5 | Watershed Improvement Goals

Photo: Roots from Cereal Rye, a common cover crop, grow deep in Iowa's soil. *Photo courtesy of Steve Berger.*

5.1 Introduction

This plan is intended to serve as a guide in decision-making and planning by the English River Watershed Management Authority (ERWMA), local agencies, local government, and citizens. Development of this watershed improvement plan was guided by 1) data obtained through the watershed assessment that took place between January 2014 and early 2015, 2) proven best management practices and emerging science, and 3) current local, state and federal soil and water resource priorities. The recommendations in this section were informed by the data, crafted by watershed staff and project partners, and refined through public feedback opportunities.

The recommendations in this plan reflect needs and priorities at the time this plan was developed. These needs and priorities may change over time. The recommendations of this plan should be re-evaluated at least every 5 years, and they may be adjusted as needed to keep pace with changing practice, policy, politics, science, as well as available staff support and financial resources. Success of these watershed improvements and resiliency recommendations will ultimately depend upon:

1) The willingness and capacity of leadership in the watershed to promote and support these goals and work together beyond political boundaries;
2) The willingness of watershed residents to become stewards of the watershed through education and a willingness to employ best management practices as able;
3) Federal, state, and local priorities that affirm the importance of Iowa's water and soil resources;
4) And the extent of resources available for stakeholders to participate in state soil and water quality initiatives.

Generally, the ERW is the responsible party for carrying out watershed improvement recommendations and efforts. The "ERW" refers to the collaborative of cities, counties, and soil and water conservation districts that comprise its membership. Successful watershed improvements require support of these recommendations, commitment to the ERWMA as an organization, and to its leadership and staff.

5.2 Watershed Improvement and Resiliency Recommendations

This section includes recommendations watershed stakeholder groups can follow in implementing water quality improvements and flood resiliency projects, over time, in the English River watershed. The first section presents recommendations that specifically focus on water quality improvements and disaster resiliency. For each of these recommendations, subwatersheds (or HUC-12s) from the English River watershed are ranked. The purpose of ranking is to encourage targeted project implementation with strategically developed partnerships and using limited resources more efficiently. Water quality baseline data, collected by the Iowa Soybean Association in 2014, were used to rank subwatersheds for nutrient reduction priorities. Flood modeling data provided by the Iowa Flood Center and University of Iowa's IIHR – Hydroscience and Engineering were used to rank the subwatersheds for flood reduction priorities. At the end of this section, the subwatersheds are prioritized using a simple scoring system that accounted for multiple indicators: water quality factors, as well as flooding.

In addition to ranking the subwatersheds, lists of best management practices (scientifically proven to help reduce nutrient loading and manage stormwater runoff) are also presented for the individual recommendations. It is expected that the English River Watershed, it's member organizations, and project partners will advance these watershed improvement goals by actively seeking available and relevant funding needed to implement projects, and engage stakeholders, at the subwatershed level. A sample subwatershed project workplan, which outlines the proposed scope of work for potential projects, can be found in Appendix H.

A

Water Quality Improvements: Nitrate Reduction

Recommendation: Reduce nitrate loading in the English River watershed from non-point sources by 41% from 2010 levels (an Iowa Nutrient Reduction Strategy target).*

The ERW will promote education about Iowa's water quality initiatives in nitrate reductions, and the best management practices (BMPs) proven to reduce nitrates from non-point sources entering waterways from urban and agricultural landscapes. The ERW will collaborate with other organizations to deliver nitrate-reduction programming, and target priority subwatersheds for nitrate-reduction projects. It is recommended that water quality monitoring occur on the subwatershed-level, and data used to re-evaluate and reprioritized as needed, going forward.

Action Step 1: Educate stakeholders on federal and state nutrient reduction science and strategies related to nitrate reduction;

Action Step 2: Educate stakeholders about emerging best management practices (Table 17) that can reduce nitrates from entering our waterways (i.e. cover crops, no-till, stream buffers, grassed waterways, terraces, ponds, wetlands, etc.);

Action Step 3: Grow partnerships with landowners, elected officials, environmental and agricultural stakeholder groups in education, outreach, and technical assistance in efforts to reduce nitrate losses on urban and rural properties;

Action Step 4: Target priority subwatersheds (Figure 32) for implementation projects, based on nitrate levels indicated by the hydrologic model**;

Action Step 5: Collect and utilize subwatershed-level water quality data to re-evaluate and reprioritize subwatershed project implementation for nitrate reduction, as needed;

Action Step 6: Highlight local / regional water quality champions and their successes in putting nutrient reduction strategies into practice.

Action Step 7: Track the progress (technical assistance) and implementation (cost-share partnerships) of best management practices by coordinating with local agencies.

* Non-point sources of pollution are contaminants that are indirectly introduced to waterways over a large area, such as through water runoff, seepage into aquifers, or through erosion. Point sources are introduced from a specific location, such as a wastewater discharge pipe. Iowa's Nutrient Reduction Strategy also calls for a 4% reduction in nutrient from point sources, but point sources are currently regulated, whereas non-point sources are not. Reduction of non-point sources at this time are dependent upon voluntary efforts by urban and rural landowners.

** The hydrologic model (developed by the Iowa Flood Center) utilizes numerous data from a 64 year period of time, and is presumed to be more accurate in estimating nitrate and runoff trend lines than the water sampling from one year. Therefore, data from the model is utilized in identifying priority subwatersheds when data is available to do so.

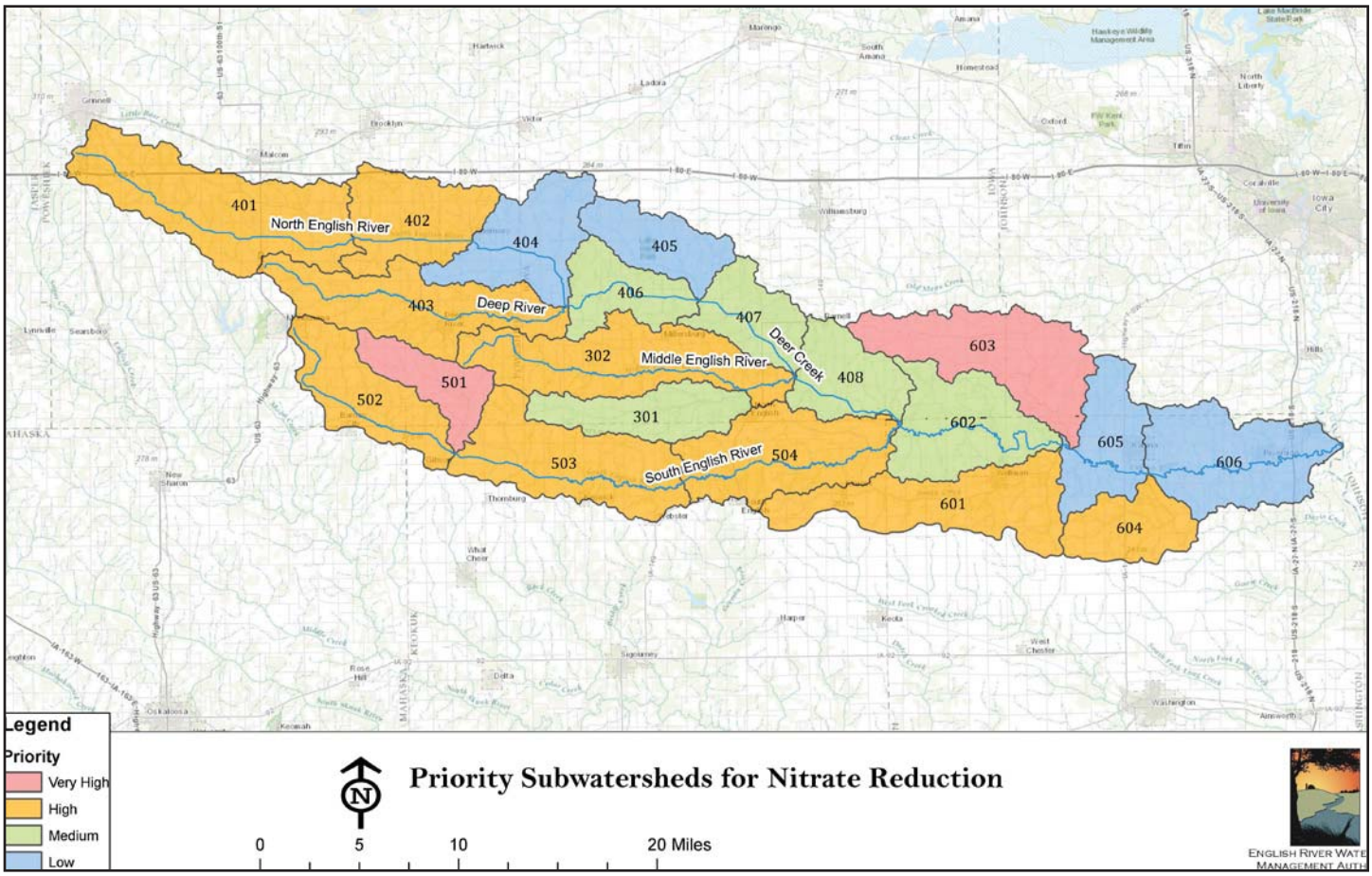

Figure 32: Priority subwatersheds for nitrate reduction in the English River Watershed

Table 16. Priority Subwatersheds for Nitrate Reduction			
ID (070802090###)	**Name**	**Priority**	**Estimated 64-year average NO3-N concentration (mg/L)**
603	Deer Creek	1 (Very High)	7.43
501	Unnamed Creek - Town of Tilton	2 (Very High)	7.00
401	Dugout Creek	3 (High)	6.75
504	Lower South English River	4 (High)	6.33
604	Camp Creek	5 (High)	6.33
502	Upper South English River	6 (High)	6.20
403	Deep River	7 (High)	6.00
503	Middle South English River	8 (High)	5.71
302	Middle English River	9 (High)	5.63
402	Upper English River	10 (High)	5.60
601	Lime Creek	11 (High)	5.60
301	Gritter Creek	12 (Medium)	5.33
406	Middle North English River	13 (Medium)	5.00
602	Birch Creek	14 (Medium)	4.80
408	Outlet North English River	15 (Medium)	4.25
407	Lower North English River	16 (Medium)	4.00
605	Ramsey Creek	17 (Low)	3.86
606	Bulgers Run	18 (Low)	3.80
404	Jordan Creek	19 (Low)	3.75
405	Devils Run	20 (Low)	2.75

Table 17. Best Management Practices (BMPs) for Nitrate Reduction*		
	Practice	**% Nitrate - N Load Reduction**
NITROGEN MANAGEMENT	Mulch - Kura clover	41%
	Cover crop - Rye	31%
	Cover crop - Oat	28%
	Nitrogen application rate - Nitrogen rate at MRTN (0.10 N:corn price ration) compared to current estimated application rate.	10%
	Nitrification inhibitor – Nitrapyrin in fall – compared to fall-applied without Nitrapyrin	9%
	Timing – Sidedress, compared to pre-plant application	8%
	Timing – Spring (versus fall) pre-plant application	6%
	Timing – Spring pre-plant/sidedress 40-60 split (compared to fall application)	5%
	Timing – Sidedress, soil test based compared to pre-plant	4%
	Source – Liquid swine manure compared to spring-applied fertilizer	4%
LAND USE CHANGE	Grazed pasture – Similar to CRP	85%
	Perennial – Land retirement (CRP) – compared to spring-applied fertilizer	85%
	Perennial – Energy crops, compared to spring applied fertilizer	72%
	Extended rotations – Minimum of 2 years alfalfa in 4 – 5 year rotation	42%
EDGE-OF-FIELD PRACTICES	Buffers – Only for water that interacts with the active zone below the buffer.	91%
	Wetlands – Targeted water quality	52%
	Bioreactors	43%
	Drainage water management – No impact on concentration	33%
	Shallow drainage – No impact on concentration	33%

*Refer to Iowa State University Extension and Outreach's *Iowa Strategy to Reduce Nutrient Loss - Nitrogen and Phosphorous Practices* in Appendix F for the Extended Version.

B

Water Quality Improvements: Phosphorus Reduction

Recommendation: Reduce phosphorus loading in the English River watershed from non-point sources by 29% from 2010 levels (an Iowa Nutrient Reduction Strategy target).

The English River Watershed will promote reduction of phosphorus in the English River Watershed through education about Iowa's water quality initiatives and best management practices proven to reduce phosphorus from non-point sources from entering our waterways. The English River Watershed will collaborate with other organizations to deliver programming, more efficiently utilize available resources, and target priority subwatersheds for implementation.* It is recommended that the water quality monitoring be conducted in the subwatersheds to evaluate program effectiveness and reprioritize subwatersheds, as needed.

Action Step 1: Educate stakeholders on federal and state nutrient reduction science and strategies related to reduction of phosphorus loading in state waterways;

Action Step 2: Educate stakeholders about emerging best management practices (Table 19) that can reduce phosphorus loading (i.e. no-till, cover crops, sediment basins, terracing, buffers, etc.);

Action Step 3: Develop partnerships with stakeholder groups (i.e. landowners, elected officials, environmental and agricultural) in education, outreach and technical assistance efforts to reduce phosphorus loading in urban and rural waterways;

Action Step 4: Target priority subwatersheds (Figure 33) for funding, partnerships, and project implementation, based on total and dissolved phosphorus levels indicated by current monitoring data;

Action Step 5: Collect and utilize subwatershed-level water quality data to evaluate and prioritize future subwatershed-level projects for phosphorus reduction, as needed;

Action Step 6: Highlight local / regional water quality champions and their efforts in putting nutrient reduction strategies into practice and sponsor an annual "English River Watershed Award."

* Phosphorus and erosion (sediment loading) in waterways are closely linked as phosphorus binds with sediment. Long-term water quality monitoring at the Riverside location in the ERW indicates that phosphorus levels have exceeded EPA benchmark values in over 95 percent of samples (taken over 28 years). However, we do not have data on phosphorus levels at the subwatershed level. Until this data becomes available, the assumption is made that priority subwatersheds for sediment reduction are also the same priority subwatersheds for phosphorus reduction. The subwatershed-level erosion data utilized to determine these priority subwatersheds were obtained from the USDA Agriculture Research Service's Revised Universal Soil Loss Equation tool (RUSLE).

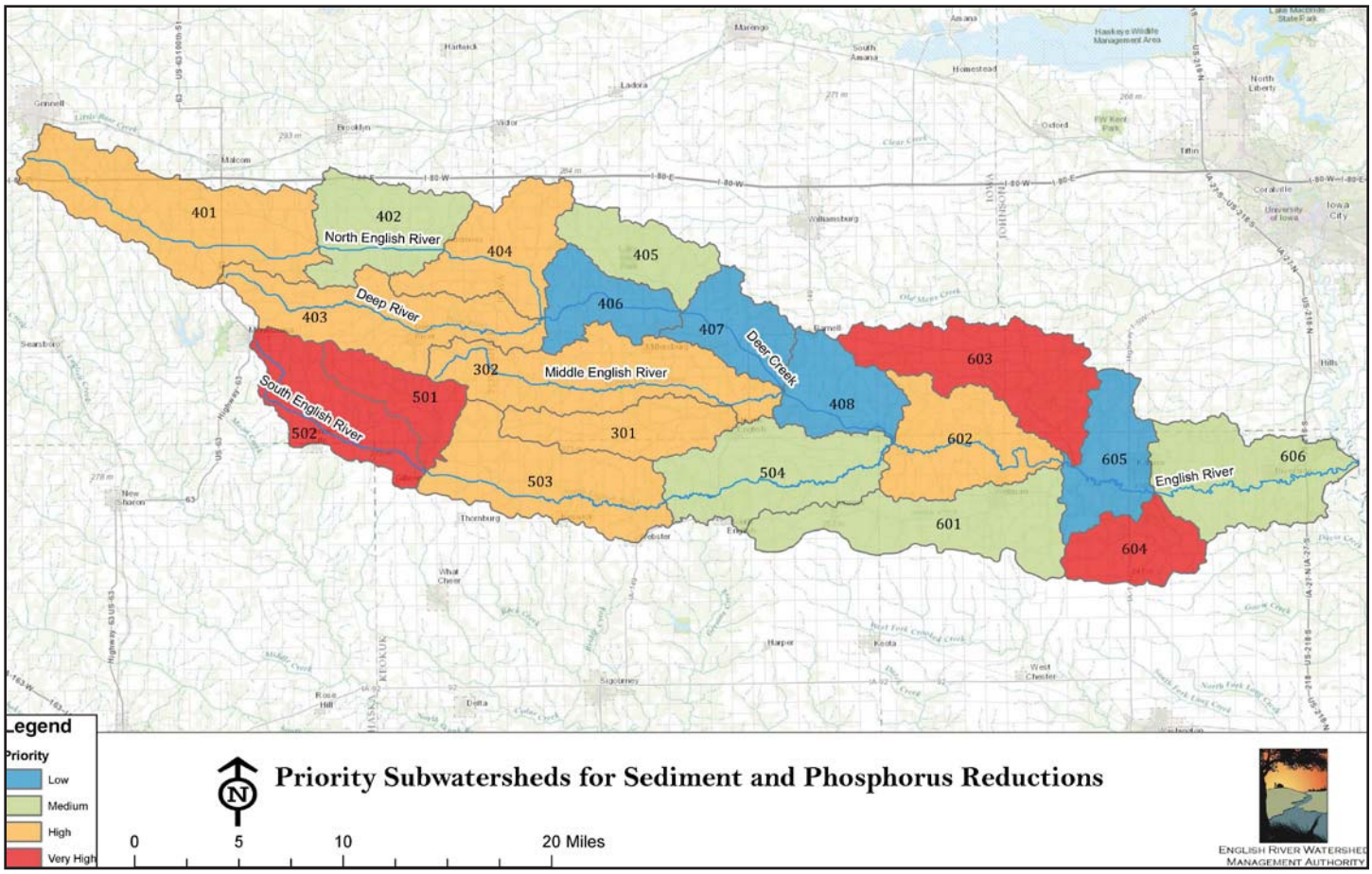

Figure 33: Priority subwatersheds for sediment and phosphorus reduction in the English River Watershed

Table 18. Priority Subwatersheds for Sediment and Phosphorus Reduction			
ID (070802090###)	**Name**	**Priority**	**RUSLE mean value**
603	Deer Creek	Very High	13.56
501	South English River	Very High	13.29
604	Camp Creek	Very High	12.48
502	Upper South English River	Very High	12.10
301	Gritter Creek	High	11.64
403	Deep River	High	11.63
302	Middle English River	High	11.42
401	Dugout Creek	High	11.33
404	Jordan Creek	High	11.26
602	Birch Creek	High	10.91
503	Middle South English River	High	10.80
601	Lime Creek	Medium	10.24
402	Upper English River	Medium	10.21
504	Lower South English River	Medium	9.33
405	Devils Run	Medium	9.15
606	Bulgers Run	Medium	8.81
605	Ramsey Creek	Low	8.27
408	Outlet North English River	Low	7.87
407	Lower North English River	Low	7.59
403	Middle North English River	Low	7.07

Table 19. Best Management Practices (BMPs) for Phosphorus and Sediment Reduction*		
	Practice	**% Phosphorus – P Load Reduction**
PHOSPHORUS MANAGEMENT PRACTICES	Tillage – No till compared to chisel plowing	90%
	Source of phosphorus – Liquid swine, dairy, and poultry manure compared to commercial fertilizer – runoff shortly after application	46%
	Source of phosphorus – Beef manure compared to commercial fertilizer – runoff shortly after application	46%
	Placement of phosphorus – Broadcast incorporated within 1 week compared to no incorporation, same tillage	36%
	Tillage – Conservation till – chisel plowing compared to moldboard plowing	33%
	Cover crops – Winter rye	29%
	Placement of phosphorus – With seed or knifed bands compared to surface application, no incorporation	24%
	Phosphorus application – Soil Test P, no P applied until STP drops to optimum	17%
LAND USE CHANGE	Perennial vegetation – Land Retirement (CRP)	75%
	Perennial vegetation – Grazed pastures	59%
	Perennial vegetation – Energy crops	34%
EROSION CONTROL & EDGE-OF-FIELD	Control – Sedimentation basin or ponds	85%
	Terraces	77%
	Buffers	58%

*Refer to Iowa State University Extension and Outreach's *Iowa Strategy to Reduce Nutrient Loss - Nitrogen and Phosphorous Practices* in Appendix F for the Extended Version.

C

Water Quality Improvements: Phosphorus Reduction

Recommendation: Reduce sediment loading in the English River Watershed by 30%.

The English River Watershed will promote reduction of sediment loading in the English River Watershed through education about land management practices that reduce soil loss from farm fields and construction sites, and best managment practices that reduce erosion from streambanks. Soil health quality will be a major component of the education effort. The English River Watershed will collaborate with other organizations to deliver programming, more efficiently utilize available resources, and target priority subwatersheds for implementation.

Action Step 1: Educate stakeholders on the agronomic benefits of soil health, and strategies for improving soil quality in farm fields;

Action Step 2: Educate stakeholders about best management practices (Figure 18) that can reduce sediment loading (i.e. no-till, cover crops, sediment basins, terracing, buffers, etc.);

Action Step 3: Develop partnerships with stakeholder groups (i.e. landowners, elected officials, environmental and agricultural) in education, outreach and technical assistance efforts to reduce sediment loading in urban and rural waterways;

Action Step 4: Identify priority subwatersheds for funding, partnerships, and project implementation, based on sediment delivery estimates indicated through land use assessments and geographic information (GIS) analysis;

Action Step 5: Collect and utilize subwatershed-level water quality data to evaluate and reprioritize subwatershed-level projects for sediment reduction, as needed;

Action Step 6: Conduct a RASCAL assessment to identify areas of excessive stream bank erosion or where best management practices would be beneficial;

Action Step 7: Work with urban areas to increase implementation of erosion control practices on construction sites;

Action Step 8: Highlight local / regional water quality champions and their efforts in putting nutrient reduction strategies into practice and sponsor an annual "English River Watershed Award."

D

Water Quality Improvements: Water Quality Monitoring

Recommendation: Continue monitoring water quality parameters at the subwatershed level.

Long-term water quality monitoring is essential to establishing reliable water quality baselines and changes over time and in assessing the effectiveness of targeted implementation projects. Engaging stakeholders in private or public water quality monitoring opportunities educates and promotes watershed stewardship. It is also important for publicly available water quality parameters to be accessible to the public, and in a user-friendly format.

Action Step 1: Promote the establishment of ongoing water quality monitoring at the subwatershed level, at locations consistent with sampling spots identified by and utilized by Iowa Soybean Association in 2014;

Action Step 2: Promote volunteer monitoring opportunities through programs such as IOWATER and Iowa Soybean Association's tile outlet monitoring program (for producers);

Action Step 3: Improve accessibility of local and state public water quality data through the English River Watershed website.

E

Disaster Resiliency: Flood Hazard Reduction

Recommendation: Reduce flood severity in the English River watershed through education and promotion of best management practices that reduce runoff in targeted subwatersheds.

As other long-term watershed projects (i.e. Soap Creek) in Iowa have shown, flood severity in a watershed can be reduced through targeted subwatershed-level projects that can reduce runoff and improve the water-holding capacity of the landscape (detention or retention basins, soils, vegetation). Across the watershed, cumulatively, these projects can mitigate flood damage to property and infrastructure by reducing the severity of flood events when they do occur.

The English River Watershed will conduct education and outreach on flood concerns in the watershed, and utilize emerging science to determine the best practices and targeted subwatersheds for flood reduction projects. Targeted subwatershed-level projects will also maximize efficient use of resources, and maximize results. The English River Watershed will utilize existing partnerships, and develop new ones on the local, state and federal level to increase access to the financial and technical resources needed to accomplish this task.

Action Step 1: Conduct outreach and education on flood impacts in the English River watershed;

Action Step 2: Promote emerging best management practices that can reduce flood runoff from urban and rural landscapes during heavy rain events;

Action Step 3: Target priority subwatersheds* for runoff reduction best management (Figure 30) for funding, partnerships, and project implementation;

Action Step 4: Utilize existing partnerships, and develop new ones to with landowners, elected officials, environmental and agricultural stakeholders in research and technical assistance, outreach / education, and project implementation to reduce flood impacts;

* Priority Subwatersheds in the English River Watershed for Runoff Reduction: Jordan, Birch, Deer and Dugout Creek (aka Headwaters of the North English River); as well as the Upper English, Deep, Upper South English, and South English Rivers.

F

Disaster Resiliency: Flood Hazard Reduction

Recommendation: Reduce flood severity in the English River Watershed through education and promotion of best management practices that increase water-holding capacity and promote infiltration on both urban and rural landscapes.

Flood severity in a watershed can be reduced through targeted subwatershed-level projects that can reduce improve the water-holding capacity of the landscape (i.e. improved soil health, vegetation or wetland areas that promotes infiltration, and detention). Across the watershed, cumulatively, these projects can mitigate flood damage to property and infrastructure by improving the capacity of the landscape to manage heavy precipitation. The English River Watershed will conduct education and outreach on soil health and land uses that promote infiltration, and land uses that facilitate reduction of flood severity, such as wetland areas. Targeted subwatershed-level projects in areas most prone to flooding will also maximize efficient use of resources, and project effectiveness. The English River Watershed will utilize existing partnerships, and develop new ones on the local, state and federal level to increase access to the financial and technical resources needed to accomplish this task. The English River Watershed will also promote expansion of a hydrological monitoring network in the watershed that can provide real-time flood-stage data from strategically placed sensors in the watershed, as well as providing tools for monitoring streamflow, precipitation, soil conditions, water quality, and groundwater resources. This data will be utilized to evaluate effectiveness of projects, and reprioritize subwatersheds for flood reduction projects, as needed.

Action Step 1: Conduct outreach and education on best management practices that promote infiltration during heavy rain events;

Action Step 2: Target priority subwatersheds* most prone to flooding (Figure 34) for funding, partnerships, and project implementation;

Action Step 3: Utilize existing partnerships, and develop new relationships with landowners, elected officials, environmental and agricultural stakeholders in research and technical assistance, outreach / education, and project implementation to reduce flood impacts;

Action Step 4: Encourage establishment of a hydrological monitoring network in the watershed, and promote access to emerging data and tools watershed stakeholders and decision-makers can use;

Action Step 5: Utilize collected data to re-evaluate and reprioritize subwatershed-level projects, as needed.

* Priority subwatersheds / areas for flood reduction projects include: the area where the English River at the English River Wildlife Area and the South English River converge, the area downstream of the English River / Gritter Creek convergence, and areas in the western section of the watershed where high runoff areas overlap with high annual flood areas (headwaters of the North English River, and Deep River).

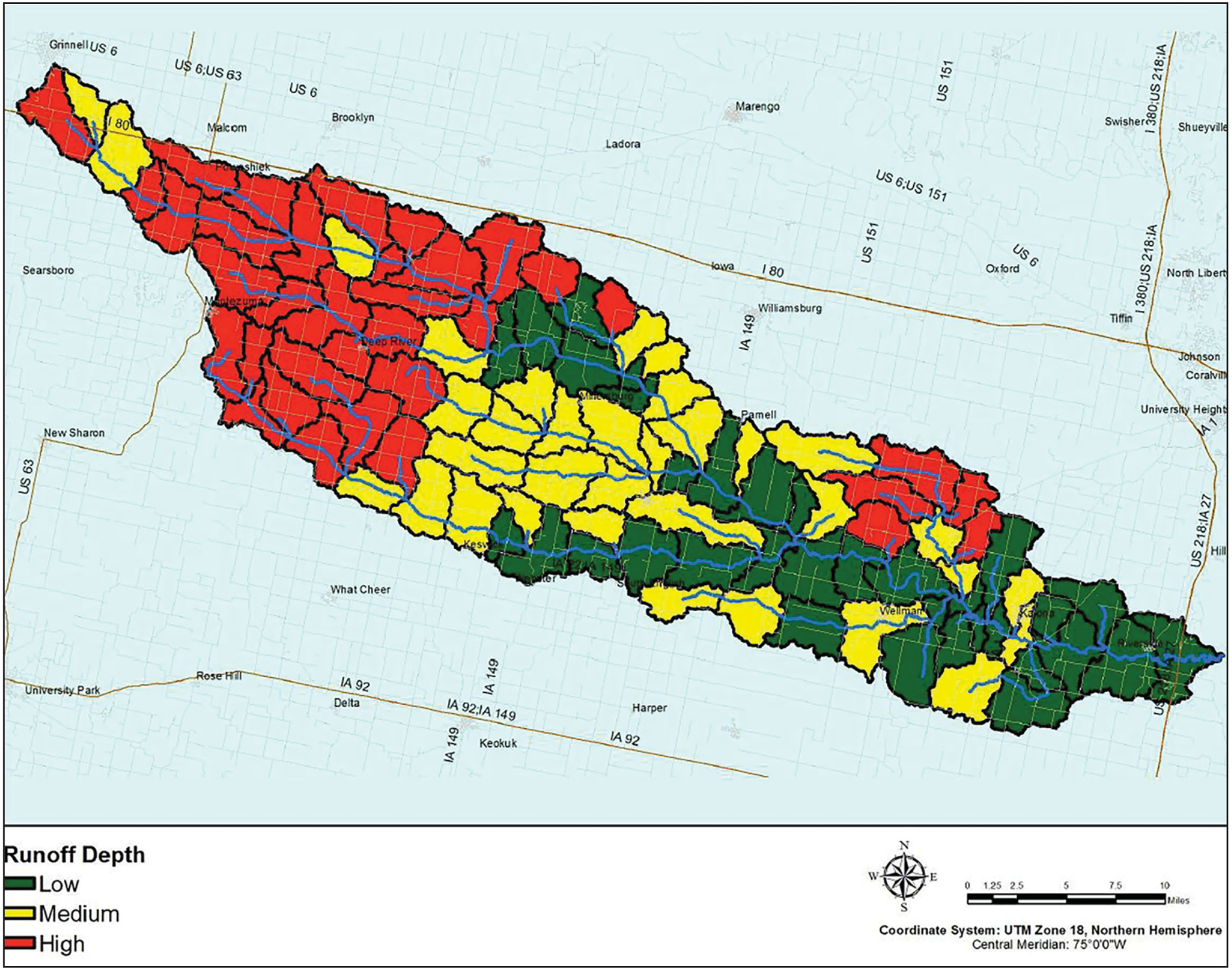

Figure 34. Priority Subwatersheds in the English River Watershed for Reduction of Mean Annual Flooding"

G

Capacity Building: Partnerships for More Effective and Efficient Outreach

Recommendation: Expand partnerships for education, outreach, and project collaboration.

The ERW will actively seek opportunities to expand partnerships with existing partners and develop new ones for project development and implementation to achieve the goals of this plan. Increased collaboration will help projects deliver more consistent messaging, increase their outreach capacity, identify and engage diverse stakeholder groups, and utilize available resources more efficiently.

Action Step 1: Seek opportunities for collaboration in program development (education and implementation), data sharing, project oversight, and evaluation.

Action Step 2: Apply for funding to support the recognition of waterways through signage on road passings over creeks and rivers in the watershed.

H

Capacity Building: Strengthen the English River Watershed Coalition through Membership, Awareness, and Resources

Recommendation: Increase the organizational capacity of the English River Watershed Managment Authority.

The ERW needs leadership and staff to have the organizational capacity required to facilitate communication, engage stakeholders, and provide project leadership in both its daily operations and on-the-ground improvement projects. Additionally, the organization needs to sustain its formal organization with leadership provided by the Board of Directors and routine meetings that are open to all watershed stakeholders. The ERWMA will continue efforts to grow the organization by reaching out to eligible member organizations, and engaging diverse stakeholder groups. Finally, the ERW will actively pursue technical and financial resources needed to sustain the administrative functions of the organization and implement the plan.

Action Step 1: Provide leadership and staffing for the English River Watershed to continue its momentum in watershed improvement initiatives;

Action Step 2: Maintain a Board of Directors and routine meetings that are open to all watershed stakeholders;

Action Step 3: Promote inclusivity of watershed stakeholders through outreach to potential member organizations and other stakeholder groups;

Action Step 4: Actively pursue technical and financial resources needed to sustain the basic administrative functions of the organization and to implement the recommendations in the plan.

5.3 Priority Subwatersheds for Combined Water Quality Improvement and Flood Hazard Indicators

The subwatersheds (HUC-12s) were ranked for priority, based on a combination of key indicators: nitrate and phosphorus (or runoff) reduction, and flooding hazard. Using values generated for each smaller subwatershed (HUC-14s) within the subwatersheds (HUC-12s) for each of the three indicators (nitrate, phosphorus/erosion, and flooding vulnerability)the subwatersheds were assigned an average point value between 1 and 4, where "1" indicates the subwatershed should be considered a "Low Priority," and "4" indicates it should be considered a "Very High Priority." The resultant score for each subwatershed were used to develop the priority rankings, which are listed in Table 19 and illustrated in Figure 35.

1. *Nitrates*. Nitrate (NO3-N) data was provided by the Iowa Flood Center (IFC), which is detailed in depth in the Hydrologic Modeling of the English River Watershed report (Appendix B) Data utilized for the subwatershed prioritization process was presented as a 64 year average NO3-N concentration (mg/L) on the HUC-14 level. This dataset can be found on page 53 of this plan.

2. *Phosphorus*. Phosphorus data was not specifically provided by simulations ran by the IFC. However, due to the movement of phosphorus across land, a runoff coefficient can be utilized as a proxy for areas more or less prone to runoff containing phosphorus. This dataset can be found on page 61 of this plan.

3. *Flooding*. Flooding data was provided by the IFC in the form of mean annual flooding chances on the HUC-14 level. This dataset can be found on page 63 of this report.

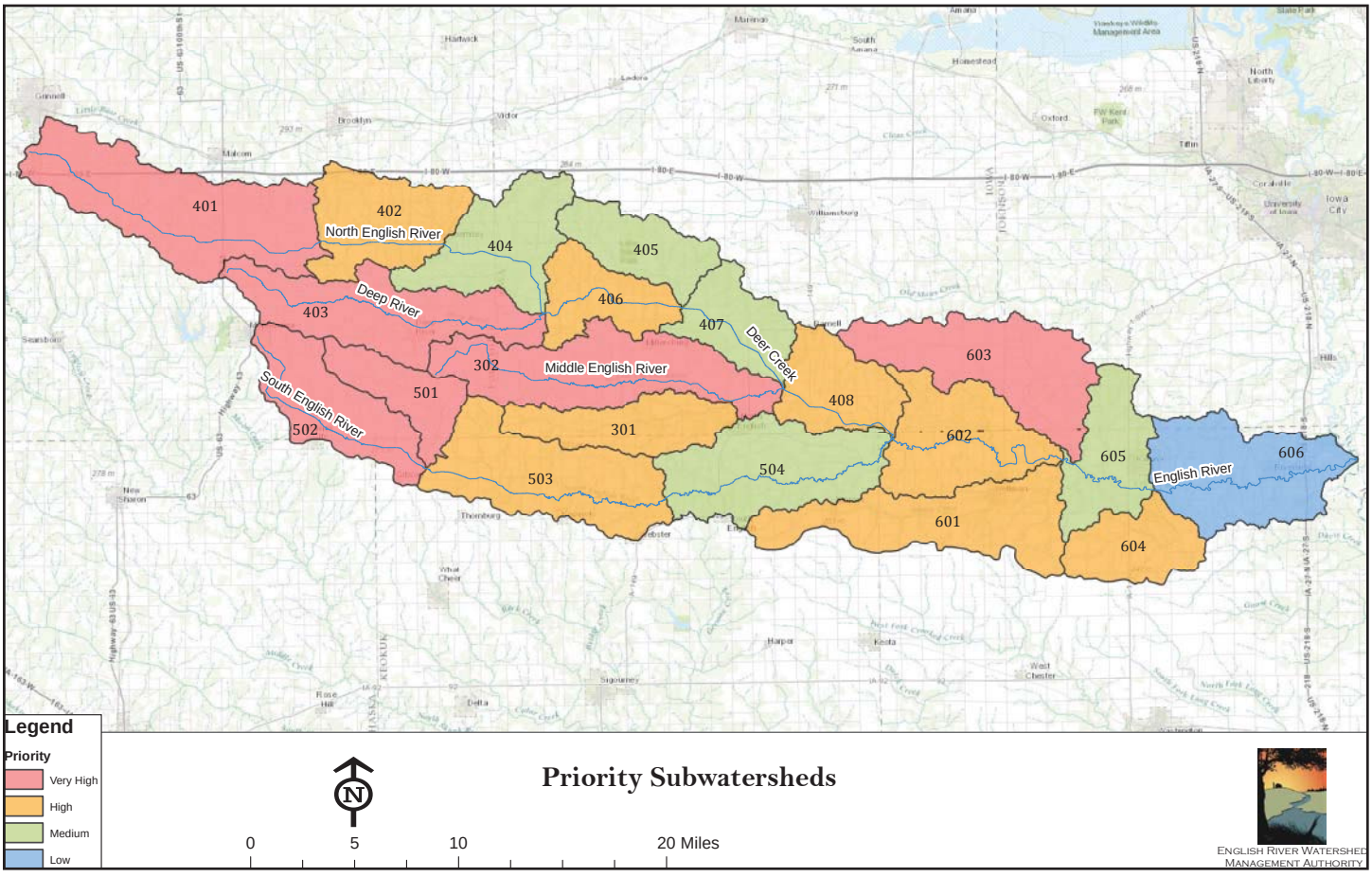

Figure 35: Priority Subwatersheds in the English River Watershed for Combined Water Quality Improvement and Flood Hazard Indicators

Table 12. Priority Subwatersheds for Combined Scoring			
ID (070802090###)	**Name**	**Priority**	**Total Score**
403	Deep River	1 (Very High)	11
603	Deer Creek	2 (Very High)	9
502	Upper South English River	3 (Very High)	9
501	Unamed Creek - Town of Tilton	4 (Very High)	9
401	Dugout Creek	5 (Very High)	9
302	Middle English River	6 (Very High)	9
602	Birch Creek	7 (High)	8
601	Lime Creek	8 (High)	8
503	Middle South English River	9 (High)	8
406	Middle North English River	10 (High)	8
402	Upper English River	11 (High)	8
604	Camp Creek	12 (High)	7
408	Outlet North English River	13 (High)	7
301	Gritter Creek	14 (High)	7
605	Ramsey Creek	15 (Medium)	6
504	Lower South English River	16 (Medium)	6
407	Lower North English River	17 (Medium)	6
405	Devils Run	18 (Medium)	6
404	Jordan Creek	19 (Medium)	6
606	Bulgers Run	20 (Low)	5

Based upon the given methodology, six subwatersheds fall into the "Very High" priority category. Deep River is ranked the highest priority for scoring high in nitrate concentration and for scoring the highest among annual flooding chances and susceptibility to phosphorus runoff. Also ranked in the "Very High" priority category is Deer Creek, Upper South English River, Unnamed Creek – Town of Tilton, Dugout Creek (headwaters of the Upper North English River), and the Middle English River subwatersheds. These subwatersheds, which are concentrated primarily near the western headwaters of the watershed, ranked high among each key variable of interest and should be the focus of watershed improvements through various best management practices detailed in this plan.

Conclusion

It is up to the watershed's stakeholders to determine the best way to implement the recommendations for improvements in their watershed. Locally-driven efforts are important to achieving buy-in from stakeholders, and locally developed watershed plans, such as this one, can potentially be more effective in bringing about significant water quality improvements across Iowa than more "top-down" strategies. However, unless watershed stakeholders are sincerely committed to outreach and education, open to change in practice, providing leadership on the topic, and being proactive in obtaining resources for desired improvements, support for a cooperative, voluntary watershed improvement model will likely lose steam.