking the route with the highest flow and the least blocked by downed trees and deposits of sand. It can be unclear which is more passable. While the avulsion process generally does not require human intervention and is an interesting occurrence to experienced river users, avulsions can be confusing and difficult for less experienced river users to encounter.

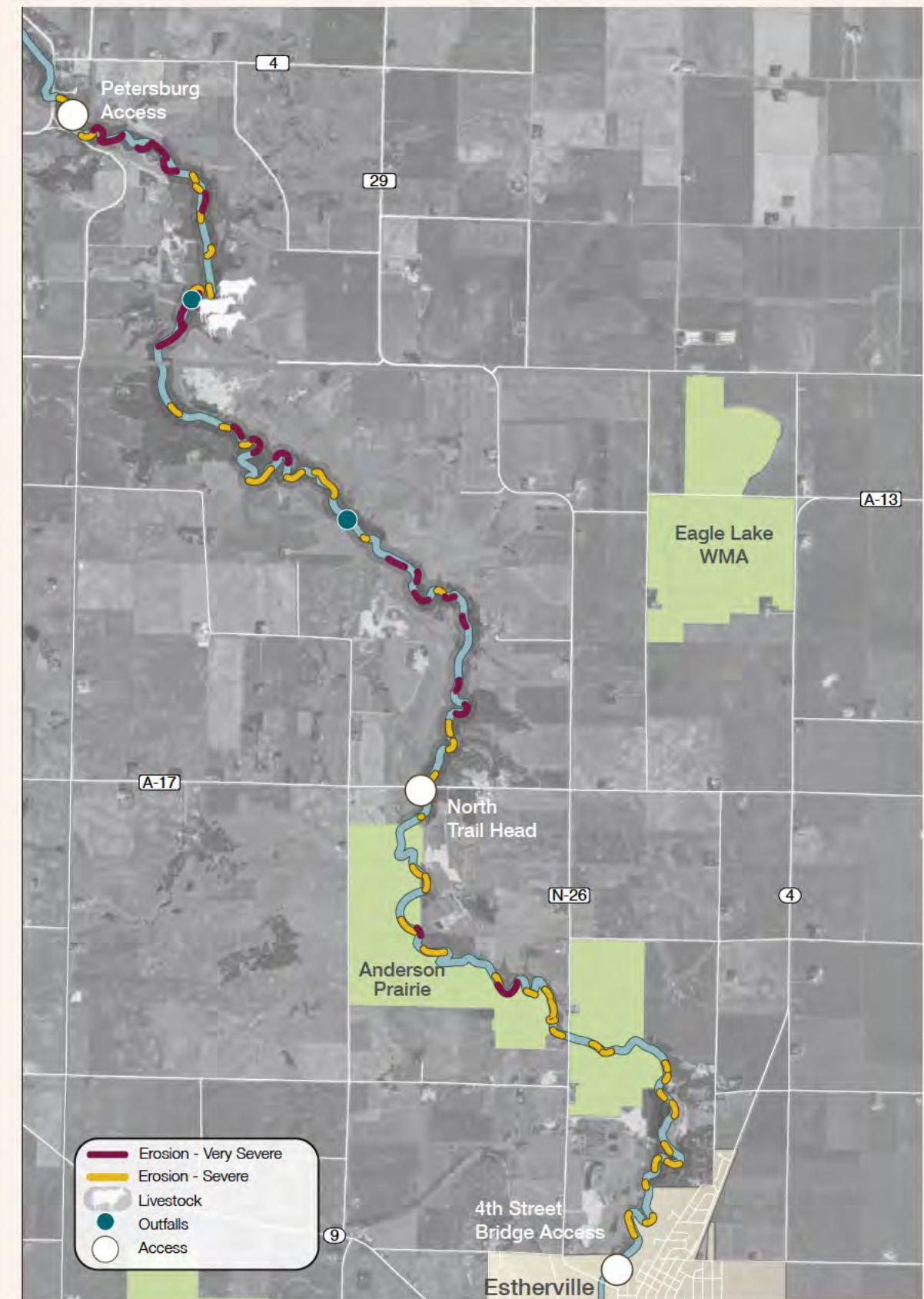


Figure 5
Very severe streambank erosion, shown in red above, are common on outside bends of the river upstream of the North Trailhead Access. Cattle were observed in and near the river and contribute to streambank instability and increased nutrient and bacteria loading.



Figure 6
 The majority of cattle grazing in the river channel in Emmet County was observed to be between Wallingford and Graettinger. This area also had the most severe streambank erosion.

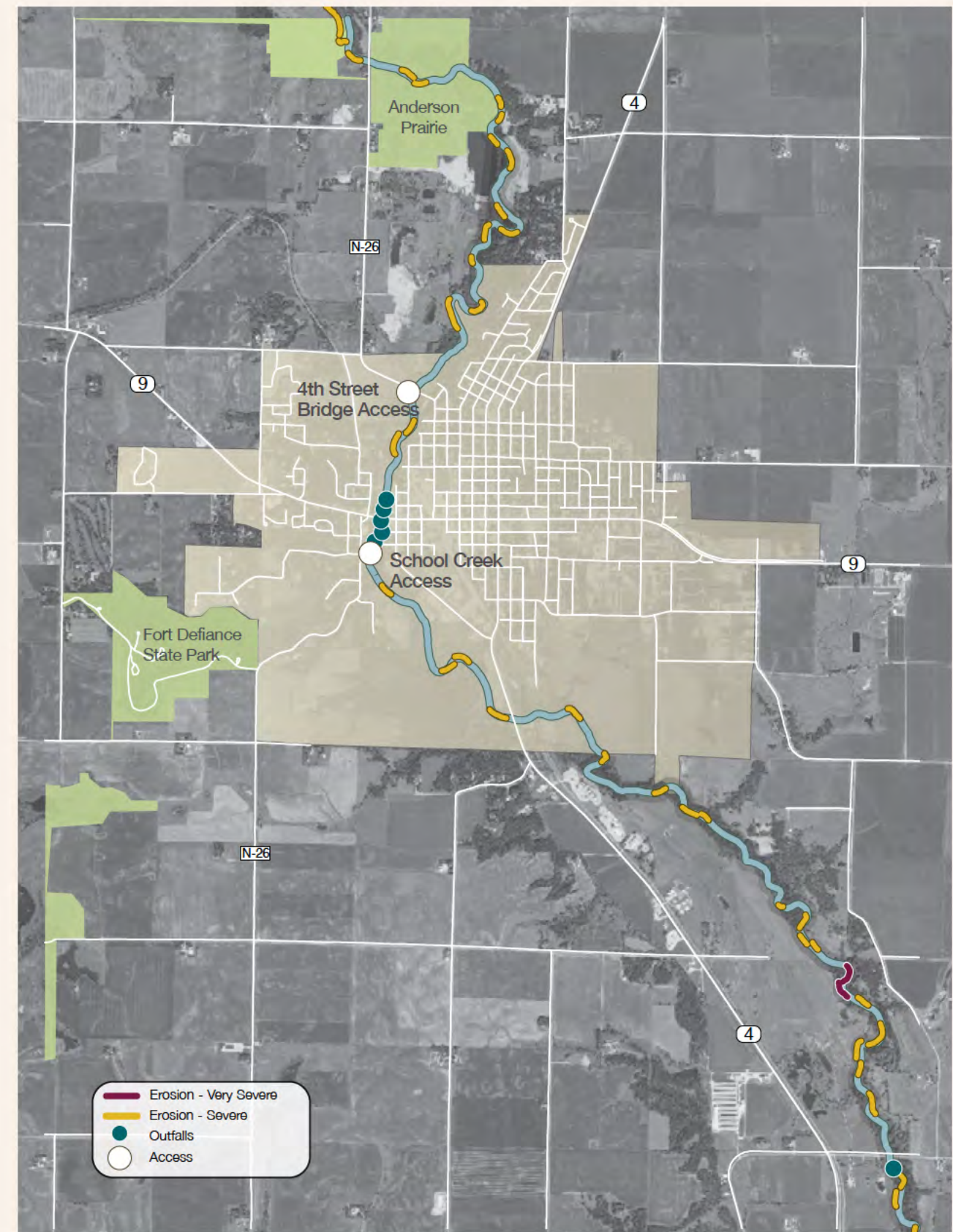
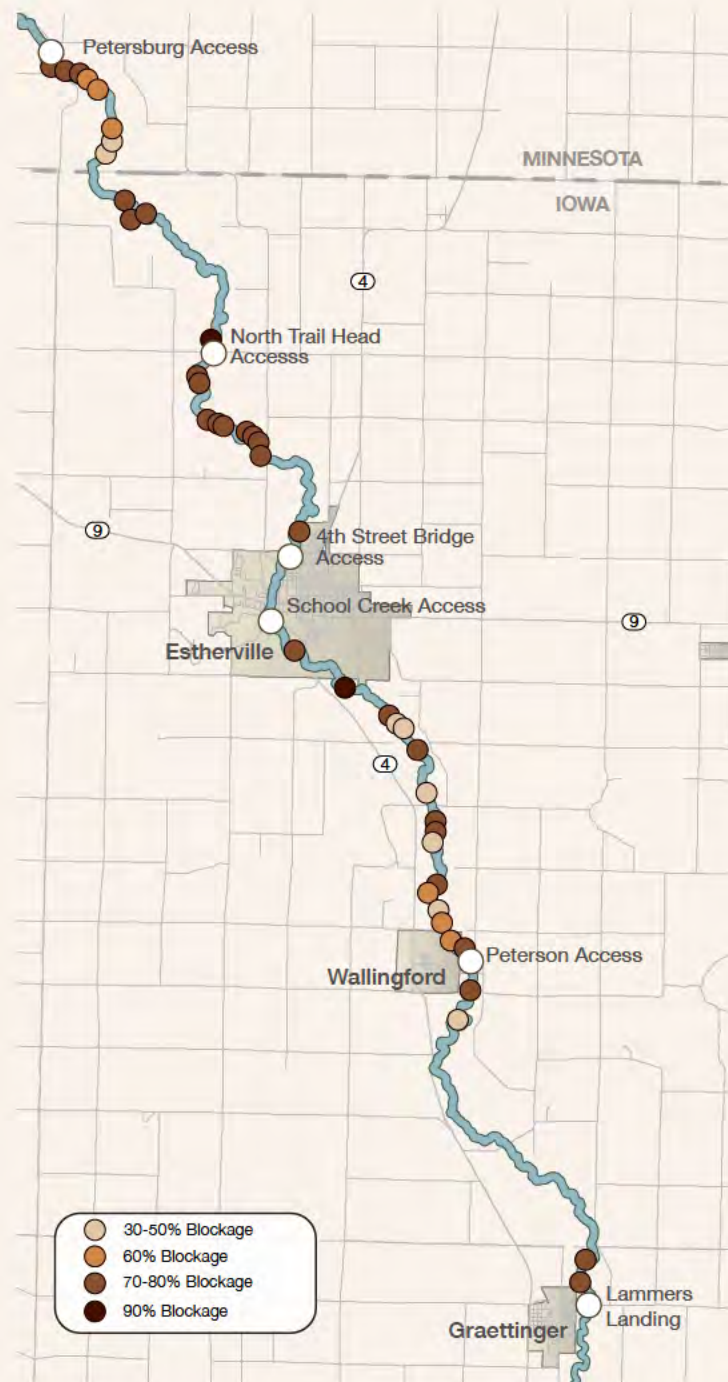


Figure 7
 The river channel inside the city limits of Estherville has been straightened and has less streambank erosion compared to other parts of the water trail. The 5 storm drain outfalls identified near the Highway 9 bridge carry stormwater to the river from surrounding areas.

Riparian Landcover Conditions

The edge of the river or transition between an aquatic ecosystem and its upland area is known as the riparian zone. Riparian areas are linear in shape and occur along the margins of all water bodies including wetlands, lakes and rivers. The vegetation or other cover on the land surface in the riparian zone is considered the riparian land cover. Land cover in a riparian area has a strong influence on water quality, streambank condition, the rate of lateral channel migration and habitat both on the land and in the adjacent aquatic area.



Research consistently shows that perennial riparian land cover such as trees, shrubs and native grasses are more beneficial for all ecosystem services compared to development or annual row crop land cover. Row crop activity at the top of tall and steep streambanks cause further instability in streambank soils and often exacerbate eroding streambank conditions. This is due to the nature of annual vegetation root systems and the use of heavy agricultural machinery near the fragile edge of the streambank.

A riparian area is often referred to as a “buffer” when perennial land cover is present. Landowners often intentionally establish perennial vegetation buffers near stream edges for conservation purposes. In other cases, vegetation buffers establish naturally because the area is not cropped. The optimal width of riparian buffer vegetation is dependent upon its intended goals. Common buffer designs range from a minimum of 100’ to greater than 500’ depending on the purpose of the buffer and watershed conditions (Bentrup 2008).

Riparian areas within 100’ of the top of streambanks on both sides of the West Fork Des Moines River were evaluated using landcover data from the 2016 cropping year to better understand the presence or absence of beneficial riparian buffer vegetation (Figure 9). Land cover data was derived from the USDA, National Agricultural Statistics Service Cropland Data Layer (CDL). The CDL is produced using satellite imagery (USDA NASS, 2016). The river corridor was divided into segments based on river access points. Landcover in each of the six segments was divided into five types: annually-cultivated crops, perennial grass and alfalfa, forest or predominantly tree cover, wetland vegetation, and other (pavement and buildings). Acres of each landcover type were calculated for each segment and the total acres of each are shown in Table 9. Ninety-six percent of the riparian area on this water trail included perennial vegetation in 2016, appropriate for buffering.

Figure 8
River channel blockages by large woody debris are important fish habitat. They also can be a hazard to beginning paddlers who lack the skill to maneuver their boat around them. Low water conditions can also require river users to portage (walk their boat) around the blockage.



Figure 9
The current aerial photograph of the North Trailhead Access are shown here along with the mid-1970’s channel centerline (shown in pink). Few changes in channel location occurred during this fifty year period. However the channel is creating two avulsions. These cut-off sections are shown with a dashed line. The main flow of the channel will eventually occupy these new channel areas.

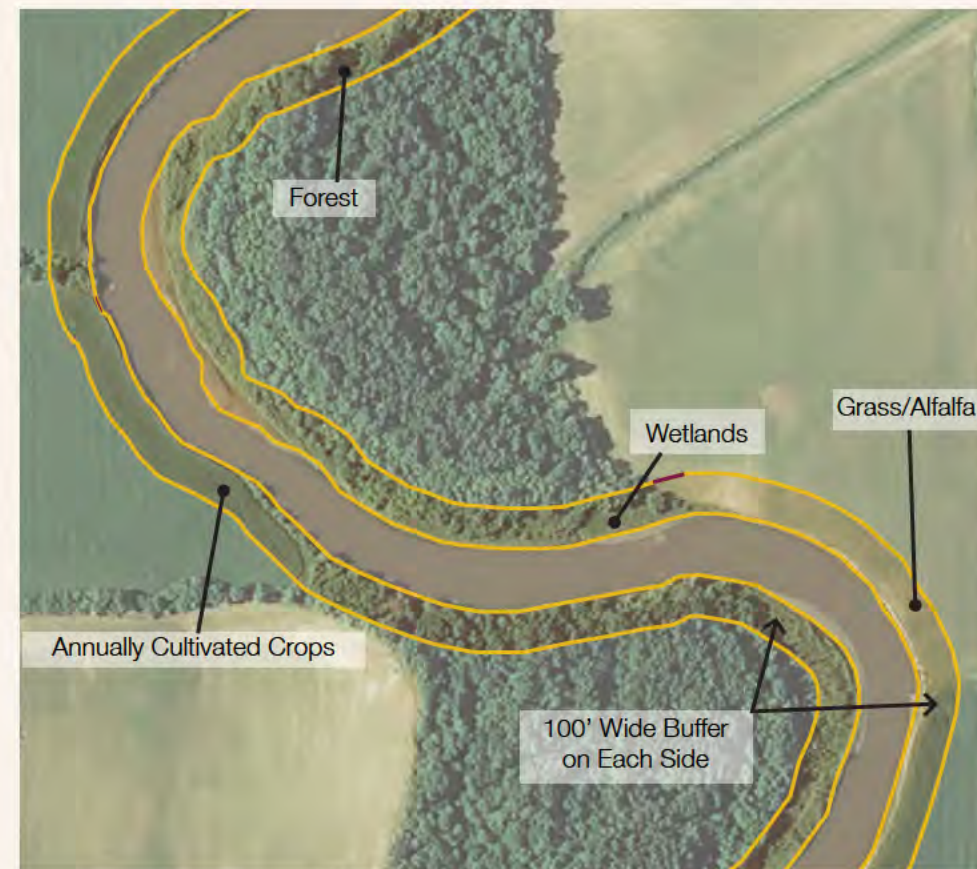


Figure 10
Yellow lines illustrate the top of the streambank and a distance approximately 100’ away from the edge. Landcover inside these lines was identified for the length of the water trail. A perennial buffer is present on 96% of the acres included in this 100’ buffer Iowa River water trail. FIND REFERENCE IN TEXT

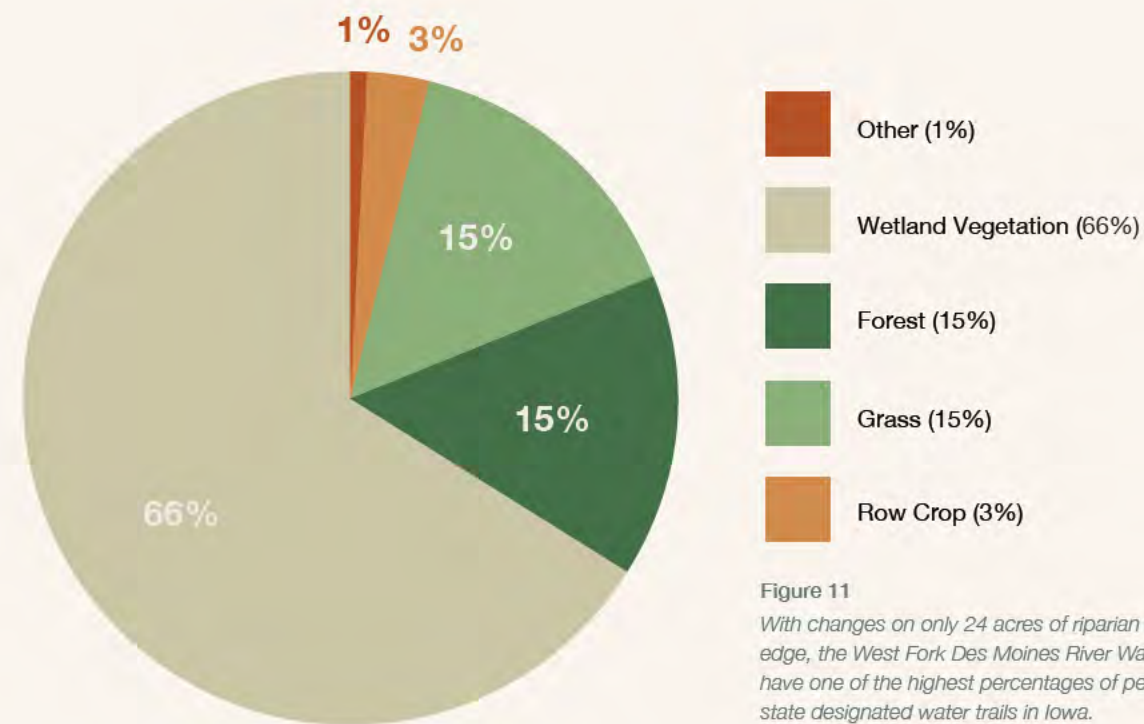


Figure 11
With changes on only 24 acres of riparian land at the stream edge, the West Fork Des Moines River Water Trail could easily have one of the highest percentages of perennial buffer of all state designated water trails in Iowa.

While perennial landcover averages out to include 96% of the 100' corridor on each side of the river channel, some segments contain far greater amounts of this preferred cover type compared to others (Figures 10 and 11). Two major opportunities exist on this water trail to enhance the riparian land cover conditions, one related to agricultural use and another related to urban uses. Riparian conditions upstream of Peterson Access are generally more conducive for channel condition and habitat compared to those downstream of Peterson Access in terms of the presence of annually-cultivated cropland. The Peterson Access to Lammers Landing segment is the only one on this water trail with greater than 3% of annually cultivated crops in the buffer area. Cropland at the top of the streambank is the least stable form of land cover and results in higher streambank erosion rates compared to forest and wetland land cover. The area between the 4th Street Bridge Access and Mike Mickelson Park contains the highest percentage of mown grass on the water trail; similar to cropland, mown grass is one of the least desirable forms of near-stream land cover from a river stability and a habitat standpoint.

The relatively high proportion of wetland vegetation identified by satellite data on some segments of the water trail contributes to high quality habitat conditions, more stable streambanks and desirable views for river users. High proportions of wetland vegetation near the channel are most commonly a result of high water table elevations due to underlying soils and geology. Low streambank heights and frequent flooding can also contribute to the presence of wetland vegetation. These types of areas are

often less successful for annual crop production.

Numerous groundwater seeps observed on streambanks (Figure 12), former river channel backwater areas and wetland plants visible on upstream segments observed while paddling confirm the conditions identified by satellite land cover data. These conditions on the West Fork provide a valuable contrast with conditions on other state-designated water trails where annually cultivated crops are common at the top of the streambank. Wetland vegetation includes both forested conditions, such as willow and cottonwood trees (Figure 13), as well as herbaceous vegetation such as sedges and swamp



Figure 12
Groundwater seeps mixed with native wetland vegetation occur sporadically.

Land Cover Type	Water Trail Segment					
	Petersburg, MN Access to North Trail Head	North Trail Head to 4th Street Bridge	4th Street Bridge to School Creek Access	School Creek Access to River Hills Access	River Hills Access to Peterson Access	Peterson Access to Lammers Landing
Annually Cultivated Crops	1.65 (1%)	4.40 (3%)	0 (0%)	0.51 (2%)	2.61 (1%)	14.26 (7%)
Perennial Grass & Alfalfa	30.97 (25%)	9.78 (6%)	3.4 (13%)	2.23 (8%)	18.81 (10%)	39.59 (20%)
Forest	44.77 (36%)	29.59 (20%)	8.57 (32%)	10.60 (37%)	8.23 (4%)	8.00 (4%)
Wetland Vegetation	47.64 (38%)	106.69 (71%)	11.44 (42%)	14.43 (50%)	155.11 (84%)	137.96 (68%)
Mown Lawn, Development	0.29 (0%)	0.23 (0%)	3.79 (14%)	0.84 (3%)	0.67 (0%)	2.16 (1%)
Totals	125.32 (100%)	150.69 (100%)	27.20 (100%)	28.61 (100%)	185.43 (100%)	201.97 (100%)

Table 9
Each segment of the water trail includes a relatively high proportion of wetland vegetation compared to other state water trails. The presence of this type of vegetation is a result of a high water table, frequent flooding and land management choices.



Figure 13
Native willow found on stream banks indicate high groundwater.



Figure 14
Monkeyflower is a native wetland species identified growing on sandbars.

Water Quality Conditions

Discussions about water quality nearly always focus on the concentrations of various elements such as dissolved oxygen, nutrients and pesticides. In addition to these chemical characteristics, physical and biological characteristics also factor into the quality of streams, rivers, and lakes. Physical characteristics are the ones we generally can see, smell or taste such as the temperature or the turbidity (cloudiness) of the water. Biological characteristics include the presence or absence of bacteria as well as the diversity of aquatic insects and fish species. It is increasingly recognized that other physical factors such as wide and shallow channels, channel beds dominated by fine sediments, bed and streambank instability, and fragmentation by culvert crossings or dams can limit biological diversity.

Measuring water quality involves comparing the concentrations of selected chemical, physical and biological elements with state standards that define water's suitability for a particular beneficial use such as swimming, aquatic life protection, drinking water source, or fish consumption. Aquatic life in a stream segment is also assessed using rigorous biological monitoring methods that allow ranking of biological quality. Water quality standards are important because they help identify many types of water quality problems. Standards are particularly helpful in assessing and solving water quality problems stemming from point sources of pollution including municipal wastewater discharges, industrial operations and mining sites. Standards do not currently exist in Iowa for nonpoint source pollutants such as nutrients and sediment.

Impaired Waters

According to Section 303(d) of the federal Clean Water Act, a beneficial use of a water body is considered "impaired" when the water in the river segment or lake is sampled and fails to meet any one of the standards set to protect that beneficial use. Federal regulations require that all states compile and submit to EPA a list of waters considered "impaired"; this list is updated with new data every two years. States must prepare a water quality improvement plan for all Section 303(d)-impaired waters to show how the impaired beneficial use can again be fully supported. Only when additional monitoring shows that the all standards are met and the beneficial use is again fully supported can the impairment be removed. In practice, Iowans are swimming, fishing, and boating waters whether or not they meet the water quality standards. It's important to note that "impaired" status only occurs when monitoring data documents the conditions present. Many river segments are not monitored and, hence, can have impaired conditions without the public knowledge of their conditions.

The West Fork, Des Moines River within Emmet County is not included on Iowa's 2016 List of Impaired Waters (also known as the 303(d) List). Substantial lengths of the Des Moines River both upstream and downstream of the study segment, however, are listed as impaired (Figure 15). The Minnesota portion of the West Fork Des Moines River between Windom Dam and Jackson Dam were first included on the 303(d) list in 1994. Minnesota's Proposed 2018 303(d) list identifies the segment between Jackson MN and the Minnesota/Iowa state line as impaired uses for aquatic consumption (mercury in fish tissue), aquatic life (turbidity, low diversity of fishes and invertebrates) and aquatic recreation (fecal coliform). Downstream from the water trail route, a portion of the river in southern Palo Alto County is included in Iowa's 2016 303(d) list as impaired for aquatic consumption (mercury in fish tissue); the advisory is for no more than 1 meal per week. This impairment extends to the confluence of the West and East Forks of the Des Moines River in Humboldt County.

The Des Moines River spans the entire state of Iowa diagonally, from Emmet County in the northwest corner of the state to Lee County in the southeast corner. Nearly the entire length of the river, with the exception of Emmet and most of Palo Alto counties, are included on Iowa's 2016 Impaired Waters List (Figure 16).

Emmet County lakes included on Iowa's 303(d) impaired waters list include Ingham, West Swan, High and Twelve-Mile. Impairments for all these lakes include algal growth (chlorophyll a) and turbidity (suspended solids).

Water quality impairments on the West Fork Des Moines Water Trail or in its watershed fit the general description of the Upper Des Moines Watershed prepared by USDA-NRCS in 2008. The watershed was identified in 2008 for A Rapid Watershed Assessment conducted in 2008 identified multiple water quality concerns including sediment, nutrients, and pathogens as major pollutants impacting surface waters. A variety of human activities were listed as contributing directly to pollutant loads in the water bodies, including intensive row crop agriculture, urban storm runoff, failing septic systems, and Confined Animal Feeding Operations (CAFOs). The assessment also noted that changes in hydrology due to stream channel straightening, subsurface drainage systems, wetland destruction, and lack of perennial ground cover has resulted in flashy stream flows, streambank instability.

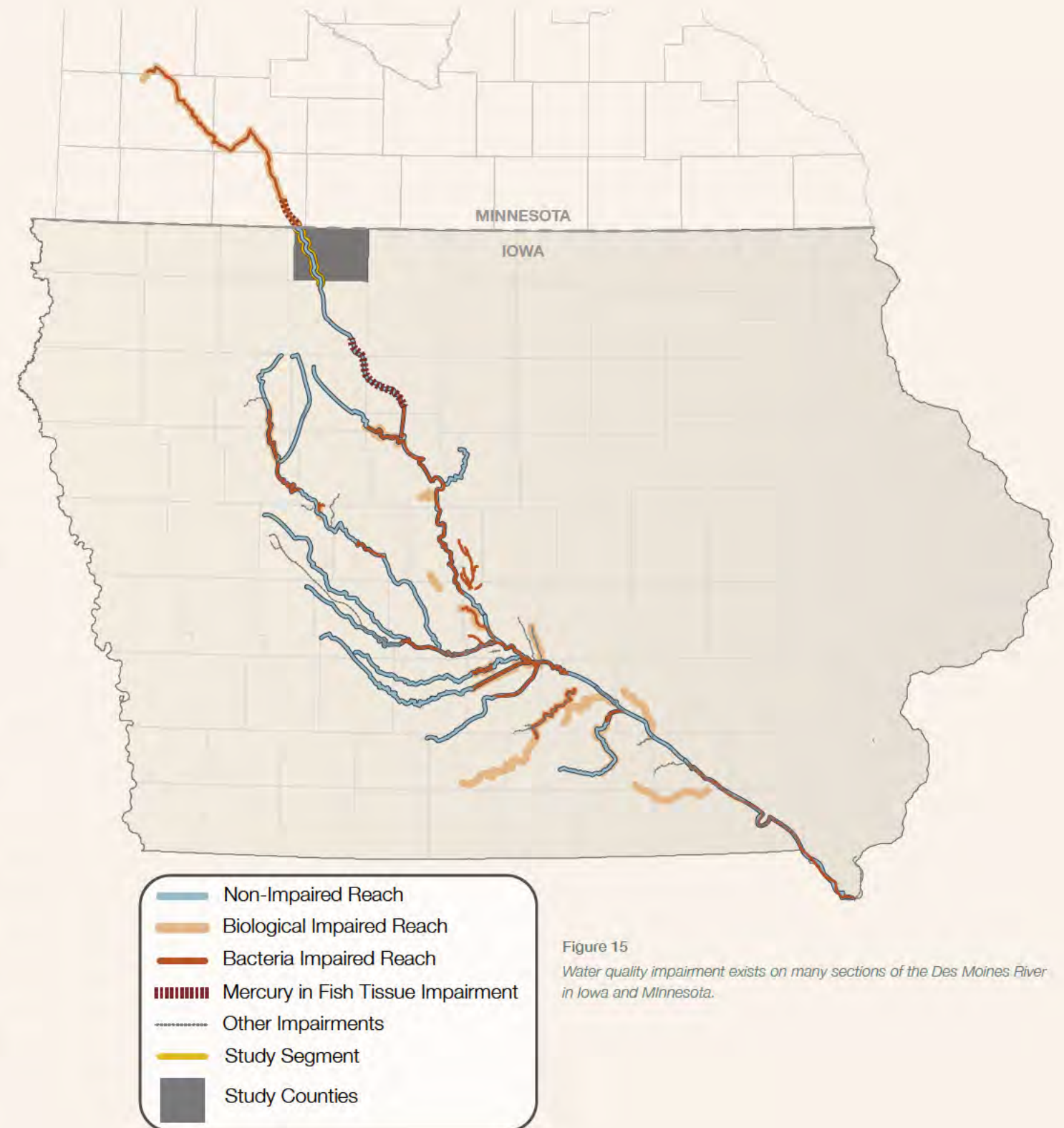


Figure 15
Water quality impairment exists on many sections of the Des Moines River in Iowa and Minnesota.

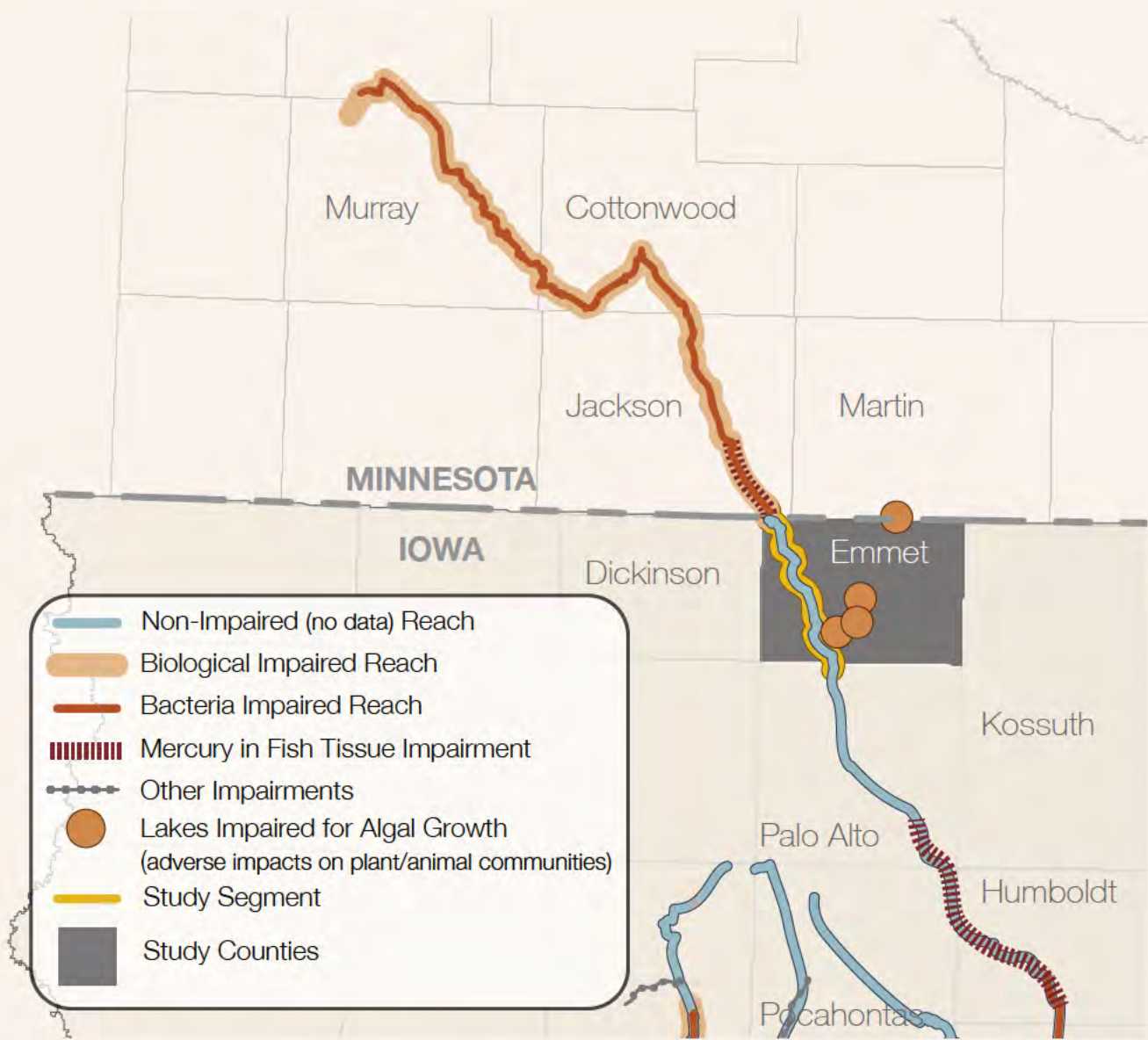


Figure 16
 Water entering Iowa from Minnesota are impaired for both biological and bacteria conditions. There are also fish consumption warnings due to mercury content in fish tissue.

Water Quality Initiatives

Local, coordinated efforts to initiate water quality enhancement are an important indicator of local and / or regional commitment to water resources. Multiple types of organizations often participate in these efforts in Iowa including federal and state agencies, county government, soil and water conservation districts (SWCD's), conservation non-profit organizations and commodity groups. Several types of funding mechanisms exist to direct resources toward initiatives on agricultural land in critical watersheds. Examples of these include the USDA-NRCS Mississippi River Basin Healthy Watersheds Initiative (MRBI), the Iowa Water Quality Initiative (WQI) and the Iowa DNR Lake Restoration Program. Prioritized Nutrient Management Strategy Watersheds are an example of critical geographic areas identified for water quality enhancement in the state. Assessments and planning efforts are used to develop strategies for enhancing water quality conditions. Total Maximum Daily Load (TMDL's) and their linked 9-element watershed management plans are examples of these strategies. These strategies are then implemented as funding becomes available. Watershed Management Authorities (WMA) is a mechanism for cities, counties, SWCD's and stakeholders to cooperatively engage in watershed planning and management including water quality enhancement.

Funding sources include state, federal and local entities as well as private sources. Federal examples include USDA programs such as the Environmental Quality Incentives Program (EQIP) and Conservation Reserve Program (CRP) and EPA Section 319 administered through Iowa DNR. At a state level in Iowa, important sources include Watershed Protection Funds

and Watershed Improvement Review Board (WIRB), both administered through the Iowa Department of Agriculture and Land Stewardship. Two statewide community-based participation efforts focus on water quality. Project AWARE (A Watershed Awareness River Expedition) engages volunteers in water quality and aquatic habitat enhancement through an annual 7-day trash removal expedition.

Emmet Soil and Water Conservation District (SWCD) has been successful in obtaining funding for a local water quality initiative in the Tuttle Lake watershed. A total of \$154,350 was awarded to this water quality enhancement project in between 2010 and 2012 through the WIRB program. These funds addressed sediment load reductions into Tuttle Lake by practices and structures that trap sediment such as grassed waterways, wetland enhancements, filter strips and grade stabilization in channels. Several watershed projects downstream of the study reach in Delaware County have also been active. The Bear Creek Watershed Project received \$1.3 M between 2006-2009 for sediment, bacteria and nutrient reductions as well as manure management. Similar projects were also funded in the Farmers, Mineral and Prairie Creeks watersheds between 2003 and 2007 with an additional \$1.6M in funding. The Silver Lake Water Quality Project in Palo Alto County received \$105,921 in 2006 EPA Section 319 funds from Iowa DNR. The objective of this project was to reduce the volume of sediment and nutrients entering Silver Lake and to implement an information/education program regarding the project, conservation, and water quality efforts being undertaken.

Context of the River

WATERSHED CHARACTERISTICS AND CONDITIONS

This study area is located within the Des Moines Lobe ecoregion (Figure 17). There are seven state-designated water trails in Iowa already existing within the Des Moines Lobe ecoregion although most are concentrated in the Des Moines metro area.

The concept of “ecoregions” is used to characterize and group geographic areas with similar climate, soils, and topography. Together, these three elements result in specific plant and animal patterns and form distinct ecological patterns unique to each ecoregion.

The Des Moines Lobe ecoregion is distinguished by Wisconsin glacial stage landforms currently under extensive agriculture.

Level to gently rolling hills with some areas containing morainal ridges, hummocky knob and kettle topography. Lack of loess over the glacial drift, the stream network is poorly developed and is widely spread. Almost all of the natural lakes of Iowa are found in the north portion of this ecoregion (Chapman et al. 2002).

The drainage basin or watershed area draining in the West Fork, Des Moines River segment being studied includes 452,448 acres (Figure 18). A majority of the watershed acres (76%) was annually cultivated cropland in 2013 (Table 10). Developed areas, including roads, neighborhoods and buildings, totaled 8% of the watershed.



Figure 18
The study segment is located in the bottom portion of the watershed. Therefore, this portion of the river is influenced by the entire watershed.

West Fork Land Cover Type	2013 Acres*
Annually Cultivated Crops	343,953
Grassland, Pasture, Alfalfa	54,283
Forest, Woodland, Shrubland	5,403
Wetlands	13,961
Developed Land	34,848
TOTAL ACRES IN WATERSHED	452,448

Table 10
Land cover from the 2013 crop year was used to characterize the watershed that supplies the West Fork Des Moines River Water Trail in Emmet County. The proportions of land cover types are very typical compared to other Iowa water trails studied in 2014.
*Land Cover Source: USDA National Agricultural Statistics Service, Cropland Data Layer 2013

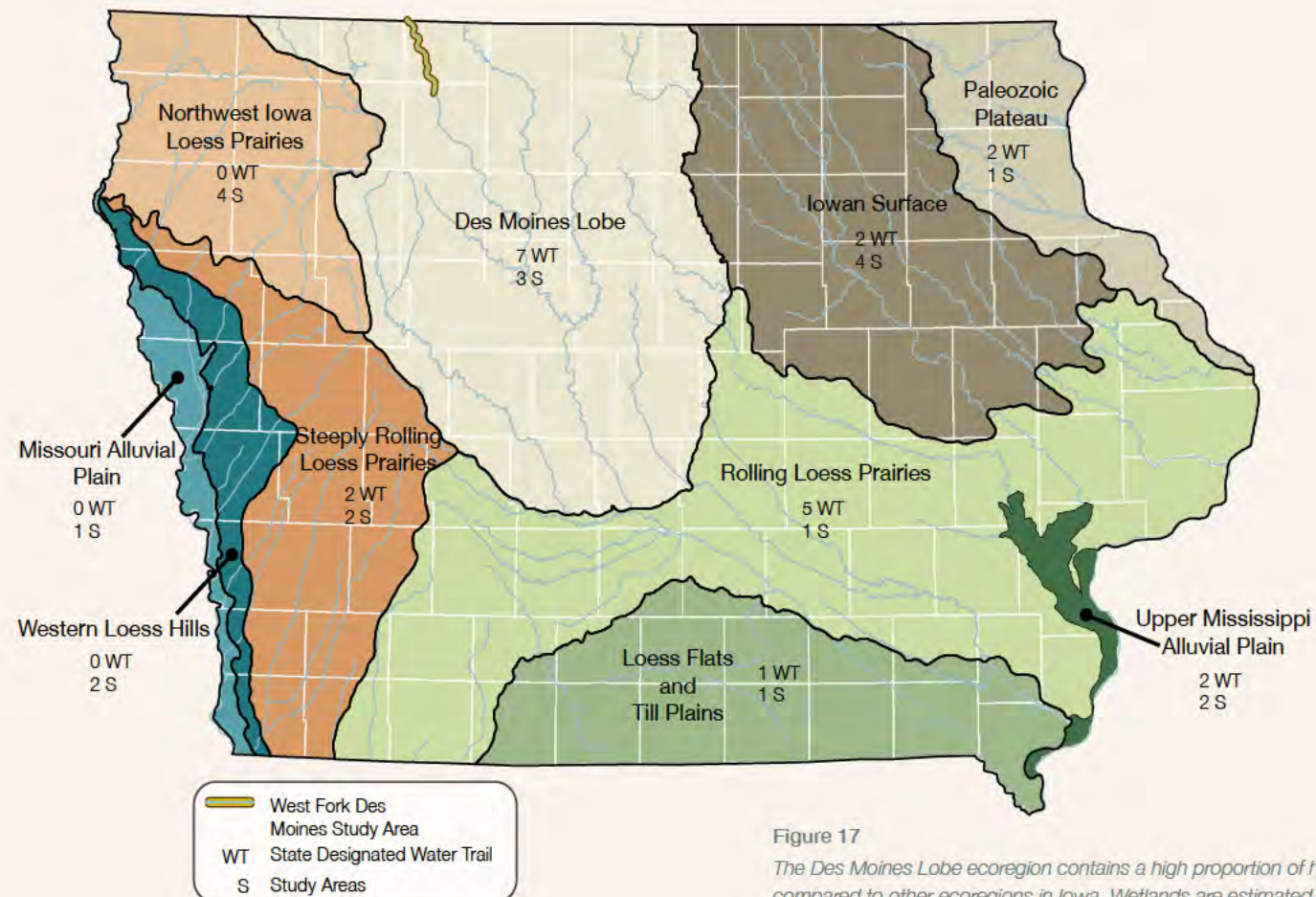


Figure 17
The Des Moines Lobe ecoregion contains a high proportion of hydric soils compared to other ecoregions in Iowa. Wetlands are estimated to have covered 50% of the ecoregion at the time of Euro-American settlement (Gallant and others, 2011).



GEOLOGIC RESOURCES

Geologically, the region of the West Fork Des Moines Water Trail is very young, especially when compared with other regions of Iowa. Geologists Joe Artz and Art Bettis reviewed data and existing mapped conditions near the water trail and summarized the area's geologic past. The below geologic information is based on their 2015 report unless otherwise noted. The soils and landforms found in the area are a direct result of glaciation that began approximately 17,000 years ago (Bettis et al. 1996). Land on either side of the West Fork Des Moines is underlain by a jumbled mix of rock types and sediments eroded by the glacier as it moved south through Minnesota from Canada. A visible major geological feature, the Algona Moraine, can be seen on the east side of the West Fork Des Moines River and the older Bemis-Altamont moraine can be seen on the west side. The moraine is relatively close to the river channel through much of Emmet County (Figure 19). Moraines, which appear as ridges in our landscapes, consist of long linear deposits of rocks and sediment carried by the glacier; these deposits occurred where a glacier stopped and melted back. The West Fork Des Moines River originally formed by carrying meltwater from the Algona Moraine. The Algona Moraine is one of three major moraines in Iowa resulting from the Des Moines Lobe glaciation.

The Algona Moraine marks the western limit of the Des Moines Lobe glacier when it melted approximately 14,700 years ago. As the glacier moved across the landscape, chunks of ice broke off and became buried in the glacial till. As these chunks

melted, the overlying glacial sediments collapsed creating voids in the land; these types of potholes created a rugged landform surface known as collapse topography. An example of collapse topography is located on Anderson Prairie State Preserve (Figure 19). In addition to the significance of the Algona Moraine, geologists Joe Artz and Art Bettis note other visible geologic landmarks near the water trail route:

- 375th Avenue / Anderson Prairie Area: Anderson Prairie State Preserve and Anderson Prairie Complex Wildlife Management Area are bisected by 375th Avenue. Those traveling by car have the opportunity to see all of depositional terraces resulting from all of the major Holocene and Pleistocene eras at this one location (Figure 21). This location is slightly downstream of the North Trailhead Access, although one would need to get off the river and hike to experience this landscape
- Outwash Channel in Estherville: The Algona Moraine / ice margin would have stood hundreds of feet high spanning diagonally through what is Estherville today. The alignment of W. 5th Street overlays a previous outwash channel from this most recent glaciation. The channel is 650-100 feet wide and is bounded by slight valley walls that range from 6-10 feet high (Figure 22). When active, this channel would have carried water and sediment from the Algona ice margin.

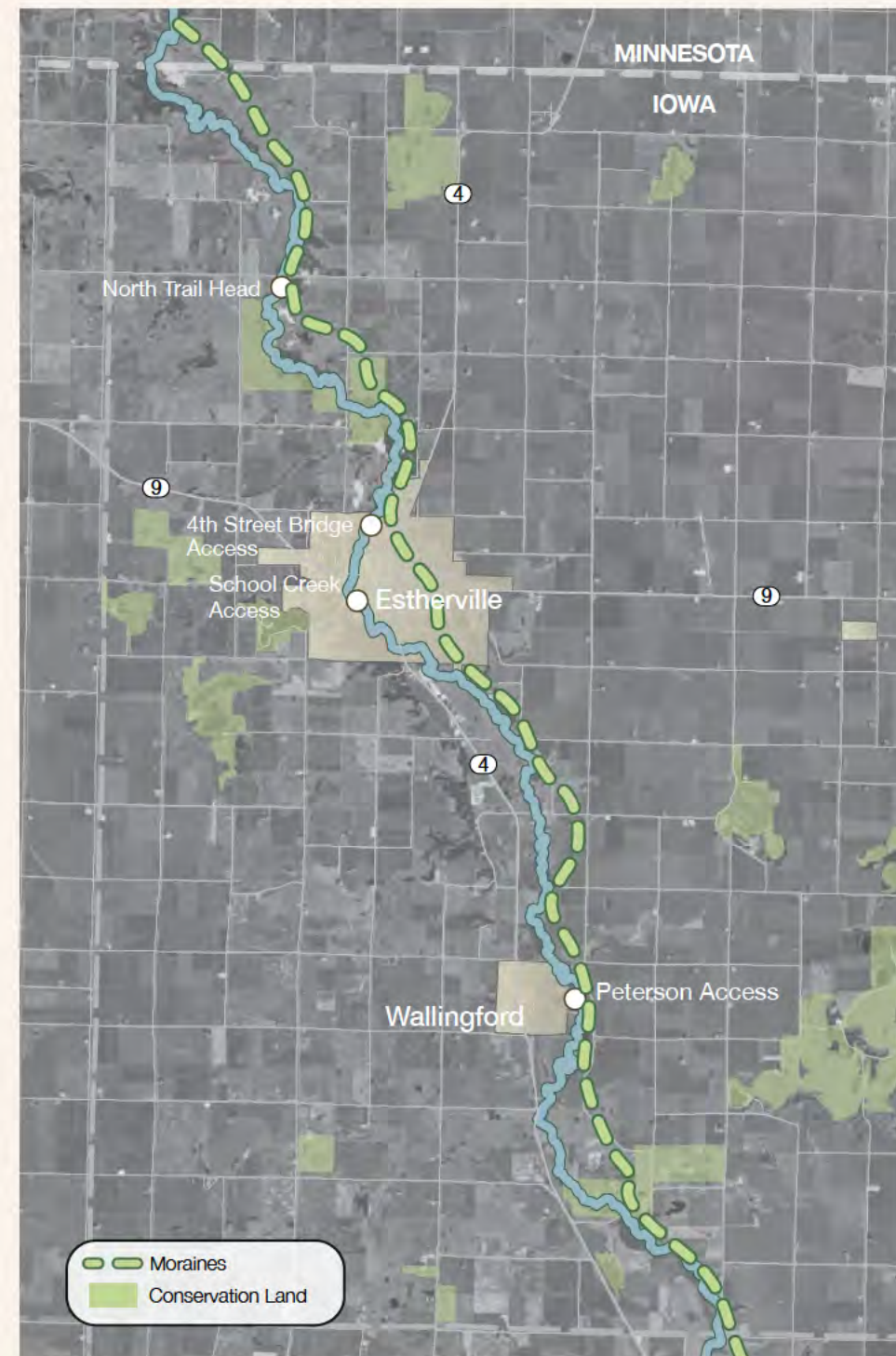


Figure 19
The Algona Moraine (shown in red above) appears as a ridge throughout Emmet County. This ridge was the location of the melting edge of the Des Moines Lobe glacier approximately 17,000 years ago.

CULTURAL & HISTORIC RESOURCES

Prehistory

The earliest evidence of human activity within the river valley of the West Fork Des Moines River in Emmet County is from the Late Woodland culture, but evidence also confirms the existence of Late Prehistoric cultures, as well—a time period that spans roughly 900 years from 300 – 1200CE (Kendall 2014, Fishel 1996). A village site, mounds, and artifact discovery sites are located in multiple areas within a mile radius of North Trailhead Access.

A significant site discovered in 1967 along an abandoned river meander by two Estherville artifact collectors (Eugene Helle and Bob Moats) drew the attention of professional archaeologists. Helle and Moats reported their finds to the Sanford Museum after noticing pottery sherds and other material eroding from a cow trail on private land. Their stewardship and commitment to preservation by sharing their finds with the Sanford Museum resulted in an excavation by the Office of the State Archaeologist (OSA) in 1971 (Anderson 1977). The Crim site, named after the land holder, is significant for artifacts that bear traits from three prehistoric cultures (Late Woodland, Great Oasis, and Mill Creek) (Figure 20). In OSA's Archaeological Reconnaissance report for this plan, Bryan Kendall states, "It is unclear if the site is the result of occupation by different groups, a group in cultural transition or a group which was incorporating traits from several different contemporary cultures" (Kendall 2014).

All three cultures bear similarities, but each are unique in character and in the technologies they advanced. The Late Woodland (300-1000CE) occupied small areas for short periods of time in small groups along lakes and rivers and introduced



Figure 20
Pottery rim sherds and point flakes from Crim Site showing different designs (photo by Megan Stroh, Sanford Museum).

the bow and arrow to the Midwest around 500CE. The Great Oasis (900-1100CE) were excellent corn farmers who lived in semi-permanent villages along rivers and lakes; they are well known for their decorative ceramics in which "the precision or 'neatness' in execution is a hallmark trait" (Alex 2000). The Mill Creek (1000-1200CE) occupied houses in villages concentrated primarily along the Big and Little Sioux rivers and their tributaries. Evidence gathered from "midden mounds" supports the existence of an extensive trade network and interaction with distant cultures. Although Mill Creek excelled at farming, they still relied upon hunting. The Oneota (1000CE-1650CE) likely displaced the Mill Creek, but no sites have been discovered within the West Fork Des Moines River Valley. No cultural sites prior to Late Woodland have been discovered in Emmet County, but just south into Palo Alto County lies a very significant site known as Five Island Lake Bone Bed and Kill Site northeast of Emmetsburg. Stone tools and pottery found here span 8500 years of Iowa prehistory from late Paleoindian to historic time periods. It's possible this marshy lake area trapped or slowed animals allowing prehistoric Indians an advantage for hunting (Kendall 2014).

It's likely the earliest Indians in North America, the Paleo-Indians, camped and migrated through the area of Emmet County on the hunt for large and small game at the end of the ice age (13,000 – 8,500 BCE). Artifacts from this period are typically rare, as Paleo-Indians were highly mobile and inhabited a rapidly changing landscape during the Pleistocene and early Holocene epochs (Alex 2000). However, the bounty they hunted, a mammoth and other ice age mammals, were discovered close to the river at a quarry site north of Estherville in 1973.



Figure 21
De L'Isle's 1718 Map showing loway village site near Spirit Lake, and the Chemin des Voyageurs trail or "Travelers Road"

Fur Trade and Beaver Wars (Mid-1600s to 1830s)

The Fur Trade forever changed the economies and lifeways of Native Americans, and the Beaver Wars (precipitated by the demand and competing interests for beaver pelts) forced eastern tribes to migrate west causing intertribal warfare between migrating tribes and indigenous tribes as both competed for hunting grounds. The loway (indigenous to the area) and Sioux (migrating into the area from the north) found themselves in conflict as they camped, hunted and trapped the lands in what is now northern Iowa and southern Minnesota (Foster, 7).

The loway, descendants of the Oneota and Iowa's namesake tribe, occupied villages across the state from the late 1600s to 1838 (Alex 2000). In the late 1680s they settled on the Little Sioux River near the Iowa Great Lakes region of Okoboji and Spirit lakes (approximately 20 miles west of the Des Moines River valley) and may have returned to the area in the 1700s (Alex 2000). Maps from the 1700s show an loway village site, marked "Aiaouez" or "Ajaouez" near Okoboji and Spirit lakes (Figure 21). These maps also show a well-known trail (Chemin des Voyageurs) that spans northern Iowa between the Mississippi and Big Sioux rivers, aligning closely with current Highway 9. It's probable the loway hunted and trapped along the West Fork Des Moines River valley in Emmet County (Lance Foster, Personal Communication).

With increased pressure from the Sioux in the north and from the Meskwaki and Sauk in the east, the loway ceded all their lands to the U.S. between the Mississippi and Missouri rivers in 1838 (Alex 2000).

The fur trade nearly wiped out the beaver in North America. Their population was reduced from an estimated sixty million in 1500 to 100,000 in 1900, but in Iowa beaver were "common to abundant" at the time of Euro-American settlement (Dinsmore 1994). Despite the demand for silk instead of beaver felt hats in the 1830s, settlers in Iowa continued to trap beaver unabated. Trapping was a way of life rather than a hobby for many Euro-American settlers. Dinsmore states, "In Emmet County, trapping was the principal business of some settlers, and for some it provided the cash they used to purchase land". By 1900 beaver were gone from the state, so it was big news when thirty-six years later a 4-foot high beaver dam was discovered in a waterway near Ruthven, making the front page of the Estherville Enterprise, November 25, 1936. The article warned the public to stay away from the area in order to protect the furbearing visitors.

Like the beaver, river otter were mostly gone from Iowa by 1900. An interesting account of an extensive otter trail estimated to be more than 25 miles in length in Emmet County is recalled in the 1917 (Pioneer Publishing Company):

There was once an otter trail from the river just above Emmet Grove to Eagle Lake, thence to Grass Lake and Tremont or (Birge) Lake, where it turned southward and passed Swan and High lakes and again struck the river about a mile below the present village of Wallingford. Over a large part of this course the trail was a well worn path, indicating it was used by large numbers of otter.

Arrival of Settlers and Removal of the Sioux (1856-1862)

A number of published sources were utilized to document the following events and developments. These books and newspapers include: History of Emmet County and Dickinson County Iowa (1917), Iowa Land of Many Mills (1940), The Annals of Iowa article: Outstanding Iowa Storms (1970), Stagecoach Trails in Iowa (1974), History of Emmet County, Iowa, Vol. III (1976), Esther's Town (2006), Inkpaduta: Dakota Leader (2008), National Vindicator, Vindicator and Republican, Estherville Democrat, Estherville News, Estherville Enterprise, Emmet County Republican, and the Estherville Daily News.

Two events, the Spirit Lake Massacre of 1857 and the Sioux Uprising of 1862, figured prominently in the region's early history and partially played out along the West Fork Des Moines River in Emmet County. The first permanent settlers arriving in Emmet County took up residence in a grove of trees along the east bank of the river in June 1856, three miles south of the Minnesota border. This site became Emmet Grove, also known as Granger's Grove after George C. Granger, the first merchant and post master in the county.

On April 1, 1857, three weeks after learning several settlers had been murdered in the Iowa Great Lakes region by a renegade band of Indians, a relief party (one hundred strong) arrived from Fort Dodge and camped at Emmet Grove. With only blankets for shelter, these volunteers endured harsh winter conditions for nine days as they followed the Des Moines River from Fort Dodge. They were to provide security and support to settlers and hoped to capture those responsible. After arriving in Emmet Grove, however, they learned that the Indians had left the area and more than 30 settlers had been murdered and lay dead near Okoboji Lakes, Spirit Lake, and the Minnesota settlement of Springfield (present day Jackson). This mass murder of settlers by an outcast band of Waphekute (Dakota Sioux) led by Inkpaduta became known as the Spirit Lake Massacre. They had taken four girls captive; two died in captivity and the other two were later ransomed, one of which was Abbi Gardner who wrote the first-hand account of the tragedy called "The History of the Spirit Lake Massacre" (Figure 22). Twenty-five members of the relief party stayed to locate and bury the dead, and the remainder left for Fort Dodge the following day.

Two days before arriving in Emmet Grove the relief party intercepted a group of twenty refugees from Springfield (Jackson, MN) working their way south along the river. The refugees had encountered the Indians three days prior. Three in the group were severely wounded and needed medical



Figure 22
Log cabin of Gardner family, one site of the Spirit Lake Massacre. Photo from March 1885 Outing Magazine.

attention. The relief party and refugees camped overnight in a grove of trees on the east side of the river as a doctor in the relief party tended to the wounded. This site is located on the Emmet and Palo Alto county line and became known as Camp Grove. While Camp Grove was never settled, Emmet Grove continued as a settlement or village for the next twenty years, but disappeared after the post office was discontinued.

The second event causing widespread panic on the Iowa frontier, commonly known as the "Sioux Uprising," began in August, 1862. Settlers in Emmet County learned of the event when a 15-year-old boy suffering from gunshot wounds wandered into Estherville "bleeding and barefoot" after hiking 30 miles down the Des Moines River from a settlement near Jackson, MN. Members of the Dakota Sioux had killed his parents and other settlers. Volunteers from Spirit Lake and Estherville went up the Des Moines River and rescued some of the settlers.

Estherville leaders quickly built a stockade around the school for protection. Shortly thereafter, Fort Defiance was erected—one of five forts or garrisons ordered built by Governor Kirkwood for the Northern Border Brigade (Iowa troops enlisted to protect settlers from the Dakota Sioux) (Figure 23). In all, more than 800 settlers lost their lives before the Dakota were defeated at the Battle of Wood Lake in September. All battles, however, were fought in Minnesota, none in Iowa. More than 300 Dakota were sentenced to death in November, but President Lincoln commuted most of their sentences. On the day after Christmas, the town of Mankato publicly

hanged 38 Dakota from a single elevated platform in the town square (Figure 24). It remains the largest mass execution in American history. In April of 1863 the Sioux were removed from Minnesota to Nebraska and South Dakota (Wikipedia). Estherville troops were released from their duties in the fall of 1863, and Fort Defiance became a residence for a period, then torn down in 1876.

It's not surprising that settlers in Iowa and Minnesota viewed the Dakota as "bloodthirsty savages" after the Spirit Lake Massacre, and perhaps the events of 1862 served to reinforce that sentiment. But these events didn't happen by chance or whim. The fur trade and Beaver Wars coupled with Westward Expansion painted native tribes into a corner creating competition for game and land, which resulted in intertribal warfare and confrontations with Euro-American immigrants. The Dakota and Nakota, the Ioway, Sauk and Meskwaki, and Winnebago were all competing for hunting grounds in Iowa. Matters only worsened in the 1830s as Euro-American settlers began staking permanent claims to the same lands. Language barriers, false assumptions and in some cases blatant deception by US Government agents resulted in native tribes relinquishing large tracts of land through a number of treaties. American Indians slowly saw their lands and their ways of life disappear. In the 1860s food and resources were scarce, and annuity payments owed to the Dakota were severely delayed due to the outbreak of the Civil War.

In Inkpaduta's case, an outlaw horse thief by the name of Henry Lott had murdered Inkpaduta's brother and his brother's wife, mother, and children in 1854. This, combined with confrontations with settlers while searching for food during one of Iowa's harshest winters led to the Spirit Lake Massacre.



Figure 23
Company A standing in front of Fort Defiance in Estherville. The fort was active in 1862-63. Located on the east bank of the Des Moines River, it became a residence prior to being torn down in 1876. This is a postcard from a private collection.



Figure 24
Thirty-eight Sioux were publicly hanged in Mankato town square the day after Christmas, 1863 as retaliation for the 1862 uprising. Painting By Artist J. Thullen – 1884, Wikimedia Commons.

Settlement Period

The first Euro-American settlers arrived in early 1856, establishing Emmet Grove as the first settlement in the county along the east bank of the West Fork Des Moines River, six river miles north of present-day Estherville. Sometimes referred to as Granger's Grove after the first settler and post master in the county, this is also one of only two locations in Emmet County where the Fort Dodge relief party camped after the Spirit Lake Massacre in 1857. Island Grove, near High Lake, was settled later that same year, and settlers moved into the area of Estherville in 1857. Other villages followed shortly after. A man, only known as "Armstrong" plied the Des Moines River by canoe from Fort Dodge and established a homestead in northeast Emmet County on the East Fork Des Moines River in 1856, but after a few months he returned to Fort Dodge. The area was permanently settled in 1864 and named Armstrong Grove, but later locals shortened it to Armstrong.

Like those who came before, early settlers established areas near rivers and lakes for reasons of sustenance. The only timber available for building materials and fuel in this vast prairie setting was located along the perimeters of waterbodies. Emmet County was organized in 1859, named after the Irish nationalist and orator, Robert Emmet, who was executed at age 25 in 1803 by the British for treason. Estherville is named after Esther Ridley, wife of founder, Robert E Ridley. Platted in 1861, it became the county seat. Mrs. Esther Vance, grand-daughter of Robert and Esther Ridley, donated the hand-drawn, hand-colored plat map to the Emmet County Historical Society where it can be seen today.

Those settling in the area of Emmet County at this time were at the edge of the frontier where living conditions were harsh and confrontation with Native Americans, an everyday fear. The nearest trading posts prior to the Civil War were Mankato and Fort Dodge, requiring three days to make the trip and back in fair weather.

Endurance of Harsh Conditions

Early homesteaders knew that planting their roots at the edge of the frontier, exposed to the unforgiving and unpredictable whims of nature would not be easy, but it harder than they expected. Feared more than Indian raids, prairie fires were numerous and destroyed the lives and property of many in the early years. Where land was covered with glacial lakes, streams and sloughs, such as Emmet County, mosquitoes were exceedingly numerous and difficult to escape, requiring settlers to frequently maintain smoky fires or smudges created by adding wet prairie grass to fires (Figure 25). In the fall of 1868, an "invasion" of redwing blackbirds destroyed much of the grain, increasing the price of flour above what many could afford because it had to be hauled in from far away. However, large numbers of buffalo fish were taken from the Des Moines River that year, allowing many residents a diet of salt fish and potatoes over the winter. In the early 1870s a number of grasshopper infestations plagued Emmet County and other parts of Iowa. It was particularly extreme in Emmet County during the spring of 1873 and summer of 1876. Crops were destroyed in multiple years requiring farmers to mortgage their homes or give up and leave town. In 1877 the state legislature offered financial assistance to those who had suffered the worst.



Heavy winter snows with strong winds were frequent on the edge of open prairies, and deadly when they arrived seemingly out of nowhere. In fact, Estherville's own O.C. Bates was first to use the word "blizzard" to describe this type of storm as editor of his Northern Vindicator newspaper on Saturday, April 30, 1870. In January that year 14-year-old Ole Knudtson lost his way and froze to death in a blinding snow storm that came as a surprise while checking traps. Three years later a similar storm took the life of Emmet County Supervisor, O.E. Prosser, who lost his way home from a board meeting with a team of horses (Lee, 28). David Laskin, in his book *The Children's Blizzard*, recounts the events of a single storm that took the lives of more than 200 settlers, mostly children, in the northwestern plains on January 12, 1888.

Blizzards were common on the plains where there was limited protection from the wind. The winter of 1856-1857, according to state climatologist Paul J. White, "was one of the most severe, if not the worst, in Iowa's whole recorded history". This no doubt played a role in the Spirit Lake Massacre as multiple storms followed a three-day blizzard in December that dumped more than three feet of snow on the northern plains. Drifts were as high as twenty feet and temperatures were as low as thirty-seven degrees below zero. Blizzards in February 1884, January 1909, and February 1936 paralyzed Emmet County. Walls of snow drifted over roads and railway lines stopping commerce in its tracks. Needed supplies, food, and coal to heat homes were delayed, requiring town leaders to organize volunteers with hand shovels to open up drifted-over areas allowing

trains to begin moving again. McCulla Cut, a section of the Rock Island Line laid through high embankments of glacial till two miles west of town was notorious for collecting large drifts of snow creating barriers to train traffic.



Figure 25
Drawing from the book "Marvels of the New West" written by William Makepeace Thayer in 1887.

Transportation in the Early Days

There were many modes of travel in the settlement period. The first roads were often Indian trails, some of which have become today's highways. Many trails in Iowa followed the ridges along rivers and streams, and traveling by foot was quite common. During one of the worst winters in Iowa (1856-57) Emmet County settlers traveled 70 miles along the Des Moines River to get needed supplies from Fort Dodge by way of snow shoes and hand sleds.

Travel was difficult at best and much of the time impossible in the early days. The Ridley's arrived in the Estherville area in 1857 after enduring a 12-day trip from Dubuque via ox team and covered wagon, another mode of travel in those days. Sloughs, lakes and streams, the remnants of the last glacial age, made travel especially difficult in northern Iowa. The lack of ferries or bridges required travelers to often wait days until water levels were low enough to cross streams or sloughs:

Oxen were the popular motive power of the early wagon train, because they required less care and feed than horses. Each wagon was drawn usually by two to four teams of oxen, and in a train there were from two to twelve wagons. Many of the wagons were so heavy that when a slough or stream had to be crossed the oxen from all the wagons were hitched to one wagon and it was drawn across. This was done in turn with each of the other wagons, many of which had a long rope attached for that purpose.

When water was too deep to cross fords (shallow areas in streams) a wagon box might be transformed into a sealed ferry boat to carry goods from the other wagons across streams and sloughs, which could take days.

From 1856 to 1882, a mail route ran once every two weeks from Mankato, Jackson, Emmet Grove, Spirit Lake, Peterson, Cherokee, Melbourne, and Sioux City. By 1869 the Fort Dodge & Spirit Lake stagecoach line traveled through Estherville hauling passengers twice weekly: Mondays on the way to Fort Dodge and Thursdays on the way back to Spirit Lake. Northwestern Stagecoach Company also operated a daily route from Estherville to Dakota City (Humboldt Co) with connections to Fort Dodge.

The first train, the Burlington, Cedar Rapids & Northern (BCR&N) arrived in Estherville June 8, 1882, and in 1885 the Rock Island and Pacific bought majority stock, and took over (Figure 26). By 1892 it was the Chicago, Rock Island and Pacific (CRI&P), and in 1894 the impressive landmark railroad trestle bridge that currently crosses the West Fork Des Moines in Estherville replaced an earlier, less fortified one. By 1915 there were ten trains per day passing through Estherville Monday through Saturday, and two on Sundays carrying both people and supplies. The Minneapolis & St. Louis passenger trail was a popular trip to Des Moines in the early 1900s. The first diesel locomotive arrived in 1949.

Probably the first public road in the county ran from Blue Earth, MN to Lake Okoboji. In 1860 there was a road that ran from Spirit Lake through Estherville to the south end of Tuttle Lake. While the records of official public roads prior to 1876 were destroyed in the courthouse fire of that year, a survey team canvassed the county and identified most of them. By 1917 there were around 100 miles of public roads in the county. Deemer Lee recalls the enthusiasm and pride his father exhibited after it only took two hours to travel from Estherville to Algona (about 60 miles) in his 4-cylinder Dodge in the 1920s.



The Tom and Jerry Bridge

Crossing rivers is much easier with bridges, but bridges need maintenance and repairs; they age, fail and have to be rebuilt. In addition to the monumental CRI&P high trestle bridge over the Des Moines River in Estherville, another bridge (though much smaller in size) is of considerable interest. Crossing the river two miles north of Estherville on County Road N26 (375th Ave) is a bridge known to history as the "Tom & Jerry Bridge." Originally a 120-foot steel span truss bridge built in 1897, it has been replaced at least once after it collapsed May 3, 1945. It's named after two pioneer settlers, Tom Leiren and his brother-in-law, Knut Gronstal (Jerry), who emigrated from different parts of Norway and landed in Estherville in 1884. Knut (Jerry) married Tom's sister and the two became good friends, starting a painting and wall-hanging business the same year. They built a fine reputation over time. One year they were hired to paint the bridge in question, and when they were done, they added their nicknames "Tom & Jerry". Tom left Estherville circa 1907 after purchasing land in Lemmon, SD. He made several trips back to Estherville to visit, but passed away in 1919. Knut continued operating the business with two sons, Carl and Chris, until passing away in 1937. Carl and Chris continued the business until Chris died in 1952, leaving Carl to operate it in a semi-retired capacity. For more than a hundred years the locals haven't forgotten and still refer to it as the "Tom & Jerry Bridge". Deemer Lee, author of *Esther's Town* and editor of local newspapers from 1927 to 1968, reflects back on quiet times spent fishing "pike holes" near the Tom & Jerry Bridge after his grandfather bought a Model-T Ford.

The Swinging Bridge

Estherville's first bridge, the Lincoln Street Bridge, was built in the late 1800s, and rebuilt in 1914 and 1975. The street name changed to Central Avenue in 1937, but the bridge is part of a larger story of Estherville's swinging bridges. As early as 1900, residents west of the river called for a foot bridge north of Lincoln Street because children living on the west side of the

river would have a safe and convenient way to get to schools on the east side of the river. There weren't sidewalks on the first Lincoln Street Bridge so it was quite dangerous walking across it. Children sometimes were tempted to cross the trestle bridge or the dam at low water to get to and from school or other locations in town. Newspapers reported children falling from the trestle bridge or from the dam into the water. In 1914 the Lincoln Street Bridge was also under construction and not passable at all. Apparently, a single plank foot bridge was built in the early 1900s to accommodate foot traffic, but it was not adequate:

Nearly every spring lives are lost in the Des Moines River at this place. A single plank foot bridge over the dam is the only means of crossing the river at that point. The city should take the matter in hand and erect a suitable bridge before more lives are lost.

A suitable footbridge was built in August of 1914, but four years later there were calls for another foot bridge in the same location. In 1921 the Rock Island Railroad paid for a sizable block of space in the Estherville Enterprise sternly warning citizens that crossing the trestle bridge is "positively forbidden" and that rule breakers will be subject to "arrest and be fined for trespassing". One can assume that foot bridges built up to this time were either inadequate or didn't last. However, in the 1930s WPA relief workers arrived and spent years working on river front projects, straightening the river, building a dam south of Lincoln Street, and constructing a rock garden and band shell. In addition to these improvements a new swinging suspension bridge was built for foot traffic north of Lincoln Street Bridge connecting East and West Des Moines streets. This bridge was more formidable than any previously constructed foot bridge. The 200-foot-long, four-foot wide bridge was suspended by two ¾ inch steel cables attached to two concrete pilings on each side of the river. Wire netting was constructed on each side of the bridge. The estimated cost of the project was \$250 to \$300 and the project was completed by the end of September, 1937.



Figure 26
Photograph of first BCR&N railroad trestle north of Lincoln Street in Estherville.
Courtesy of Emmet County Historical Society.

Emmet County Mills

Two of the more prominent industries that depended on rivers in the early days were the milling and ice industries. Both industries had modest beginnings, experienced a heyday, and slowly came to an end as a result of technological advancements.

As soon as settlers began staking claims in the first half of the 19th century, they built mills to harness the power of the river's flow that turned the wheels that ground grain, sawed wood or carded wool. According to the 1840 US Census, there were 118 mills operating in Iowa employing 154 citizens. Beginning in the 1850s, grain (wheat, barley, corn, and oats) became primary exports, and by 1870 there were 502 gristmills and 545 sawmills in Iowa, most of them powered by water (Petersen, 1941) More than eighty mills operated along the banks of the Des Moines River alone (Swisher, 14). Certainly fires, drought, the chinch bug, and grasshopper infestations negatively impacted the milling industry, "...But perhaps the major cause



Figure 27
Part of Emmet County Map from Andreas Atlas, 1875. Black asterisks denote location of mill sites.

for the passing of the local mill was economic—the great agricultural change from the growing of wheat to the increased production of corn and cattle and hogs”.

The Andreas Atlas of 1875 identifies four mill locations in Emmet County (Figure 27), all spread out along the west bank of the Des Moines River. References to only the mill sites in Estherville are recorded.

It's likely the first mill in Estherville built by R.E. Ridley and Adolphus Jenkins was operating in 1859, the year the county was organized. The mill and dam are shown on the west side of the river in the 1861 hand drawn Estherville plat map (Figure 28). A saw mill was also in operation when Fort Defiance was built in 1862, but it's uncertain who the proprietor was. However, by the time the first issue of the first newspaper was published in 1868, it appears Jenkins and Ridley had gone their separate ways. The Estherville Mill owned and operated by the Jenkins Brothers in the same location was heavily advertised in long columns in the Northern Vindicator for several years without Ridley listed as proprietor. However, R.E. Ridley built a dam across the river south of Estherville for a grist mill in December 1868 and articles in 1872 locate the “Ridley Brothers Mill” one mile south of town, but no mention of that mill after 1872, except when a horse broke through “Ridley's mill pond” and had to be rescued.

The Jenkins Brothers' mill was a large capacity mill, grinding large volumes of grist that drew folks from seven counties:

The Estherville Mill is literally thronged with customers... wheat is bro't [sic] to this mill from Jackson and Martin counties in Minnesota, and Kossuth, Palo Alto, Clay, Buena Vista, and Dickinson counties in Iowa.

Having a good mill in town had huge advantages for local commerce. At busy times of the year, out of town customers had to wait for their grist to be ground so shopped and patronized local businesses, and sometimes stayed overnight.

Elbridge Whitcomb and D.W. Lane competed with the Jenkins Brothers by building a flour and saw mill on the east side of the river (south of Lincoln Street) that operated by steam power in 1872 and 1873, but Jenkins became partners with Whitcomb in February 1873. The Northern Vindicator reported that the steam mill, “don't [sic] pay expenses, and never did. Jenkins & Bro. have bought the machinery, and will transfer it to their water mill.” The Jenkins Brothers eventually sold their mill after



Figure 28
Original hand-drawn plat map showing portion of Estherville, dated 1861. Courtesy of the Emmet County Historical Society.

1874. While “For sale” notices were printed in the Northern Vindicator April through August 1873, the county history states the Jenkins brothers left the milling business around 1877. An obituary for Adolphus Jenkins notes that he left the milling business due to asthma.

There is a large gap in Estherville's newspaper records between 1873 and 1882, but the first indication the Estherville Mill was being operated by someone other than the Jenkins brothers comes from an advertisement identifying M.J. Ammon as proprietor in the October 6, 1882 National Broad Axe. M.J. Ammon was likely Mary Jane Ammon, the wife of John Ammon. But news articles reporting information about the mill mention John Ammon as proprietor. John and Mary left Decorah for Estherville in 1880, and a review of Estherville's land records revealed Mary as owner of several parcels of land. It's possible that John listed his wife as owner of land parcels as a means of protection. A memorial reporting his death in the Estherville Enterprise revealed a business enterprise that failed “by no fault of his own” in Decorah prior to his arrival in Estherville.

John Ammon actively solicited business for his water mill through newspaper ads from October 1882 until mid-1885, at which point the mill was no longer operating, likely due to ice or water damage, or perhaps machinery failure at a repair cost Ammon couldn't afford. During the years the water mill was not operating, the mills outside Emmet County solicited business through the local newspapers, and the newspapers also reported local citizens taking their grist to mills in Sheldon, Okoboji, Milford, Emmetsburg, and Jackson, MN. In 1887 and 1888 the Northern Vindicator encouraged business men to invest funds to get the water mill and dam in working order. Steam mills had been built in Emmetsburg and Spirit Lake,

but the editor of the Northern Vindicator reasoned that the water mill, “could be run for at least ten or twelve dollars per day cheaper” than a steam mill. Of course, the disadvantages of water mills were floods, ice outs in spring, and low water in summer. Ammon was entertaining the idea of selling both property and water power or at least looking for investors in order to improve the mill and dam.

The Estherville Mills.

The Estherville Flouring and Saw Mills are now in running order and successful operation, and customers will be paived with promptness and in a manner that cannot fail to give general satisfaction.—

THE WATER POWER

employed in propeling these
MILLS
is unsurpassed on the Upper Des Moines, and is improved in a manner that is not surpassed by any other water power in Northwestern Iowa.

ESTHERVILLE MILL,
M. J. AMMON

PROPRIETOR.

desire to announce to the people of this vicinity that I have placed the Estherville Mill in complete running order, and are prepared to make as good flour as any mill in Northwestern Iowa. It is always in charge of

FIRST-CLASS MILLER.

An "honest count" is guaranteed. Give us fair trial before going elsewhere.
 ESTHERVILLE, IOWA

In September 1890, John Ammon built a new mill foundation, and the following month installed a new dam with the expectation that the new mill, The Estherville Mill, would be running soon. A notice in the February 1891 Northern Vindicator stated that C.R. Ammon & Company "solicit patronage for grinding corn meal, buckwheat flour, rye flour, and graham. It appears that John handed the reigns of the water mill to his son, Chauncey Ammon. Ads beginning April 23 of this year list proprietors as C.R. Ammon and C.M. Brown. In July, however, the following notices appeared in the Northern Vindicator, indicating high water may have been problematic to John Ammon's improvements:

Ammon & Brown let the contract for the building of a new flouring mill... seventy feet west of the present building, placing it out of reach of high water and nearer to the road... a shaft from the wheels in the flume will convey the power to the point needed.

The work of excavation for the basement of Ammon & Brown's new roller flouring mill has begun. The building is to be two stories with a basement. The dimensions of lower story will be 70 by 30, and the upper 30 by 20. The capacity of the mill will be fifty barrels per day. The proprietors inform us that the contract calls for its completion to be October 1st, and that the best machinery obtainable has been secured to equip it. The old name will be retained with the exception of the word "roller" which will cause it to read "The Estherville Roller Mills".

A large ad stating "The Estherville Roller Mills...will be ready for business Oct 1st, 1891, west side of river" occurred in future newspapers. But it appears Ammon & Brown's mill didn't actually begin full operation until January, 1892. Ammon & Brown were likely motivated by potential competition, the

building of a steam flouring mill south of town on 6th street, which began operating in August 1891.

Estherville resident E.L. Brown (no relation to C.M. Brown) backed the "scheme" for a steam grist mill as early as January 1891. Perhaps, steam mills had improved to the point they were better investments. While past articles were critical of steam mills, the Northern Vindicator now showered praise for this new steam mill, equipped with a 45 horse-powered engine that operated both the mill and the mill's elevator, stating it was "one of the best institutions of the kind in the Northwest." Prior to Brown & Ammon's water mill coming back on line in 1892, the steam mill handled were involved in the scheme. It was first called the Hall, Brown & Moore Mill, but E.L. Brown bought out Moore's interest before it began operating. As co-owner of the Estherville steam mill, C.W. Hall had sold his steam mill north of Jackson and moved his family to Estherville. However, in March 1892 he sold his interest in the mill to M.W. Bibbens, and moved to Des Moines. E.L. Brown divested his ownership to Bibbens in 1892, but before he did, he patented "Esther's Pride," a flour produced at the mill, which was first marketed in newspapers in 1893. L.R. Bingham, former distributing agent for a mill in Sheldon, rented and managed the mill until June, 1894 when Bibbens sold the mill to the Brown Brothers: Amenzo from Estherville, and Spencer from Mason City (no relation to C.M. Brown or E.L. Brown). Newspaper ads began calling the mill the "Estherville Steam Roller Mills" in November, 1893. The number of individuals with the last name "Brown" involved in both Estherville mills, and the similarity in the names of the two mills likely created some confusion for the writers of the 1917 county history.

From 1892 through 1899, the two grist mills operated in Estherville, the one powered by water owned by Ammon & Brown, the other by steam owned by the Brown Brothers.

We Are Now Prepared to Furnish



Emmet County and surrounding country
 with the
Best Flour Made
 at the Estherville Steam Roller Mills.
 Come and see us.
L. R. BINGHAM.



Figure 29
 Photo of old mill and dam from early 1900s. Last owners were Chauncey Ammon and C.M. Brown. Courtesy of Emmet County Historical Society.

Ammon & Brown's water power mill produced at least three flour brands: Queen Esther, Arc Light, and Advance. Ammon & Brown purchased and installed an "Otto" gas engine in 1893 to operate the water mill when water levels were too low. The engine ran most of the summer of 1894, which was a very dry year. In late 1894, Ammon & Brown refused to let the city draw water from the mill pond for the city water supply, so the city drew water from below the dam. Articles noting repairs and the installation of new machinery for the water mill were not uncommon.

In October of 1899 Ammon & Brown bought the steam mill from the Brown Brothers and gained control of the entire milling industry in Estherville (Figure 29). Ammon & Brown improved and upgraded the steam mill, increasing the capacity from 75 to 100-bushel barrels per day in August 1901. Low water, that same month, caused the water mill to cease operating, and a proposition to sell the water mill, mill pond and dam to the city to add park lands and help with city water supply was rejected by city council. It is unknown if Ammon & Brown ceased operating of the water mill entirely, but it would be reasonable to assume that operations were at least reduced. Due to ailing health, C.R. Ammon sold his interest in both the water and steam mills to his partner C.M. Brown in March, 1902. The mill was advertised as "The Estherville Roller Mills" with C.M. Brown listed as sole proprietor until 1907.

On August 14, 1907 the city bought the water mill, dam, and water power, and in December that same year, C.M. Brown retired. The Iowa Savings Bank took possession of the steam mill with E.E. Hartung as manager. Just after midnight on August 15, 1910, the steam mill caught fire and was completely destroyed within hours. That was the end of the milling industry in Emmet County.

Other Mills in Emmet County

A grist and saw mill was being built in section 16 in Emmet Township by Sawyer and Jones of Sparta Wisconsin in January 1869. An 1873 article notes "Don Reynolds is boss miller in the Steam Mill...an attentive, reliable miller and is giving general satisfaction". In May of 1870 an article written in Danish appeared in the Northern Vindicator announcing a party at the Peterson Mill, which would've been located just east of Wallingford near present day Peterson Access. In late 1873 and early 1874 a notice was posted in the Northern Vindicator of a new road being built to run 10 rods south of Peterson Mill with a bridge over the West Fork Des Moines River there. In September of 1885 the Peterson Mill was listed for sale.

An August 1873 article in the Northern Vindicator mentions the body of a "young Swede" who drowned in the river "several miles above here" being found near "Griggs' mill", but no other mention of Griggs' Mill could be found in newspaper archives.

FOR GIRLS WHO SKATE.

CHARMING HABITS FOR AN EXHILARATING SPORT.

A Handsome Costume as Important as Grace in Skating—Astrakhan Extremely Modish—Dress Reaction in Favor of the Little Ones—Calling Gowns.

Fashion's Fancies.



An old proverb says: "When the days begin to lengthen then the cold begins to strengthen," and that means ice, and ice means skating, and skating means a skating costume—quite as important to those who only go to look on as to those who intend to risk their precious selves on the treacherous steel blades. Nothing can be more graceful than a girl skater when she skates well, but watching the tyro on skates is like

listening to the first efforts of a future violinist. A skating costume has brilliant possibilities, but the designer often fails when he attempts to originate one.

Ice Skating: A Social Institution

Mill ponds created by dams on the river were ideal locations for swimming and fishing in summer and ice skating in winter, but one or more drowned in the river every year until the Estherville swimming pool was built in 1933. Ice skating was a popular Victorian leisure activity, and despite the dangers, citizens still congregated in large numbers when the ice was thick enough for skating. In December of 1913 the Northern Vindicator stated, "Fully six hundred of our people young and old, enjoyed the fine skating at the river Thanksgiving Day". It was also not uncommon for skaters to tour up river and back several from Estherville into Emmet Township, a distance of ten miles (NV, Dec 6, 1894). A report in the Estherville Enterprise stated that several young men from Estherville got up early one morning and skated to Jackson and back, returning in the early evening.

Reports of ice skating on the river go back to the first newspapers printed in Estherville. Summaries from Godey's Lady's Magazine and Lady's Friend appeared in the Northern Vindicator with images of women wearing "skating costumes". Local newspapers frequently reported conditions of the ice on the Des Moines River and nearby lakes, but they also reminded citizens of the dangers of the sport by reporting the numerous tragedies that occurred both regionally and from across the state.

One of the worst tragedies reported occurred on the Wapsipinicon River at the Littleton mill pond when seven people drowned after breaking through the ice December 20, 1894. Another tragedy happened closer to home when three boys broke through the ice on the river near Estherville Saturday, November, 29, 1902. Two were rescued, as the newspaper reported in detail, but the third (the brother of one of the rescued) was unable to hold onto his brother's leg. After losing his grip, he grasped the blade of his brother's skate, but it came off and he plunged into the frigid waters "to rise no more". One of the more heartbreaking tragedies occurred on Christmas Day when Willie Duhigg, aged ten, drowned on Christmas day while skating on Medium Lake north of Emmetsburg. He was the only son of the widow Annie Duhigg. Every year there were drownings nearby and across the state.

The idea of artificial skating rinks on fields as safe alternatives to skating on the river and lakes were suggested in Estherville newspapers as early as 1892. To be sure, rinks were also developed on bodies of water where dangers of breaking through the ice still existed. The idea of a rink, however,

meant that it was managed and maintained typically by the city, unless it was a business opportunity. Sometimes ice that naturally forms on rivers and lakes is rough and unsuitable for skating. Using the city's water supply to flood areas of the river or fields would create smoother surfaces ideally suited for skating. Since the abandonment of Estherville's water mill in the early 1900s, the old mill dam was not maintained. In 1922 the Vindicator and Republican recommended two off-river skating rinks. However, early efforts to build rinks off the river were met with failure—on one occasion, the ice melted and flooded nearby basements.

In 1926 desires to build a new dam on the river south of Lincoln Street for a skating pond and rink were levied by Estherville citizens. In 1939 the City of Spencer was successful in flooding the Little Sioux River to create a skating rink that included lights and a warming house. This same year the city of Estherville promised its citizens a skating rink on the river between the foot bridge and the Rock Island Bridge, but it wasn't until 1947 that a dam was built for this purpose. Unfortunately, the dam failed numerous times and a mill pond never lasted. Skating, however, continued on the river and lakes in the area as best it could.

By the 1950s, however, the ability to build artificial ice-skating rinks improved and one of the first skating rinks was built in 1955 through a partnership with the City of Estherville and the American Legion, located on South 14th Street in the 400 block near the city well site. By 1962 there were two skating rinks with a third added in 1963. By 1973 Estherville had five skating rinks: one at Good Samaritan Park, one at South 14th Street Park, one at Trinity Lutheran Church, one at the lagoon by North 4th Street Bridge, and one at North Riverside Park.

Skating parties were popular as far back as the Victorian Period, followed later by ice carnivals and the popularity of competitive racing. Local churches often hosted skating parties for kids with evening gift giving and worship services on holidays. Ice skating was deeply woven into the social fabric of communities of Emmet County, and likely all communities across the country.

The City of Estherville hosted its first Winter Sports Festival in February, 1969. It was hugely successful, drawing thousands of people including Governor Robert Ray and his family. Activities during this 3-day event included ice skating competitions, snowmobile races, ski races, a snow sculpture contest, a snowman building contest for children under twelve, and a queen competition. The nationally known group

the Young Americans (now credited with being the first show choir in America) performed a concert Saturday night that was attended by more than 2,000 people, including the governor and his family. The Young Americans had appeared on TV specials and variety shows with Bing Crosby, Julie Andrews, Judy Garland, and Bob Hope prior to performing at the Winter Sports Festival.

This annual festival became Iowa's largest winter festival and continued to command large crowds of attendees from across the Midwest for more than three decades. Additional activities were scheduled throughout the years, including: a parade, ice fishing contest, a snowball dance, Bridge tournament, quilt show, chili cook-off, downhill carboard box races, racquet ball tournament, bowling tournament, a giant greeting card contest, radio-controlled car races, inner-tube races, table tennis tournament, flea-market, etc.

ESTHERVILLE, IOWA, 51234, FRIDAY, JANUARY 24, 1975

ESTHERVILLE'S

7th ANNUAL-1975

WINTER SPORTS FESTIVAL

FRIDAY-SATURDAY-SUNDAY
January 31, February 1, 2

NATURAL RESOURCES

Locally, the West Fork Des Moines River is known for its hatchery-stocked walleye fishing; the region is also known for shallow wetlands, prairie areas and bird watching. Portions of this study area are considered of high conservation value in the Iowa Wildlife Action Plan due to a number of factors. One special designations has been made within the study area by a conservation organization. This designations is non-regulatory and meant to highlight the unique value of the areas designated and to encourage conservation efforts to sustain their value to wildlife and people. The designation is a potential Important Bird Area, meaning that it has been nominated by the Audubon Society but not adopted. Multiple research studies conducted between 2006 and 2016 document a variety of wildlife species in the study area.

Aquatic Species

Organisms living in the river ecosystem are one of the most obvious wildlife-related resources associated with a water trail. Fish and other organisms such as mussels require long lengths of rivers to successfully reproduce and complete their life cycle. Many fish species make annual movements between spawning, feeding and overwintering habitats. Riverine fish also use different habitats throughout their life cycle, and move upstream and downstream in the system to avoid unfavorable conditions (flood, drought, harsh winter conditions). Therefore, connections between reaches of the West Fork Des Moines River and its tributaries are important to the overall health of the Des Moines River ecosystem. One obstacle to organism movement at some water levels, the Estherville dam in Mike Mickelson Park, exists in the study area. The dam is a popular fishing access because fish are trapped below the dam during periods of low flow, making them easier to catch.

Statewide analysis of the presence/absence of aquatic species was conducted in 2000. This analysis used Iowa's Ambient Water Monitoring data which includes the highest quality species monitoring and water quality sampling data

available. Fifteen years of monitoring data from reference sites were used to generally characterize conditions statewide based on ecoregion areas. The West Fork Des Moines River is located in the Des Moines Lobe ecoregion which tends to have higher scores for benthic macroinvertebrate and fish assemblages compared to other ecoregions in southern and southwest Iowa streams.

No recent river and stream biological monitoring surveys or physical habitat assessments have occurred within or near the study area in Iowa. The nearest Iowa surveys occurred in 2013-2016 downstream in Humboldt County.

Fish

General fish species maps generated by Iowa DNR in 2010 as a part of the Iowa Dams Plan included 18 species known to occur on the West Fork, Des Moines River corridor (Figure 30). These species included Bigmouth Shiner, Black Bullhead, Bluntnose Minnow, Channel Catfish, Common Carp, Fathead Minnow, Golden Redhorse, Green Sunfish, Johnny Darter, Largemouth Bass, Sand Shiner, Shorthead Redhorse, Spotfin Shiner, Stonecat, Walleye, White Crappie, White Sucker, and Yellow Bullhead. The Multiple Species Inventory and Monitoring (MSIM) project collected fish samples between 2012 and 2013 at several additional locations near the West Fork. Additional species identified in these samples included: Central Stoneroller, River Carpsucker, Brook Stickleback, Northern Pike, Iowa Darter, Fantail Darter, Brassy Minnow, Orangespotted Sunfish, Bluegill, Hornyhead Chub, Blackside Darter, Black Crappie and Creek Chub.

Mussels

An extremely limited amount of sampling for mussels has been conducted on or near the West Fork Des Moines. The only known samples were obtained through the MSIM. The four species identified are shown in Table 11. Paddlers note mussel shells on sand point bars are a common occurrence upstream of Estherville. Additional field sampling is recommended to expand what is known about local conditions.

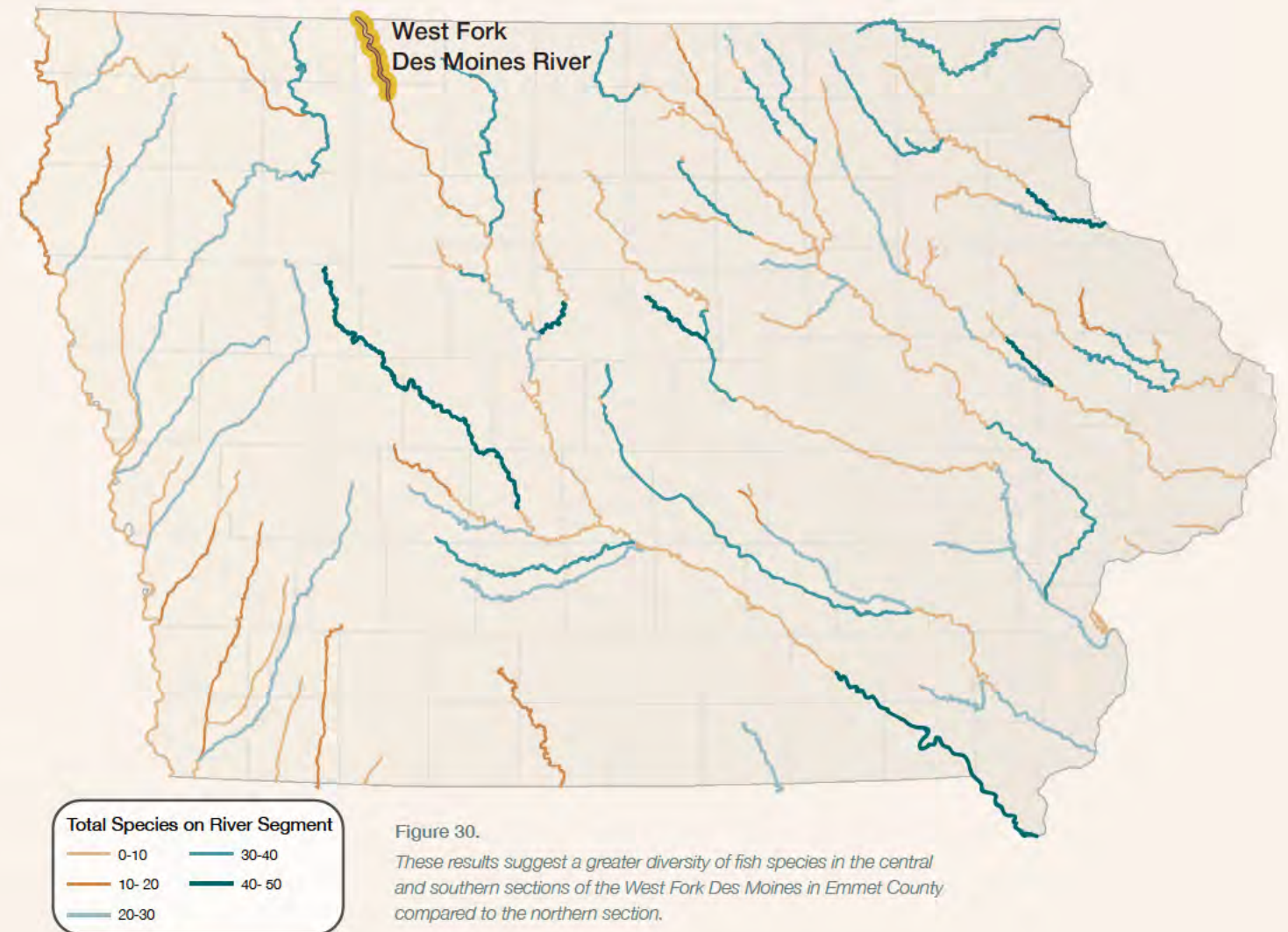


Figure 30. These results suggest a greater diversity of fish species in the central and southern sections of the West Fork Des Moines in Emmet County compared to the northern section.

	Mussel Species
Species of Greatest Conservation Need:	Fatmucket, White Heelsplitter
Other Species:	Plain Pocketbook, Fragile Papershell

Table 11 Encouraging results are reported for the limited amount of mussel sampling that has occurred in the study area. Two of the four species are included on Iowa's Species of Greatest Conservation Need list.



Amphibians and Reptiles

A total of 17 species of herptiles have been identified in the study area through MSIM project sampling. Of these, 12 are included on Iowa's Species of Greatest Conservation Need List (Table 12). MSIM monitoring sites included Anderson Prairie Complex, Burr Oak Waterfowl Production Area (WPA), West Fork Wetlands, West Fork Wildlife Management Area, and Whitetail Flats.



Birds

Breeding birds are of great interest to many Iowans. Dewey's Pasture Complex, 9 miles southwest of Graettinger and the West Fork, Des Moines River, is a 5,522-acre site comprised of prairie, wetlands, lakes, upland areas and woodlands of state and national importance. Although slightly outside the study area boundaries, this site is extremely important habitat. Only 20% of the site is upland, with the remaining landcover being lakes and marsh. The complex is a designated Bird Conservation Area by Iowa DNR as well as a National Natural Landmark by the National Park Service, one of only seven in Iowa. The complex is located less than 2 miles beyond the study area watershed boundaries. No other rivers being studied for potential state water trail designation includes a National Natural Landmark so near. The complex serves as a nesting site as well as a migratory stopover for waterfowl and upland birds.

One Audubon Important Bird Area is also located in this study area, the Ingham, High, and Cunningham Lakes Wetland Complex. This 15,701-acre complex located three miles east of Wallingford and the West Fork Des Moines River in Emmet County includes diverse habitats such as shallow lakes, marshes, dense deciduous forests, tallgrass prairies and grasslands. These habitats support a large range of birds.

The Breeding Bird Atlas is a source of breeding bird data used throughout the United States and Canada. Each atlas project within a state or province uses approximately 20 hours per study block of observation time to record breeding activity over a course of five years. Study blocks include 3-mile by 3-mile blocks systematically selected across the state. These atlas project survey areas record evidence of breeding. The Breeding Bird Atlas has been compiled twice in Iowa with the most recent compilation from 2008 to 2012. A total of three Breeding Bird Atlas II blocks intersect with the study segment. All three are located north of the River Hills access and contain grassland, deciduous forest, and a large amount of wetland vegetation compared to rivers in other parts of Iowa. Each study block includes some land in permanent protection along the river, with the exception of the block directly north of River Hills Access. That study block includes land in permanent protection lands that are not adjacent to the river.

A total of 101 unique species were identified in the study; 18% (19) of these are included on Iowa's Species of Greatest Conservation Need (SGCN) List. Table 13 lists the 19 SGCN species identified in these study blocks. Some are state-listed as either threatened or of special concern. The 87 additional bird species identified as breeding in or near the riparian zone on these study blocks are listed in Appendix D.

Amphibians	Endangered Species	Threatened Species	Special Concern Species	Species of Greatest Conservation Need
Blanchard's cricket frog				X
Tiger salamander				X
American toad				
Cope's gray treefrog				X
Eastern gray treefrog				X
Boreal chorus frog				
Bullfrog				
Northern leopard frog				X
Reptiles	Endangered Species	Threatened Species	Special Concern Species	Species of Greatest Conservation Need
Spiny softshell turtle				X
Snapping turtle				X
Painted turtle				
Western Fox snake				X
Blanding's turtle		X		X
Northern Prairie skink				X
Smooth green snake			X	X
Redbelly snake				X
Plains garter snake				X

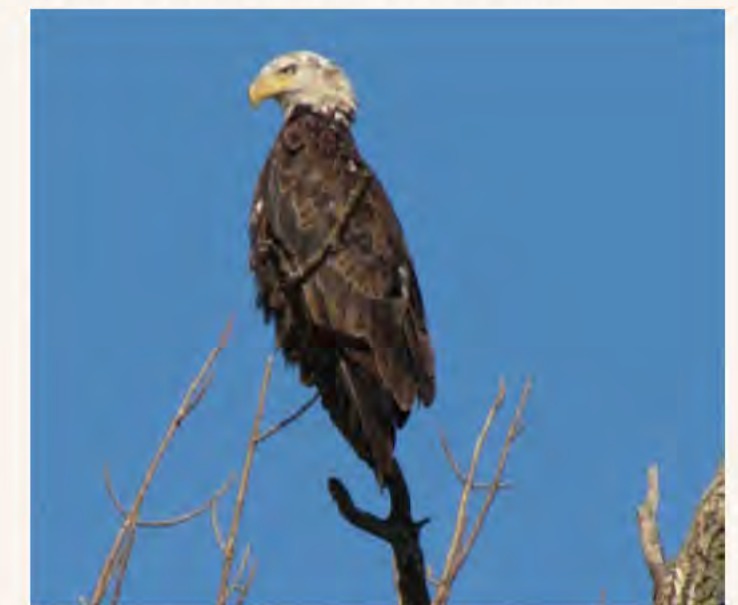
Table 12

All but one of the MSIM monitoring sites are located in close proximity to the West Fork Des Moines River. Each of the sites has either shallow lakes, wetlands or rivers.

Species	Endangered Species	Threatened Species	Special Concern Species	Species of Greatest Conservation Need
Henslow's Sparrow		X		X
Bald Eagle			X	X
Black Tern			X	X
American Woodcock				X
Black-billed Cuckoo				X
Bobolink				X
Chimney Swift				X
Common Nighthawk				X
Dickcissel				X
Eastern Meadowlark				X
Field Sparrow				X
Grasshopper Sparrow				X
Red-headed Woodpecker				X
Sedge Wren				X
Trumpeter Swan				X
Upland Sandpiper				X
Willow Flycatcher				X
Wood Thrush				X
Yellow-billed Cuckoo				X

Table 13

Breeding Bird Atlas II documented 101 species of birds present and either likely or possibly breeding in the riparian areas surrounding this segment of the West Fork Des Moines River. Those included on Iowa's Species of Greatest Conservation Need list are included in this table.





Population and Development

The U.S. Census 2010 indicated approximately 162,883 people lived within 25 miles of the West Fork, Des Moines River water trail. Additionally, Emmet County has two major State Highways 9 & 4 that travel east to west and north to south, respectively, intersecting in Estherville. Iowa Highway 9, runs across the northern portion of the county, while Iowa Highway 4 basically follows the path of the West Fork. Iowa Department of Transportation 2015 annual average daily traffic counts estimate that 17,180 vehicles utilize Iowa 9 daily, while Iowa 4 receives 7,005 vehicles.

Compared to other rivers studied, the West Fork of the Des Moines includes very few homes within 450 feet (equivalent to the length of 1½ football fields) of either side of the river, particularly in unincorporated areas (Table 14). Road crossings act as a public interface for river users and an access point for rescue teams. Only 3 road crossings exist on the 32.2 miles of study segment river excluding bridges within 1000 feet of a river access point.

Houses* Near the Water Trail	Within Municipal Limits	Rural	Total Houses
Within 450' of either side of river	61	8	69

Table 14
 Relatively few homes are located close to the West Fork, Des Moines River with the exception of those within Estherville.
 *Residential location data source: Structure Points of Emmet County, Iowa DNR, 2010

VISUAL RESOURCES

Visual experiences of the river in Emmet County vary from north to south. Changes in underlying geology and landform near Estherville are largely responsible for river channel, land use and vegetation differences between the two reaches. The upstream reach includes a relatively narrow river valley and tightly curving channel patterns. It boasts exceptional views of the grass-covered and rolling hills of the area surrounding Anderson Prairie Complex Wildlife Management Area. This reach also closely follows the western edge of the Algona Moraine.

The river valley and channel widen and straighten downstream of Estherville due to patterns of glacial meltwater. This wider floodplain south of Estherville is used more intensely for agriculture compared to the upstream reach. Iowa Highway 4 parallels the river downstream of Estherville providing traffic noise. The upstream reach includes a great deal of river edge wetland vegetation, both forested and herbaceous. Annually-cultivated cropland, cattle grazing in and near the river and artificial rip-rap or old tires placed on the river bank for stabilization are more commonly seen downstream of Estherville. Water clarity is generally better on the upstream reaches as well.

It's likely the West Fork Des Moines River was channelized at some point in history but the existing channel is re-meandered throughout the county. This varies from downstream segments in Palo Alto County which retain their straightened form. Willow and other wet trees species are typically found on inside bends while Silver Maple, Hawthorne, Boxelder and Cottonwood are found on the slightly higher terraces. Herbaceous wetland vegetation can be found in the riparian areas in Mike Mickelson Park in Estherville at the top of the streambank; these include sedges and Prairie Cord Grass. This area at the top of the streambank is highly visible and regularly mown as a lawn but has enormous potential for ecological restoration, particularly upstream of the Highway 9 Bridge.

Signs of wildlife communities are common on all reaches, but particularly noticeable upstream of Estherville. Paddlers will see a variety of birds, including Bald Eagles hunting, as well as beaver and turtles.





RESOURCE EXPERIENCES NEAR THE WEST FORK DES MOINES RIVER

Recreation & Tourism in the Region

This study area offers numerous types of recreation and tourism attractions to round out a paddling experience. A large number of public recreation land acres have been set aside within 10 miles of the water trail, many with shallow wetlands. In addition, the study area also contains cultural and historical amenities and opportunities with museums, historic sites and buildings.

Trails

Iowa is recognized for its growing trails emphasis. Land and water trails are seen as an opportunity to enhance quality of life for residents and attract multi-day visitor trips. Northwest Iowa is increasingly expanding its trail opportunities.

Water Trails

Designation of the West Fork Des Moines in Emmet County offers several exciting opportunities. First, the West Fork Des Moines River in Minnesota is designated as a state water trail. Designation of the Iowa segment in Emmet County would create the first water trail that crosses state boundaries. Beyond this Minnesota state water trail, the nearest state designated routes are nearly 50 miles away in Iowa and Minnesota (Figure 31). Designation and further development of the West Fork Des Moines addresses a need for paddling opportunities in northwest Iowa.

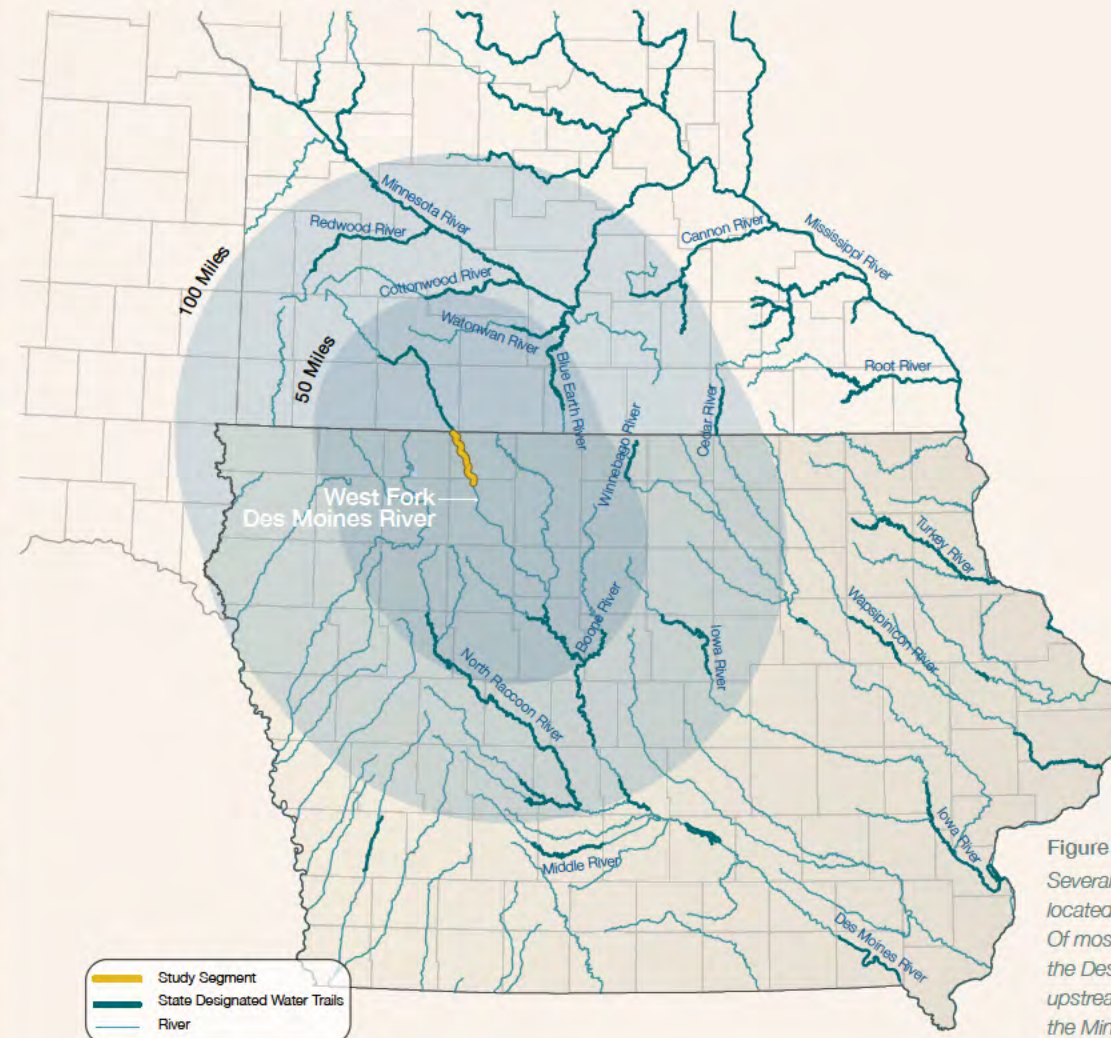


Figure 31. Several state-designated water trails are located within 50 miles of the study segment. Of most interest is the designated segment of the Des Moines River in Minnesota immediately upstream of this study segment. The name of the Minnesota segment is the Des Moines River State Water Trail.

Land Trails

Although the primary focus of this study is aimed at water trails, land based trails provide additional recreational opportunities and activities for visitors and residents. Two miles of concrete trails already exist in Estherville and future plans include 5.5 additional miles (Figure 32). When completed, the city trail system will loop around the municipal boundary connecting several important nodes. One of the existing segments of trail parallels the West Fork Des Moines River in Mickelson Park.

Fort Defiance State Park, adjacent to Estherville includes slightly more than 6 additional miles of trails. The Iowa Great Lakes Trail is a regional trail system located approximately 15

miles west of Estherville. Seventy-five miles of trails are included in this system. A potential connection link between Estherville and this trail system is proposed (Figure 33).

Near-river Overnight Accommodations

Hotel options exist in Estherville and the nearby Iowa Great Lakes area. Camping options are more limited but several options off-river exist. There are no camping opportunities on the river in Emmet County (Table 15).

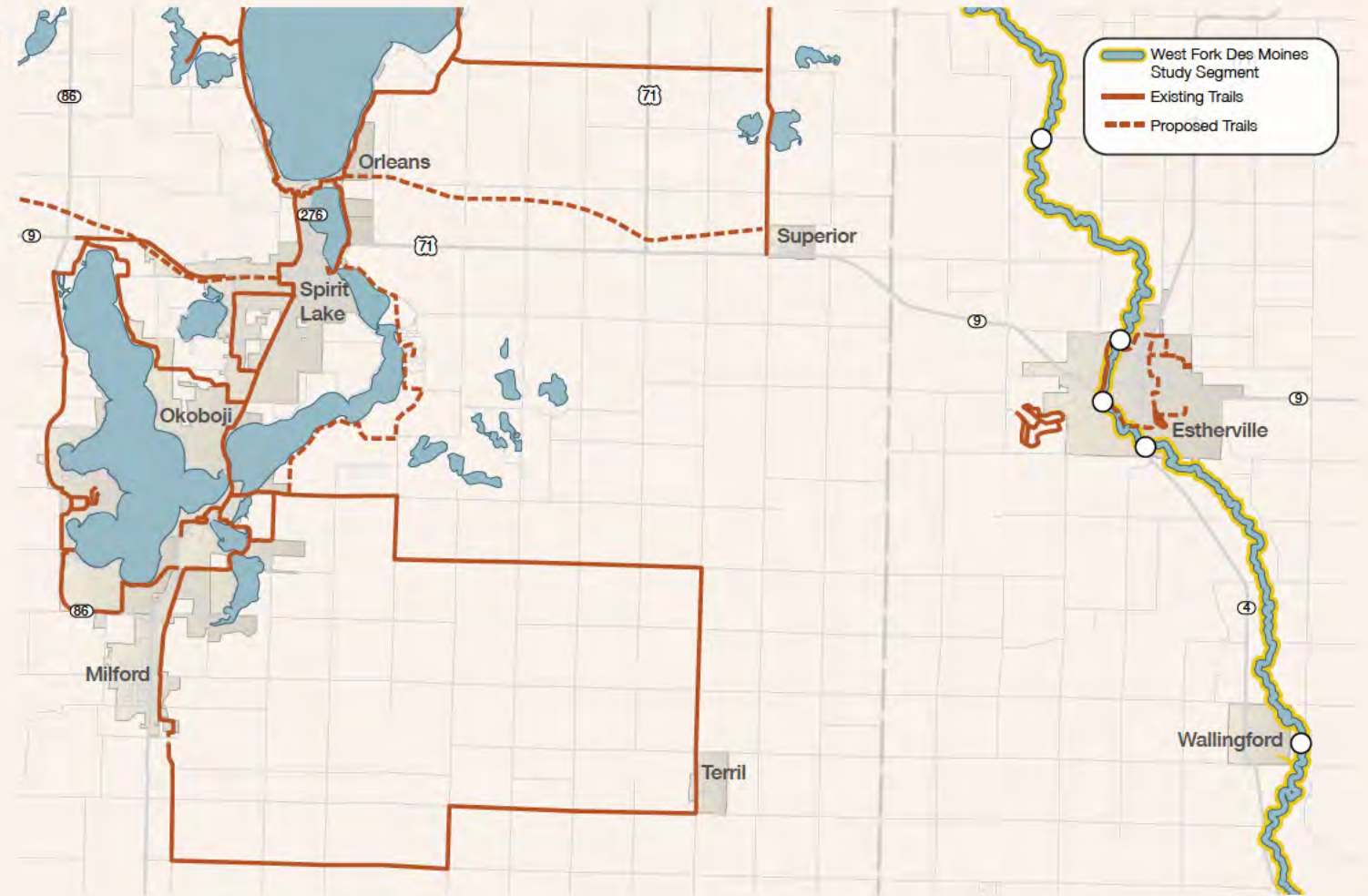


Figure 33. Regional trails will likely connect Estherville to the Okoboji region in the future.



Figure 32. Estherville has approximately 6 miles of hard-surfaced trails built or planned within city limits. Future plans include crossing the West Fork Des Moines River in Mickelson Park.

Water Trail Access	Distance to Nearest Modern Lodging	Nearest Modern Lodging	Distance to Nearest Camping	Nearest Camping
Petersburg Access	12.4 Miles	Estherville (96 rooms)	0 Miles	Petersburg Access (primitive camping allowed)
North Trailhead	5.2 Miles	Estherville (96 rooms)	5 Miles	Fort Defiance State Park (8 electrical, 8 primitive sites)
4th Street Bridge Access	.5 Miles	Estherville (96 rooms)	3.2 Miles	Fort Defiance State Park (8 electrical, 8 primitive sites)
School Creek Access	.5 Miles	Estherville (96 rooms)	2.4 Miles	Fort Defiance State Park (8 electrical, 8 primitive sites)
Peterson Access	7.5 Miles	Estherville (96 rooms)	4.3 Miles	Wolden Rec Area (90 modern sites)

Table 15. The Petersburg MN Access site offers on-river primitive camping and picnicking facilities. Camping is restricted at all other on-river recreation areas on the water trail.

Visitor Attractions

Historic sites and museums are the most common type of visitor attraction in Emmet County in addition to recreation (Table 16). Markers and museums focus on the region's early Euro-American settlement and conflicts with resident Indian tribes. A number of historic buildings within 10 miles of the water trail are open to the public including four properties listed on the National Register of Historic Places. Table 17 includes visitor attractions near the water trail related to themes other than history.

Attraction	NRHP	Information	Nearest Town						Miles to River
			Estherville	Wallingford	Graefinger	Emmetsburg	Great Lakes Region	Jackson, Min	
Estherville Public Library		Historic Carnegie Public Library; Located in the heart of downtown Estherville, this historic building is over 100 years old. Enjoy the beauty of the architecture, monuments, and green space in the surrounding square.	x						0.4
Emmet County Historical Society Museum Complex		Hundreds of displays about the history of Estherville focused on life in the late 1800s and early 1900s at a blacksmith shop, one-room school, outhouse and more; houses a rich collection of the history of Emmet County with photographs and artifacts. The complex includes an actual country school building, cabin and machine shed.	x						1
Peterson Point Historic Farmstead	X	The Peterson family homesteaded this farm on High Lake in 1866 and lived there for many years. The farmstead includes a restored farmhouse, barn, and various outbuildings.		x					3.4
Emmetsburg Public Library	X	Located in the Courthouse Square, it now houses the Iowa State University Extension Office.				x			
Fort Belmont		Unique re-creation of Fort Belmont built by settlers living in Belmont township of Jackson County MN in the early 1860s; Replica 1860's log cabin and stockade, Blacksmith shop, Hand-built prairie sod house, 40-foot tower overlooking the Des Moines River Valley, 1/3 replica working grist mill, 1873 farmhouse & summer kitchen, 1902 Church, Museum and trading post						x	10.7
Jackson County Courthouse	X	Constructed in 1908 with neoclassic architectural design. The dome and courtroom are embellished with painted murals executed by regional artists and craftsmen.						x	0.2
Mini-Wakan State Park Historic District	X	Restored Shelter House from built in CCC era and park pillars is listed as a historic district on the NRHP. Civilian Conservation Corps Company 778 began park development sometime between the beginning of June and the end of October 1933. Their work included grading for a road, building the picnic and parking area, the stone gate pillars, and placing riprap along the lake shore. Work on the shelter house was completed in 1934.					x		9.9
Estherville Rock Garden		Constructed in 1933 on the west bank of the West Fork Des Moines River in Mike Mickelson Park to be a beautiful area in which to relax by the river. Stones from various towns were brought in to build the masterpiece. The garden was restored in 1996 after flooding damaged much of the area.	x						0
Estherville Meteorite Site		A historical marker identifies the site near where a Meteorite landed in 1879.	x						2
Victorian Museum on Main		The crown jewel of Emmetsburg's Victorian homes. Built in 1883, the home is part of a four-building museum complex.				x			9.7
The Higgins Museum		Museum of U.S. Banking includes bank notes from 1863-1935 from all over the U.S. and 16,000-20,000 historic Iowa photo postcards					x		14.7
Abbie Gardner Sharp Cabin		In 1857, 13-year-old Abbie Gardner's family was killed during the Spirit Lake Massacre. Abbie was taken hostage and released 84 days later. She returned to Arnolds Park in 1891 and made the cabin one of Iowa's earliest tourist attractions.					x		14.7
Westport Schoolhouse		One-room schoolhouse built in 1896 and used until 1952. Historic primers, desks, piano and maps.					x		14
Iowa Rock 'N Roll Music Association Museum		Preserving the legacy of rock and roll music in Iowa by honoring achievements, educating youth, and inspiring artists. Recording studio, instruments, costumes, posters, awards, jukeboxes, radio booth and a Hall of Fame Wall of Honor. Exhibits preserving the history of rock n' roll.					x		14.8

Table 16

Historic buildings, sites and museums with interesting stories are found in most small towns in the area of the water trail. The Great Lakes Region, approximately 15 miles west of Estherville, also offers attractions based on history of that area.

Attraction	Information	Miles to River
Jackson Motorplex, Jackson MN	Half-mile sprint car oval racetrack	9.4
Pearson Lakes Art Center, Okoboji	Six galleries with permanent and traveling exhibitions showcasing local, regional and national artists. Interactive gallery and performing arts theater. Art classes for all ages. Events hall, gift shop.	14.2
Okoboji Spirit Center, Arnolds Park	Houses an Iowa Welcome Center, Maritime Museum and Gift Store, Hedberg Theatre, Okoboji Foundation and the Iowa Great Lakes Chamber of Commerce.	14.8
Pollinator Paradise Butterfly Garden, Okoboji	Butterfly enclosure with monarch caterpillars, chrysalises and monarchs. Exhibits on butterflies, bees and gardening. Kids play areas. Annual Bee & Butterfly Festival held the first Friday of September.	13.7
Arnolds Park Amusement Park, Arnolds Park	Established in 1876, this amusement park offers games, rides, concerts, shopping and a beach.	14.7

Table 17
Non-History Museum Attractions. Family attractions in the area include both outdoor experiences as well as indoor exhibits.

Outdoor Recreation on Public Land

A broad range of public recreational lands exist within 10 miles of the water trail including properties in Dickinson, Palo Alto and Emmet counties as well as in Minnesota. Slightly more than 20,000 acres are available (Figure 34). Appendix E organizes the major land holdings by ownership type, their relative distance from the West Fork Des Moines River and a description of uses each area promotes. Much but not all of the recreational land relates to water including lakes, wetlands and rivers.

Public land owned by the City of Estherville on the West Fork Des Moines River is a unique and valuable asset for the city. Nearly the entire reach of the river inside the municipal boundaries, including the dam, is part of Estherville's open space network. This offers excellent recreation opportunities for flood-tolerant activities such as trails as well as coordinated conservation opportunities. Perhaps most importantly, it offers Estherville the opportunity to develop the river's edge to enhance fishing and water play opportunities that would draw visitors and residents alike. Municipal parks near the river are listed in (Table 18).

Public recreation lands offer some opportunities with accessible elements. Recreational property owners or managers were asked to report which elements on their lands comply with the Americans with Disabilities Act (ADA) requirements and are considered readily accessible to and usable by individuals with physical limitations. Features not meeting these standards can

present barriers to use or participation. The following elements meeting ADA standards were reported by their owners or managers:

- Restrooms at Emmet County Nature Center, Fort Defiance State Park, Wolden Recreation Area, South Hoyer, Riverside, and Spurgin Parks in Estherville
- Picnic tables at Fort Defiance State Park
- Open shelters at Fort Defiance State Park and Wolden Recreation Area
- Lodge facility at Fort Defiance State Park

Permanently Protected Lands

Land is considered permanently protected when it is in public ownership or held with a permanent conservation easement. While it's possible that these lands could be developed or converted to agricultural use, it's unlikely. Lands in permanent protection provide critical habitat and water quality functions as well as open space enjoyment for people. Those in public ownership also offer future generations access to natural areas and recreational uses. More than 30,000 acres of land are permanently protected within 10 miles of the West Fork, Des Moines River study area (Table 19). This amount of land acres is higher than average amount in permanent protection for rivers being considered for state water trail designation.

	Miles From River	Fishing	Playground	Walking Trails	Modern Restrooms	Other
Municipal Public Recreation Areas						
South Fourteenth Street Park, Estherville	0.6		x			
Spurgin Park, Estherville	0.3			x	x	park benches, picnic tables, 4 tennis courts
Wayne King Park, Estherville	0.9		x			open shelter, picnic tables
Jensen Park, Estherville	0.7		x			picnic table
Joe Hoyer Park, Estherville	0	x	x		x	Open shelter house that offers access to electricity and picnic tables; disc golf
Lincoln Park, Estherville	0.3		x		x	Open shelter, picnic tables
Mike Mickelson Park, Estherville	0	x	x	x	x	boat ramp, Rock Garden
Thoreson Memorial Park, Estherville	0.8		x	x	x	14 acres, three shelters, bocce ball court; sand volley ball court, basketball court, softball/baseball fields
Trinity Park, Estherville	0.3		x			
Riverside Park, Estherville	0	x		x	x	West Entrance to Swinging Bridge, outdoor ice skating rink
Evergreen Park, Graettinger	0.4					Pool, tennis court, ball fields
Citizens Memorial Park, Graettinger	0.2		x			Ball fields, shelter house,
Fahnestock Park, Graettinger	0.6		x			

Table 18
A great diversity of city parks are available in Estherville. Many include family amenities such as playgrounds and picnic shelters. This table summarizes the most prominent city parks in Estherville and Graettinger in terms of recreational opportunities that a visitor to the city might seek out.



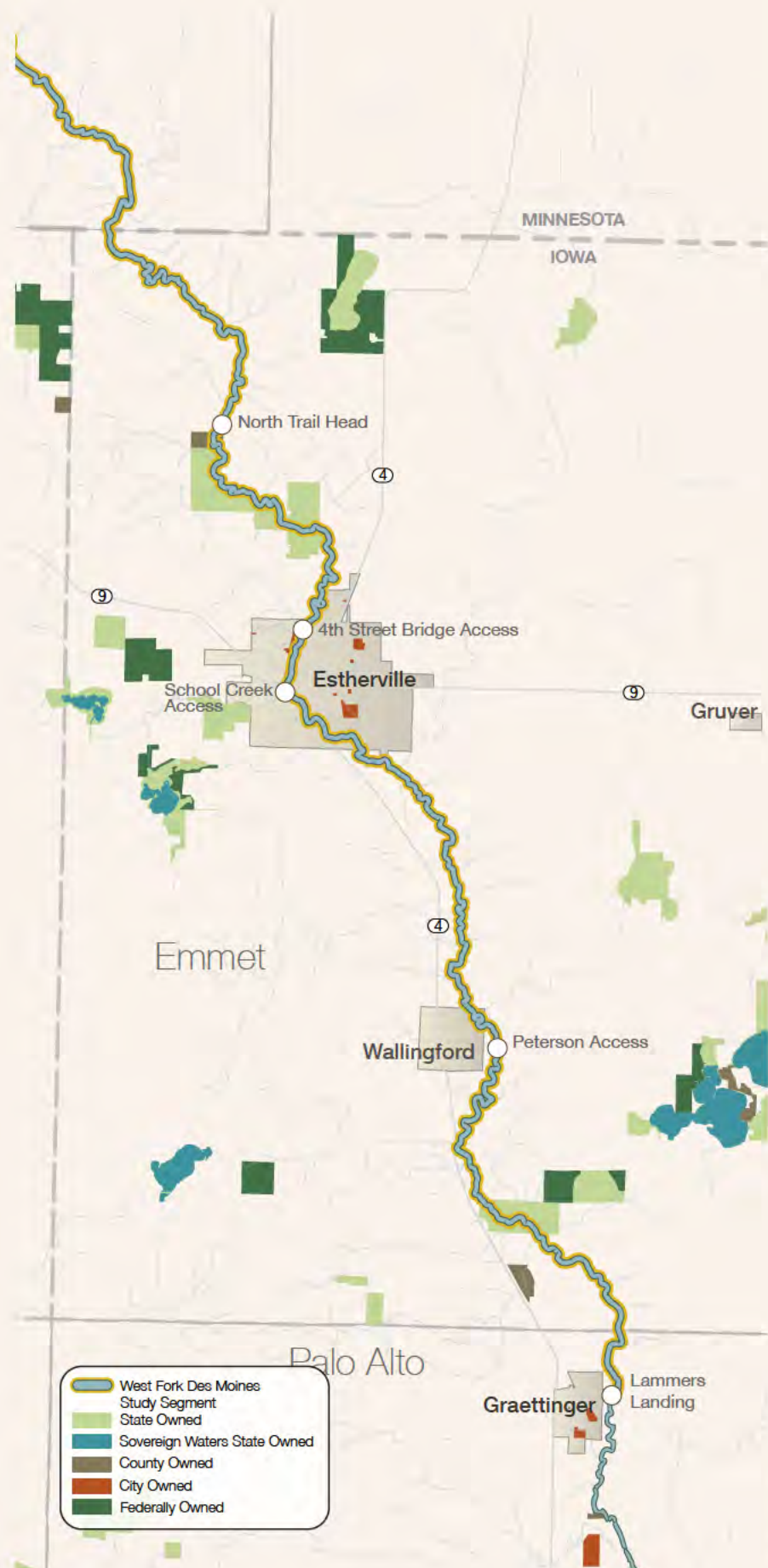


Figure 34
The majority of public recreation lands surrounding the water trail are state-owned and disconnected, spatially, from the West Fork Des Moines River.

Interpretation Programs and Efforts

Emmet County Conservation staff offer comprehensive environmental education programs to schools, civic groups and youth clubs. Two education events related to planning for this water trail study occurred from 2014. Events were led by a combination of state experts and the local naturalist. A total of 30 people participated in these events. An Archaeology Program was held in July with Cheri Haury-Artz of Iowa's Office of State Archeologist; the majority of participants were children. An Aquatic Insects Program was led by Jackie Gautsch of Iowa DNR.

Locally-led trash-pick up floats have been held periodically on the river between Estherville and Wallingford for more than 10 years. The group is informally led members of the Emmet County Water Trail Association. The 2014 and 2015 half-day events were reported as the most successful event to date and included clean-up in the channel as well as the riparian areas. They removed a variety of metal items, glass, plastic sheeting, a couple bicycles, and tires. The total amount of garbage removed was less than in past years, suggesting the group is likely making progress.

	Land Within 10 miles of West Fork Des Moines River	Land Adjoining West Fork Des Moines River
Public Areas for River Access	103	103
City Parks	299	123
County Parks	1,350	235
State Parks	254	1,830
State Preserve	461	186
WPA (Blue Wing Marsh, Burr Oak Lake, Cheever Lake, Christopherson Slough, Dewey's Pasture, Eagle Lake, Fallow Marsh, Four Mile Lake, Ingham-High, Jerry Schotzko, Loon Lake, Spring Run, Twelve Mile Lake, West Swan Lake)	4,452	0
WMA (Anderson Prairie, Birge Lake, Blue Wing Marsh, Burr Oak Lake, Christopherson Slough Complex, Dewey's Pasture Complex, Eagle Lake (Emmet, East Swan Lake, Fallow Marsh, Five Island Lake, Four Mile Lake, Grass Lake, Hales Slough, Ingham-High Wetland Complex, McClelland Beach, Perkins Marsh, Ryan Lake, Spring Run Wetland Complex, Trickle Slough, Twelve Mile Lake (Emmet), West Fork, West Swan Lake)	13,215	1,643
WRP, EWP, EWRP Easement	3,793	1,593
Sovereign Waters (Cheever Lake State Preserve, Five Island Lake, High Lake, Ingham Lake, Little Swan Lake, Lost Island Lake, Pleasant Lake, Spirit Lake, Swan Lake, Trumbull Lake, Twelve Mile, Lake, West Swan Lake)	6,838	0
Recreation (Dickenson County Trails)	10	0
Acres in Permanent Protection	30,775	5,713
Total Land in Permanent Protection within 10 miles of the West Fork Des Moines River Water Trail	30,755 acres	
Total Recreational Land within 10 miles of the West Fork Des Moines Water Trail	26,982 acres	

Table 19

State-owned Wildlife Management Areas (s) and federally-owned Waterfowl Production Areas (WPAs) represent over 50% of the permanently protected land and water within 10 miles of the West Fork of the Des Moines River study segment. Natural Lakes, considered sovereign waters owned by the state, make a significant contribution to the public space available for recreation and conservation.

Water Trail Potential

This section of the chapter synthesizes findings from earlier sections and suggests future water trail development directions. One goal is to distinguish each designated water trail from others in the state as well as to suggest resource conservation and restoration opportunities appropriate to this location. Included in this section is a water trail theme proposal, discussion of potential recreation improvements on and off river, suggested access improvements to reduce water pollution and enhance habitat at these points, considerations for the route and experience classification, conservation and restoration opportunities, and permitting expectations.

WATER TRAIL THEME

A water trail theme describes the unique experiences a river and its surrounding area offers the public. Themes are used to distinguish one water trail from another for marketing as well as in conservation priorities. Themes also identify and focus future development efforts on and near the river. The West Fork Des Moines has a wonderfully rich story to share with visitors (Figure 35). Its theme is likely to center on its vast natural resource base, including a highly prized Anderson Prairie Preserve. The river's physical connection with Minnesota and their state-designated water trail makes it the first interstate water trail in Iowa. Central among other rich experiences here is the ability to visit a region of the state with a rural culture but located so close to the Iowa Great Lakes.

Background

The West Fork Des Moines River in Emmet County sports some of the least disturbed landscapes in Iowa's Des Moines Lobe ecoregion. Visually, users see rolling pastured hills, pothole prairies, groundwater seeps and wetland vegetation on streambanks, soaring birds of prey and publicly owned undisturbed prairies. Less visible and known about are the rich cultural and historical resources of the area. Only one other state designated water trail in Iowa has more land in permanent protection within 10 miles of the river compared to the West Fork Des Moines. Nearly all the 30,755 acres in protection is state owned for wildlife management purposes although nearly 4,000 acres are privately owned with conservation easements. Of these lands, there are four complexes of more than 2,000 acres each. These areas have the potential to provide rich habitat opportunities. A great deal of diversity exists on and near this river including amphibians, reptile and bird species. A total of 13 amphibian reptiles species included on Iowa's Species of Greatest Conservation Need (SGCN) list have been identified here. And of all the rivers in Iowa studied for potential designation as a state water trail since 2013, this river has one of the highest numbers of breeding bird species documented. Nineteen of these bird species are included on Iowa's SGCN List. Admirably, 96% of the riparian area within the first 100' of

the top of streambank of the West Fork Des Moines is perennial vegetation; only 23 acres are annually cultivated crops.

Some important pre-historic and historic cultural resource sites near the river corridor are already in permanent protection and are available for interpretation, offering outstanding complementary opportunities to active recreation. Because Euro-American settlement arrived in this region of the state much later than eastern Iowa, there is a strong legacy in this region from that era as well.

From a recreation standpoint, the proposed water trail route interfaces with existing land trails and other developed recreational areas only inside Estherville. The water trail offers spectacular opportunities for long day trips, particularly for experienced paddlers. Various hazards exist including a low head dam and large woody debris snags. Paddling options on local lakes in Emmet County also exist. Currently there are no livery operations or campgrounds on the river. Long-standing flood waters have complicated river use in recent years. Management of recreation lands near the river following floods have also required removal of large amounts of sediment and flood debris.

Although water quality in West Fork in Emmet County is not listed as impaired, segments above and below are listed and fish consumption advisories for mercury are in place. The segment between Jackson MN and the Minnesota/Iowa state line is listed with impaired uses for aquatic consumption (mercury in fish tissue), aquatic life (turbidity, low diversity of fishes and invertebrates) and aquatic recreation (fecal coliform). Downstream from the proposed water trail route, a portion of the river in southern Palo Alto County is included in Iowa's 2016 303(d) list as impaired for aquatic consumption (mercury in fish tissue); the advisory is for no more than 1 meal per week. This impairment extends to the confluence of the West and East Forks of the Des Moines River in Humboldt County. Additionally, Emmet County lakes included on Iowa's 303(d) impaired waters list include Ingham, West Swan, High and Twelve-Mile. Impairments for all these lakes include algal growth (chlorophyll a) and turbidity (suspended solids).

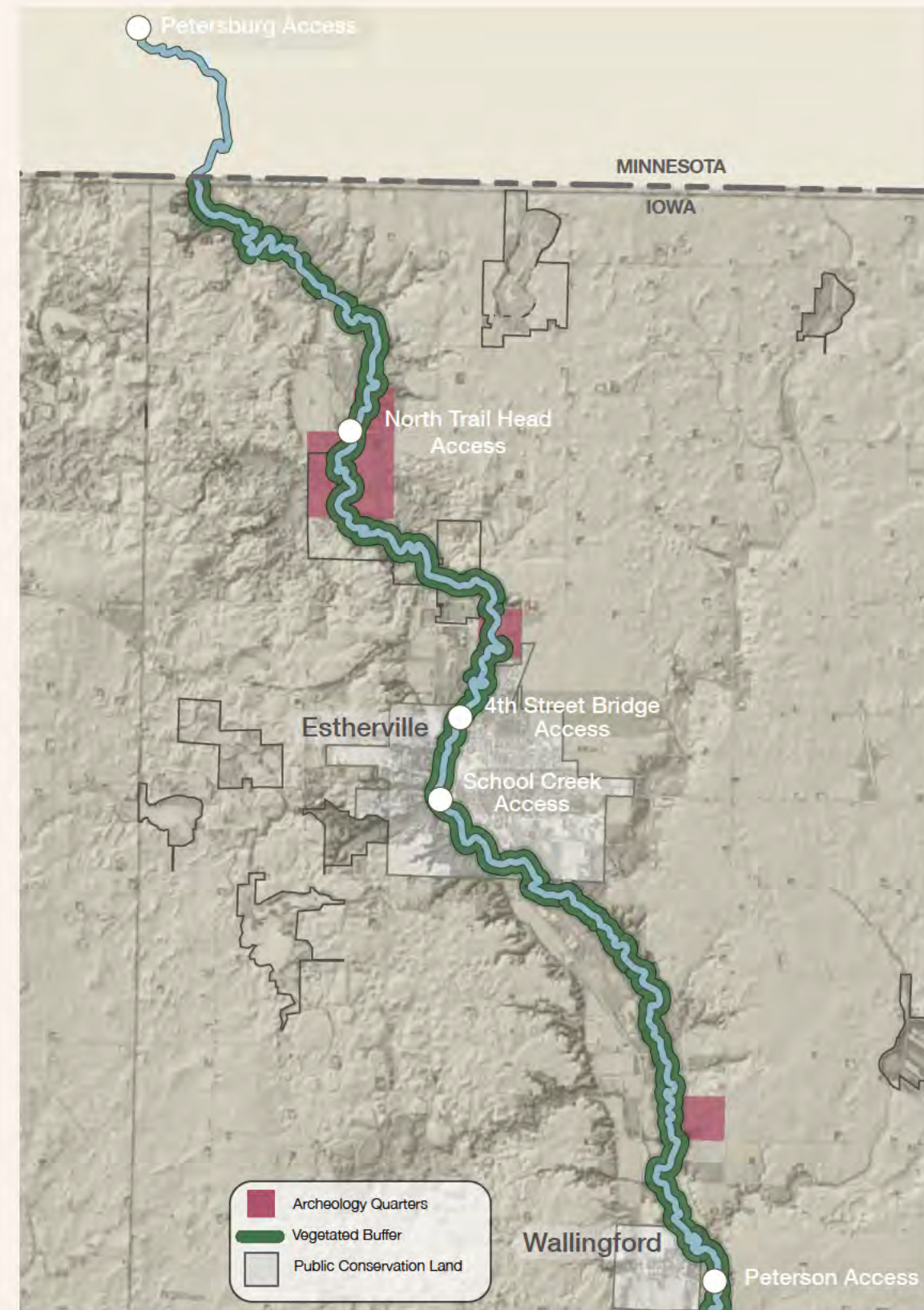


Figure 35
Known historic and cultural sites (included within the red shaded quarter-section squares), while often located on private land and not publicly accessible, lend a rich heritage to other visible natural resources such as vegetation and fish.

Proposed Water Trail Route

Upstream of Estherville, the West Fork Des Moines is generally a meandering and tree-lined channel. Forested and herbaceous wetlands are common near the river channel. Low-lying forests are dominated by silver maple mixed typically with cottonwood, box elder and willow, with some elm and ash. Higher benches include bur and white oak. Grasslands visible from the river include both permanently protected land, such as Anderson Prairie Preserve, as well as privately owned grazed grasslands. Diverse bird watching opportunities exist on this stretch including belted kingfishers, great blue herons, killdeer, solitary sandpipers, blue jays, cedar waxwings, red-winged blackbirds, song sparrows, goldfinches, yellowthroats, wood ducks, mallards, mourning doves, and some blue-winged teal. Great horned owls and red-tailed hawks are fairly common along the river and bald eagles fish this section of the river. Many large log jams are present on the water trail route and can present challenges to beginning paddlers.

Four potential changes are recommended for future consideration. First, there is strong interest in further recreational use of the river edge land inside Estherville, including modification of the existing, breached dam. Second, additional shorter paddler routes, approximately two hours of float time, downstream of Estherville would support increased use of the river. Third, a lack of developed campgrounds at the river's edge begs for more camping opportunities. Finally, expansion of the water trail both upstream and downstream is recommended.



Water Trail Experience Classification

Current river and people management of this water trail most closely aligns with the Recreational experience classification with the exception of one segment. This segment of the river is inside Estherville, from 4th Street Bridge Access to School Creek Access. This segment is excluded from the state water trail route until the dam in Mike Mickelson Park is mitigated. Recreational classification means it is a typical river experience in Iowa and appropriate for people with some paddling experience. However, while recreational experience classification typically pairs with intermediate skill levels, because of the number of avulsions and logjams creating navigational difficulty on the segments upstream of the 4th Street Bridge Access, it is recommended these segments be rated for advanced skilled paddlers. The water trail functions well in this classification. However, opportunities exist to enhance use of the river by current users as well as to expand use to new populations (Figure 36).

The School Creek Access and the breached low-head dam in Mickelson Park is an ideal location for a Gateway classification segment but existing conditions would require enhancement. One or more future accesses could be developed downstream to provide an ideal shorter river distance for beginners, novices and tubers. Upgrades would include new Universal Design accesses with special attention to channel conditions and flow patterns. In addition to a Universal designed launch at both ends of the segment, the following upgrades in the spirit of Gateway classifications are also suggested:

- Consider all future changes to these accesses in ways that relate the most strongly to the historical and cultural nature of these places as well as the rich recreational amenities located nearby
- Parking for all future accesses would ideally be located outside of the 50-year flood inundation levels.
- Configure the access experience with as low a slope % as possible; this includes the parking areas, paths to the launch and the launch itself
- Add interpretation for the segment including information and other displays related to riverine systems, geology, and history and culture of the region
- Establish or strengthen a river management presence on this segment of the river as well as a communication strategy between river users and land managers

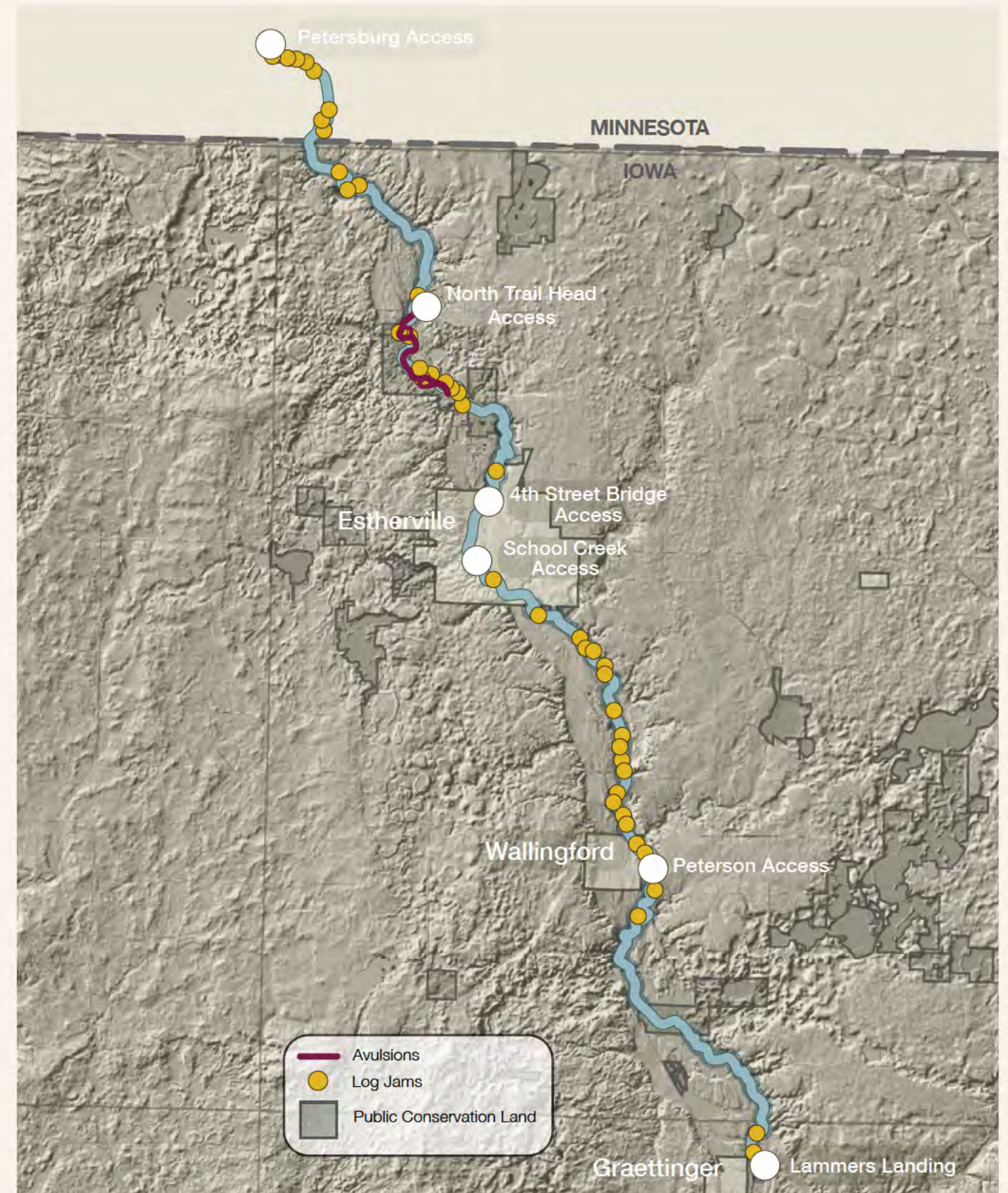


Figure 36
Upstream segments of the water trail, despite their rugged beauty, are likely to be challenging for beginning users. Downstream segments also have hazards but create greater opportunities for improvement in navigation.

RECREATION DEVELOPMENT POTENTIAL

Water-Based Recreation Potential

Table 20 organizes enhancement opportunities for river use aspects of the water trail.

Land-Based Recreation Potential

With nearly 27,000 acres of public recreation land within a 10-mile radius of the water trail, there are currently many opportunities for outdoor recreation, particularly hunting. Several already planned improvements on public land in the river corridor were identified during the preparation of this chapter. The most recent recreation planning documents were reviewed in 2018. The following improvements related to off-water recreation were included in these plans

- City of Estherville's Trails Master Plan identifies an additional 5.5 miles of planned trails that have not yet been constructed
- Regionally, bike trail routes between Estherville, local public land such as Anderson Prairie Preserve and the Iowa Great Lakes have been identified but not yet constructed

Recreational Enhancement	Issue Addressed
Enhance Everyday Management Conditions	
Reinforce capacity for on-water rescue	Emergency staff turn-over is common in Iowa particularly among volunteer organizations. Reinforcing the network of personnel serving the river corridor in Emmet County is a good way to learn of new management challenges and share information between agencies.
Standardize ordinary maintenance at launches	Better communication and agreement by all access owners/managers could result in more efficient and timely removal of sediment and debris from launches and other ordinary maintenance tasks
Enhance communication between water trail sponsors and access managers	Future coordination of water trail activities and issues would be enhanced with a defined organizational structure and regular communication among access owners/managers
Develop policy/agreement showing responsibilities for each water trail access manager	Access managers need to be aware of their responsibilities as pertains to maintaining signage, amenities and kiosks.
Enhance Water Trail Experience for Current Uses	
Upgrade accesses lacking appropriate alignment to the thalweg (deepest part of the channel)	The angle of launch alignment on the 2 accesses in Estherville are oriented upstream. This alignment requires additional maintenance and sediment removal as well as creates muddy conditions for people and vehicles using the launches. Reconstruction and updating of these accesses would support greater use and less maintenance.
Enhance communication for users before they get to the river	River users will feel better prepared for their experience with updated maps of the river corridor; maps can be printed as well as available to download online. Links to current water levels and information about how to interpret them would also be helpful.
Enhance communication with river landowners	Landowners are an important partner in any water trail. Small living-room style meetings are recommended with landowners to provide information about paddler and land owner rights in Iowa. The brochure, "West Fork Des Moines River Recreational Use", communicates the limits and rights of recreational users on the river in Emmet County and will be a useful part of these discussions.
Update public interpretation	Utilize the resources included in this chapter to produce compelling, varied interpretation of critical issues and resources based on the conditions on this river segment
Upgrade signage to meet State Water Trail Standards	Not all access signage meets the State Water Trail program standards. Additional bridge signs may also be necessary for wayfinding on the water. Issues include unmarked accesses and very few have signs that can be seen from the water helping paddlers know they have reached the access
Upgrade facilities	A fish cleaning station and fishing line recycling tubes near the dam in Mike Mickelson Park would support this high use fishing area.
Attract New Paddler & Angler User Populations	
Modify Existing Hazards in Estherville to Complete the Water Trail in Emmet County	The existing water trail omits a 1.1 mile segment in Estherville due to river hazards. The old-style dam in Estherville is a drowning hazard at some water levels. The dam is also breached, causing streambank erosion adjacent to it. Neither hazard signage nor a portage route to avoid the dam exist. Modification of the dam would create new interest in the river and Estherville as a destination and expanded opportunities for angling in Mike Mickelson Park. A small rapids is also present in Estherville; it also lacks hazard signage and a portage route.
Woody debris	Sporadic clearing of large log jams in some segments of the river by trained professionals or volunteers will likely be required to facilitate use of the river by beginning paddlers.
Develop Universal-Design Access and Gateway Segment	None of the existing accesses or segments accommodate users with special needs or beginning paddlers. A gateway segment with Universal-Design accesses on both ends is recommended.

Table 20
Three types of recreational river enhancements were identified during planning. Each type and the specific enhancements included in each are detailed in this table.

Basic Riparian Land Improvements Impacting Habitat and Water Quality

Four elements related to water quality are recommended of all river access points in Iowa.

- Parking for river accesses should be located on sites not prone to frequent flooding; for this river, the 50-year inundation level is a good goal
- Streambank conditions near river access points and other prominent locations should be stable; stabilization should utilize the latest techniques for streambank restoration (rather than focusing on rip rap as a solution)
- The first 50 feet back from the top of the streambank edge is reserved for a natural (unmown) native perennial buffer. All constructed parking and other features, with the exception of launches and trails, should be located outside of this buffer area; this setback area should be vegetated with natural (unmown) perennial vegetation. Existing parking areas at launches should have a similarly vegetated buffer of at least 40 feet in width

Table 21 summarizes these general conditions for this study area. Yellow cells indicate an enhancement is recommended.

Facility Where Access is Located	Width of Vegetative Buffer Between Parking and River	Streambank Conditions Adjacent to Launch
Petersburg Access	20'	
North Trailhead	25'	Severe Erosion
4th Street Bridge Access	10'	
School Creek Access	10'	Severe Erosion
Peterson Access	20'	Severe Erosion
Lammers Landing	2'	

Table 21
Enhancements that reduce soil erosion and slow overland flow into the river channel at an access also reduce pollutant loading into the river. Yellow cells indicate an enhancement is recommended.

RESOURCE PROTECTION & RESTORATION POTENTIAL

The land and water resources associated with the West Fork Des Moines River corridor in Emmet County is known to include numerous significant bird, reptile and amphibian species as well as cultural resources. And a great deal of riparian land is already in permanent protection, particularly upstream of Estherville. However, there is very little long term resource conservation and management planning. Additional conservation and management could help the project area reach even stronger biodiversity goals, particularly as it relates to shifts in climate, including flooding. Corridor users would benefit from enhanced conservation and protection as well as from focused interpretation that builds knowledge about the unique resources present. The following standards relate to all future development efforts intended to bring people to the river corridor:

- Recreational development actions occur in ways that protect long-term conditions for existing aquatic and terrestrial wildlife, plant communities and river channel function in the area
- Conservation planning and communication is utilized to identify land management actions that are helpful in protecting habitat conditions in the river corridor and its tributaries as well as those that degrade conditions
- Soil is recognized as a living resource capable of facilitating both economic stability and degraded water conditions when erosion in excessive amounts occurs
- Cultural and historic resources are prioritized for conservation, preservation and interpretation

Conservation and Restoration Elements

Multiple conservation and restoration opportunities became apparent from stakeholder input and through research for this chapter. These opportunities and potential partners are described below in Table 22; these elements are illustrated in Figure 37.

Expected Permitting Considerations

Development projects disturbing streambank, riparian areas, channel bottoms, and/or near-river areas will require review to determine if critical resources will be impacted. The following permitting activities should be expected:

- Phase I: Intensive Archaeological Survey
- Joint Application: a joint permit application is shared between the DNR flood plain development program, the DNR sovereign lands program, and the U.S. Army Corps of Engineers
- Municipal and County Floodplain permitting

Conservation and Restoration Enhancement	Supporting Organizations and Individuals
Enhance Aquatic Resource Conditions	
Remove barriers to fish passage; pursue a 100' wide perennial buffer on the entire water trail and its tributaries; explore a beaver management area on tributaries to stimulate channel restoration and re-meandering; better understand current water quality conditions with monitoring. Doing so allows for understanding and realistic goal-setting to enhance habitat conditions for sport fishing.	Emmet County CCB, Iowa DNR River Programs, Minnesota DNR
Enhance Terrestrial Resource Conditions	
Promote establishment of pollinator habitat-friendly landscapes in both rural and urban areas.	Iowa DNR
Enhance Cultural and Historic Resource Conditions	
Further investigation, prioritization of state-recorded and locally-known archeologic and historic resources; pursue permanent protection (from development and exploitation) for priority cultural, historic sites. Doing so allows for their interpretation, future research, and educational opportunities	Iowa OSA, Emmet County Historical Society

Table 22

Three types of conservation and restoration enhancements were identified during planning. Each type and the specific elements included in each are detailed in this table

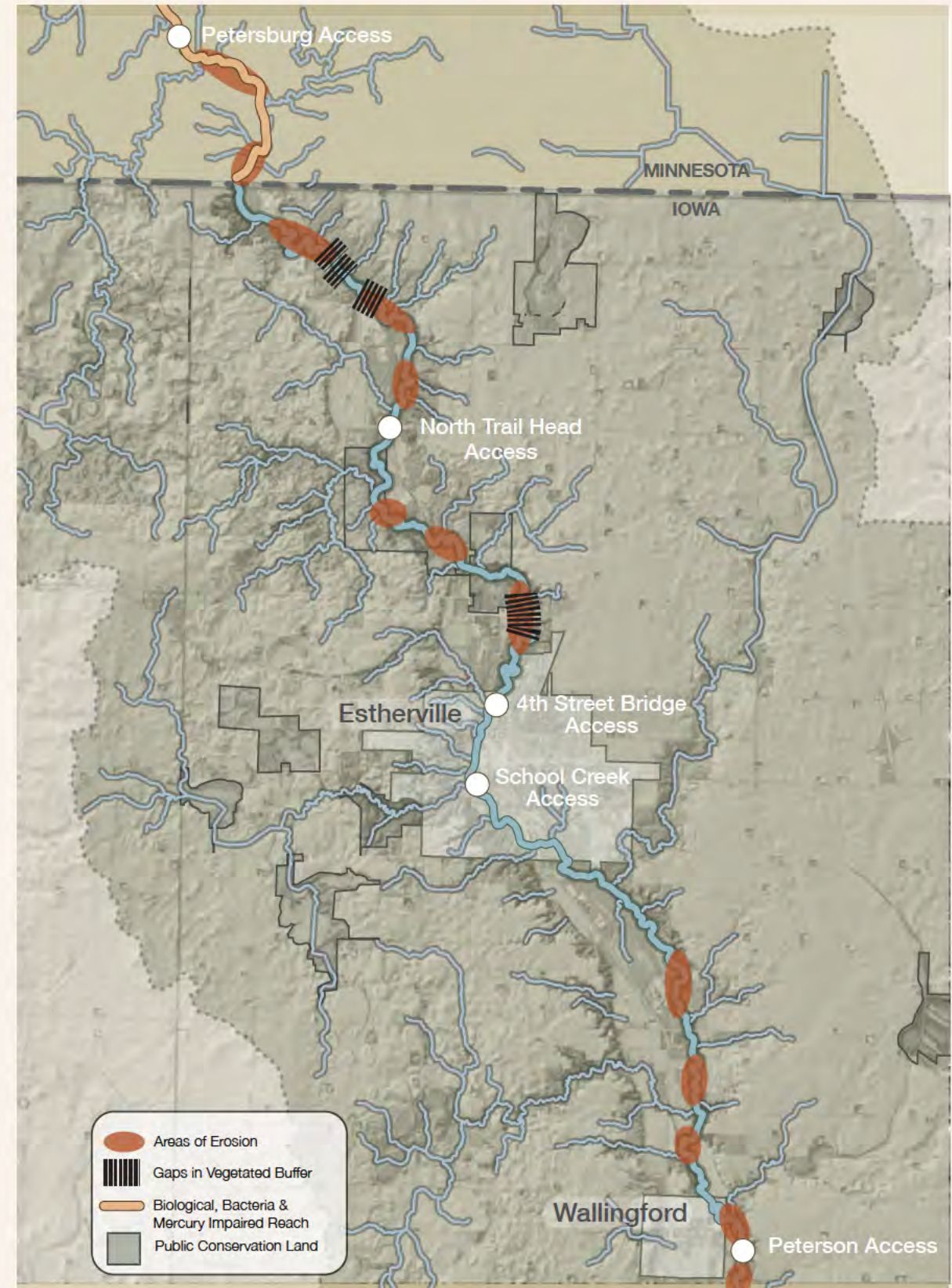


Figure 37

Areas with severe bank erosion offer opportunities for natural channel restoration and stabilization.



WATER TRAIL RECOMMENDATIONS/SUMMARY

State-designated water trails are as much about other resources and experiences as they are about paddling. The most successful trails integrate and synthesize multiple opportunities at once: working to minimize damage to sensitive aquatic species, such as native mussels, while working to create new habitat; thoughtfully designing restoration practices such as streambank bioengineering to reduce nutrient pollution and increase biodiversity in ways that respect the needs of anglers and boaters; and partnering with local organizations with shared goals for conservation in the watershed and region of the water trail. People are the most important component in taking advantage of these opportunities.

Planning for state-designated trails brings all parties to the table because it is realized that all parties are necessary to protect, conserve, restore and promote resources on the ground. Movement forward from this planning activity is informed by the work of many informed technical specialists, researchers, local stakeholders, water trail program sponsors, and land managers. The future for this river corridor is very optimistic. State water trail staff and funding sources are poised to promote development, conservation and restoration on the river and within its corridor. Other funding sources, such as those promoting biodiversity, cultural resource protection and outdoor education, are more likely to value the integration of multiple resources and the regional focus of the river corridor more than a single resource consideration at one specific location.

The water trail sponsor, the City of Estherville, has several decisions ahead. Initially they will commit to pursuing whichever experience classifications they believe are most appropriate. Decision making about how to address the failing dam in Mike Mickelson Park is also critically important. These decisions, plus prioritized planning elements, will enable the water trail to competitively acquire funding and other support to reach their goals.

Once the vision is constructed by the water trail sponsor, all entities on the water trail will engage in managing and planning for the future of the water trail to the extent they find it important individually. Future decisions also include how the route will be interpreted and shared with the public, marketing strategies,

priorities about preservation, conservation and restoration on the river and in the riparian corridor, and other options laid out in this chapter.

The most important element in any state-designated water trail will always be people. This water trail's ability to integrate and synthesize the resources available in the corridor into an interpreted experience rests entirely on them. Much of the "boots on the ground" work will be performed by paid county, municipal and state staff. Critically important opportunities, however, will require local and regional volunteer leadership.



CHAPTER 2 WATER TRAIL VISION

The City of Estherville has agreed to be the water trail sponsor. Emmet County Water Trails Association and Emmet County Conservation Board are partners in promoting, developing and managing it. All parties are interested in enhancing recreational use, tourism, conservation and protection of the river corridor.

Water Trail Theme. The theme of this water trail revolves around the river as a natural area—a place to regenerate oneself and appreciate nature. Tucked away in rural northwest Iowa, the water trail overlaps with Anderson Prairie Preserve and many acres of natural grassland, forests and wetlands. The majority of the paddling that occurs in Emmet County is local. The water trail sponsor hopes to change this, by encouraging responsible recreation from the multi-state and Iowa Great Lakes regions, with state designation. The theme and vision of this water trail identifies many opportunities to grow the population of those who use and/or appreciate these resources as well as adjacent communities and businesses.

Vision. The water trail sponsor and the steering committee are keen to protect the peaceful, undeveloped and natural experience that currently exists on the West Fork Des Moines River, while building a broader base of users who will appreciate and enjoy the corridor. Building a broader base includes expanding the abilities of people who can enjoy the river as well as minimizing hazards, enhancing fish habitat for anglers and enhancing emergency response capabilities.



Estherville is the center of this water trail both physically and figuratively. There is a strong overlap between the water trail route and existing Estherville city parks and land trails, allowing users to move from the river's edge into the community and to local businesses. Several planning elements included in this project vision will better support pedal-paddle use and overnight accommodations for paddlers. An opportunity exists to develop a full hook-up RV campground near the river's edge which will be a first for Emmet County.

The water trail sponsor and the Emmet County Water Trail Association have a strong interest in fostering future successful relationships between river users and rural landowners, particularly if river use volumes increase. They are committed to education that teaches respectful recreation between both parties and about the natural and cultural resources present.

The long-term vision for this water trail includes four types of physical improvements: developing infrastructure to allow use by people with limited physical abilities and to reduce maintenance costs; river-edge camping opportunities associated with a river launch; mitigating the two river hazards that exist in Estherville; and creating an urban waterfront destination point, including modification of the existing low head dam, for angling and river play.

- Emmet County has five existing river accesses. The condition of these accesses are satisfactory but two in Estherville are built in ways that make use difficult without frequent sediment removal. Reconstruction of the Mickelson Park access with a Universal Design style launch and expanded parking is recommended both to reduce maintenance and to extend use by more people. The addition of a second Universal Design launch several miles downstream of Mickelson Park will allow half-day floats from Estherville, something not possible now.
- River-edge camping is not currently available in Emmet County and desired. A full-hookup campground and dump station is recommended on land owned by the City of Estherville; a new carry down river access is also recommended so people can boat into and out of the campground.
- A destination river-edge park is recommended between the Swinging Bridge and the existing low head dam in Mickelson Park. Modification of the existing, breached dam is recommended; designs surrounding the Swinging Bridge and the School Creek access will offer extensive access to the river for anglers, tubers, kayakers and people-watchers. A design solution that protects underground utilities upstream of the dam and provides safe passage for river users and fish is recommended. An ADA-accessible fishing access is also recommended in conjunction with the dam modification.

Cooperation between the City of Estherville and Emmet County Conservation to develop the new access downstream of Estherville has already begun. Planning for purchase of the land is underway and the site has been cleared for construction by OSA. No future cultural resource investigations are anticipated.



CHAPTER 3 RECREATIONAL DEVELOPMENT & CONSERVATION RECOMMENDATIONS

State water trails in Iowa are examples of important, successful experiences between people and natural resources.

The West Fork Des Moines Water Trail is the first state water trail in Iowa with a local non-profit organization solely focused on supporting its development and management. This water trail route stands on its own in terms of merit for recreation and conservation opportunities. Paddling the West Fork Des Moines River near the Iowa – Minnesota state line is to experience some of the least disturbed landscapes in Iowa's Des Moines Lobe ecoregion. Visually, users see rolling pastured

hills, pothole prairies, groundwater seeps and wetland vegetation on streambanks, soaring birds of prey and publicly owned undisturbed prairies. Less visible and known are the rich cultural and historical resources of the area. The mostly rural route has a 125' wide channel and provides an approachable experience for users interested in seeing wildlife and vegetation resources up close. Estherville is the hub of the water trail because of its city-owned greenbelt with varied recreational resources and the variety of amenities available in the community. This planning integrated regional and local interests and opportunities for conservation and recreation that support the West Fork Des Moines River, particularly existing users such as anglers, paddlers and campers.

State Water Trails in Iowa

In 2010 the Iowa Department of Natural Resources (DNR) completed "IOWA WATER TRAILS: Connecting People with Water and Resources" (Wagner and Hoogeveen 2010a). This statewide plan was the result of a 2008 mandate for the water trails program. This plan ushered in a new legacy of enjoyment, respect, and care for the navigable waters of Iowa. This recreation development plan adds to that excitement by utilizing the increasing volunteer spirit and local pride communities have for their rivers. The vision for Iowa's water trails program centers both on expanding recreational experiences as well as protecting and enhancing Iowa's aquatic and riparian resources. And in addition to providing access to Iowa's rivers, the vision points to water trails as an entry point for people to become aware of and learn about the challenges facing Iowa's waterways. Similarly, state water

trail plan goals focus on user experiences, natural resource conservation and efficient management.

Recreation planning for state water trails responds to the individual character of each river, the local support present and landscape conditions. Recommended outcomes focus on enhancing both the recreational infrastructure and the experiences of water trail users. The Iowa Water Trails Program recognizes water trail users as all people using the river as well as the adjacent land. On the river itself this includes paddlers and other boaters, anglers, swimmers and tubers. Active and passive users on land adjacent to the river are also included, such as, land trail users, hunters, picnickers and bird watchers, as well as those who enjoy watching the river from their parked car.

STATE WATER TRAILS PROGRAM GOALS

Goal One:

Provide positive water trail experiences meeting user expectations

Goal Two:

Use water trail development to strengthen natural resources conservation

Goal Three:

Adapt water trail development techniques to the waterway's individual character

Goal Four:

Support public access to water for recreational purposes

Goal Five:

Create a robust, resilient system for developing and experiencing water trails

Goal Six:

Encourage education in outdoor settings

Goal Seven:

Support positive water trail experiences by initiating strategies to manage intensively used areas



ADMINISTRATIVE RULES AND DEFINITIONS

A number of federal, state and local statutes, rules and ordinances apply to recreational river use in Iowa. These rules govern public use of rivers and behavior while on-water. Current interpretation of statutes, rules and codes related to recreation are summarized in Figure 39.

Meandered vs Non-Meandered Stream:

The stream bed, sandbars and banks of rivers classified as “non-meandered” are considered part of the adjacent property. River users on these “non-meandered” rivers may be allowed to recreate only on the water surface, with additional incidental allowances associated with navigation (see Navigation and Trespass, below) where the bed and banks of the stream are in private ownership. All of the West Fork Des Moines River in this plan is non-meandered. Iowa Code 462A.2, 462.69 IOWA WATER NAVIGATION REGULATIONS; Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3).

Navigation and Trespassing:

Paddlers on Iowa rivers are allowed to portage their boat to safely circumvent a channel blockage or hazard. Users also are allowed to portage their boat on dry sandbars and channel bottoms. Iowa Code 462A.2, 462.69 IOWA WATER NAVIGATION REGULATIONS; Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3). Entering privately owned land next to the river without the express permission of the owner is considered trespass. Remaining there after being notified or requested to leave by the owner is considered criminal trespass. Iowa Code 716.7 IOWA DAMAGE AND TRESPASS TO PROPERTY REGULATIONS; Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3).

Tort Liability of Governmental Subdivisions: Municipal tort law protects cities, towns, and counties from claims of liability for local units of government when recreational infrastructure on rivers is built to current standards. Iowa Code 670 TORT LIABILITY OF GOVERNMENTAL SUBDIVISIONS.

Iowa’s Recreational Use Statute:

Under the Iowa recreational use statute, a landowner is encouraged to open their land and water for public recreational use, (swimming, boating and hunting to name a few) by receiving immunity from liability except for injuries resulting from the landowner’s willful or malicious acts, or when a landowner charges a fee for recreational use. Iowa Code 461C PUBLIC USE OF PRIVATE LANDS AND WATERS.

Littering: Discarding litter onto water or land is prohibited. Additional fines or penalties may exist based on the jurisdiction of the littering incident such as county or municipal-owned property. Iowa Code 455B.363 LITTER.

Motorized Vehicle Use in River:

The use of motorized vehicles, including ATVs, in all parts of certain navigable streams, such as the West Fork Des Moines River, is prohibited at all times and conditions. Iowa Administrative Code 461, Chapter 49 provides a list of those navigable streams in which off-highway vehicle use is prohibited. Specific exceptions exist and relate to agricultural access. In meandered streams, motor vehicles shall not be operated on any part of the stream at any time, including on dry sand bars. Iowa Administrative Code 571, Chapter 49 OPERATION OF MOTOR VEHICLES IN MEANDERED STREAMS, NAVIGABLE STREAMS AND TROUT STREAMS; Iowa Code 321I.14.g ALL TERRAIN VEHICLES.

Livestock Fences Across Streams:

The owner of the bed of a non-meandered, navigable stream has a right to erect fences, including electric fences, across the stream as necessary to contain livestock on his or her land in a manner that affords boaters safe passage. Methods of affording safe passage typically include setting the wire high over deep water that cattle avoid, or the use of a non-conductive rubber hose over the electric wire to allow river users to raise the wire. It is recommended that fences be flagged as a warning for river users. Iowa Code 657.2(3) WHAT DEEMED NUISANCES and Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3).

Consuming Alcohol and Intoxication:

Operating a motorboat or sailboat while under the influence of alcohol (.08 alcohol blood level or higher), controlled substances, or illegal chemicals is unlawful. In addition, public intoxication may be enforced in public places. Local ordinances may vary in terms of allowing alcohol consumption in public places such as city or county parks. Iowa Code 123.46 CONSUMPTION OR INTOXICATION IN PUBLIC PLACES.

Personal Floatation Devices (PFDs):

All vessels are required to have at least one personal floatation device (PFD) or life vest for each person onboard. PFDs must be readily accessible in an emergency. All children under the age of 13 on a vessel are required to wear a PFD. Iowa Code 462.A WATER NAVIGATION REGULATIONS.

Boat Registration:

Registration is not required for inflatable vessels seven feet or less in length, and canoes and kayaks 13 feet or less in length that have no motor or sail. It is also not required for vessels properly registered in another state and using Iowa waters for 60 days or less. Iowa Code 462A WATER NAVIGATION REGULATIONS.

Cultural Resource Protection:

To streamline construction on all sites recommended for infrastructure in this plan, the Desktop Cultural Review has already been completed. For more information about the disruption of cultural resources, see Phase IA Archaeological Reconnaissance of the West Fork of the Des Moines River Water Trail Corridor through Emmet and Palo Alto Counties in Iowa (Kendall, B., 2014); Section 404 of the Clean Water Act; Section 106 of the National Historic Preservation Act of 1966. Federal transportation funded projects also have additional specific cultural review requirements in Section 4(f) of the Department of Transportation Act of 1966.

Illegal Dumping:

The dumping or depositing of solid waste or debris in rivers, on streambanks, in public areas, and on others’ property is illegal. This includes tires, appliances, construction and demolition waste, trash, and hazardous chemicals. Iowa Code 455B.307 Dumping.

Farm Waste:

Farm waste includes machinery, vehicles, and equipment used in conjunction with crop production or with livestock or poultry raising and feeding operations and trees, brush, and grubbed stumps from the same property. Farm waste and farm buildings cannot be dumped or deposited within 100 feet of streams, lakes, ponds, or intermittent streams. IOWA ADMINISTRATIVE CODE 567 – 100.4(455B).

Floodplain Filling, Changing a Channel, Placement of Rip Rap or Rubble on Streambanks:

A permit is required when floodplain elevation or channel alignment changes are proposed and when rip rap or rubble is proposed. A joint permit application is required that includes federal and state reviews. At the federal level, the U.S. Army Corps of Engineers issues permits under Section 404 of the Clean Water Act. In the state of Iowa, Iowa DNR grants floodplain and sovereign land permits. Iowa Administrative Code 571, Chapter 13; Iowa Administrative Code 567, Chapters 71, 72; Section 404 of the Clean Water Act. A county floodplain development permit is also required in Emmet County.

Logjam Clearing:

Large woody debris piles often block parts or all of river channels the size of the West Fork Des Moines. Any trees or other large wood that comes to rest on the bottom of a channel is owned by the adjacent landowner. Therefore, modifying log jams for navigation or conservation purposes requires landowner permission. Log jams, while they can be impediments or natural hazards for navigation, also can function as habitat for aquatic species. DNR Fisheries biologists should be involved in decisions about cutting wood in channels, and balanced solutions should be found.

Figure 39
Iowa regulations providing the framework for use and behavior of public waters are constantly evolving. These interpretations were developed in late 2016 with assistance from the Iowa Attorney General’s Office and Iowa DNR staff.



PROJECT STUDY AREA

The project area of this plan includes the West Fork Design Moines River between the Petersburg Access in Jackson County, Minnesota and Lammers Landing near Graettinger in Palo Alto County, Iowa. The municipal area of Estherville is a critically important aspect of this water trail. This plan serves important recreational and resource conservation purposes:

- To provide a contemporary summary of all recreational plans near the West Fork Des Moines River and integrate them with existing and proposed water trail infrastructure
- To develop conceptual plans for infrastructure development and river management strategies to be used by local agencies and organizations for funding and construction
- Ensure that all proposed recreational development elements are consistent with the conceptual framework of the Water Trail Sponsor, DNR River Programs standards and the goals of the local steering group
- Raise awareness about the extent and value of the natural and cultural resources present
- Build local consensus for resource conservation and protection goals

The expected recreation and resource conservation outcomes of this plan center on enhancing conditions on the West Fork Des Moines River in ways that support successful, broad-based public access to the river for recreational purposes with infrastructure designs that work with the river system. Because natural resource conservation is a critical element of Iowa's Water Trails Program, it's important that recreational development opportunities enhance the physical condition of the river and cause no further degradation. The following framework elements are used to guide the choice of recreational enhancements as well their design:

- Enhance and support public access to water for recreational purposes
- Minimize limitations to recreational access based on age and physical abilities
- Provide positive water trail experiences meeting user expectations
- Use water trail development to strengthen natural resources conservation
- Reduce routine maintenance needs
- Increase flood Resilience of recreational amenities at rivers edge
- Contribute to stable river structure and function
- Work to understand the causes and extent of bacteria and mercury impairment and biological water quality impairments so the public can be informed and conditions can be enhanced
- Promote aquatic and terrestrial habitat to support diverse biological populations
- Invigorate the opportunities present for outdoor education, tourism and recreation

Recommended projects to reach these expected outcomes (Figure 38) are integrated into later sections of the plan to illustrate how specific elements contribute to the success of the planning.

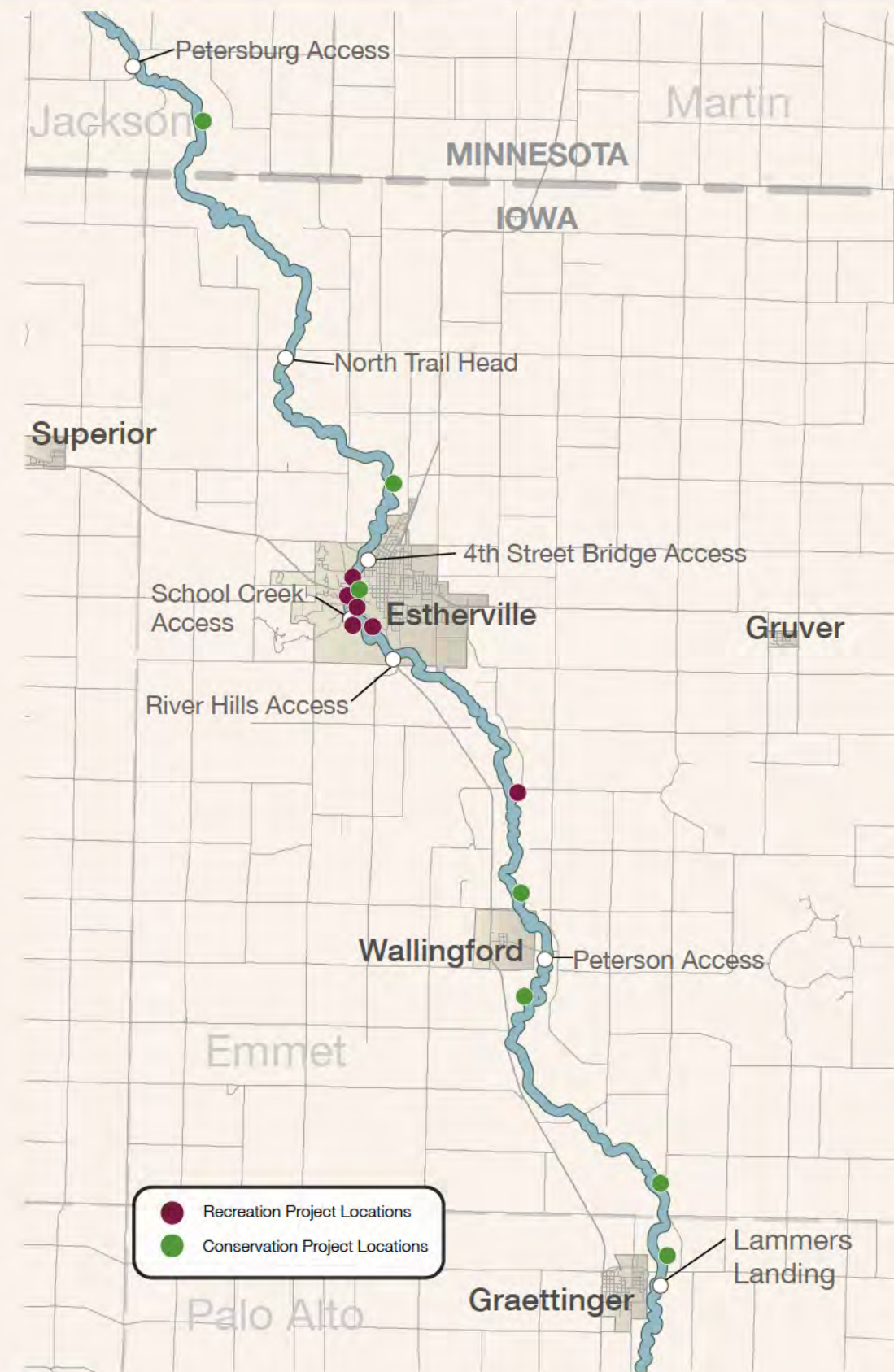


Figure 38
This plan includes both recommended recreational and conservation projects.

ASSUMPTIONS AND CONCEPTS

This recreational plan includes concept design for all near-water infrastructure construction including the upgrade of existing river accesses. Several assumptions exist in this planning related to natural resource conservation and the goal of working with the river system.

All recreation and resource conservation projects in this plan that require vegetation clearing or construction on the floodplain, in the floodway and on the river's edge should conform to the minimum standards established by federal, state and local regulation. In addition to federal protection of wetlands and Waters of the U.S., state and local floodplain and Sovereign Lands regulations also exist. The Iowa DNR Water Trail development standards also recommend a minimum 50-foot wide unmown riparian buffer between the top of the streambank and all parking areas.



THE WEST FORK DES MOINES RIVER IN EMMET COUNTY

This water trail is Iowa's first effort to create an interstate water trail with Minnesota. As such, the uppermost segment begins at Minnesota's southern-most access, Petersburg, in Jackson County. One dam and one rock rapids exist on the water trail, both inside the Estherville city limits. The watershed areas draining into this water trail includes 452,448 acres, the majority of which is in row crop production (Figure 40). The river on the upper end of the route has a narrow and tight river valley and the river is sinuous with tight curves until it reaches Estherville. The segments between Petersburg and North 4th Street accesses have a particularly wild feeling for Iowa; scenery on this portion of the river is some of the most beautiful for a small river in Iowa. The channel is an average of 125' wide here and the most common land cover paddlers will see is wetland vegetation and forests. Below Estherville the average channel width is 150 feet. Although the channel is nearly as sinuous compared to the upstream segment, the views are more open because the river valley is wider and more developed with agriculture.

Compared to other state water trails in Iowa, this route has more land near the river in permanent protection. A total of 30.775 acres with 10 miles of the route is either publicly owned or in permanent conservation easement; more than 87% of this land is open to the public for recreation. The water trail route intersects with two large state-owned parcels: the Anderson Prairie Complex and the Burr Oak Lake Complex. Both complexes lack developed river accesses. The nexus of this water trail however, is Estherville. Lodging, dining, and the majority of points of interest along the route are located here. The adjoining Riverside and Mike Mickelson parks in Estherville provides the most developed river edge parks with multiple river accesses, picnic facilities, a swinging bridge, playgrounds, and paved walking trails. Both the dam and rock rapids hazards are located in these parks. Walleye fishing below the dam, which is breached, is popular.

Paddlers have the opportunity around nearly every bend in the river to observe wildlife near the waters' edge, especially upstream of Estherville. Multiple research studies conducted between 2006 and 2016 document a variety of wildlife species in the study area. A portion of this study area has been nominated by the Audubon Society, but not adopted, as an Important Bird Area, meaning that it has high conservation value. A total of 17 species of herptiles have been identified in the study area through MSIM project sampling. Of these, 12 are

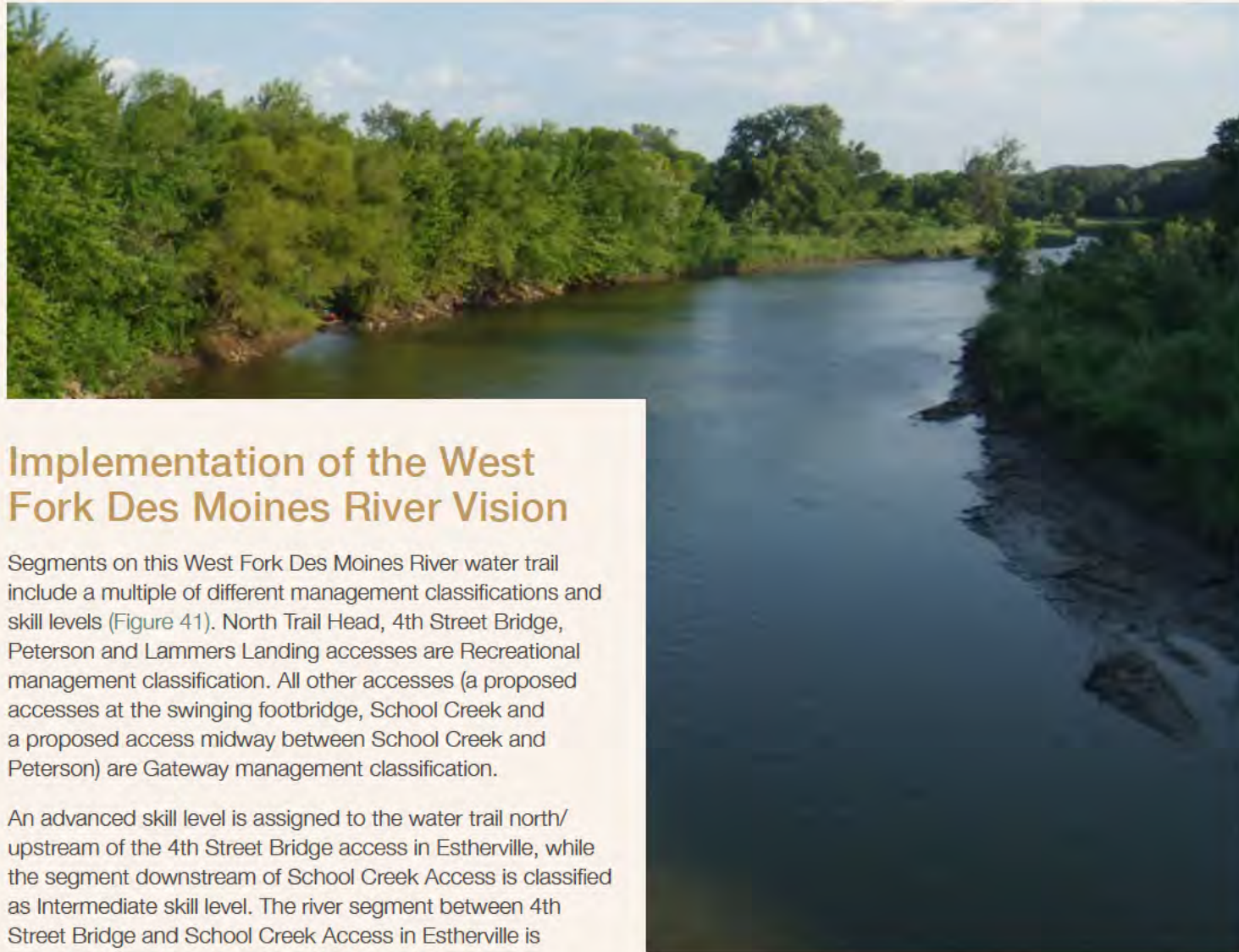


Figure 40
recommended recreational The Minnesota portion of the watershed is larger than many people realize.

included on Iowa's Species of Greatest Conservation Need List. A total of 101 species of birds were identified on study blocks surrounding the West Fork Des Moines River; 18% (19) of these are included on Iowa's Species of Greatest Conservation Need (SGCN). The 87 additional bird species were identified as breeding in or near the riparian zone.

It's likely the earliest culture in North America, the Paleo-Indians, camped and migrated through the area of Emmet County on the hunt for large and small game at the end of the ice age (13,000 – 8,500 BCE). Their bounty, a mammoth and other ice age mammals, were discovered close to the river at a quarry site north of Estherville in 1973. Like the native cultures before

them, the first Euro-Americans travelled and settled along major rivers and their tributaries. Two historic events, the Spirit Lake Massacre of 1857 and the Sioux Uprising of 1862, figured prominently in the region's early history and partially played out along what is now the water trail in Emmet County. Similar to other cities, the river figured prominently in the settlement and development of industries in Estherville.



Implementation of the West Fork Des Moines River Vision

Segments on this West Fork Des Moines River water trail include a multiple of different management classifications and skill levels (Figure 41). North Trail Head, 4th Street Bridge, Peterson and Lammers Landing accesses are Recreational management classification. All other accesses (a proposed accesses at the swinging footbridge, School Creek and a proposed access midway between School Creek and Peterson) are Gateway management classification.

An advanced skill level is assigned to the water trail north/upstream of the 4th Street Bridge access in Estherville, while the segment downstream of School Creek Access is classified as Intermediate skill level. The river segment between 4th Street Bridge and School Creek Access in Estherville is excluded from the water trail until the low-head dam in Mickelson Park is modified or removed and is no longer a hazard. The potential exists for a beginner skill level segment between School Creek Access and a new, proposed access 5.2 miles downstream if channel blockages are reduced and Universal Design accesses are constructed.

A large part of the vision for this water trail is to protect the natural, peaceful paddling experience that exists today. Recreational development in the vision includes physical upgrades to reduce maintenance and meet current standards for launch construction. A new proposed access downstream of Estherville will open the opportunity for 3-4 hour paddles near the community—the most heavily used segment of the water trail. Construction of launches and near-launch amenities will allow people with a broader range of physical abilities to access the river. Other goals include minimizing maintenance and restoring eroding stream banks near accesses, and educating users about the legal rights of adjacent landowners.

Planning Process

This vision was developed through a two-year planning process integrating stakeholders, agencies and landowners. A county level steering group composed of individuals with specialized interests and skills were developed in Emmet County with approximately 15 members. The steering group included representation from the water trail sponsor, municipal and county staff as well as special interests such as angling, paddling, land trails, conservation, history, public safety and rural landowners. This group guided the overall development of both the vision and this plan.

The existing conditions surrounding this section of the West Fork Des Moines River were assessed prior to starting the recreational and resource conservation planning processes. An extensive review period occurred with the Steering Group, county and municipal staff, and the Iowa DNR prior to finalization of the plan.

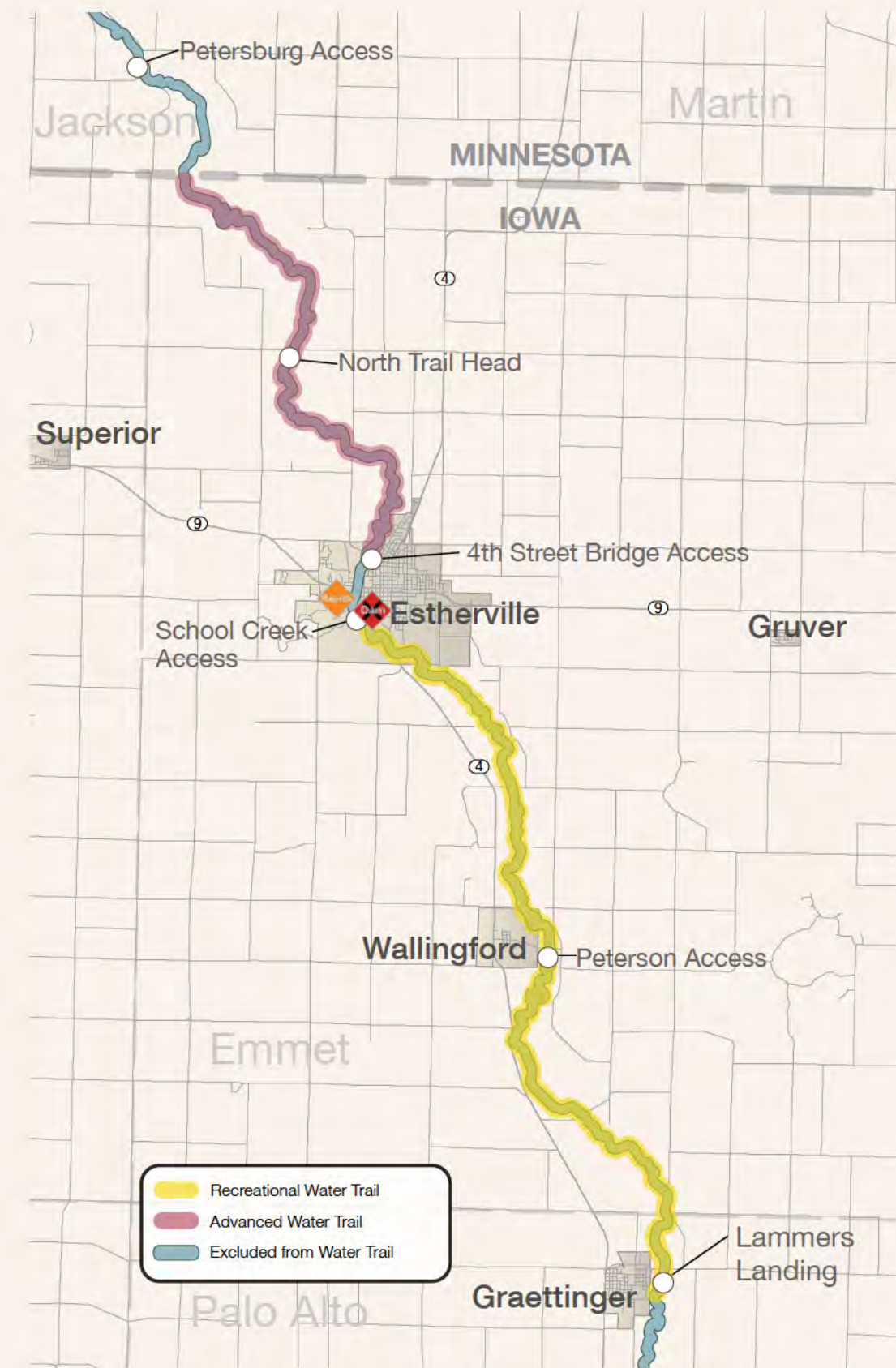


Figure 41
The majority of the river in this study will be classified as recreational. However, a small portion is excluded from the water trail due to an existing hazard. The segment from School Creek Access to the new Midway Access may be classified as a Gateway segment in the future after improvements are completed.

Recreational Development Recommendations

SCOPE OF THE PLAN

Recreation development elements are recommended for both river's edge and off-river locations and address needs identified during planning. River's edge recommendations include minimizing in-water hazards and re-designs of existing or construction of new river accesses to meet specific goals. Off-river recommendations include implementation of existing Estherville recreation plans as well as new amenities that fulfill local use needs.

A number of issues related to recreation development emerged that do not include infrastructure but are no less important. Typically, these issues are not site-specific but rather apply to part or the entire study segment. These issues relate to river and user management on the water trail, maintenance of infrastructure and communicating with the public. Table 23 summarizes all identified recreational needs as well as local decisions about how to resolve them.

The goals of recommended recreation infrastructure proposed near state water trails are always grounded in resource protection and enhancement including water quality and terrestrial and aquatic habitat. These recommendations were developed locally by the project Steering Group, the City of Estherville, as well as Emmet and Palo Alto County Conservation. The design of infrastructure utilized technical experts from Iowa DNR and Iowa State University.

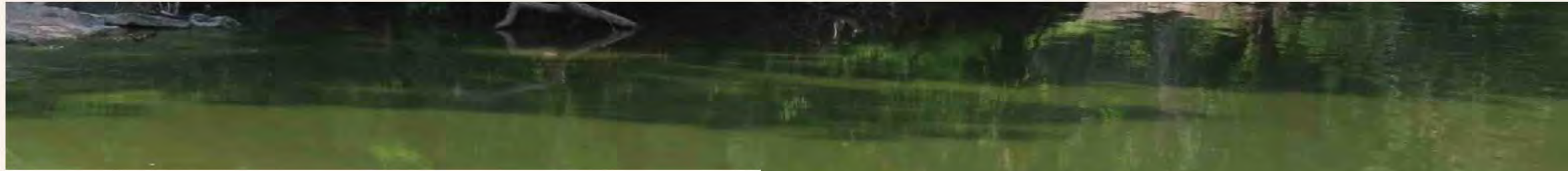
Recreation Needs Identified	Recommended Resolution
On-Water Rescue Capacity	Capacity is developing locally and should continue
Rural landowner tensions	Brochure for paddlers and landowners developed explaining legal rights; suggest living room-style small meetings to build relationships between Water Trail Sponsor and landowners
Lack of promotional materials, map for water trail	Develop a water trail map
Limited existing communication between river access managers	Enhanced communication through regular contact and consistent, agreed upon maintenance expectations
North Trailhead Access: streambank instability above and below launch	Streambank restoration
4th Street Bridge Access: launch oriented upstream so severe deposition is common	Launch is a low priority for investment due to improvements planned immediately downstream; access will remain in place but not improved because it is used by fishing boats
Rapids near Swinging Bridge: formidable to some paddlers, lacks portage	Development of a node or area of concentrated river edge and water recreation, education utilizing the existing large adjacent parking area
Lack of river play areas where users can wade or easily access water surface	Development of multiple hard-surfaced, terraced edges in Riverside and Mickelson parks
Lack of accessible (ADA or Universal Design) angler access	Development of ADA accessible angler access at river's edge in Mickelson Park
Lack of developed, angler-friendly river edge fishing spots causing streambank compaction and impacting vegetation; streambanks are eroding, undercut in some locations	Development of multiple hard-surfaced, terraced areas in Riverside and Mickelson parks
Breached low head dam in Mickelson Park: recirculating currents at some water levels; no portage or hazard signage	Development of a recreational node at the dam location; dam conversion to multiple small grade control structures that maintain utility line cover, provide fish habitat and tubing / water play opportunities
School Creek Access undersized parking area for this popular launch and fishing area; launch oriented upstream; streambank instability adjacent to launch; launch is located next to the mouth of School Creek so extreme deposition is common	Construct new Universal Design access slightly downstream of existing access, create a larger parking area and link this area to Mickelson Park by a footbridge crossing School Creek
No existing campgrounds (primitive or RV with full hookups) near the river in Emmet County	Develop new RV full hookup and primitive campground with carry down boat access on City land
Lack of beginner friendly segment due to channel conditions and large wood in channel	Minimize full channel blockages on selected segment and construct Universal Design accesses on both ends
Local interest in a 2-3 hour float beginning at School Creek Access; distance to next access is 8 miles; no public land exists on this segment	Develop new access approximately 5 river miles downstream of School Creek Access
Estherville trails plan is partially constructed	Complete construction of trails plan

Table 23
Sixteen separate needs related to recreational development were identified during the planning process. They represent the recreational elements needed to achieve the local vision for this water trail.

RECREATIONAL DEVELOPMENT STANDARDS

Several site development protocols exist that may differ from traditional recreational construction. Launches included in this plan are designed in conformance with Iowa DNR Water Trail standards (Wagner and Hoogeveen 2010). Construction plans at the design development stage and cost estimates were developed for all access upgrades included in this plan. These documents include preliminary earthwork, stormwater management and site layout plans for all infrastructure, but these plans do not constitute bid documents. Final engineering and construction document development is required prior to bidding for construction of projects.

Consistent with resource conservation goals and federal, state and local regulations, any existing areas with wetland vegetation in river access areas are to remain undisturbed. All design in stream-edge riparian areas included in this plan minimized the number of mature trees required to be removed and the amount of earthwork. No earthwork, cut or fill, was designed within the channel. Only the minimum amount of earth fill is utilized as necessary to construct parking surfaces with proper slopes and drainage. All drainage from proposed parking areas is directed away from the launch surface. Rather, this drainage is directed laterally from the parking area for infiltration. Lastly, the water quality volume of stormwater runoff from all parking areas is treated on-site using infiltration practices.



RECOMMENDED RECREATION DEVELOPMENT PROJECTS

Recommendations that apply to the entire river corridor and are administrative in nature are detailed below as river user management recommendations.

River User Management Recommendations

R 1 On-Water Rescue Capacity

Enhancing local capacity as it relates to river rescue is a good way to better prepare for unexpected circumstances, learn of new management challenges and share information between agencies. Support and reinforcement of the already existing network of county and municipal emergency personnel serving the river corridor in Emmet and Palo Alto counties is recommended. Particular emphasis on the future Gateway experience segment as well as the most heavily used segments of the water trail are recommended.

R 2 Community Building with Rural Landowners

One-on-one or small group discussions with rural landowners on the water trail are recommended. A brochure, *Recreational Use of the West Fork Des Moines River* (Appendix C), was developed to respond to concerns raised during public meetings associated with this planning process. The brochure identifies the responsibilities and rights of river users as well as common rural landowner issues such as livestock fencing across the channel.

R 3 Communication to Users

Enhanced communication with users before they get to the river is recommended. River users will feel better prepared for their experience with updated water trail maps; printed maps as well as downloadable pdf online versions are recommended.

R 4 Enhanced Communication between Water Trail Access Managers

A formalized system of communication is recommended between County Conservation staff in both counties and the City of Estherville. Regular communication can enhance coordination of water trail activities and issues and can result in more consistent, efficient and timely removal of sediment and debris from launches and other ordinary maintenance tasks.



Recreational Development Recommendations

Recreational infrastructure recommendations are located between Estherville and Graettinger. Each recommendation typically includes a map or detailed drawing as well as a text description. Figure 42 summarizes the locations of recommendations R5 – R15.

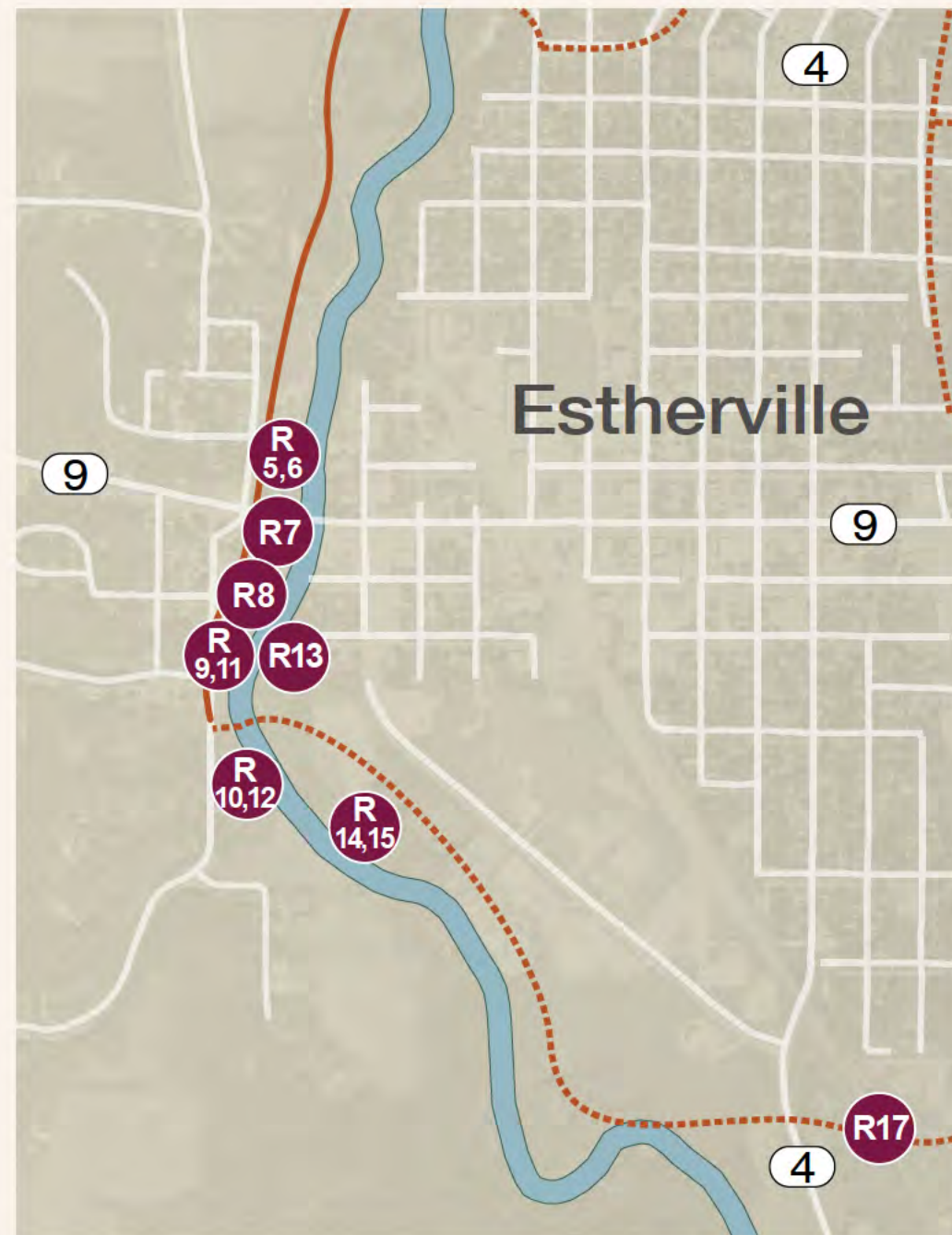
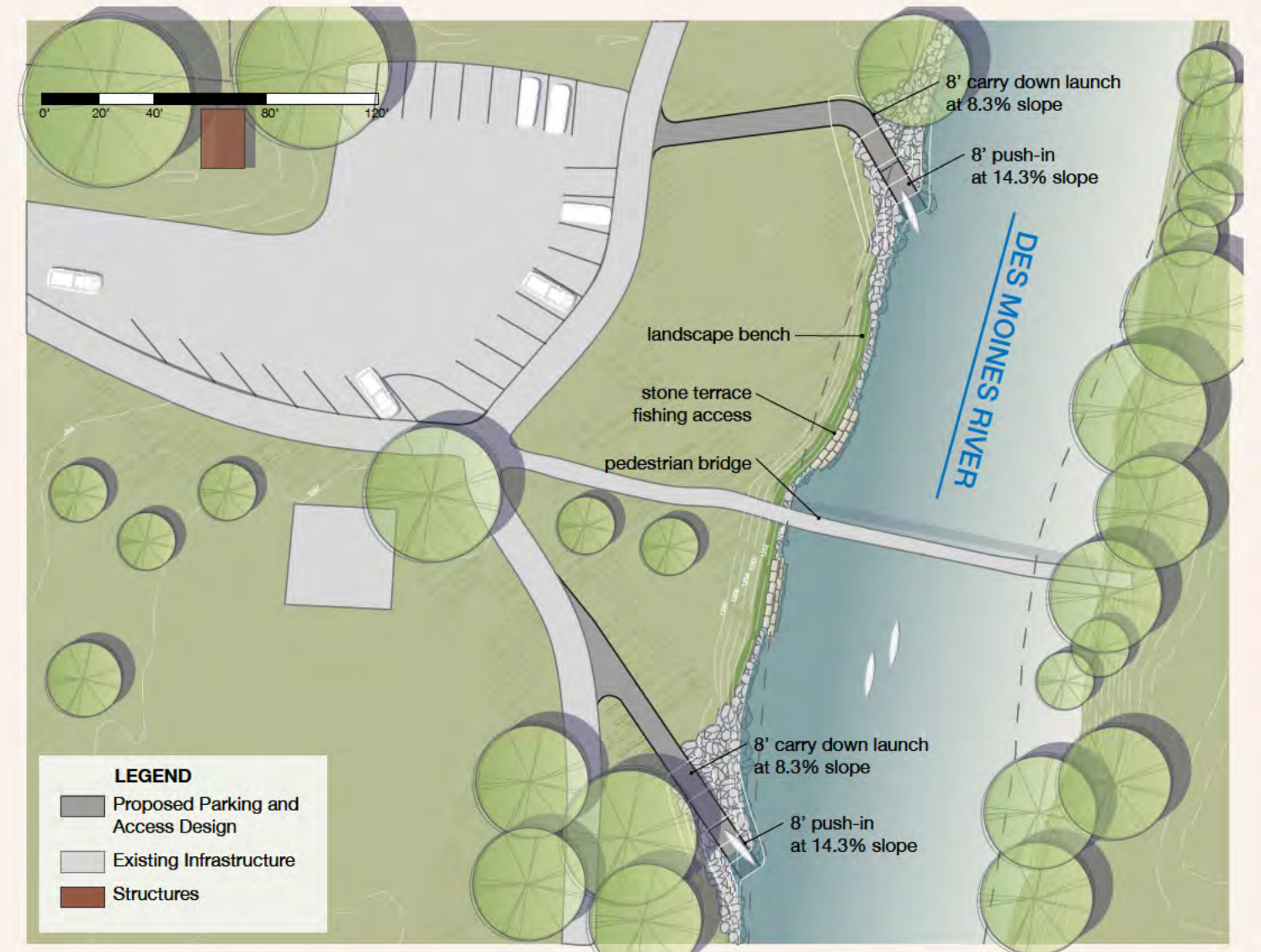


Figure 42
River Access and Recreational recommendations R5 - R15 interrelate to create an active river edge for anglers, boaters and tubing in Estherville.



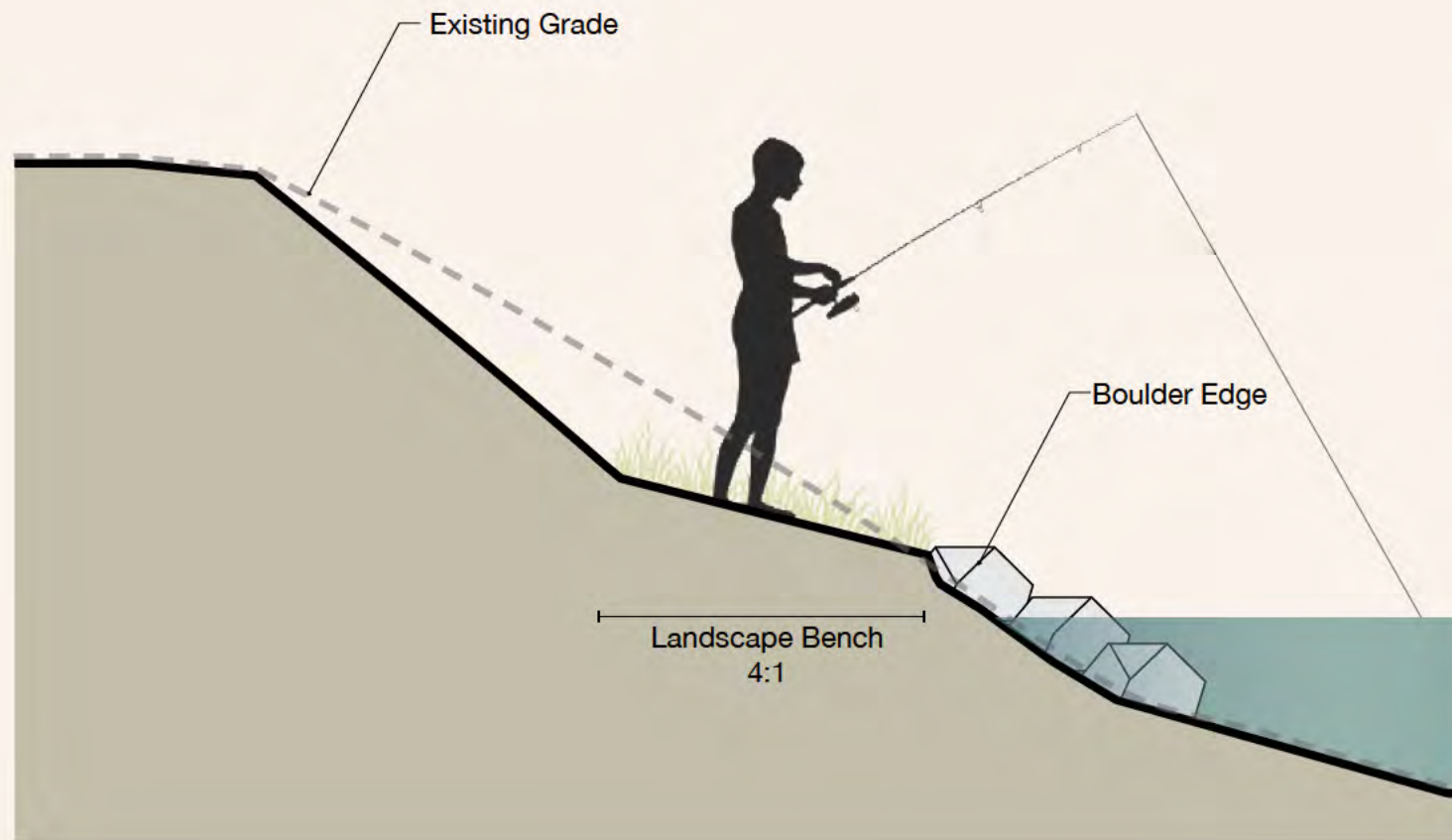
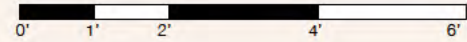
R 5
Swinging Bridge River Access and Portage

R 5 Swinging Bridge River Access and Portage

A new river access and portage near the existing rapids and Swinging Bridge in Riverside Park is recommended. This location is ideal for a formal access because an existing parking lot in good condition already exists here. Carry-down accesses are recommended both above and below the rapids. This allows river users to portage around the rapids if they desire or for users to play on the rapids with tubes. It also allows users to begin or end their float at this location.

R 6 Angler-Friendly River Edge Improvements at Swinging Bridge Access

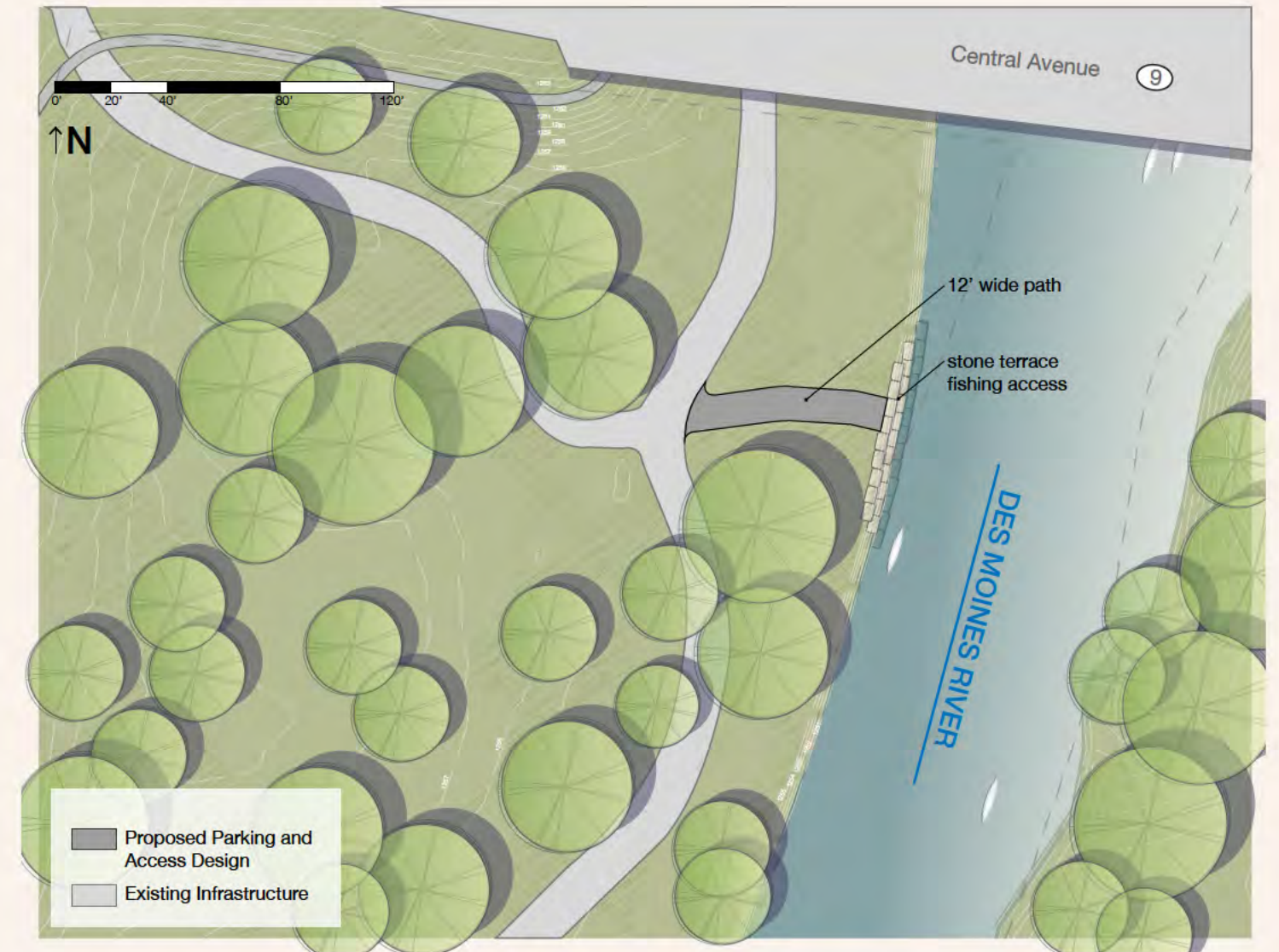
A low impact terraced rock edge is recommended in the area of the Swinging Bridge. This rock edge will allow space for both anglers and those playing in the river to share space. The terraced rock design will accommodate users at variable water levels.



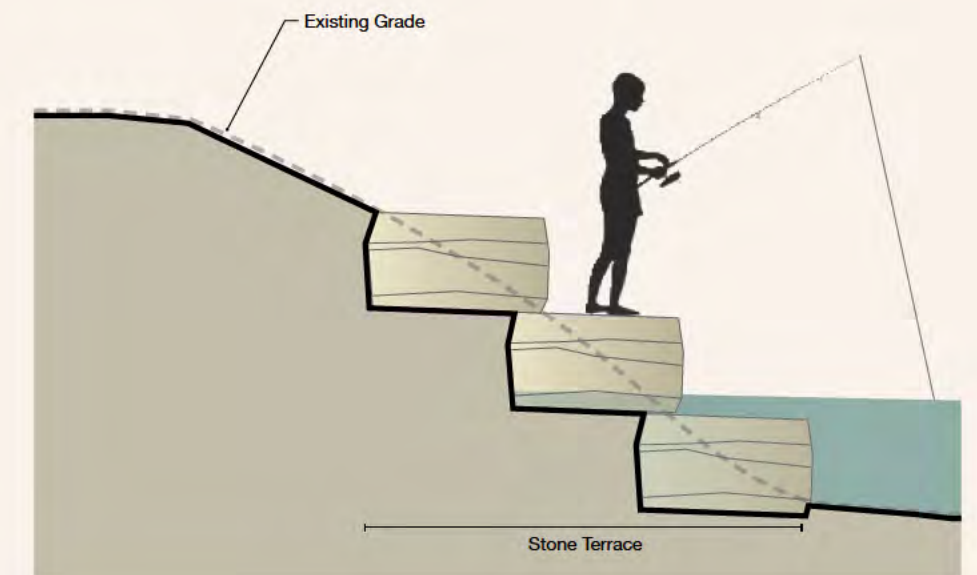
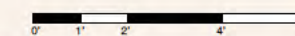
R 6 Proposed Angler-Friendly River Edge Improvements at Swinging Bridge Access

R 7 New Angler Access Adjacent to Highway 9 Bridge

This recommended angler access point is located in Mickelson Park and is visible from the adjacent highway and conveniently accessed from the existing swimming pool parking area or the walking path. The access design using the same terraced ballast rock as the Swinging Bridge river edge improvements.



R 7 Proposed Angler Access Adjacent to Highway 9 Bridge



R 8 New Portage Access Above Mickelson Park Dam

A new portage located upstream of the existing dam is recommended. This portage will serve river users wanting to avoid the dam modification area entirely. This proposed location takes in account a future dam modification but may need revision after a final design alternative is selected and engineering designs are complete.

R 9 Dam Modification

Modification of the existing low head dam on the West Fork Des Moines in Estherville is recommended. Low head dams are the most dangerous type of dam in Iowa because of recirculating currents and turbulent water below them. The dam is also breached and is beginning to cause streambank erosion and loss of land. Modification of the dam will result in more safe conditions for river users and enhanced conditions for fish, mussels and anglers. The site of the modified dam can also be a major draw for visitors. The dam is owned by the City of Estherville. The design proposal included in this plan is intentionally generic.

R 10 New Universal Design Access Downstream of Dam

A Universal-style design access is recommended to replace the existing School Creek Access in Mickelson Park. Universal design launches provide access to the water's edge for a greater portion of the population because they are less steep and provide separate vehicle and pedestrian launch points. This design style is also particularly helpful at high volume launches because they reduce potential conflicts between vehicles and pedestrians. The existing access has numerous challenges to use and maintenance. The proposed location is on the same side of the river as the existing launch, but farther downstream of the mouth of School Creek. The existing parking area is expanded and reconfigured to provide additional capacity.

R 11 New River-Edge Terraced Rock Access Area

The river's edge near the dam modification area provides a great opportunity to expand use by anglers and others playing in the water. A terraced ballast rock edge is proposed up and downstream of the existing dam on the Mickelson Park side of the river. This area is already very popular with

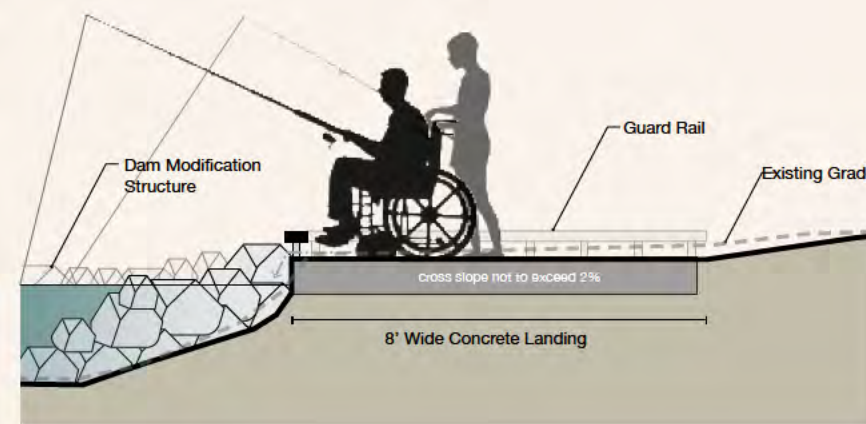
anglers and people watching the river. This enhancement will accommodate a greater number of users without causing streambank erosion and trampling of vegetation.

R 12 Sidewalk Extension and Crossing in Mickelson Park

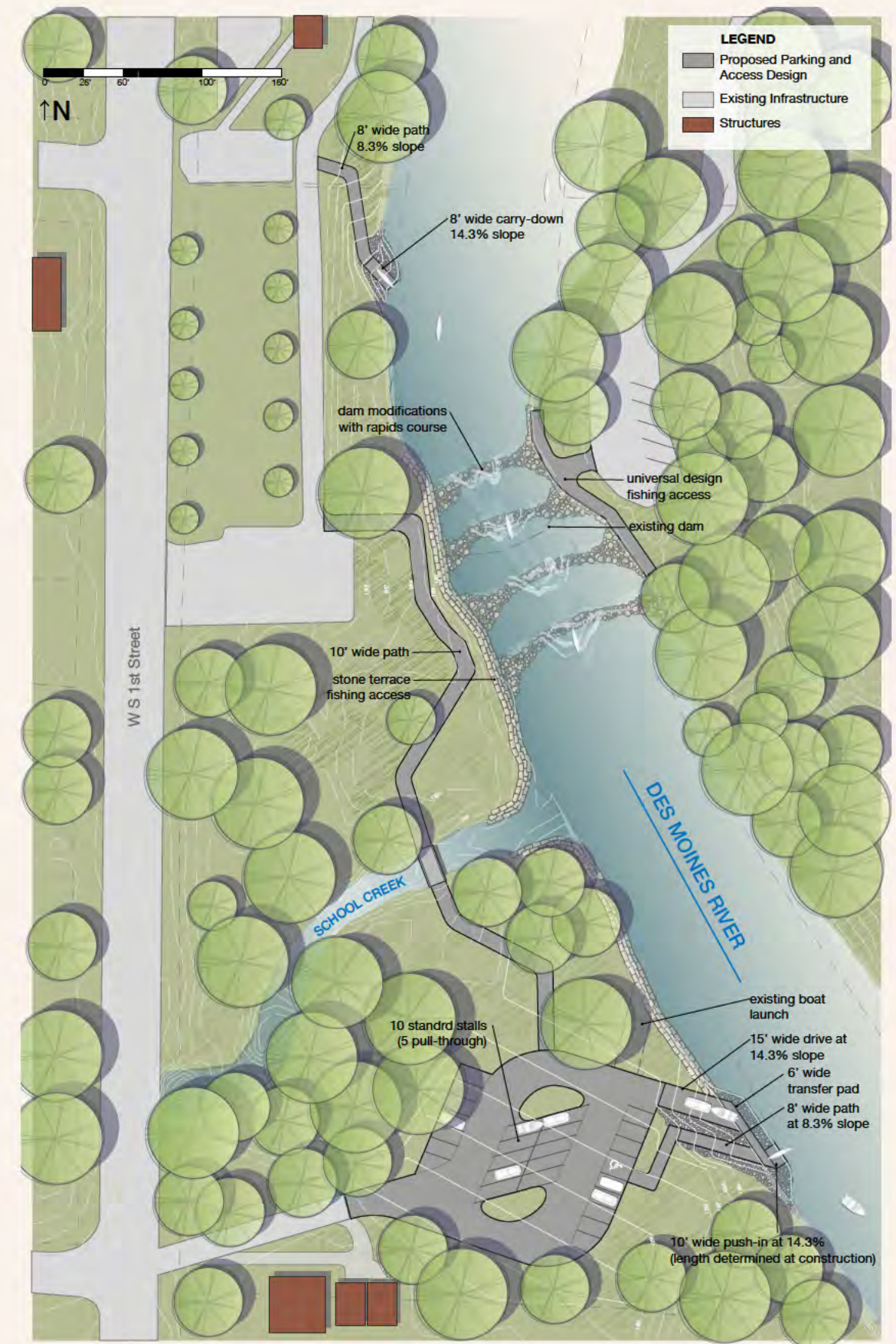
There is currently no walking path connection across School Creek. A concrete paved extension is recommended to the path that ends just upstream from the dam in Mickelson Park. This extension would cross School Creek and connect with the proposed Universal design-style launch. This connection allows direct access between the water trail launch and the rest of Mickelson Park and the existing trail system. The School Creek crossing design can be of a similar style to the other tributary crossing slightly upstream in the park.

R 13 Mickelson Park: ADA accessible walk and fishing access near dam, river left

An ADA accessible walk and fishing area is proposed in the area of the dam modification. Vehicles and anglers are already accessing the dam area on the east side of the West Fork Des Moines River using an unimproved road. The existing streambank is low and creates the ideal area for an accessible fishing area. The area currently being used for parking is shown to be expanded and slightly reconfigured to accommodate more vehicles.



R 13
Proposed Universal Design Angler Access.



R 8 - R 13
Proposed Portage Access Above Mickelson Park Dam

R 14 New RV Campground

A new full-service RV campground is recommended in Estherville on the West Fork Des Moines River. No campgrounds or primitive camping areas exist on the river in Emmet County. And campgrounds with full service hook ups are uncommon in the area. The proposed site is owned by the City of Estherville, slightly downstream of Mickelson Park. Restrooms and a dump station are possible at this location because a portion of the site is elevated above the 100-year floodplain.



R 14
Proposed Full-Service Hookup RV Campground on City land.

R 15 New Carry-Down Access

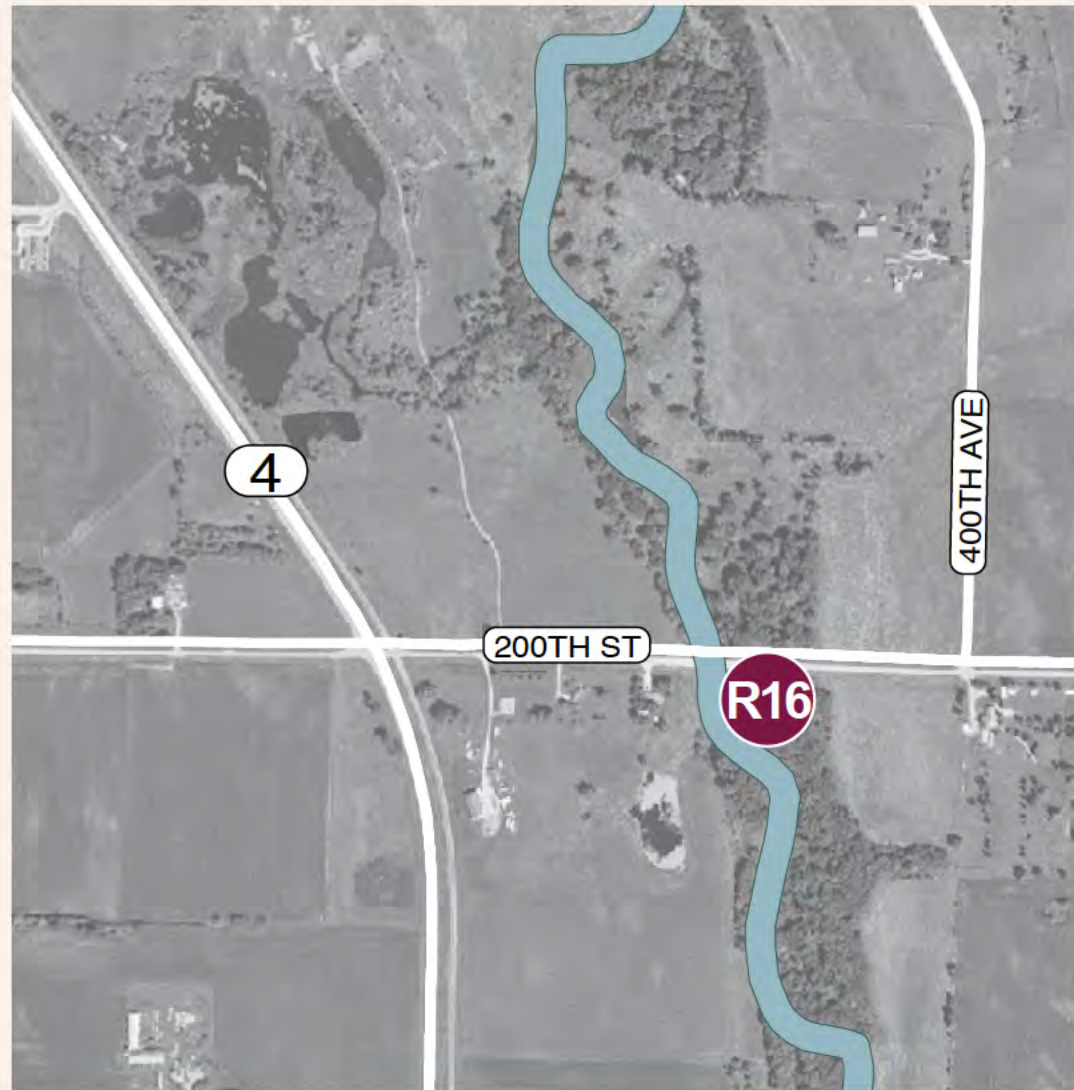
A new carry-down style boat launch is proposed on the new RV campground site. This simple launch is primarily intended to serve people staying at the campground.



R 15
Proposed Carry-Down River Access for Campground Users.

R 16 New Universal Design Access Midway Between Estherville & Graettinger

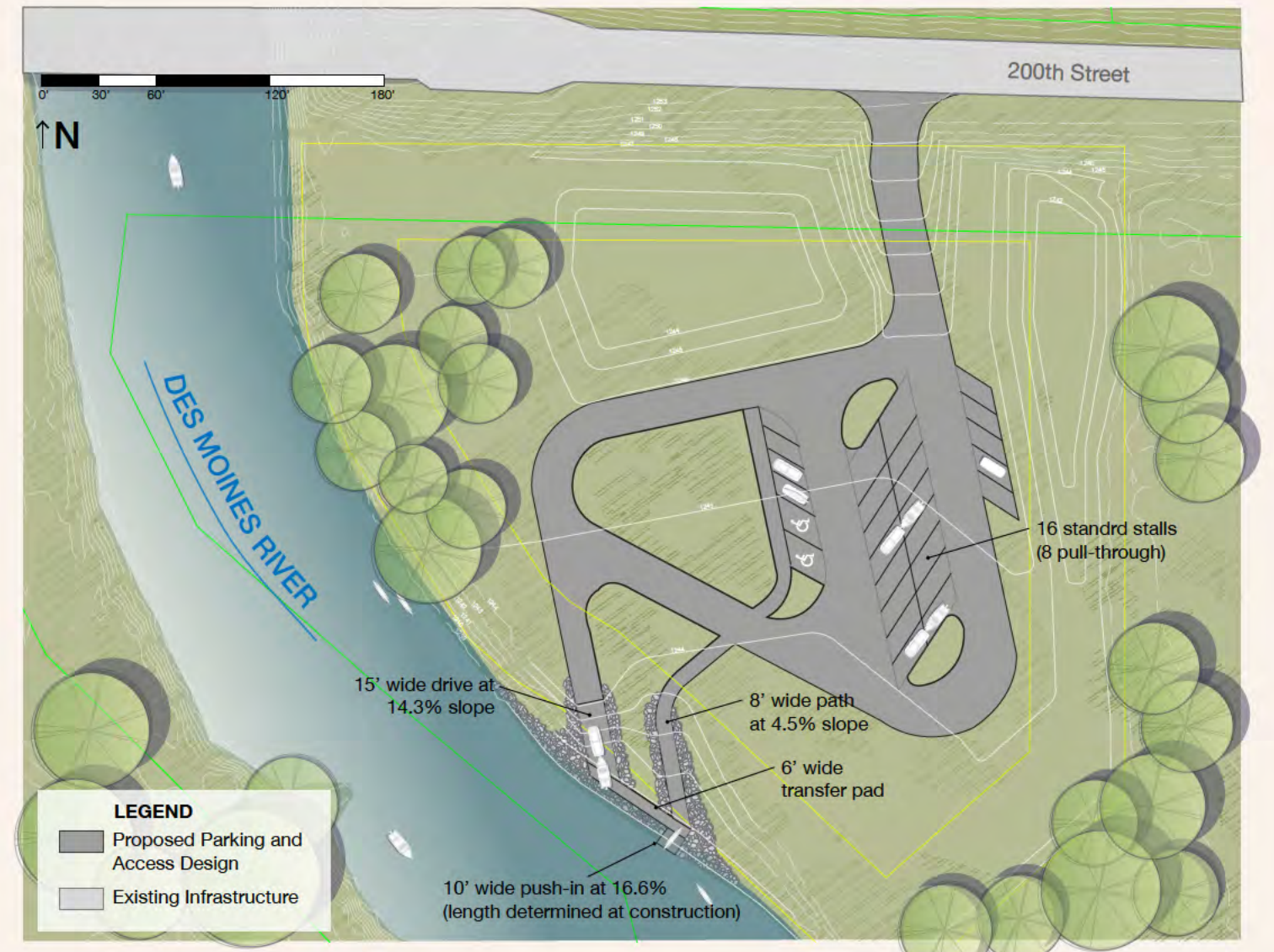
A new access and Universal design launch is recommended 3 miles downstream of Estherville. Local paddlers are interested in a 2-3 hour float based out of Estherville, particularly downstream due to river conditions. Presently there are no runs of this length in Emmet County. Midway Access. The site identified is adjacent to the 200th Street Bridge. Although it is low lying, as are most of the parking areas in Emmet County on the West Fork Des Moines, the land is surrounded by land in permanent easement with the Wetland Reserve Program. A Universal design launch style at this location complements the launch of the same style upstream at Mickelson Park, and enables this segment of the river to be classified as Gateway in the future.



R 16
Location for Proposed New Access

R 17 Land Trail Extensions in Estherville

The land trail plans for inside the city limits of Estherville are fairly recent. The portion of the system already constructed is popular with users. Completion of the remaining segments will complement the water trail and the West Fork Des Moines River.



R 16
Proposed Universal Design Access Midway Between Estherville & Graettinger



Resource Conservation Recommendations

SCOPE OF THE PLAN

The West Fork Des Moines River corridor and its watershed in Emmet County is remarkably rich in natural and cultural resources (Figure 43). River-edge forests, wetlands and prairies host diverse birds and amphibians. This reach of the river, particularly in Estherville, is very popular with anglers. And some of Iowa's most interesting history during the European settlement period happened alongside the river in Emmet County. Like nearly every river in Iowa, there are resource conservation needs that, if addressed, would

improve river user experiences and make it more likely they would return. Recommended resource conservation efforts in this plan are limited to the river's edge and the river itself. These efforts address local interests related to the condition of water and the visual quality that river users see when using the river. Figure 44 and Table 24 summarize the resource conservation needs and the resolution recommended by the steering committee and the water trail sponsor.



Figure 43
Natural and cultural resource opportunities line the water trail route. Public conservation and recreation lands compliment water trail uses.

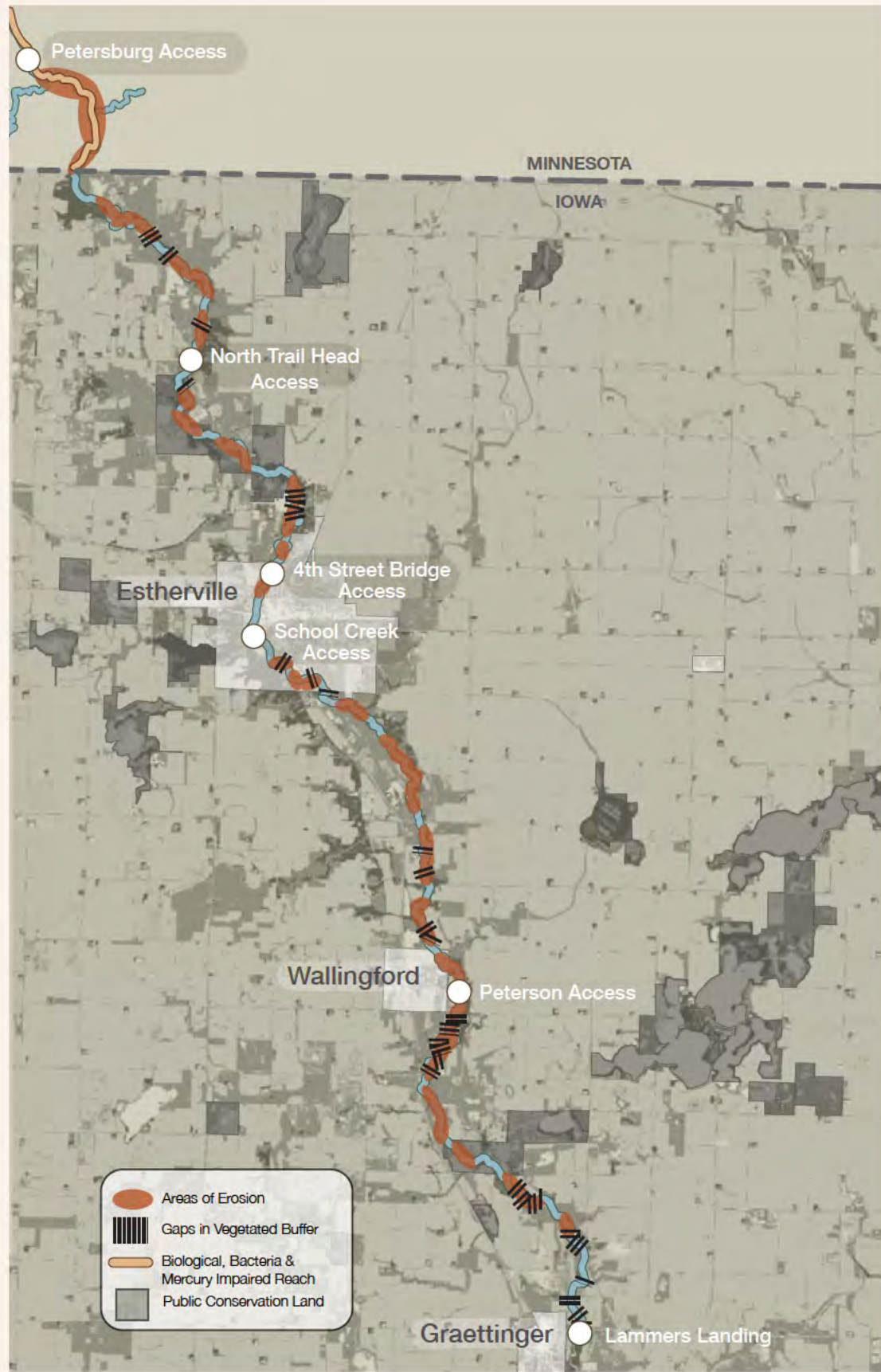


Figure 44
Several instances of severe stream bank erosion and gaps in the perennial vegetation buffer, as well as impaired surface waters are challenges for future management.



Conservation Needs or Opportunities Identified	Recommended Resolution
A lack of water quality monitoring data for the West Fork Des Moines River in Emmet County makes it unclear if mercury contamination reported for the Minnesota segment of this river is also impacting fish tissue in Iowa	Encourage volunteer water quality monitoring on the water trail route
A high priority of the steering committee included the establishment of a continuous riparian buffer planting on both sides of the West Fork Des Moines River for this water trail. Only 24 acres within the 100' wide corridor of the water trails lacks perennial cover	Develop a continuous perennial vegetation stream buffer from the Minnesota / Iowa state line to Graettinger
Existing streambank erosion adjacent to the North Trailhead Access	Restore the stability of this streambank using design guidelines from the state water trail program and the Iowa River Restoration Toolbox
Very severe streambank erosion upstream of the Swinging Bridge in Estherville	Restore the stability of this streambank using design guidelines from the state water trail program
Mown lawns, with no other perennial vegetation at the top of the streambank, is impacting the stability of stream banks	Reduce mowing in these areas on the water trail, particularly when wetland vegetation is being mown
Mature forested riparian areas near Anderson Prairie were considered of local ecological importance by the steering committee	If willing landowners of mature forest on the river are identified, these lands could be shifted into a permanent protection status through a conservation easement or other means

Table 24
None of these conservation opportunities are overly daunting on their own if local interest in them continues. Attention to these will lead to improved visitor experiences on the water trail.

RECOMMENDED RESOURCE CONSERVATION PROJECTS

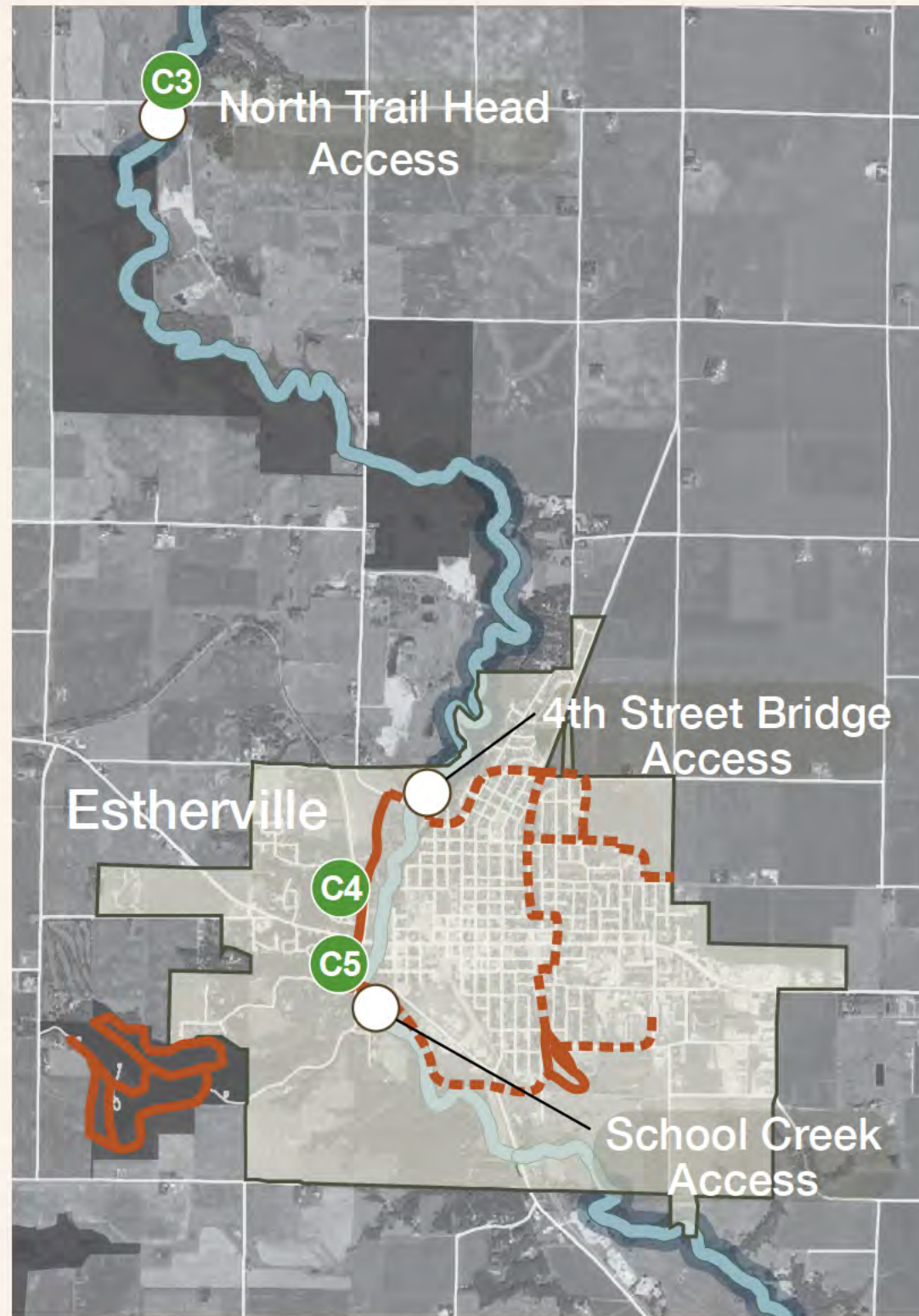


Figure 45
A small number of stream edge improvements are recommended in the Estherville area.

C 1 Encourage Water Quality Monitoring on the West Fork Des Moines River

Segments of the West Fork Des Moines River immediately upstream in Minnesota (2018) and southern Palo Alto County (2016) are listed as impaired for aquatic consumption due to mercury in fish tissue; advisories to limit consumption of fish are in place on both segments. The water trail route itself is not included on the Impaired Waters list for Iowa, but this is likely due to insufficient professional monitoring data. Presently there is insufficient water quality monitoring data in Emmet County to understand conditions if this impairment is also impacting this water trail. Increased monitoring on the West Fork Des Moines would support public information about human safety.

C 2 Establish a Continuous Perennial Vegetation Buffer

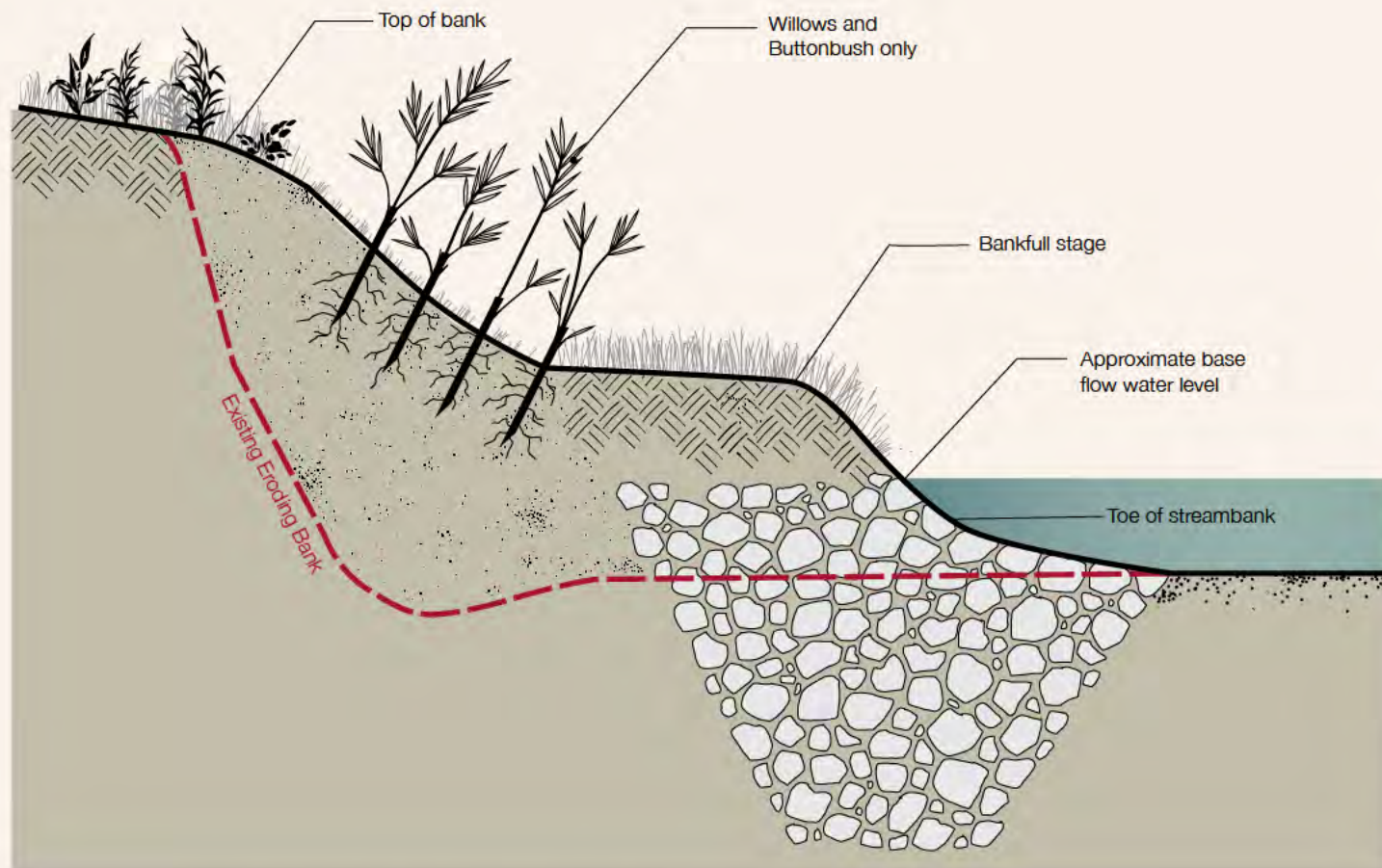
Development of a 100-foot wide perennial stream edge buffer is recommended for the entire 32.2 miles of the West Fork Des Moines Water Trail. The buffer width is measured beginning at the top of the streambank. A total of 24 acres were measured as missing from this buffer using 2016 cropping data. The majority of missing acres (14.3) is located between Peterson Access and Graettinger. Establishment of a woody tree and shrub mix, comprised of native trees and shrubs along with a temporary seed mix is recommended. This mixture provides diverse habitat for multiple species when it is mature as well as the most successful, natural reinforcement for streambank protection. Perennial buffers provide excellent filtering capability for sheet erosion from adjacent crop fields as well as important bird habitat. Soil and Water Conservation Districts in each county, as well as USDA NRCS offices, have working relationships with many landowners and will be an invaluable partner in completing this recommendation.



C 2
Establish a Continuous Perennial Vegetation Buffer. The Steering Group identified this goal as important early in the planning process.

C 3 North Trailhead Streambank Restoration

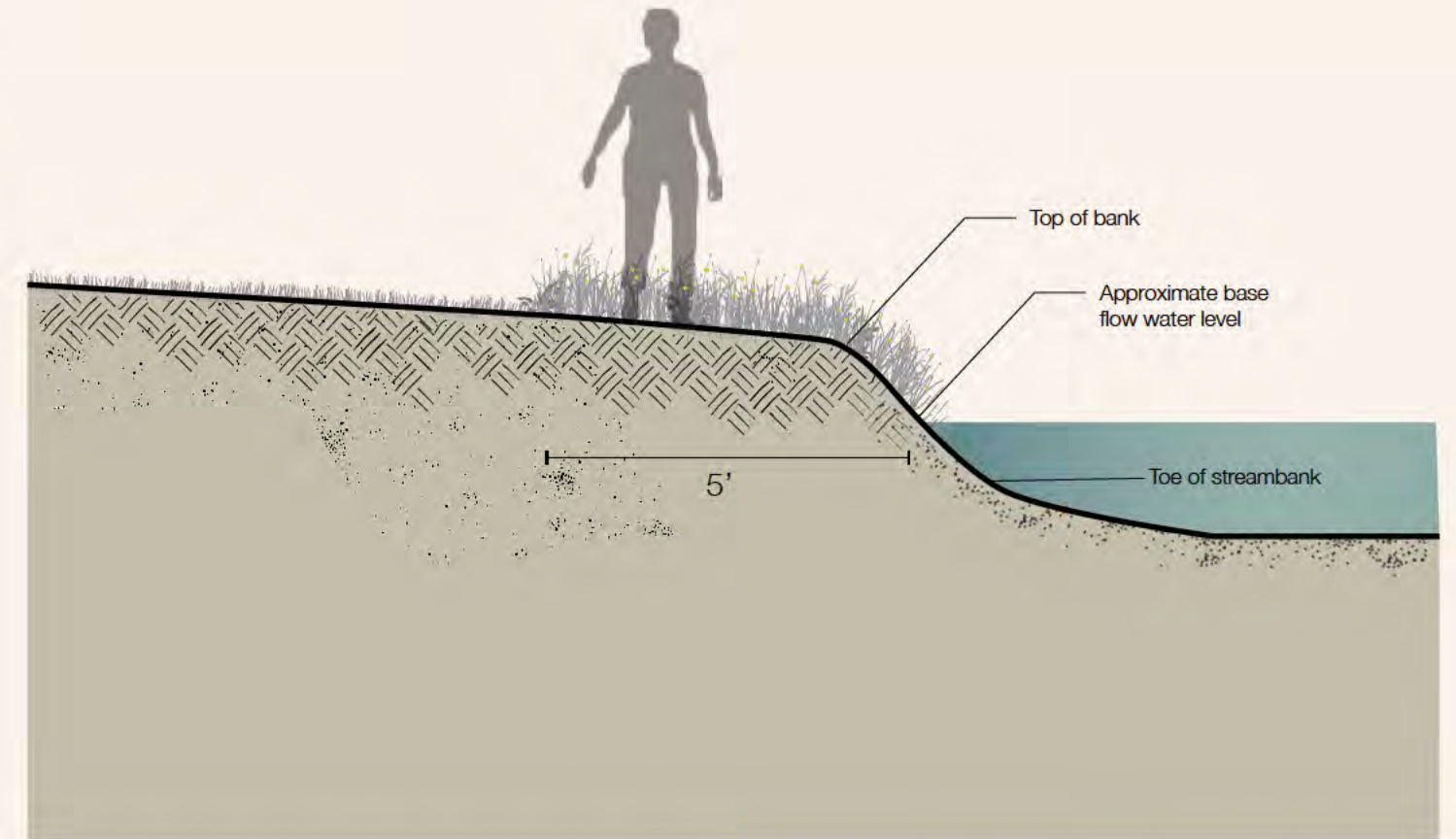
Restoring streambanks and minimizing future streambank erosion is a high priority on this river. The North Trailhead river access is the only access on the West Fork Des Moines River in Emmet County experiencing severe streambank erosion. The erosion is located downstream of the launch and is likely exacerbated by the bridge directly upstream. Restoration of a stable bank profile is recommended to avoid the loss of additional land and minimize water quality degradation. Recommended practices to restore streambank stability include reshaping of the vertical bank and placement of a stone or rock toe. The rock toe can be local rock or broken concrete sized to withstand the shear stress of river flow. Generally, the rock will extend only as high as the lowest-growing woody vegetation at the location. Native grass seeding or soil bioengineering practices are utilized above the stone toe.



C 3
A combination of toe rock (largely buried) and native vegetation are recommended to stabilize the stream bank at the North Trailhead Access and upstream of Swinging Bridge.

C 4 Streambank Restoration Near Swinging Bridge

An area of very severe streambank erosion is located slightly upstream of the Swinging Bridge in Estherville. Land on the west side of the river is eroding at a rapid rate. The severity of this erosion is uncharacteristic for the West Fork Des Moines in Emmet County. An additional engineering study is recommended to determine the most feasible response in terms of stabilization that balances cost with river edge habitat conditions.



C 5
Native sedges growing naturally on the stream edge in Estherville provide a cohesive soil and stream bank interface. Reducing mowing slightly near the top of the bank will lead to more stability and less erosion of stream bank soils.

C 5 Reduce Mowing On River Edge

Change of how the river edge is managed is recommended in Estherville city parks. The edge of the river in both Riverside and Mike Mickelson parks is managed as a mown lawn up to the top edge of the streambank. While it appears similar to a lawn, the river edge vegetation in Riverside Park is actually predominantly sedge, a wetland species. Sedge is present because of the high water table and soil conditions in this low-lying area. This species is also very tolerant of flooding. Sedge roots are actually much stronger than the roots of lawn grass and more beneficial in terms of protecting the streambank from erosion and loss of land. Constant mowing discourages root development and streambank stability. A five-foot wide buffer strip of unmown lawn / sedge is recommended in Riverside Park. This change will require public information because the visual appearance will change.

C 6 Mature riparian forest protection

The exploration of various strategies is recommended to voluntarily protect privately-owned existing mature riparian forest tracts adjacent to the West Fork Des Moines River. The presence of these forested areas provide long term stability to the river's form and critically important habitat. Special emphasis on forests in close proximity to Anderson Prairie is recommended. Potential strategies include (1) donation or purchase of permanent conservation easements from willing landowners and (2) donation or purchase of fee title from willing landowners. Both of these strategies compensate landowners for donating their land while still retaining ownership of it.

Prioritization Of Recreational Development & Resource Conservation

All recommended elements in this plan are summarized and organized in Table 25 including the lead entity, partners, location, estimated costs and local prioritization by the water trail sponsor.

PERMITTING CONSIDERATIONS

Some recommended elements require earthwork and other disturbance. As with all construction on and near rivers, multiple permits may be required prior to any disturbance. The following are expected:

- Local City and County ordinances or policies may require permitting processes for developing on a floodplain
- Joint permit application shared between the DNR flood plain development program, the DNR sovereign lands program, and the U.S. Army Corps of Engineers. Prior to, or at the time of applying for the joint permit, request an environmental review from Sovereign lands at the DNR, and specifically ask if a mussel impact survey is needed. Currently, you can email Seth Moore at seth.moore@dnr.iowa.gov. The full permit can sometimes take 6 months or more. Knowing you need a mussel survey up front can save you a lot of time.
- A Phase I archaeological investigation has already been completed for all improvement sites and projects included in this water trail plan. The sites have been cleared for construction by OSA. No future cultural resource investigations are anticipated.

POTENTIAL PARTNERS, FUNDING SOURCES AND LOCAL RESOURCES

Funding and development of each plan element is the responsibility of the lead jurisdiction shown in Table 25 with oversight from the water trail sponsor. A number of local and state partner organizations and agencies are organized and positioned to assist with development of individual plan elements.

Likely funding partners to supplement local funds include federal and state agencies and grant programs such as Resource Enhancement and Protection (REAP), State Low-Head Dam Public Hazard Program grants, State Water Trail grants, state and federal recreational trails program funding, regional Transportation Alternative Program funding, statewide Transportation Enhancements Program funding, the Land and Water Conservation Fund, Wildlife Conservation and Appreciation funds from U.S. Fish and Wildlife Service.

CATEGORY	PLAN ELEMENT	RECREATION DEVELOPMENT PROJECTS	WT SPONSOR PRIORITY	LEAD JURISDICTION	OTHER COLLABORATORS	COST ESTIMATE, if applicable	
RECREATION	R1	On-Water Rescue Capacity	1	City of Estherville, Emmet County	Iowa DNR		
	R2	Community-Building with rural landowners	1	Emmet County Water Trail Association			
	R3	Communication to users	1	Iowa DNR	Emmet County Water Trail Association		
	R4	Enhanced communication between water trail access managers	1	City of Estherville	Emmet County		
	R5, R6	Swinging Bridge Access: New carry-down access and portage above and below rapids at Pedestrian Bridge, river right; new natural surface and terraced rock edge at Pedestrian Bridge, river right	2	City of Estherville		\$75,270	
	R7	Mickelson Park: New fishing access near Highway 9 bridge, river right	3	City of Estherville		\$13,700	
	R8	Mickelson Park: New carry-down access above dam to serve as portage	3	City of Estherville		\$16,110	
	R9	Mickelson Park: Dam modification	1	City of Estherville			
	R10, R11	Mickelson Park Access: New Universal Design access downstream of the dam, expanded parking and ballast rock terraced edge play area, both on river right	3	City of Estherville		\$144,000	
	R12	Mickelson Park Improvements: Sidewalk extension and tributary crossing between dam-area parking	3	City of Estherville			
	R13	Mickelson Park: ADA accessible walk and fishing access near dam, river left	3	City of Estherville		\$13,800	
	R14	Downstream of Mickelson Park: RV Campground	1	City of Estherville			
	R15	Downstream of Mickelson Park: New carry-down access at RV Campground, river left	1	City of Estherville		\$24,100	
	R16	Midway Access: New Universal Design access midway	1	City of Estherville	Emmet CCB	\$172,000	
	R17	Land trail extensions in Estherville	2	City of Estherville			
	CONSERVATION	C1	Volunteer Water Quality Monitoring	3	Emmet County Water Trail Association		
		C2	Riparian Buffer Gaps implementation	3	Emmet County Water Trail Association	Emmet SWCD	
C3		North Trailhead streambank restoration	1	City of Estherville			
C4		Streambank erosion near Swinging Bridge	1	City of Estherville			
C5		Reduce mowing at river edge	2	City of Estherville			
C6		Mature riparian forest protection	3	Emmet County Water Trail Association	INHF		

Table 25

This table organizes all recreation and conservation recommendations included in the water trail plan. Lead and supporting organizations as well as local priorities are also included.

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Appendices

Appendix A.

River Management Elements Relating To Water Trail Classification

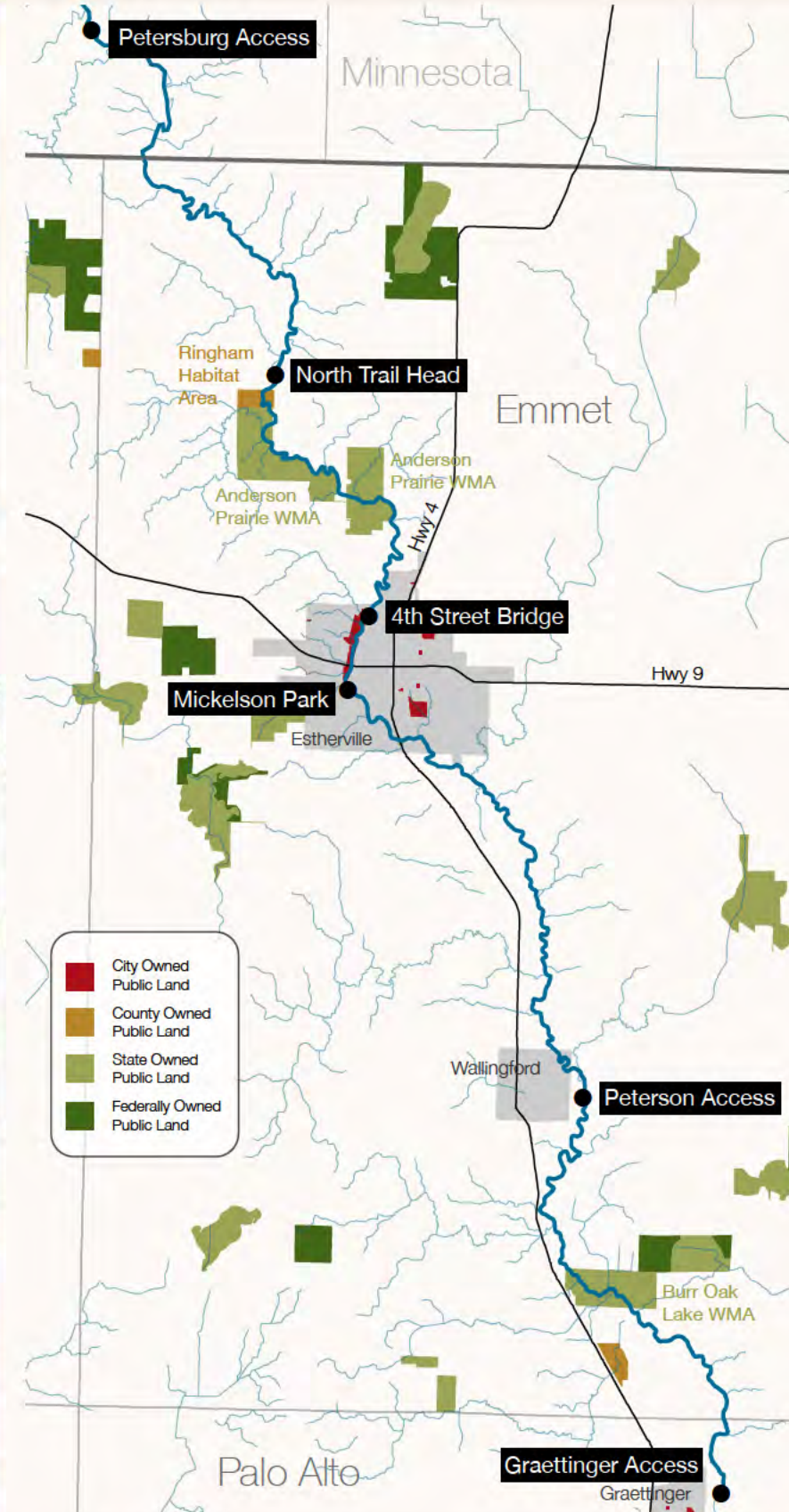
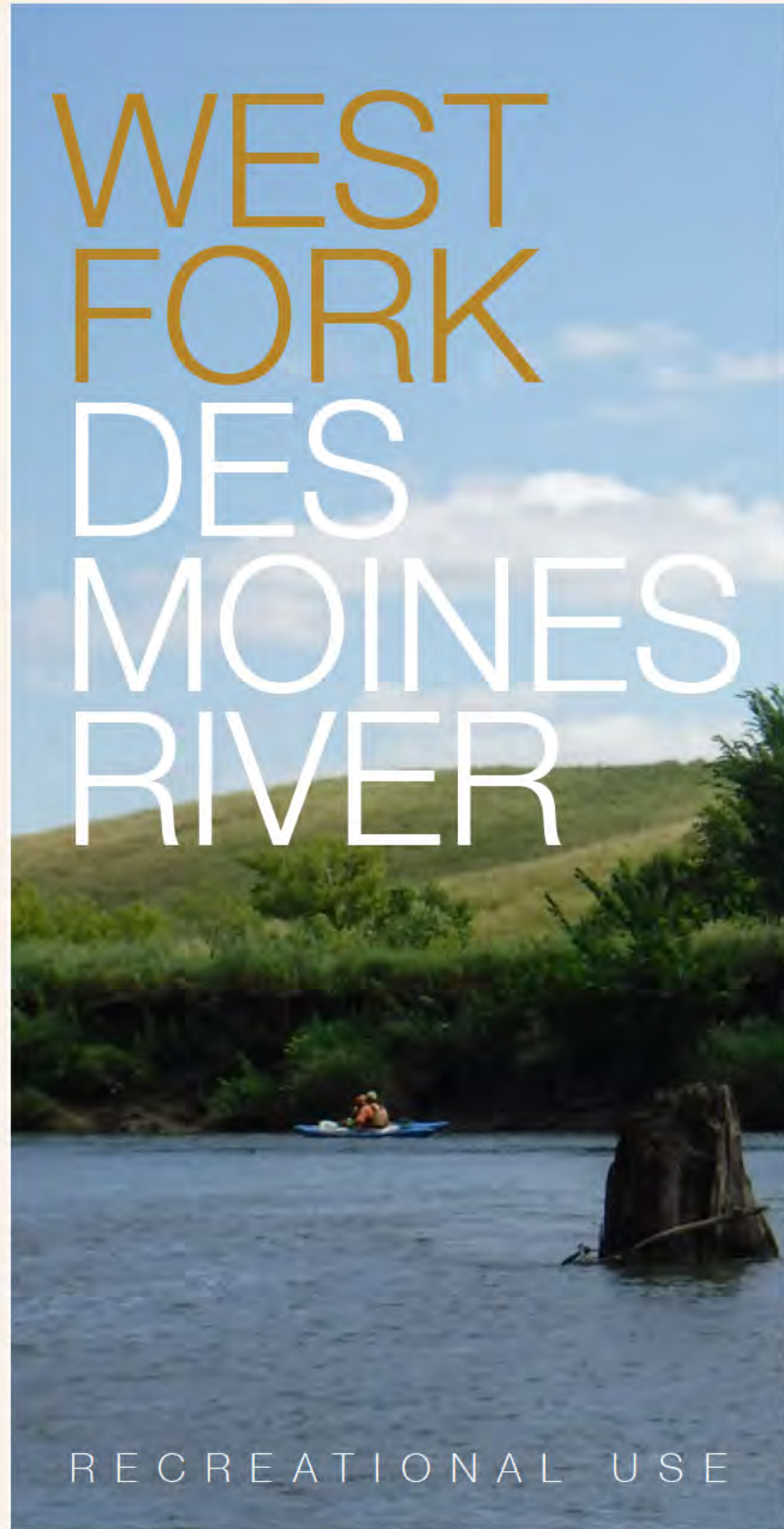
	GATEWAY	RECREATIONAL	CHALLENGE	WILDERNESS
RIVER USER SAFETY	Public communication describes river and access conditions, and identifies appropriate skill level for segment.			
	Emergency action plan is recommended, and includes egresses including private lane accesses with land owner's approval . Plan is communicated among landowners and responders; E911 communication framework for locating distraught users established	Emergency action plan recommended and communicated among landowners and responders; E911 communication framework for locations established		
RIVER USER BEHAVIOR	Water trail sponsor locally leads in litter control, etiquette, and promotes safety education and enforcement programs and campaigns. Trash receptacles available at controlled settings.	Water trail sponsor participates in litter control, etiquette, and safety education and enforcement programs and campaigns		
	Law enforcement is briefed in dealing with problem users	Law enforcement presence is occasionally visible and law enforcement is briefed in dealing with problem users	Law enforcement presence rarely visible; however, law enforcement may need to be briefed in dealing with problem users.	
	Leave No Trace ethic is encouraged through materials and literature.			
SERVICES	Explore managing liveries through the use of concessionaire agreements, fees, and conditions placed on operation.	Management of liveries through low-cost concessionaire agreements with some conditions placed on operation is encouraged.	Skilled guide services or instruction may be more appropriate than standard rental businesses. System to vet guides and/or instructors for use of public access may be considered for public safety.	Guide services may be more appropriate than standard rental businesses

Appendix B.

Water Trail Experience Classification Summary

	GATEWAY	RECREATIONAL	CHALLENGE	WILDERNESS
USER EXPECTATIONS	<ul style="list-style-type: none"> Most predictable experience; typically in a controlled urban setting A paired launch and landing with ramped, hard-surface or well-maintained compacted aggregate Slopes generally 12% or less on motorized boat ramps and 8% or less on side-walk or paths down to river's edge. Widths for boat ramps no less than 12' and side-walks or paths no less than 4'. A readily enjoyable setting that will be attractive to all users 	<ul style="list-style-type: none"> Less predictable experience; typically in a more rural setting Typically for users with intermediate skills, but can be for beginners, too. Varied settings Basic level of navigational aid available and hazard warnings (maps, signage, portages) 	<ul style="list-style-type: none"> User expects to manage risk in hands-on ways Good boat control necessary Launch and/or parking may be slightly to very difficult to use --Typically for users with advanced skills Basic level of navigational aid available and hazard warnings (maps, signage, portages) 	<ul style="list-style-type: none"> Some degree of solitude and wildlife viewing Paddling endurance and skill required --Typically for users with intermediate to advanced skills Launch and parking areas can be very undeveloped in context with the setting Basic level of navigational aid available and hazard warnings (maps, signage, portages)
TYPICAL DEVELOPMENT GOALS	<ul style="list-style-type: none"> Exposing the greatest number of new users to water trails Appropriate for extended families and groups of friends Part-day trip opportunity Strong emphasis on building user confidence through signage and ultra-easy launch and parking Launches, parking, trails designed with Universal Design standards May include white water park or features, family tubing opportunities, specified angling areas, etc. 	<ul style="list-style-type: none"> Offers a typical Iowa water trail experience Part-day trip to Day-trip opportunity Family and group experiences Access points may be less developed compared with Gateway experience Access surfaces may not be as stable as Gateway Some parking areas may be small or limited and parking surfaces may be gravel rather than cement 	<ul style="list-style-type: none"> Day- and multi-day-trip opportunity Low-impact access development may result in more difficult movement from parking to launch: steep slopes, tight turn on trails, or long distances from parking to launch 	<ul style="list-style-type: none"> Day- and multi-day-trip opportunity Less development, more restoration and protection of habitats May include parking in already impacted areas, rustic launches, and rustic remote campsites Low-impact practices required in all water trails-related construction
ACCESSES	≤ 6 miles apart	>5 miles	Varies	>9 miles
AMENITIES <small>(such as restrooms, running water, picnic areas, camping)</small>	<ul style="list-style-type: none"> Often available at accesses Liveries and shuttles likely available 	<ul style="list-style-type: none"> May be available but usually not as developed Liveries, shuttle desirable but usually not available 	<ul style="list-style-type: none"> May be available but usually not encouraged Guided experiences may be encouraged 	<ul style="list-style-type: none"> Any facilities present, such as remote campsites, are minimal, primitive, and without signage Guided experiences may be encouraged over rental

APPENDIX C. West Fork Des Moines River Brochure



This brochure focuses on recreational use of the West Fork Des Moines River in Emmet County and is sponsored by the Emmet County Water Trails Association. The purpose of this brochure is to clarify the types and limits of recreational uses allowable on the river and adjoining land, particularly when the adjoining land is privately owned. This brochure has been prepared using the most current legal interpretations and codes.

“the purpose of this brochure is to clarify the type and limits of recreational uses allowable on the river and adjoining land”

FUNDAMENTALS



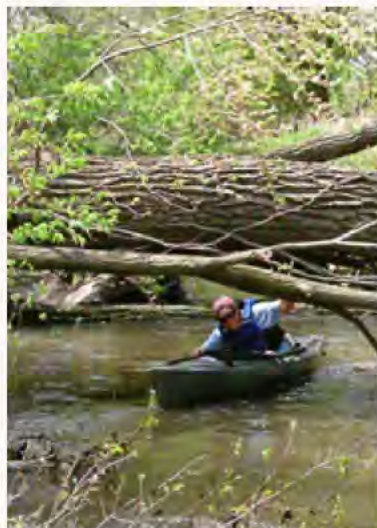
At least 84% of drowning fatalities nationwide involved individuals who were not wearing a life jacket. All boats are required to have at least one personal flotation device (PFD) or life vest for each person onboard. PFDs must be readily accessible in an emergency¹. All children under the age of 13 on a vessel are required to wear a PFD.

Registration is not required for inflatable vessels, seven feet or less in length, and canoes and kayaks 13 feet or less in length that have no motor or sail².

Consumption of alcohol on the water may lead to poor judgment and increased risk of drowning. The river is public property and subject to the governing laws³. If you plan to drink alcohol on the river, please drink responsibly.

WHO OWNS THE RIVER?

Rivers, the water as well as the land under the water, have unique ownership rights and conditions as defined by state and federal law. A common question from landowners as well as river users relates to who owns the river and what rights people have to use it for recreational purposes. The West Fork Des Moines River is designated as a navigable river⁴. This status relates to ownership rights of the river channel and banks.



WHERE CAN PEOPLE ACCESS THE RIVER?

While the water in the West Fork Des Moines River is public, the land under the river is generally owned by private landowners⁵. Therefore, the public can get onto and off the West Fork Des Moines River from any public land; this includes public boat access points and city parks and rural wildlife areas adjoining the river. Once on the river, paddlers sometimes come across hazards and obstructions that require them to use land under the water or on the streambank.

USING THE RIVER

Low water conditions are common during summer and fall months. Additionally, log jams blocking part or all of the river channel can be dangerous for river users due to changes in the water flow. These types of blockages or impediments are common on the West Fork Des Moines River, especially in northern Emmet County.

These conditions may require paddlers to physically move their boats across dry sandbars or channel bottoms, or walk their boats (portage) up and along the top of streambanks to avoid obstructions. This movement is considered incidental to navigation⁶. Camping on sandbars (without express permission from the landowner) is not legally permitted.



ASSOCIATED ISSUES

SURROUNDING RIVER USE:

Beyond portaging over and around in-stream hazards, river users are prohibited from entering private property without permission. Iowa trespass laws are clear about this. Entering privately owned land next to the river without the express permission of the owner or remaining there after being notified or requested to leave by the owner is considered criminal trespass⁷.

Iowa recreational use statute encourages landowners to open their land and water to others for recreational uses including swimming and boating by receiving immunity from liability except for injuries resulting from the landowner's willful or malicious acts⁷.



Small litter as well as illegal dumping are an issue on some Iowa rivers. Disposing of empty beverage containers, cigarette butts, food waste packaging, and other debris in or near the river is illegal in Iowa⁸. Large debris and solid waste, including tires, appliances, construction and demolition waste, farm waste, trash and hazardous chemicals cannot be dumped in rivers or on streambanks regardless of who owns the land⁹. Fines or penalties may vary based on the jurisdiction where the littering incident occurs (county or municipal jurisdictions).

Electrified fences crossing the river channel are sometimes used to contain livestock. These fences can be a hazard to river users and block navigation depending on water levels. Landowners have the right and responsibility to erect fences across the stream as necessary to confine livestock, as long as it affords safe boater passage¹⁰. In circumventing these barriers paddlers should use the least invasive strategy possible. All such barriers should be left as they were found.

The use of motorized vehicles, including ATVs, in all parts of certain navigable streams, such as the West Fork Des Moines in Emmet County, is prohibited at all times and conditions¹¹. Specific exceptions exist and relate to agricultural access.



BEHAVE ON THE RIVER AS A GUEST!

- Obey state and local rules and regulations. Access the river only from public lands and access points.
- Respect private property. Never trespass to gain access. (And remember, "No camping allowed")
- Be considerate to others while on the water. Give anglers a wide berth.
- Be considerate to local residents and landowners.
- Never litter. Always pack out trash.
- Respect wildlife by observing from a safe distance.
- Leave artifacts and natural features undisturbed.
- Be Safe. Wear your PFD. Limit alcohol consumption.

FOR MORE INFORMATION, VISIT:

<http://www.iowadnr.gov/Things-to-Do/Canoeing-Kayaking/How-to-Paddle>

Emmet County Sheriff's Department:

(712) 362-2639 (dial 911 for emergencies)

To report illegal activity, rude behavior, foul language, loud music and other rude behavior.

Conservation Officer:

(712) 260-1009

Respond to fish, boating and wildlife violations and criminal trespass concerns.

TIP (Turn in Poachers/ fish and game crime reporting) HOTLINE:

(1-800) 532-2020 (www.iowadnr.gov/tip, <http://tipoflowa.org/>)

Environmental Spills Hotline:

(515) 725-8694

Emmet County Conservation Offices:

(712) 867-4422

This brochure was produced with support from the Iowa Department of Natural Resources River Programs and Iowa State University College of Design.

¹ [pfd] Iowa Code 462A WATER NAVIGATION REGULATIONS

² [boat registration] Iowa Code 462A WATER NAVIGATION REGULATIONS

³ [alcohol use] Iowa Code 123.46 CONSUMPTION OR INTOXICATION IN PUBLIC PLACES

⁴ [West Fork is navigable] Iowa Code 462A.2, 462.69 IOWA WATER NAVIGATION REGULATIONS

⁵ [non-meandered] Iowa Code 462A.2, 462.69 IOWA WATER NAVIGATION REGULATIONS

⁶ [avoid channel obstructions in non-meandered channel] Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3)

⁷ [trespass] Iowa Code 716.7 IOWA DAMAGE AND TRESPASS TO PROPERTY REGULATIONS; Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3).

⁸ [littering] Iowa Code 455B.363 LITTER

⁹ [dumping and farm waste] Iowa Code 455B.307 Dumping; IOWA ADMINISTRATIVE CODE 567 — 100.4(455B)

¹⁰ [electric fence] Iowa Code 657.2(3) WHAT DEEMED NUSLIANCES and Iowa Attorney General Opinion: Smith to Kremer, State Representative, 2-6-96 (#96-2-3)

¹¹ [ATV in channel] Iowa Administrative Code 571, Chapter 49 OPERATION OF MOTOR VEHICLES IN MEANDERED STREAMS, NAVIGABLE STREAMS AND TROUT STREAMS; Iowa Code 321L.14.g ALL TERRAIN VEHICLES

APPENDIX D.

Breeding Birds Identified In The West Fork Des Moines Corridor But Not Included On Iowa's SGCN List

SPECIES

American Coot	Eastern Bluebird	Pileated Woodpecker
American Crow	Eastern Kingbird	Purple Martin
American Goldfinch	Eastern Phoebe	Red-bellied Woodpecker
American Kestrel	Eastern Screech-Owl	Red-eyed Vireo
American Redstart	Eastern Towhee	Red-tailed Hawk
American Robin	Eastern Wood-Pewee	Red-winged Blackbird
Baltimore Oriole	Eurasian Collared-Dove	Ring-billed Gull
Bank Swallow	European Starling	Ring-necked Pheasant
Barred Owl	Gray Catbird	Rock Pigeon
Belted Kingfisher	Gray Partridge	Rose-breasted Grosbeak
Black-capped Chickadee	Great Blue Heron	Ruby-throated Hummingbird
Blue Grosbeak	Great Crested Flycatcher	Savannah Sparrow
Blue Jay	Great Horned Owl	Scarlet Tanager
Blue-gray Gnatcatcher	Hairy Woodpecker	Song Sparrow
Blue-winged Teal	Indigo Bunting	Sora
Brown Thrasher	Killdeer	Spotted Sandpiper
Brown-headed Cowbird	Least Flycatcher	Swamp Sparrow
Canada Goose	Mallard	Tree Swallow
Cedar Waxwing	Marsh Wren	Turkey Vulture
Chipping Sparrow	Mourning Dove	Vesper Sparrow
Clay-colored Sparrow	Northern Cardinal	Virginia Rail
Cliff Swallow	Northern Flicker	Warbling Vireo
Common Grackle	Northern Harrier	Western Meadowlark
Common Yellowthroat	Northern Rough-winged Swallow	White-breasted Nuthatch
Cooper's Hawk	Northern Shoveler	Wild Turkey
Double-crested Cormorant	Orchard Oriole	Wood Duck
Downy Woodpecker	Pied-billed Grebe	Yellow-throated Vireo

APPENDIX E.

This table summarizes the largest or most prominent public lands in terms of recreational opportunities within 10 miles of the water trail. All public recreational properties in the study area are managed either by state, county or municipal entities. The county-managed properties seem to offer the greatest diversity in terms of recreational uses.

	Miles From River	Hunting	Fishing	Paddling	Hiking Trails	Modern Restrooms	Other
STATE MANAGED PUBLIC RECREATION AREAS							
Anderson Prairie State Preserve	0	X			X		186 acre native prairie
Anderson Prairie WMA	0	X					712 acres located along the West Fork of the Des Moines River.
Burr Oak Lake WMA	0	X					777 acres
Christopherson Slough Complex	2.6	X					2,130 acres
Dewey's Pasture Complex	6.6	X					5,522 acres
Five Island Lake WMA	2.4	X					1,058 acres
Anderson Prairie State Preserve	0	X			X		186 acre native prairie
Anderson Prairie WMA	0	X					712 acres located along the West Fork of the Des Moines River.
Fort Defiance State Park	1				X		221 acres, equestrian use allowed on some trails, cross-country skiing, non-modern campground
Ingham-High Wetland Complex	2.2	X					3209 acres
Mini-Wakan State Park	9.5		X	X		X	CCC lodge
Spring Run Wetland Complex	8.4	X					4,590 acres
West Fork WMA	0	X					1,603 acres
West Swan Lake WMA	4.3	X					1,143 acres
COUNTY MANAGED PUBLIC RECREATION AREAS							
Jim Hall Habitat Area	4.1		x	x	x		82 acres (37 acres water), wildlife refuge
Pappy's Lakeside	3.6		x	x	x		4 acres on Ingham Lake, swimming, play equipment, shelter
Ringham Habitat Area	0	x			x		76 acres, birdwatching station, Native American burial mounds
Wolden Rec Area and Wolden Arboretum	3.5	x	x	x	x	x	65 acres on 467-acre High Lake, camping, hiking, showers, playground, shelter house, sand volleyball courts, Nature Center, arboretum
Basswood Recreation Area	0	X	X	X	X		69 acres; Picnicking, hiking trails, fishing, rock riffle, boat ramp, and hunting.
Lammers Landing	0		x	x			8 acres, boat ramp
Lost Island-Huston Park	8			x	X		Nature Center. Wildlife Observation blind, camping, picnic shelters, boat ramp and dock, swimming beach,
Riverview Wildlife Area	0		x				17 acres; timber