2018

SUBWATERSHED TOOLKITS

UPPER SOUTH ENGLISH RIVER

HUC-12: 070802090502

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Funding for development and printing of this plan was provided by the Iowa Watershed Approach.

The Iowa Watershed Approach is a collaborative program that brings together local, state, federal, and private organizations to work together to address factors that contribute to floods and nutrient flows. Iowans will enjoy improvements in quality of life and health resulting from upstream watershed investments tied to community resilience activities. This adaptive model, supported by U.S. Housing and Urban Development (HUD) dollars, will leverage the principles of Iowa's innovative Nutrient Reduction Strategy to make our communities more resilient to flooding and help improve water quality.

SECTION 1: PLANNING PROCESS

The English River Watershed (ERW) completed "Phase 1" comprehensive watershed planning in 2015. The goal of this project was to take an inventory of the physical environment, complete hydrologic modeling on the basin scale (HUC-8), collect baseline water quality data, engage landowners in the planning process, and formulate watershed improvement recommendations based on data public input. The entire plan, titled the *English River Watershed Improvement and Resiliency Plan*, can be found on the English River Watershed website.

PHASE 2 KEY QUESTIONS & OUTCOMES

Beginning in Fall 2017, the English River Watershed began the "Phase 2" subwatershed planning process, which was completed in December of 2018. The goal of this phase was to discover priority areas on the subwatershed level (HUC-12) for targeted implementation of cost-share funds. The plans are intended to introduce many of the tools and analyses that can be used by municipalities, SWCDs, the WMA, and other organizations when considering watershed improvement projects.

The ERW consists of 20 HUC-12 subwatersheds. A total of 14 subwated plans were developed in accordance with the criteria established by the project funding source. Table 1 shown below highlights the differences between the 9-step planning process in Phases 1 and 2.

Table 1. The 9-Step Planning Process for Phase 1 and Phase 2. *Source: ERW*

Planning Step	Phase 1 Outcomes	Phase 2 Key Questions	Phase 2 Outcomes
1. Engage the Public	Determined of the community's concerns and perceived threats to water quality and quantity.	What concerns are specific to the HUC-12 subwatershed?	Completed a mail survey to all 14 subwatersheds and gained input at various meetings and events.
2. Inventory Resources	Determined the broad land uses, environmental characteristics, and history of the watershed.	What data exists on the subwatershed level and can be analyzed in comparison between subwatersheds?	Compiled data on soil erosion, flooding and social risks, water quality, and detailed urban land uses.
3. Develop Problem Statements	Determined the broad causes and sources of impairments in the watershed.	What tools can be developed to provide support for watershed entities seeking grant or cost share funding?	Designed a "toolbox" of resources for watershed entities that address problems specific to each subwatershed.
4. Identify Target Conditions	Identified recommendations for HUC-8 scale watershed improvements to water quality and quantity.	What are the HUC-12 level specific water quality and quantity conditions?	Analyzed historical erosion data, developed erosion potential maps, and completed 2 seasons of water quality monitoring.
5. Develop Restoration Targets	Determined priority issues throughout the watershed through public participation.	What is the potential for conservation practices (amount or type)?	Completed the Agricultural Conservation Planning Framework (ACPF) and urban modeling.
6. Evaluate Alternatives	Prepared BMP benefits table with associated reductions in contaminants or flood volumes.	What do the recommended practices achieve?	Matrix for cost/benefits of urban/rural practices and risk analysis based on community assets.
7. Prepare the Implementation Plan	Assigned responsibility to the WMA for continued research and pursuit of cost share funding.	Who is responsible for implementing programs? Who can provide technical assistance?	Matrix for responsible parties, funding opportunities, and resources provided by ERW.
8. Implement the Plan	Physical and digital copies of the plan were delivered to watershed entities.	How will the results and recommendations of the plan be communicated to the public?	Physical and digital copies of the plan delivered to watershed entities and interactive webmaps.
9. Evaluate the Plan	Determined a routine for updating the plan and monitoring implementation goals.	How will practices be measured and who will update the plan?	Developed a monitoring plan, including metrics for success.

ABOUT THE SUBWATERSHED

The Upper South English River subwatershed is located in the north central region of the ERW. It overlaps three counties (Poweshiek, Keokuk, and Iowa). The City of Montezuma (population 1,462), Barnes City (population 176), and Gibson (population 61) are incorporated area sthat overlaps the subwatershed. The Upper South English River subwatershed primarily consists of Mississippian soils and, in comparison to the entire ERW, features average depth to bedrock. The mean Corn Suitability Rating for the subwatershed is between 54-56.

Figure 1 is a location map of the subwatershed. The subwatershed encompasses 18,411 acres (28.7 square miles) of land, which is predominately row crops (corn and soybeans). The South English River stretches approximately 13.71 miles through the subwatershed in northwest to southeast direction, which meets an unnamed creek about 2 miles northeast of Gibson.

It was determined in Phase 1 planning that the primary resource concern in in the subwatershed is nitrate and nitrite contamination. Additionally, the Upper South English River subwatershed ranked average in comparison to all subwatersheds for annual flood risks. Watershed stakeholders also expressed their desire for routine water quality monitoring in all subwatersheds.

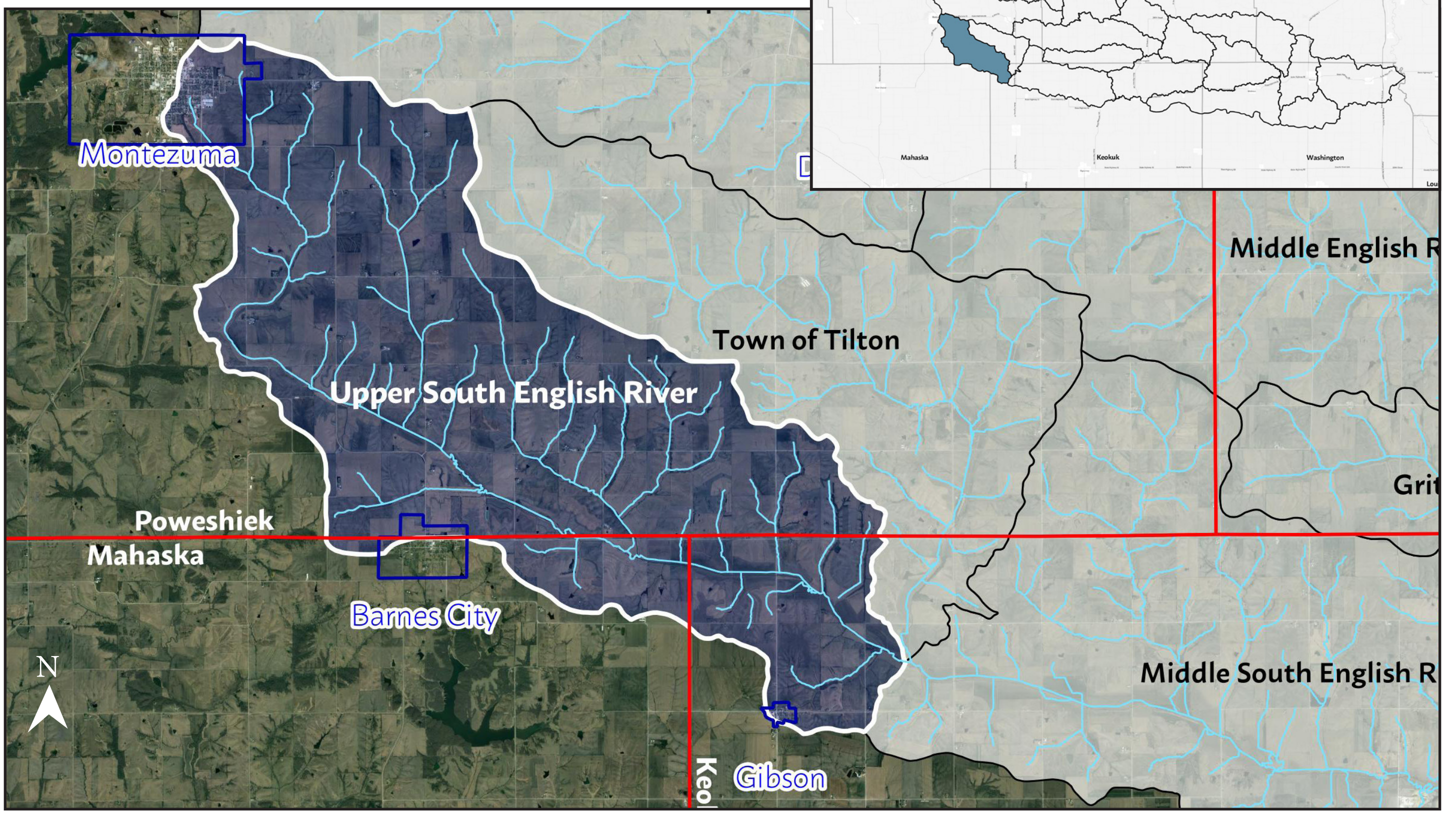

Figure 1. Upper South English River Subwatershed Boundary Map. *Source: ERW*

SECTION 2: 2018 CONSERVATION SURVEY

The English River Watershed completed the "2018 Conservation Survey" in the spring of 2018. The survey builds upon the landowner survey completed in Phase 1 and seeks to better understand the barriers farmers face when considering adoption of conservation practices.

A random sample of agricultural properties of at least 10 acres in size in the watershed were sampled via mail. The sample totaled 986 properties in Iowa, Poweshiek, Johnson, and Keokuk Counties. 264 surveys were completed, which is a response rate of 26.8 percent.

Among the entire sample, the majority of respondents indentified in the age group of 55 - 64 years old (27.7%). Table 2 shows the breakdown of farm size in the survey. Table 3 shows the breakdown of type of farm operations in the survey.

Table 2. Farm size in survey sample. *Source: ERW*

Farm Size	% of Respondents
Less than 25 acres	7%
25 - 75 acres	14%
75 - 250 acres	32%
250 - 500 acres	21%
500 - 1,000 acres	13%
More than 1,000 acre	13%

Table 3. Type of farm operation in survey sample. *Source: ERW*

Crops/Livestock	Number of Respondents / % of Sample
Corn	211 / (35.2%)
Soybeans	210 / (35.1%)
Hogs	30 / (5.0%)
Beef Cattle	68 / (11.4%)
Dairy Cattle	11 / (1.8%)
Other	69 / (11.5%)

CONSERVATION ADOPTION AND WILLINGNESS

The survey first sought to understand which conservation practices are currently being implemented and which practices, dependent on availability of cost-share funding, are in demand. This information allows conservation organizations to provide more relevant information to landowners. Figure 2 shows the number of respondents that have tried a specific practice (green bars) and the number of respondents who would try specific practices with the availability of 75 percent cost-share (blue bars).

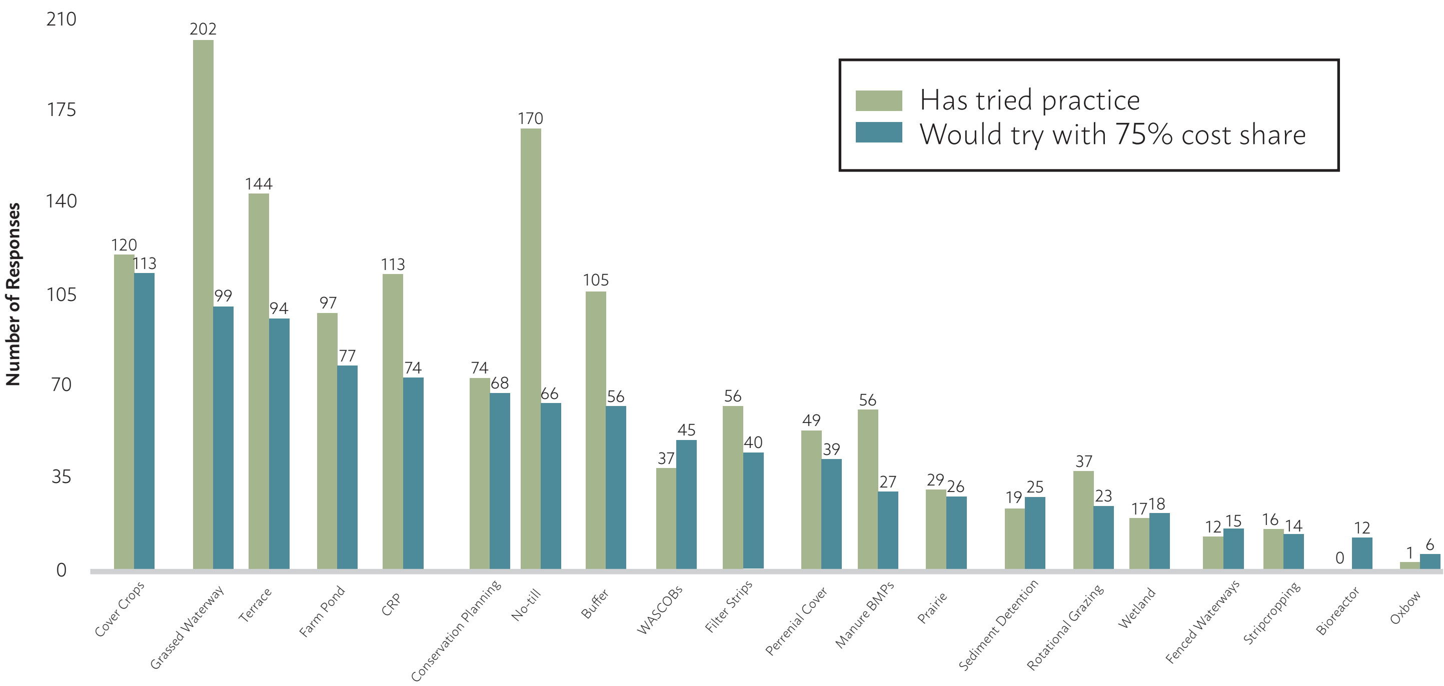

Figure 2. Conservation adoption and willingness to adopt conservation practices with cost share among survey sample. *Source: ERW*

CONSERVATION ORGANIZATIONS

Farmers face a plethora of options when seeking information about conservation. This situation can lead to confusion among various conservation organizations and produce conflicting information. Table 4 shows survey respondent's familiarity with the purpose of each group and how respondents are interacting with various groups in Iowa.

Table 4. Familiarity with organizational purposes and groups distributing conservation information among survey sample. *Source: ERW*

Organization	Mean Familiarity with Mission or Purpose (5 = Very Familiar)	Distribution of Conservation Information (Total # of Responses)
Natural Resource Conservation Service	3.21	140
Iowa Department of Natural Resources	3.16	67
County Conservation	2.99	71
Iowa State University Extension and Outreach	2.81	83
Iowa Department of Agriculture and Land Stewardship	2.70	57
Soil and Water Conservation District	2.67	84
English River Watershed	2.40	61
Iowa Flood Center	1.49	N/A
Crop Advisor	N/A	22
Growers or Producers Associations	N/A	33
Fertilizer or Agricultural Products Dealer	N/A	35

BARRIERS TO CONSERVATION

Finally, the survey attempted to uncover barriers to conservation according to farmers in the watershed. Figure 5 displays the respondent's level of agreement with various statements related to conservation and Table 5 shows some of the barriers that exist for farmers considering adopting conservation practices. Data specific to Iowa and Keokuk Counties can be found in the full report at the link below.

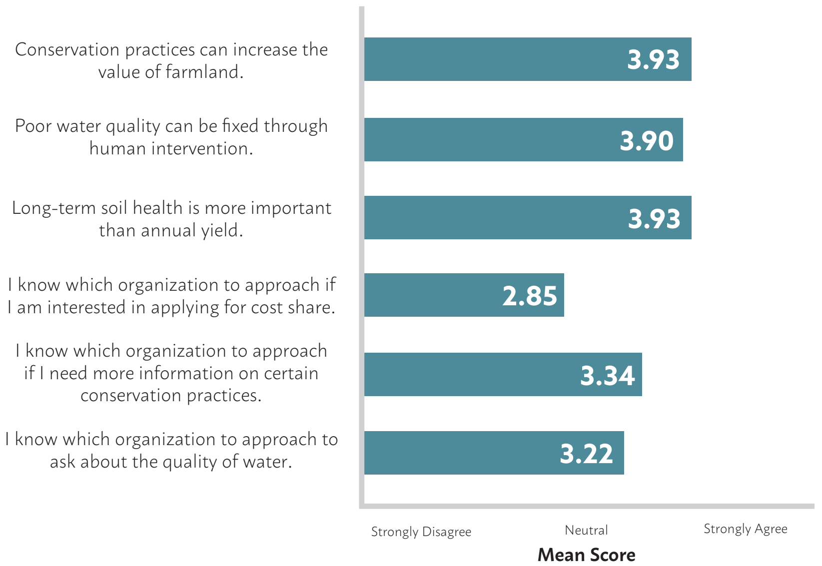

Figure 5. Mean level of agreement among conservation statements. *Source: ERW*

Table 5. Top barriers to conservation identified by survey sample. *Source: ERW*

Rank	Barrier	# of Responses
1	Cost of practice	142
2	Too many "strings attached" with state/federal programs	116
3	Loss of productive land / impact on yields	74
4	Uncertainty of crop values year to year	52
5	Maintenance plans are too strict or confusing	38
6	Unsure of actual environmental benefits	28
7	Other	14

SECTION 3: WATER QUALITY MONITORING

There are 20 subwatersheds of the English River Watershed (ERW) and a sampling site monitored by watershed staff and volunteers located at or near the outlet of each subwatershed. Site 18 is located at the 120th Avenue bridge, over the South English River, NE of Gibson. It was sampled approximately every 6 weeks between June 7 through December 18 in 2017, and between March 23 through October 30 in 2018. The Iowa Department of Natural Resources provides data from sampling at the "English River at Riverside" location as well as data from sampling in watersheds across the state (6,856 samples collected statewide between 2008 – 2018); these data are included for comparative purposes.

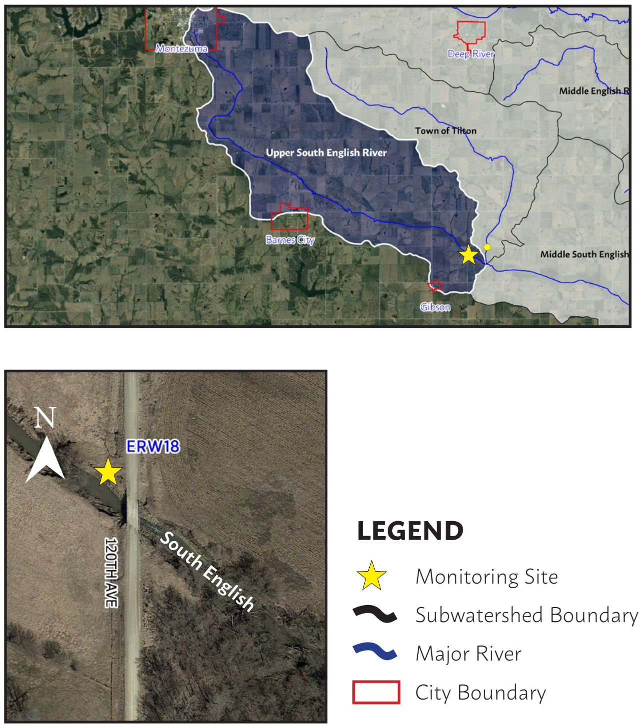

Figure 4. Water quality monitoring location for Upper South English River subwatershed. *Source: ERW*

MONITORING RESULTS

Of the 20 sampling locations across the ERW, Site 18 ranked 2nd highest for average N+N values in 2017, and 9th in 2018.

Of the 20 sampling locations across the ERW, Site 18 ranked 12th in average E. Coli values for 2017, and 20th (lowest) in 2018.

Of the 20 sampling locations across the ERW, Site 18 ranked 19th in average Ortho-phosphate values for 2017, and 20th (lowest) in 2018.

Of the 20 sampling locations across the ERW, Site 18 ranked 13th for average Total Phosphorus values in 2017, and 19th in 2018.

Table 6. Nitrate+Nitrite as N (mg/L)
The EPA drinking water standard for Nitrate + Nitrite as N is 10ppm (parts per million, or mg/L).

Site	Range high value/ low value (ppm)	Median (ppm)	Average (ppm)	% Samples exceeding EPA standard
2017 – Site 18	0 – 14.0	3.6	4.7	33.3%
2018 – Site 18	2.9 – 8.3	3.6	4.7	0%
2017 – English River at Riverside	0.1 – 9.8	4.2	3.8	0%
2018 – English River at Riverside	0.1 – 5.6	2.2	2.7	0%
2008 – 2018 – Statewide	0 – 30.0	5.8	-	-

Table 7. e.Coli

The State of Iowa beach advisory/health standard for E. Coli is 235 Colony Forming Units (CFUs) per 100mL.

Site	Range high value/low value (CFUs/100mL)	Median (CFUs/100mL)	Average (CFU0s/100mL)	% Samples exceeding standard
2017 – Site 18	360 – 1,000	980	780	100%
2018 – Site 18	0 – 840	490	455	75%
2017 – English River at Riverside	74 – 20,000	375	1,996	75%
2018 – English River at Riverside	10 – 6,500	110	792	17%
2008 – 2018 – Statewide	0 – 820,000	160	-	-

Table 8. Ortho-Phosphate

Currently, there are no standards set for Ortho-phosphate values in freshwater streams.

Site	Range high value/low value (ppm)	Median (ppm)	Average (ppm)	% Samples exceeding standard
2017 – Site 18	0 – 0.05	0.03	0.03	-
2018 – Site 18	0.02 – 0.05	0.04	0.04	-
2017 – English River at Riverside	0.02 – 0.12	0.06	0.07	-
2018 – English River at Riverside	0.02 – 0.29	0.06	0.08	-
2008 – 2018 – Statewide	0 – 5.90	0.08	-	-

Table 9. Total Phosphorus

The EPA standard for Total Phosphorus as P is 0.075ppm (parts per million or mg/L) for freshwater streams.

Site	Range high value/low value (ppm)	Median (ppm)	Average (ppm)	% Samples exceeding EPA standard
2017 – Site 18	0.14 – 0.20	0.16	0.17	100%
2018 – Site 18	0.09 – 0.14	0.12	0.12	100%
2017 – English River at Riverside	0.10 – 1.00	0.17	0.27	100%
2018 – English River at Riverside	0.12 – 1.50	0.20	0.37	100%
2008 – 2018 – Statewide	0 – 9.20	0.20	-	-

SECTION 4: SOIL EROSION

The ERW *Resiliency and Improvement Plan* seeks to reduce soil loss from farm fields, urban areas, and construction sites through best management practices that promote soil retention and stability. In order to target specific areas of concern where practices would be most beneficial, a deeper understanding of soil erosion on the subwatershed level is necessary. Data presented in the following analysis was provided by the Iowa State University Daily Erosion Project (DEP), at https://dailyerosion.org/map. The illustration below shows what is modeled by the DEP in comparison to visible gulley erosion. The illustration highlights that the DEP only models sheet and rill erosion; erosion from other sources such as classic gullies or streambanks is not included.

RUNOFF

One method for estimating erosion is to calculate the average amount of water that left the hillslopes by above ground transport. Figure 6 shown below portrays monthly variation in average runoff in the Upper South English River subwatershed. Flooding in April of 2013 generated over 7 times the total runoff than Upper South English River's average monthly runoff of 0.50 inches.

Subwatersheds are identified by the last 3 digits of their 12-digit hydrologic unit code (HUC) in Table 10. For example, Upper South English River's HUC is "070802090502"; see 502 Table 10 below.

Table 10. Estimated Average Monthly Runoff and Average Monthly Precipitation (2008-2016). *Source: DEP*

	405	404	402	302	401	501	403	**502**	301	406	408	407	503	504
Average Monthly Runoff (in)	0.53	0.53	0.52	0.51	0.51	0.51	0.50	**0.50**	0.50	0.48	0.48	0.48	0.46	0.43
Average Monthly Precipitation (in)	3.26	3.23	3.17	3.28	3.12	3.23	3.21	**3.24**	3.29	3.25	3.27	3.33	3.26	3.24

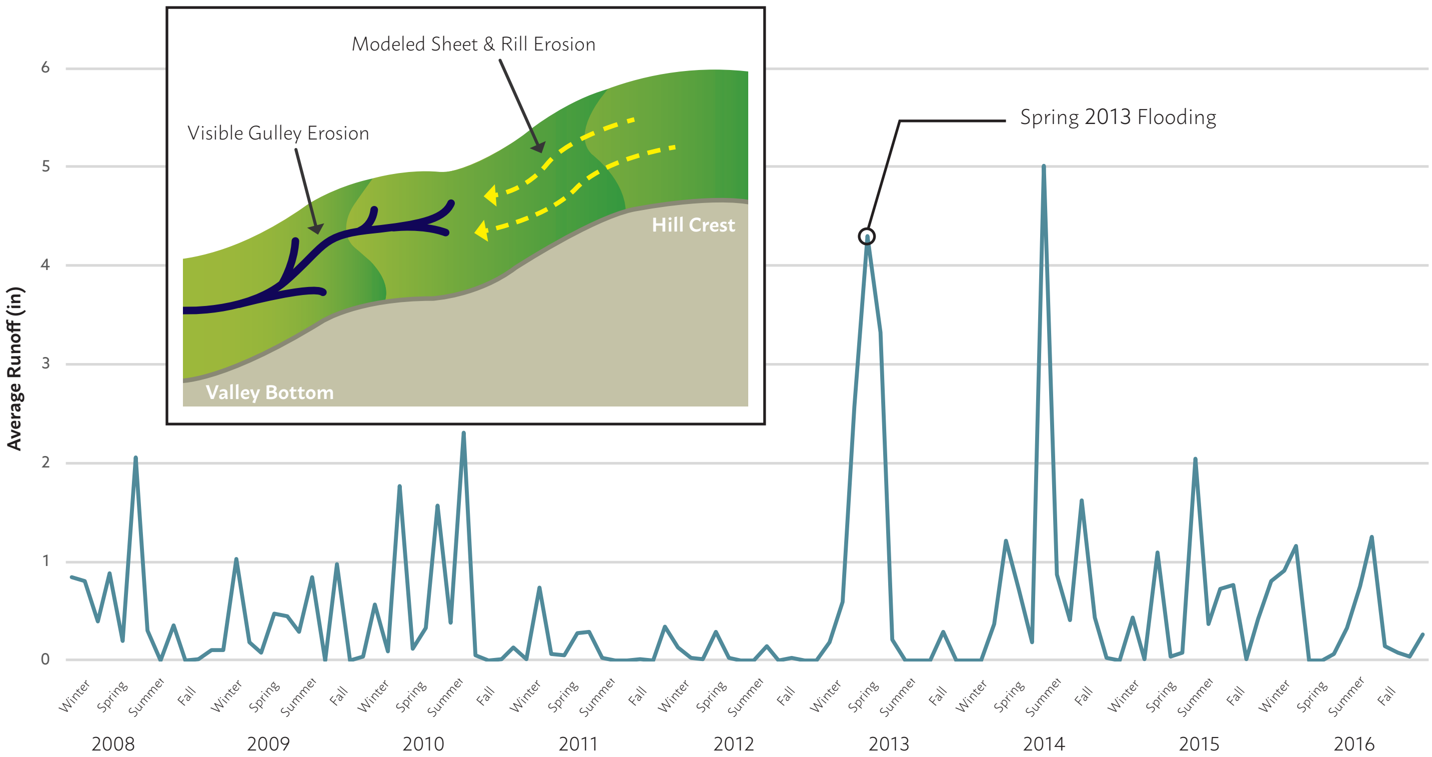

Figure 6. Average Runoff in Upper South English River (2008-2016). *Source: DEP*

SOIL DETACHMENT & DELIVERY

Detachment is the amount of soil that is disturbed on the hillslopes during various rain events. For this analysis, historic flooding in 2013 was utilized for comparison among subwatersheds regarding their ability to hold soil. The Upper South English River subwatershed experienced an average of 4.83 tons per acre of disturbed soil during the given flood period. By comparison, the average soil detachment among the 14 subwatersheds was 6.47 tons per acre. This data is shown below (Figure 7) as light green bars.

Soil delivery is the average amount of soil transported to the bottom of hillslopes. Blue bars in the bar graph shown below (Figure 7) display average soil delivery from 2008 to 2016. The Upper South English River subwatershed ranks near the middle of all subwatersheds for soil delivery at 5.60 tons per acre per year. It is estimated that erosion rates in Iowa are about 5.1 tons per acre per year (Mike Duffy, 2012). Based on this average, soil loss in the Upper South English River subwatershed is slightly above the state average and below the average (7.00 tons per acre per year) of all subwatersheds in the English River Watershed.

All data presented in this section is publicly available via an interactive webmap hosted by the DEP. Visit the link below to access soil erosion data specifically for the Upper South English River subwatershed.

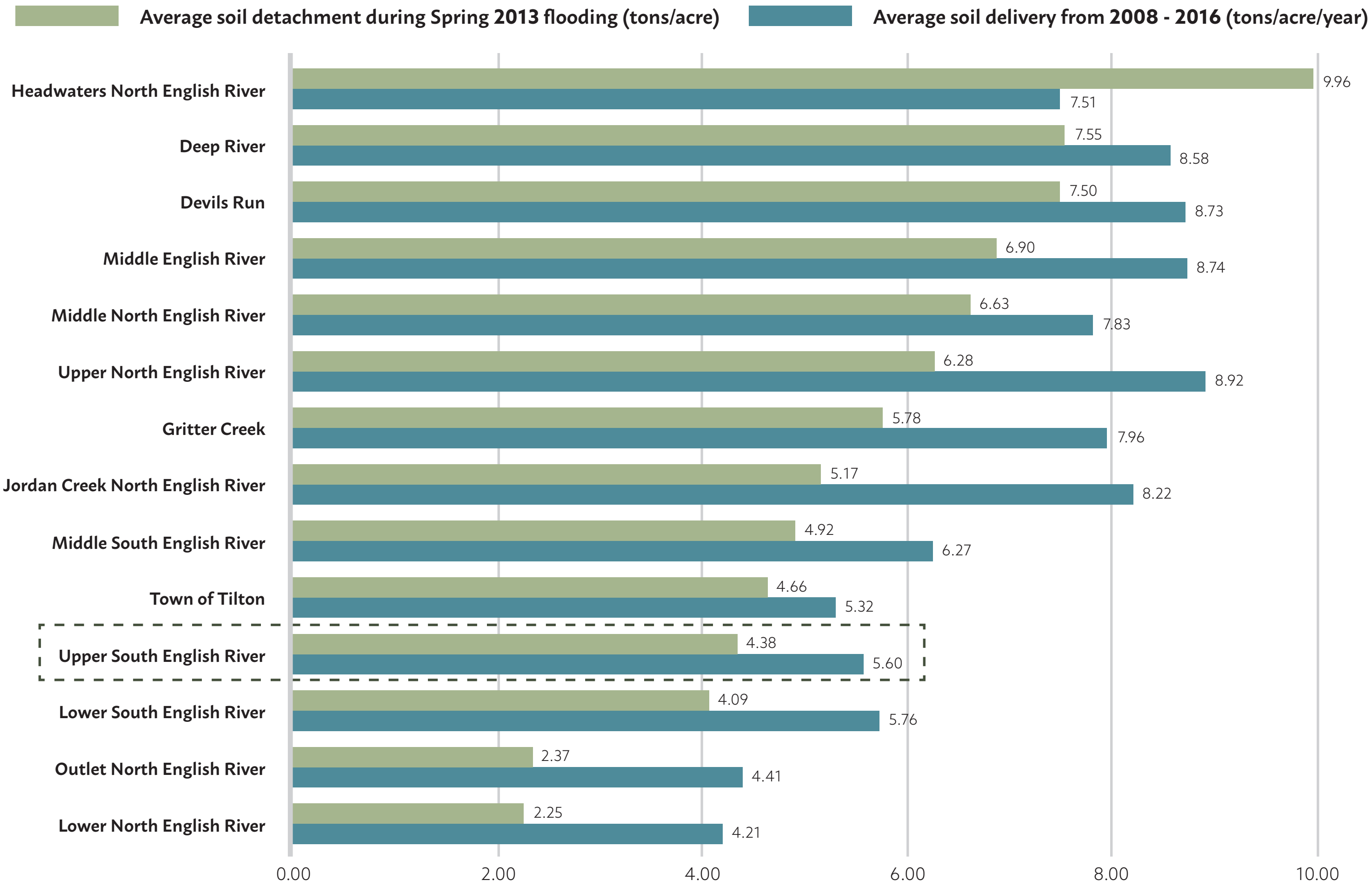

Figure 7. Soil Delivery and Detachment in Upper South English River (2008-2016). *Source: DEP*

VIEW DAILY EROSION PROJECT FOR UPPER SOUTH ENGLISH RIVER:
https://bit.ly/2OCf8Vy

Source: Duffy, Mike. Value of Soil Erosion to the Land Owner, August 2012. https://www.extension.iastate.edu/agdm/crops/pdf/a1-75.pdf

SOIL EROSION POTENTIAL

The following analysis uses the Natural Resource Conservation Service's (NRCS), formerly the Soil Conservation Service (SCS), curve number (CN) runoff equation to spatially illustrate the potential for soil erosion in the subwatershed. The equation examines the interaction between land cover type and hydrologic soil type to estimate runoff from a specific storm event. This analysis was completed by a group of graduate students through a partnership University of Iowa Urban and Regional Planning Department.

For this analysis, a 2-year storm event is assumed, which equals 1.41 inches of rain in 1 hour. This analysis *predicts* soil erosion and is merely a model that uses the best available data. Such data may still be outdated or contain inaccuracies. The model also assumes specific runoff percentages that may not truly represent all storm scenarios. The goal of this assessment is to highlight "problem areas" in the subwatershed where BMPs would likely have the most impact.

Figure 8 shows "High" runoff potential in dark orange colors and "Low" runoff potential in lighter shades. In the Upper South English River subwatershed, the higher areas of runoff potential are located primarily along the banks of upstream tributaries. An interactive webmap of this data is available on the ERW website. Click the link below to view the map.

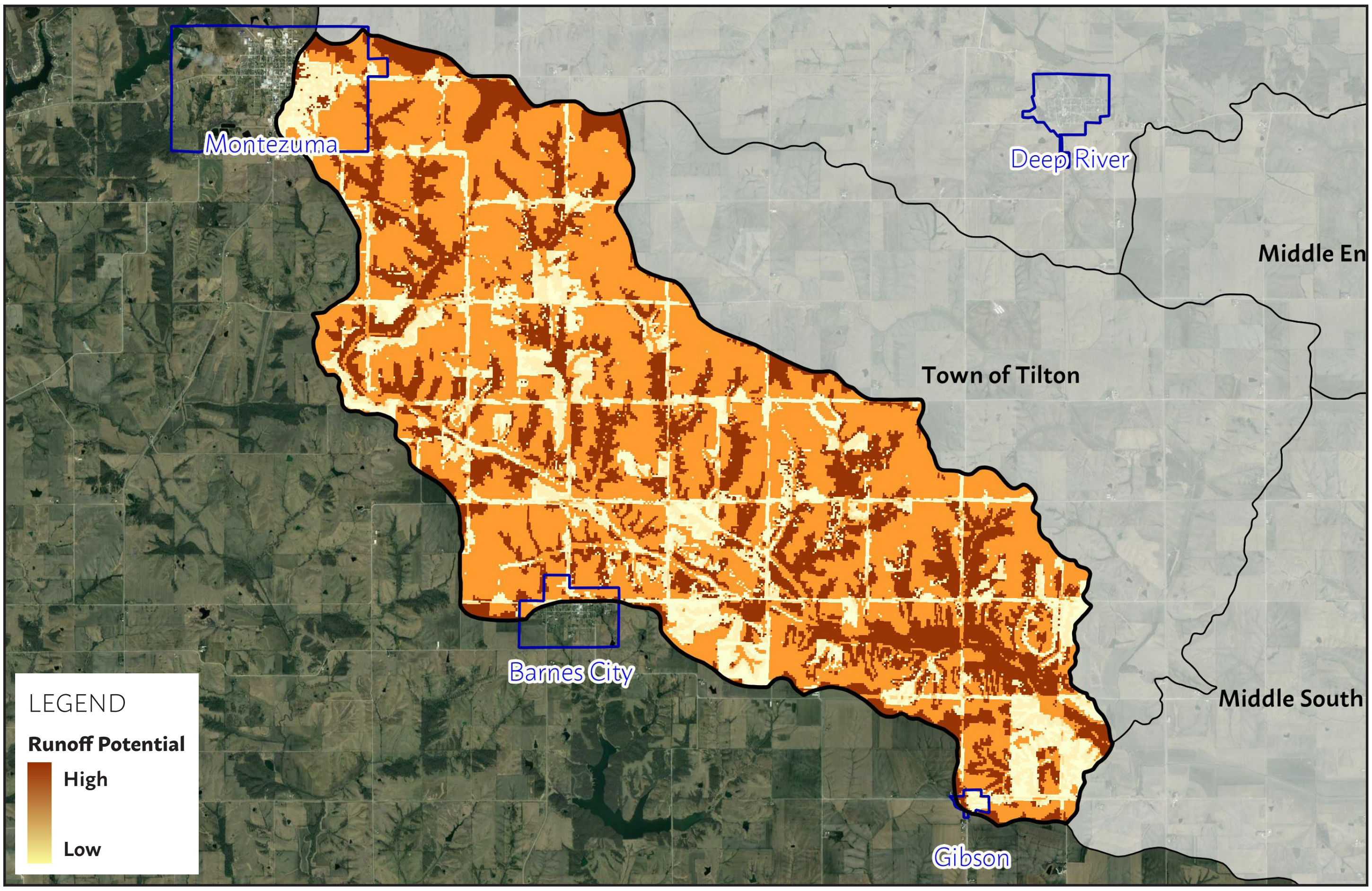

Figure 8. SCS-CN Runoff Potential Model for Upper South English River Subwatershed. *Source: ERW*

VIEW SOIL EROSION POTENTIAL WEBMAP FOR UPPER SOUTH ENGLISH RIVER:
http://www.englishriverwma.org/erosion

SECTION 5: AGRICULTURAL CONSERVATION PLANNING FRAMEWORK

The Agricultural Conservation Planning Framework (ACPF) is a digital toolbox watershed planning and research. Utilizing a geographic information system (GIS), ACPF processes topographic data for terrain in the watershed. These data can determine land and agricultural fields within a watershed that are most prone to contribute runoff to streams. Furthermore, ACPF can identify where in-field and edge-of-field practices could be installed throughout the watershed. Such practices include surface intake filters, restored wetland, grassed waterways, buffer strips, water and sediment control basins (WASCOBs), bioreactors, saturated buffers, and floodplain reconnections. The Iowa Flood Center executed the ACPF for all subwatersheds in the English River Watershed as part of the Phase II planning project. That report can be found on the English River Watershed website.

POTENTIAL BEST MANAGEMENT PRACTICES

According to the ACPF results, there exists the potential for 414.42 miles of contour buffer strips, 33 bioreactors, 444 WASCOBs, 18 nutrient-removal wetlands, a total of 3,699.51acres of drainage area for the wetlands, and 148.87 miles of grassed waterways in the Upper South English River subwatershed (Table 11). If all 18 wetlands were installed in the subwatershed, roughly 20.1 percent of the subwatershed drainage area would be treated. These practices are spatially depicted in Figure 9. In order to see the map in greater detail and to locate the exact position of potential practices, access the ACPF webmap via the link on the following page. Locations for BMPs are not prioritized in this analysis. Further analysis is needed to determine which practices present the highest potential.

Actual implementation of practices in the subwatershed was also analyzed in comparison to potential practices identified by the ACPF tool. Refer to the Iowa Flood Center's full report for a complete analysis, which can be found on the English River WMA website.

Table 11. Count of Potential Best Management Practices as identified by ACPF in the ERW by subwatershed. *Source: Iowa Flood Center*

HUC-12	Area (acres)	CBS (miles)	Bio-reactors	WASCOBs	Nutrient Removal-Wetlands	Wetland Drainage (Acres)	% of HUC-12	Grassed Waterways (miles)
301	14,836	389.52	23	255	7	1,728.87	11.7 %	35.18
302	29,845	693.60	53	464	14	2,520.01	8.5 %	104.88
401	36,075	885.55	80	826	39	8,608.98	23.8 %	313.86
402	19,076	381.94	49	245	2	348.79	1.8 %	58.52
403	26,535	579.03	65	393	5	1,156.23	4.4 %	91.17
404	19,540	328.89	36	195	5	903.01	4.6 %	137.75
405	13,007	155.69	8	113	1	226.90	1.7 %	57.89
406	12,841	79.46	27	65	0	0	0.0 %	120.80
407	12,611	107.77	20	66	1	183.03	1.5 %	28.28
408	14,193	185.31	12	89	5	1,004.06	7.1 %	43.37
501	11,016	271.67	18	246	6	1,106.28	10.0 %	101.12
502	**18,411**	**414.42**	**33**	**444**	**18**	**3,699.51**	**20.1 %**	**148.87**
503	27,397	615.76	37	451	8	1,687.15	6.2 %	190.94
504	25,728	533.86	49	291	1	158.05	0.6 %	98.27

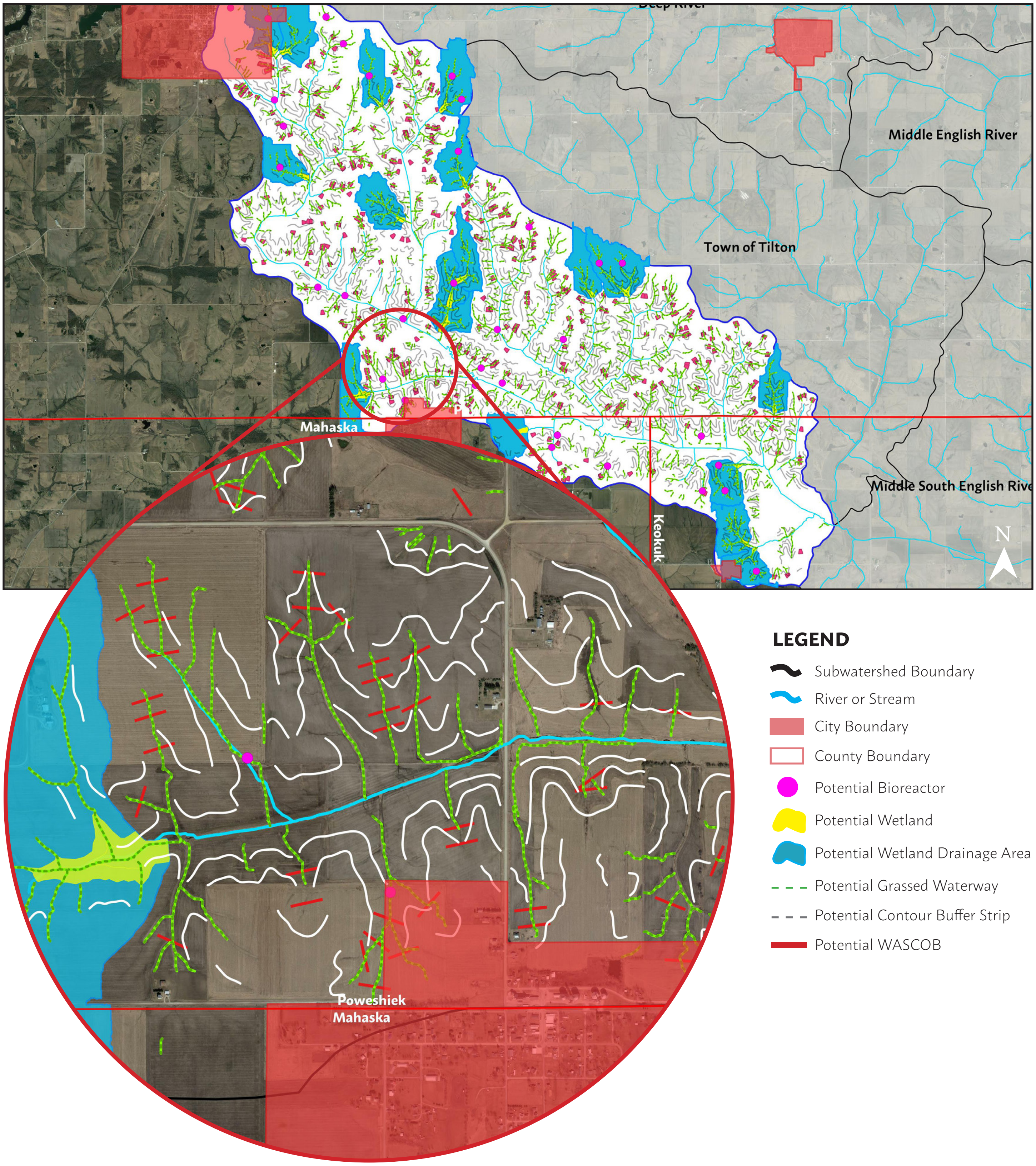

Figure 9. ACPF Model Results for Upper South English River Subwatershed. *Source: Iowa Flood Center*

VIEW ACPF WEBMAP FOR UPPER SOUTH ENGLISH RIVER:
http://www.englishriverwma.org/acpf

SECTION 6: URBAN ASSESSMENT

The purpose of the following assessment was to quantify stormwater runoff per catchment area and to calculate pollutant loads, which provides data that can indicate higher runoff and pollutant contributing areas or "hot spots". The analysis improves the understanding of where urban best management practices (BMPs) can provide the most benefit. These results are critical in securing grant funds and can help communities and public or private organizations better plan for utilizing limited funding.

The City of North English is the only urbanized, incorporated area in the Upper South English River subwatershed. English River Watershed boundaries encompass the entirety of North English. However, the Upper South English River subwatershed only spans a portion of northwest North English, which is primarily residential land uses. The majority of urbanized area lies in the Lower South English River subwatershed.

Urbanization increases the amount of impermeable surfaces in a watershed. Rainfall can carry contaminants over urban areas, into storm sewer system, and consequently into waterbodies. Nitrogen, phosphorus, and sediment are of primary concern if they exceed natural levels in streams and rivers, and are the principal contaminants prioritized by the Iowa Nutrient Reduction Strategy (NRS).

Runoff volume and pollutant models take into account a variety of environmental and physical conditions, including land use and impervious surfaces, soil types, and slope. Modeling was provided by the University of Northern Iowa GeoInformatics Training Research Education and Extension (GeoTREE) Center.

RUNOFF VOLUME

Comprehensive watershed planning completed in 2015 identified that runoff and flooding are primary resource concerns in the Upper South English River subwatershed. Figures 11-13 represents the stormwater runoff volume for each catchment area within the city limits of North English where orange and red portray higher runoff volumes. These "hot spots" would be suitable locations for BMPs that capture and retain water. The Iowa Stormwater Management Manual (ISWMM), a guide for the design and installation of stormwater BMPs in urban and rural areas, recommends wet ponds, wetlands, and infiltration basins for the purpose of water retention and flood control.

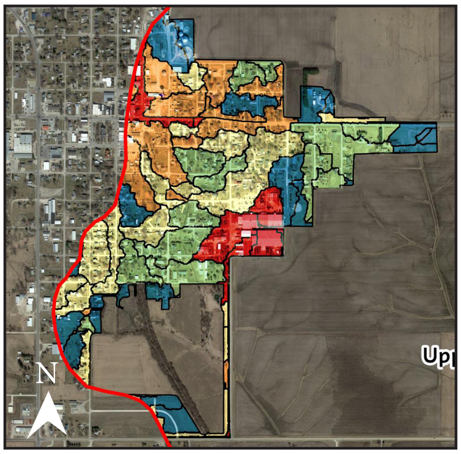

Figure 11. Modeled Runoff Volume in Montezuma, IA (cubic feet/acre/year). *Source: UNI GeoTREE*

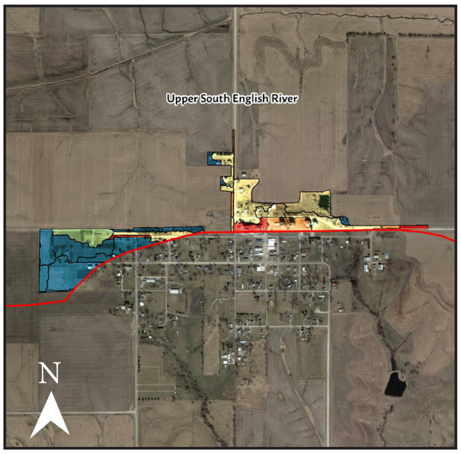

Figure 12. Modeled Runoff Volume in Barnes City, IA (cubic feet/acre/year). *Source: UNI GeoTREE*

Figure 13. Modeled Runoff Volume in Gibson, IA (cubic feet/acre/year). *Source: UNI GeoTREE*

Runoff Volume (Cubic feet/acre/year)

- 5,741 - 13,819
- 13,918 - 19,751
- 19,751 - 26,169
- 26,169 - 43,357
- 43,357 - 88,749

NITRATE, PHOSPHORUS, & SEDIMENT LOADING LOADING

Figures 14-16 displays total nitrate loads for each of the catchment areas where darker shades of red portray higher loads. These "hot spots" would be suitable locations for structural BMPs such as porous paver systems, bioretention areas, and infiltrating trenches. According to the ISWMM, these practices are proven to provide total nitrogen reductions between 60 and 80 percent. Figures 17-19 and Figures 20-22 display total phosphorus loads and total sediment loads, respectively, for catchment areas where darker shades of red portray higher loads. These "hot spots" would be suitable locations for best management practices such as bioswales or rain gardens.

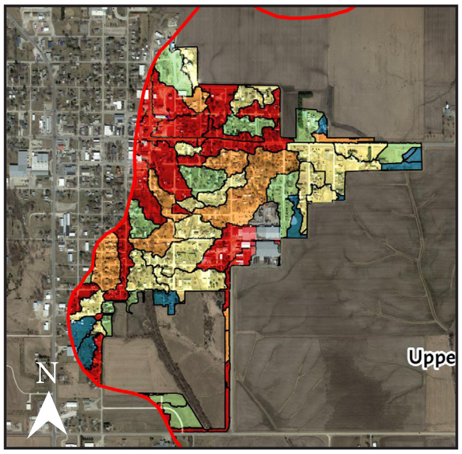

Figure 14. Modeled Nitrate Load in Montezuma, IA (lbs/acre/year). *Source: UNI GeoTREE*

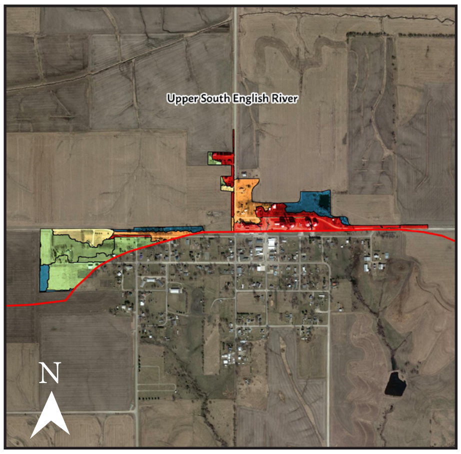

Figure 15. Modeled Nitrate Load in Barnes City, IA (lbs/acre/year). *Source: UNI GeoTREE*

Figure 16. Modeled Nitrate Load in Gibson, IA (lbs/acre/year). *Source: UNI GeoTREE*

Total Nitrate Load (lbs/acre/year)

- 0.000 - 0.201
- 0.201 - 0.331
- 0.331 - 0.469
- 0.469 - 0.549
- 0.549 - 2.000

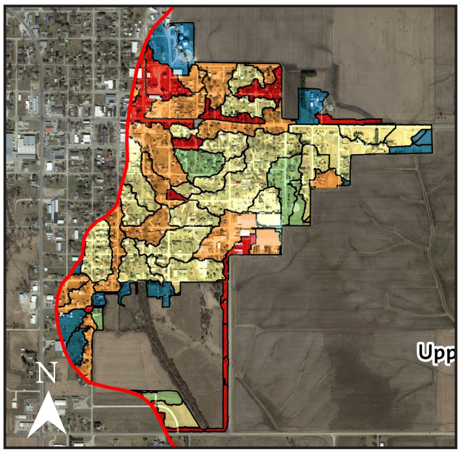

Figure 17. Modeled Phosphorus Load in Montezuma, IA (lbs/acre/year). *Source: UNI GeoTREE*

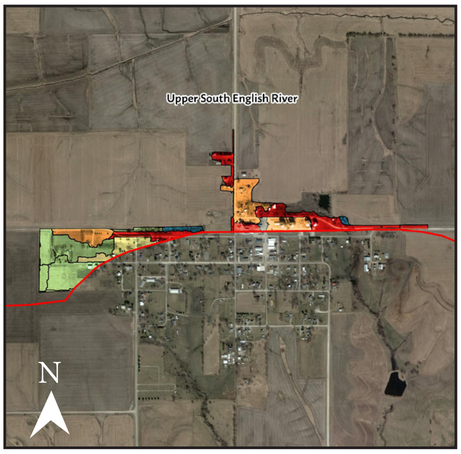

Figure 18. Modeled Phosphorus Load in Barnes City, IA (lbs/acre/year). *Source: UNI GeoTREE*

Figure 19. Modeled Phosphorus Load in Gibson, IA (lbs/acre/year). *Source: UNI GeoTREE*

Total Phosphorus Load (lbs/acre/year)

- 0.525 - 0.646
- 0.646 - 0.828
- 0.828 - 1.128
- 1.128 - 1.424
- 1.424 - 3.035

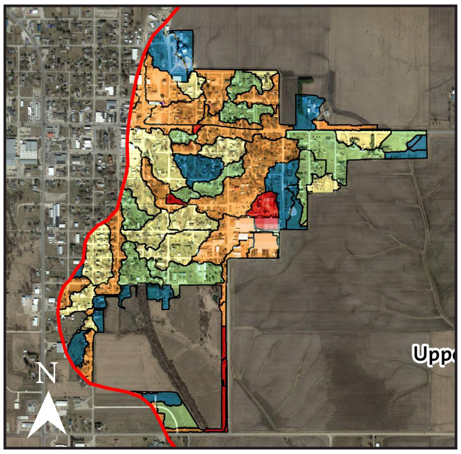

Figure 20. Modeled Sediment Load in Montezuma, IA (lbs/acre/year). *Source: UNI GeoTREE*

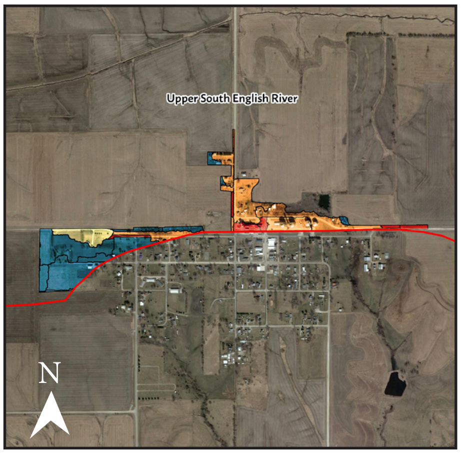

Figure 21. Modeled Sediment Load in Barnes City, IA (lbs/acre/year). *Source: UNI GeoTREE*

Figure 22. Modeled Sediment Load in Gibson, IA (lbs/acre/year). *Source: UNI GeoTREE*

Total Sediment Load (lbs/acre/year)

- 124 - 276
- 276 - 376
- 376 - 483
- 483 - 799
- 799 - 3143

BMP SCENARIOS

These data allow for modeling the impacts of BMP introduction in various catchment areas in urban areas in the ERW. For example, a bioretention cell (roughly 21,000 square feet in area) was introduced near English Valley's High School to gauge the potential impacts of this practice. The results of modeling suggest implementation of this practice would result in a 81.1 percent reduction in runoff and a 79.6 percent reduction in particulate solids in the catchment area. This scenario is hypothetical and likely would not represent actual implementation locally, but provides an example of the impact urban conservation practices can make to both runoff volume and water quality.

Please contact staff at the ERW if you are interested in having these types of scenarios completed in your watershed community. All data presented in Section 6 is available via an interactive webmap produced by the UNI GeoTree Center, and can be accessed at the link below.

VIEW MONTEZUMA INTERACTIVE WEBMAP:
https://arcg.is/0Da4nb

VIEW BARNES CITY INTERACTIVE WEBMAP:
https://arcg.is/0THq81

VIEW GIBSON INTERACTIVE WEBMAP:
https://arcg.is/rSSPP

SECTION 7: HAZARD MITIGATION

Hazard mitigation planning is defined as the effort to reduce loss of life and property by lessening the impact of disasters. Most counties in Iowa are required to complete a county-wide Hazard Mitigation Plan, which makes the county and its cities eligible for federal funding for emergency and non-emergency disaster assistance programs. English River Watershed stakeholders identified in Phase 1 Comprehensive Planning that reducing flood severity is a priority for watershed improvement. A brief analysis of flooding hazards is included in this plan as supplemental information and support for county Hazard Mitigation Plans. The Poweshiek County Multi-Jurisdictional Hazard Mitigation Plan was adopted in 2016 and expires in 2021.

EXTENT OF HAZARDS

As determined by the Federal Emergency Management Agency (FEMA), Figure 23 shown below represents the flood hazards that exist in the Upper South English River subwatershed. The flood hazard area accounts for roughly 8.2 percent of the subwatershed area. Riverine flooding can cause damage to crops, roads, homes, and businesses when river levels rise and overflow their banks. Urban areas, such as the cities of Montezuma, Barnes City, and Gibson, are also subject to impacts from flash flooding, or flooding that develops within 6 hours of the immediate storm.

Tables 12 and 13 show previous flooding events in the county from 2008 to present (August 2018) and public assistance costs per flood event. Not all assistance costs were incurred directly within the subwatershed because data is only available on the county level. The subwatershed covers about 4.9 percent of Poweshiek County's area. By contrast, the English River Watershed overlaps about 45 percent of Poweshiek County. Figures presented are not exhaustive; many flash flood events do not meet the threshold to trigger public assistance.

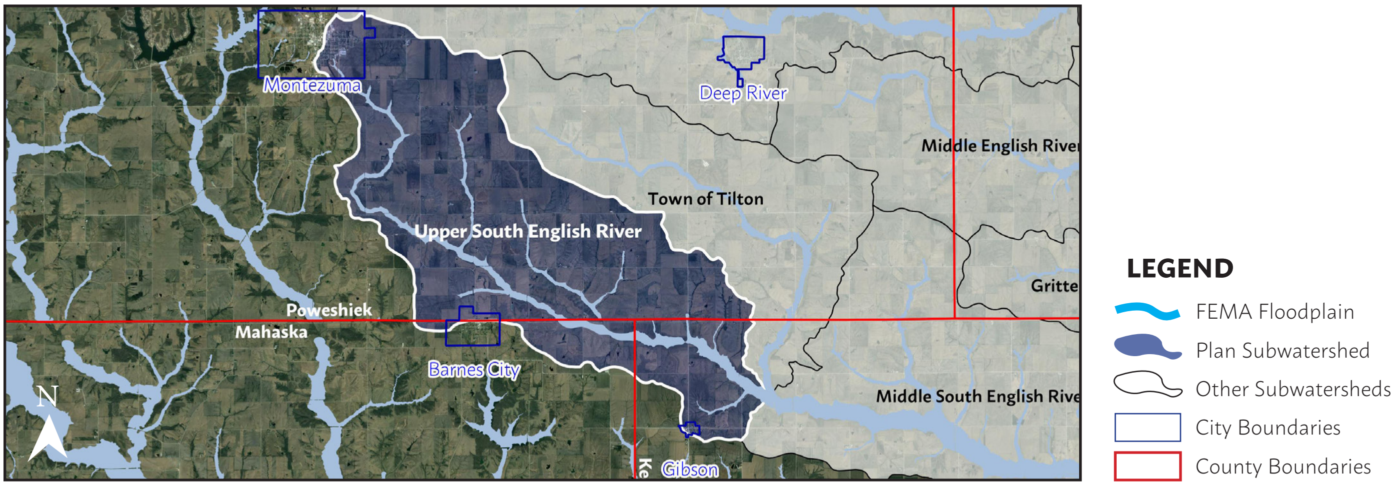

Figure 23. Flood hazard boundary areas for Upper South English River Subwatershed. *Source: FEMA*

Table 12. 10-Year Disaster Assistance Funding by Type of Work in Poweshiek County. *Source: HSEM*

Type of Work	Assistance Costs
Roads/Culverts	$623,826.13
Debris Removal	$133,878.41
Emergency Procedures	$40,166.52
Total	**$797,171.06**

Table 13. 10-Year Disaster Assistance Funding by Flood Event in Poweshiek County. *Source: Iowa Homeland Security & Emergency Management (HSEM)*

Flood Event Period	Assistance Cost	Flood Height at Deep River Monitoring Gauge
May 25 - August 13, 2008	$249,331.52	No historic data available
May 19 - June 1, 2013	$352,811.41	81.53' (6th Highest)
June 26 - July 8, 2014	$195,728.13	81.94' (7th Highest)
Total	**$797,171.06**	

POTENTIAL LOSSES

Hazards United States (HAZUS) is a nationally-applicable, standardized method for estimating potential losses from floods and other hazards. Table 14 provides estimations of building and content damage from flooding events in ERW counties. There exists 1 structure vulnerable to losses from the 1 percent annual chance flood (red dots) and 10 structures vulnerable to the 0.2 percent annual chance flood (green dots) in the subwatershed (Figure 15).

Table 14. Estimated Losses from Flood Hazards by County in the ERW. *Source: HSEM*

County	Building Count	Estimated Building Cost	Estimated Content Cost	Estimated Building Damage	Estimated Content Damage	Combined Estimated Loss
Average Annual Loss Vulnerability						
Iowa	20	$1,374,100.00	$1,000,000.00	$2,921.00	$1,379.00	$4,300.00
Poweshiek	5	$407,220.00	$203,610.00	$5,274.00	$2,563.00	$7,837.00
Keokuk	2	$11,620.00	$5,810.00	$484.00	$268.00	$752.00
100-Year Loss Vulnerability (1% Annual Chance Flood)						
Iowa	10	$1,002,150.00	$814,025.00	$82,248.00	$35,149.00	$117,397.00
Poweshiek	4	$372,360.00	$186,180.00	$60,882.00	$34,394.00	$95,276.00
Keokuk	2	$11,620.00	$5,810.00	$5,653.00	$3,117.00	$8,770.00
500-Year Loss Vulnerability (0.2% Annual Chance Flood)						
Iowa	20	$1,374,100.00	$1,000,000.00	$183,065.00	$100,204.00	$283,269.00
Poweshiek	5	$407,220.00	$203,610.00	$83,011.00	$50,406.00	$133,417.00
Keokuk	2	$11,620.00	$5,810.00	$5,997.00	$3,289.00	$9,286.00

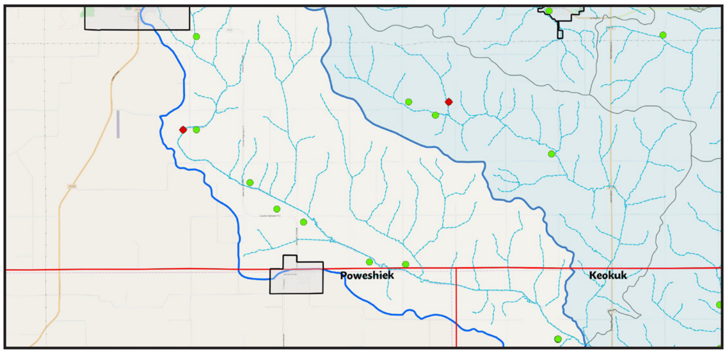

Figure 15. Vulnerable structures for flood hazards in the Upper South English River Subwatershed. *Source: HSEM*

VIEW INTERACTIVE HAZUS DATA:
http://www.englishriverwma.org/hazus

The National Flood Insurance Program (NFIP) is a federal program that provides flood insurance for residential and commercial landowners in participating communities and counties (Table 15).

VIEW NORTH ENGLISH NFIP FLOOD MAP:
http://arcg.is/SLfjH

Table 15. City or County Participation in NFIP. *Source: FEMA*

Municipality/Entity	Participation in NFIP
Grinnell	Yes
Guernsey	Yes
Montezuma	**Yes**
Webster	Yes
Kinross	Yes
Johnson County	Yes
Keokuk County	**Yes**
Iowa County	Yes
Poweshiek County	**Yes**
Barnes City	**No**
Deep River	No
Gibson	**No**
Keswick	No
Millersburg	No
Parnell	No
North English	No

SECTION 8: ACTION PLAN

This plan is intended to serve as a guide in decision-making and planning by the ERW, local agencies, local government, and citizens. Mitigation actions stated in this section are the result of data obtained through the Phase 2 planning process, the 2018 Conservation Survey, and other stakeholder input. The priority mitigation actions should be re-evaluated at least every 5 years and adjusted as necessary to keep pace with accomplished projects, current policies and practice, and availability of funding. Sections 2 through 7 of this plan present social and environmental conditions present in the subwatershed. Table 16 shown below highlights the key findings from each assessment.

Table 16. Key Findings. *Source: ERW*

Section	Topic	Key Finding
2	Conservation Survey	The top five practices watershed landowners are willing to try with 75 percent cost share are cover crops, grassed waterways, terraces, farm ponds, and CRP.
2	Conservation Survey	Landowners are most familiar with the mission of the NRCS and report receiving the most information about conservation from the NRCS.
2	Conservation Survey	Landowners are fairly unclear which conservation organization to approach if they are interested in applying for cost share.
2	Conservation Survey	Landowners cite the cost of conservation practices as the most pressing barrier to implementation, followed by too much state or federal regulations attached to cost share programs.
3	Water Quality	In the 2017 and 2018 sampling seasons the subwatershed ranked very low for E.Coli Bacteria, ortho-phosphate, and total phosphorus contaminiation.
3	Water Quality	In the 2017 sampling season the subwatershed ranked the highest for nitrate and nitrite contamination, and ninth highest in the 2018 sampling season.
4	Runoff & Soil Erosion	Average monthly runoff in the Upper South English River subwatershed is average among all ERW subwatersheds.
4	Runoff & Soil Erosion	The subwatershed is slightly above the statewide average for soil delivery and below the ERW average.
5	ACPF	Land suitable for nutrient removal wetlands in the subwatershed is abundant; 18 suitable locations were identified by the ACPF, which would potentially treat over 20 percent of the subwatershed area.
5	ACPF	In comparison to the Upper North English River subwatershed, which is of similar land area, the Upper South English River subwatershed has land suitable for two times more WASCOBs.
6	Urban Assessment	The City of Montezuma's greatest contributor to water quality pollution is land located close to the city center; cathcment areas closer to the downtown square have greater amounts of impervious surfaces that allow pollutants to reach the storm sewer.
6	Urban Assessment	Land situated southeast of the Marshall Street and East Grinnell Street is the greatest contributor to nitrate and phosphorus loading.
7	Hazard Mitigation & Flooding	Flood risks in the subwatershed are slightly above average; 11 structures are vulnerable to flood damages.

ACTION STEPS

Based upon the key findings in the Upper South English subwatershed, high and low priority actions are displayed in Table 17. Action steps were determined by comparing all subwatersheds for primary resource concerns identified in Phase 1 planning. Digital maps as displayed in this plan can be utilized to locate potential BMP locations for action items categorized as "high".

Table 17. Action Steps. *Source: ERW*

Priority	Action Step
High	Improve communication of the types of technical or financial assistance available to landowners by specific conservation organizations (refer to Table 17)
High	Improve communication of the mission and purpose of the organization across digital and print formats, and at events.
High	Continue monitoring water quality parameters at the subwatershed level.
Low	Target rural locations in the subwatershed where BMPs that reduce ortho-phosphorus loading can be installed in the subwatershed (refer to ACPF and Urban Assessments).
Low	Target urban and rural locations in the subwatershed where BMPs that reduce total phosphorus loading can be installed in the subwatershed (refer to ACPF and Urban Assessments).
High	Target urban and rural locations in the subwatershed suitable for BMPs that reduce nitrate loading can be installed in the subwatershed (refer to ACPF and Urban Assessments).
Low	Target rural locations in the subwatershed suitable for BMPs such as wetland treatment systems, detention and retention ponds, biofiltration, or livestock and manure management practices (refer to ACPF Assessment).
High	Target rural locations in the subwatershed where sheet and rill erosion rates are high and promote BMPs that reduce erosion (refer to ACPF Assessment).
High	Target rural locations in the subwatershed where sediment delivery rates are high and promote BMPs that reduce sediment delivery (refer to ACPF Assessment).
High	Consider temporary or permanent flood protection procedures for the vulnerable structure itself or land use practices upstream of the property.
High	Increase the organizational capacity of the English River WMA to support conservation groups serving landowners in the subwatershed.

FUNDING SOURCES

Mitigation actions can be financially supported through a variety of state and federal programs (Table 18). Funding for conservation practices can also be supported through private sources such as the McKnight Foundation, Trees Forever, National Fish and Wildlife Foundation, Healthy Watersheds Consortium Grants, and the Walton Foundation.

Table 18. State and Federal Conservation Programs. *Source: ERW*

Program	Eligible Applicants	Website	Description
Hazard Mitigation Grant Program (HMGP)	IN, SA, NP, MU, CO	https://bit.ly/2wiKqq7	Funding for projects stated in Hazard Mitigation plans
Pre-Disaster Mitigation Program (PDM)	SA, MU, CO	https://bit.ly/2wiKqq7	Funding for projects stated in Hazard Mitigation plans
Iowa Watershed Approach (IWA)	IN, MU, CO, NP	https://bit.ly/2P7ibSi	Limited 90% cost share for structural nutrient reduction practices
Water Quality Initiative (WQI)	SWCD, CO, CB, MU, NP, WU, WMA	https://bit.ly/2BSCjWG	Funding for projects in priority watersheds
EPA 319 Non-Point Source Program	WMA, SWCD	https://bit.ly/2BTXTtS	Technical assistance, financial assistance, or demonstration projects
Water Quality Protection Practices	SWCD	https://bit.ly/2TsRdHD	Funding for preventing off-site sediment, nutrient and livestock waste pollution problems
Iowa Financial Incentives Program (IFIP)	SWCD	https://bit.ly/2sSlVOC	State cost share for temporary or permanent practices
IDALS No-Interest Loans	SWCD	https://bit.ly/2sXRIgV	Construction of permanent soil conservation practices
Iowa Watershed Protection Program (WSPF)	SWCD	https://bit.ly/2HGZ5DO	Technical assistance, training on watershed development, implementation assistance
Soil and Water Enhancement Account – REAP Water Quality Improvement Projects	IN, SWCD	https://bit.ly/2DJrTr8	Funding to protect surface and ground water resources from point and non-point sources
Integrated Farm and Livestock Management Demonstration Program (IFLM)	IN, SCWD	https://bit.ly/2HFIY9r	Program demonstrating land use management techniques and implications
General Signup Conservation Reserve Program (CRP)	IN	https://bit.ly/1n6goiI	Land conservation program enrolling environmentall sensitive land in conservation cover
Environmental Quality Incentives Program (EQIP)	IN	https://bit.ly/2gofEG9	Financial resources to plan and implement conservation projects
Emergency Watershed Protection Program (EWP)	IN, MU, SA	https://bit.ly/2mL89bn	Funding to relieve imminent natural hazards in a watershed
IDNR Watershed Improvement Grants	WMA, MU, CO	https://bit.ly/2ssYBqq	Funding for creation of 9-step watershed plans
Iowa Water Quality Loan Fund (SRF)	IN, MU, CO, NP	https://bit.ly/2HENtB2	Low interest loan program for funding stormwater, waste water improvements
Volunteer Water Monitoring	IN, WMA, SWCD	https://bit.ly/2MHKvdX	Volunteer program for training and collection of water quality samples
Resource Enhancement and Protection Program (REAP)	IN, MU, CO, SWCD	https://bit.ly/2Ga425C	Invests in Iowa's natural and cultural resources

IN = Individuals/Landowners SA = State Agencies NP = Non-Profit Organizations MU = Municipalities
CO = Counties CB = Conservation Boards SWCD = Soil and Water Conservation Districts
WMA = Watershed Management Authorities

ACRONYMS

ACPF	Agriculture Conservation Planning Framework
BMP	Best Management Practice
DEP	Daily Erosion Project
EPA	Environmental Protection Agency
ERW	English River Watershed
FEMA	Federal Emergency Management Agency
HSEM	Homeland Security & Emergency Management
HUC	Hydrologic Unit Code
ISWMM	Iowa Stormwater Management Manual
IWA	Iowa Watershed Approach
NFIP	National Flood Insurance Program
NRCS	Natural Resource Conservation Service
NRS	Nutrient Reduction Strategy
SCS-CN	Soil Conservation Service - Curve Number
SWCD	Soil & Water Conservation District
WMA	Watershed Management Authority

ACKNOWLEDGEMENTS

This report is one of fourteen subwatershed plans developed as part of Phase 2 planning in the English River Watershed. These plans would not have been possible without the hardwork by the Iowa Flood Center and their participation in the National Disaster Resiliency program, a federal grant administered by the Housing and Urban Development department. The following is a list of project partners that were instrumental in providing data, technical assistance, and support through the planning process.

The Iowa Flood Center

Iowa County, Iowa

The University of Northern Iowa's GeoTREE Center

The Iowa Department of Natural Resources

Iowa Homeland Security & Emergency Management

The Iowa Water Center & The Daily Erosion Project

Center for Evaluation and Assessment

The State Hygenic Laboratory

Iowa Department of Agriculture & Land Stewardship

Eldon C. Stutsman, Inc.

CONTACT INFORMATION

All of the data, assessments, and tools highlighted in this plan are available to the public. Please contact staff at the English River Watershed to discuss how we can assist you in conservation planning and implementation.

The English River Watershed organization operates out of the Kalona City Hall offices. Our team is available by email, phone, or via our website: (http://englishriverwma.org/contact).

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