Duck Creek Watershed Management Plan

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Scott County
Soil and Water
Conservation
District

Length of Plan: 9 + years (additional years determined after year 9) **Date of Approval:** 2011
Date of Re-evaluation: June, 2014, 2017 & 2020

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The Duck Creek Watershed Plan was created with the support and input from the following individuals:

Partners of Scott County Watersheds (Duck Creek Watershed Management Plan Advisory Council):

Jane Weber, Scott County SWCD; **Wally Mook**, Bettendorf Public Works, Director; **Jim Hoepner**, Davenport Resident; **Patty Copeland**, LeClaire Resident and Bettendorf Public Works; **Harlan Meier**, Local Farmer; **Dr. Ellen Kabat-Lensch**, Scott Community College; **Paul Loete**, MSA Professional Services; **Mike Clarke**, Davenport Public Works, Director; **Barney Barnhill**, Davenport Alderman; **Dean Mayne**, Bettendorf Alderman; **Jeff Liske**, Scott County Board of Supervisors; **Tim Huey**, Scott County Planning & Development; **Larry Thompson**, Davenport Resident and **Brian D. Bowman**, Quad Cities Home Builders Association

Iowa Department of Natural Resources:
Charles Ikenberry, TMDL Project Manager, Watershed Improvement Section; **Jeff Berckes** Water Quality Improvement Plan (TMDL) Program Coordinator, Watershed Improvement Section; **Rachel Glaza**, Nonpoint Source Project Officer, Watershed Improvement Section; **Terry Jones,** Environmental Specialist Senior; **Russell Royce,** Environmental Specialist

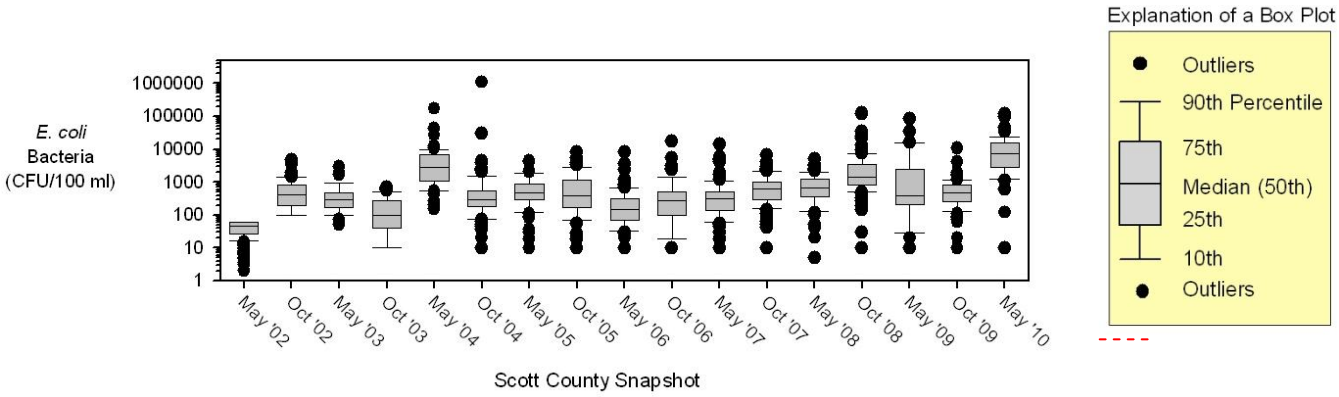
Others:

Doug Johnson, Resource Conservationist, Natural Resource Conservation Service; **Jennifer Griem**, Soil Conservation Technician, Natural Resources Conservation Service; **Wayne Petersen**, Urban Conservationist, Iowa Department of Agriculture and Land Stewardship; **Amy Johannsen,** Compliance Officer, Natural Resources Department, City of Davenport; **Brian Stineman**, Natural Resources Manager, City of Davenport; **Kevin James**, GIS Analyst - IT Department, City of Davenport; **John Grimm**, City of Bettendorf; **Jack Hoskins** and **Larry Linnenbrink**, Scott County Health Department; **Dennis Ryan**, Water Pollution Control Plant Manager, City of Davenport

I. EXECUTIVE SUMMARY

Duck Creek is not supporting two of the intended uses of the stream: primary contact recreation (Class A1 use) and children's recreation, (Class A3 use). Primary contact recreation includes activities that involve direct contact with the water such as swimming and wading. Children's recreation is similar, but specific to activities or locations where children contact the water. Neither designated use is currently supported in Duck Creek due to high levels of indicator bacteria called Escherichia coli (*E. coli)* measured in the stream. High *E. coli* levels in a waterbody can indicate the presence of potentially harmful bacteria and viruses (also called pathogens). Humans can become ill if they come into contact with and/or ingest water that contains pathogens. The two figures below show water monitoring results that include Duck Creek.

Figure 1.1: Scott County IOWATER Snapshot Data, May 2002- May 2010



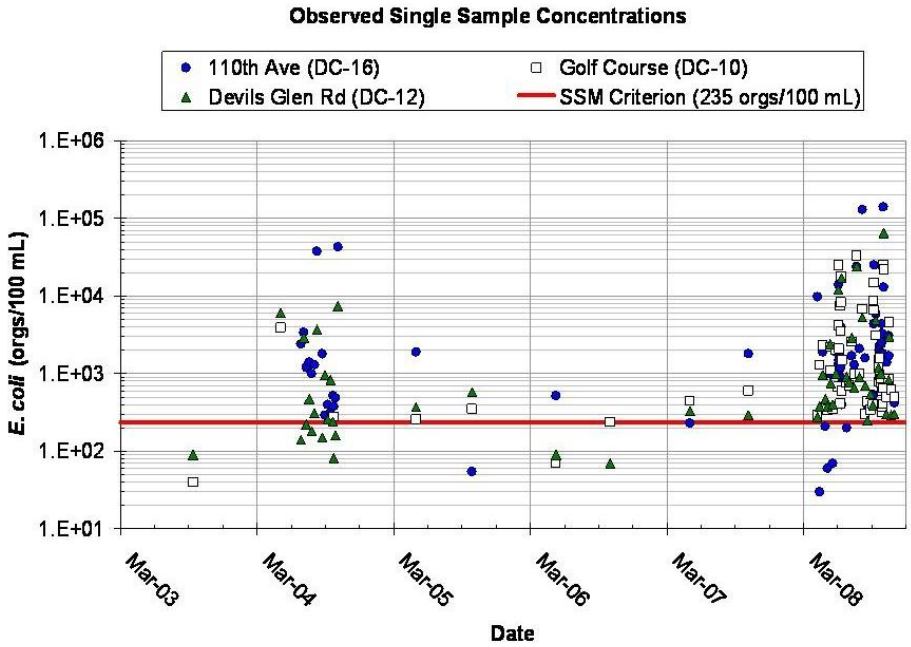


Figure 1.2: Monitoring results from March 2003-March 2008 at three monitoring locations along Duck Creek

Bacteria enter Duck Creek from point sources and nonpoint sources. Point source pollution is a single, identifiable, source of pollution. Nonpoint source pollution comes from many diffuse sources. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, streams, rivers, wetlands and even our underground sources of drinking water. Point sources in the watershed include; onsite waste water treatment facilities (septic systems) under NPDES General Permit No. 4 discharging to a surface water, three wastewater treatment facilities, sanitary sewer overflows (SSOs) prohibited by the City of Davenport's wastewater permit, animal feeding operations (AFOs), municipal separate storm sewer systems (MS4s) in the cities of Davenport and Bettendorf (potential Illicit connections leading to dry weather flow from the storm sewer system and growth and deposition of bacteria within the storm sewer system). Nonpoint sources in the watershed include; non-permitted onsite wastewater treatment facilities (septic systems) not designed to discharge to a surface water, livestock with direct access to streams, pasture, manure application to row crops, urban miscellaneous sources (build up of bacteria on urban land uses, resuspension of bacteria from the stream bed and undocumented wildlife deposition within the urban area), pet waste and wildlife.

This plan outlines a 9 year process to address non-permitted onsite wastewater treatment facilities (septic systems) not designed to discharge to a surface water, livestock with direct access to streams, pasture, manure application to row crops, and pet waste and to begin to address urban miscellaneous sources (build up of bacteria on urban land uses, resuspension of bacteria from the stream bed and undocumented wildlife deposition within the urban area). Every 3 years, the plan, projects and programs implemented and water quality monitoring data gathered will be evaluated to determine if milestones and targeted pollutant load reductions are being met. After year 9, addressing urban miscellaneous sources through the restoration of natural hydrology will become the focus of future efforts to meet the water quality standard.

This plan will be of little to no value to water quality improvement unless recommendations are implemented. This will require the active engagement of local stakeholders and the collaboration of several local agencies. In addition to the implementation of the recommendations of the plan, the collection of water quality data as part of an ongoing monitoring plan, evaluation of collected data and modification of the targets and or plan is necessary. Monitoring is a crucial element to assess the attainment of water quality standards and designated uses, to determine if water quality is improving, degrading, or unchanged, and to assess the effectiveness of implementation activities and the possible need for additional activities.

II. WATERSHED ANATOMY

i. Location

The Duck Creek Watershed is located entirely in Scott County, Iowa. The watershed encompasses the urban sectors of The City of Davenport, The City of Bettendorf and rural Scott County. **Figure 2.1** shows Scott County's position in the state of Iowa and the watershed's position in Scott County. Duck Creek empties directly into the Mississippi River.

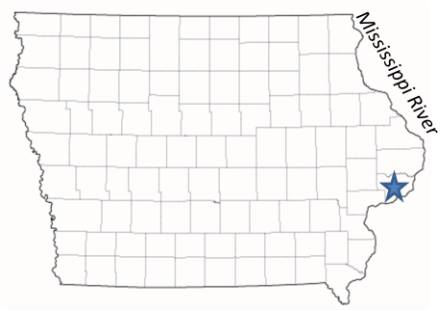
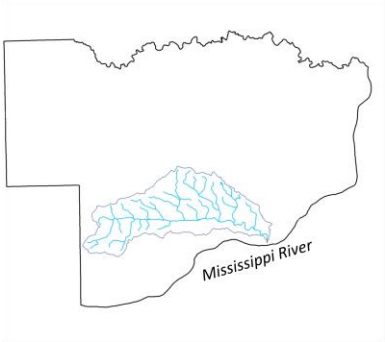


Figure 2.1: Scott County, Iowa (left) and the Duck Creek Watershed within the county (right)



ii. Jurisdiction, Ownership & Population

Jurisdiction

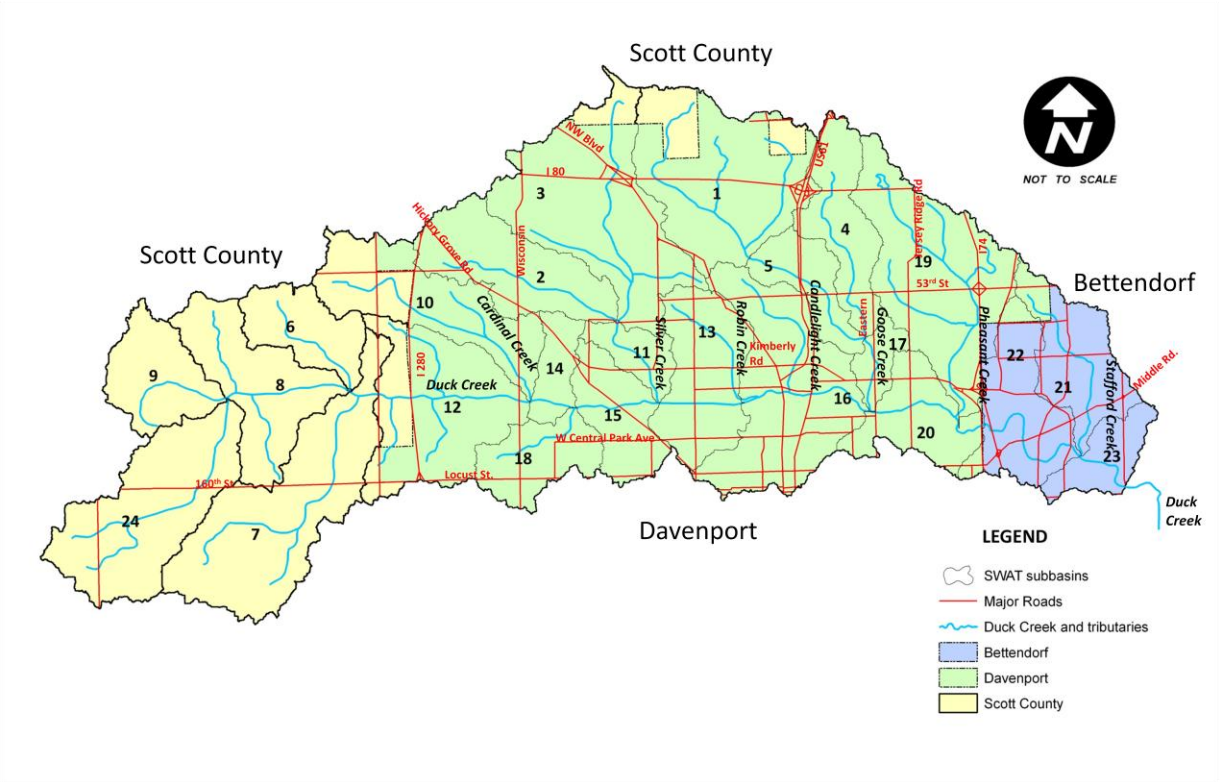
The City of Davenport makes up 24,718 acres (61%) of the watershed. The City of Bettendorf makes up 3,345 acres (8%) of the watershed. Scott County makes up 12,231 acres (31 %) of the watershed. **Table 2.1** is a breakdown of the Duck Creek Watershed's jurisdictions.

Table 2.1: Duck Creek Watershed Jurisdictions

Jurisdiction	Acreage of Watershed	Percent of Watershed
City of Davenport	24,718 acres	61 %
City of Bettendorf	3,345 acres	8 %
Scott County	12,231 acres	31%
TOTAL	**40,294 acres**	**100 %**

Figure 2.2 shows a map of the watershed's jurisdictions (next page).

Figure 2.2 Duck Creek Watershed Map. Jurisdiction , Cities of Davenport, Bettendorf & Scott County



Ownership

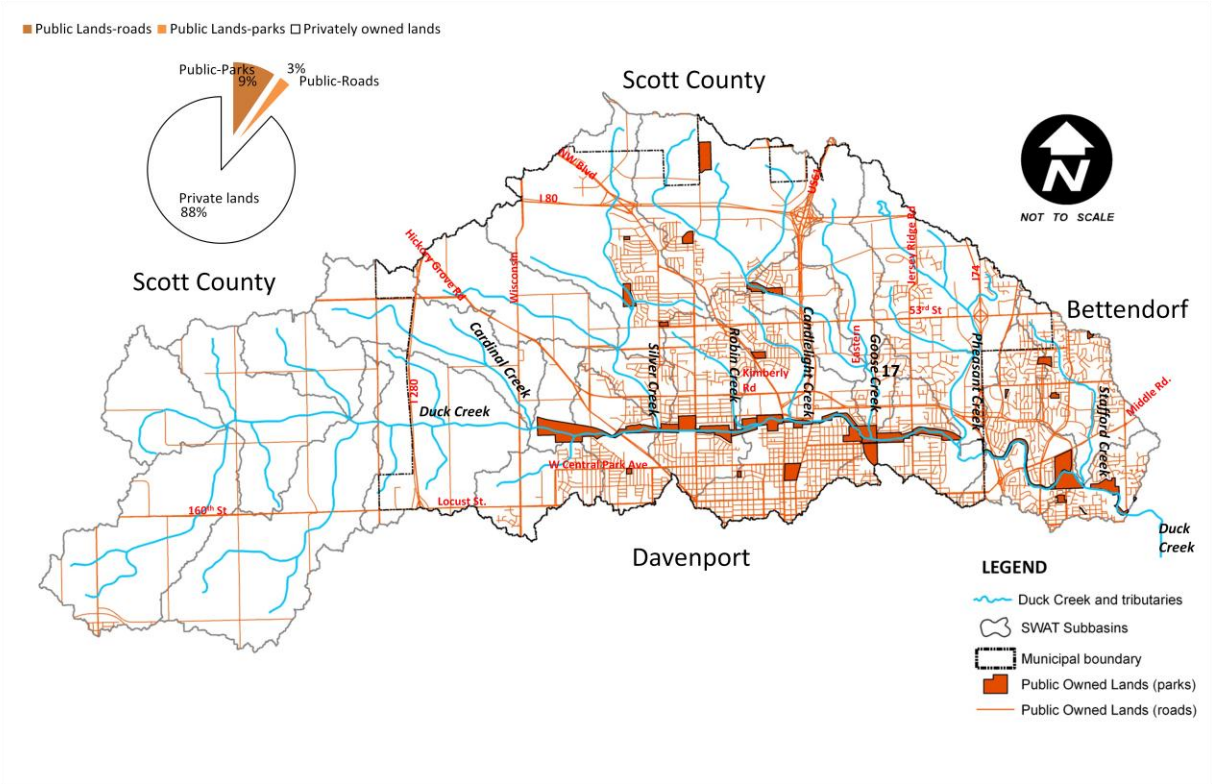
4,783 acres (12%) of the Duck Creek Watershed is publicly owned. Publicly owned lands include municipal owned parks and federal, state, county and municipal roads. Other public land in the watershed includes road right of ways (acreage data not available). The majority of the land in the watershed is privately owned, 35,511 acres (88%). **Table 2.2** is a breakdown of the Duck Creek Watershed's public and private lands.

Table 2.2: Duck Creek Watershed Ownership

Owner	Acreage of Watershed	Percent of Watershed
Public Lands Watershed	4,783 acres	12 %
Private Lands Watershed	35,511 acres	88 %
TOTAL	**40, 294 acres**	**100 %**

Figure 2.3 shows a map of publicly owned lands (next page).

Figure 2.3 Duck Creek Watershed Map. Ownership, public vs. private



v. Population

The Duck Creek Watershed is located entirely in Scott County, Iowa. The population of the City of Davenport is approximately 100,000. Of those residents, approximately 63,750 (64%) live in the Duck Creek Watershed. The population of the City of Bettendorf is 33,000. Of those residents 16,000 (49%) live in the Duck Creek Watershed. The total population in Scott County is about 165,000. Of those residents about 80,050 (combined Davenport and Bettendorf residents in watershed plus 300 residents residing outside of municipal boundaries in the county) (49%) live in the Duck Creek Watershed. **Table 2.3** displays the population statistics in the watershed.

Figure 2.3: Duck Creek Watershed Population

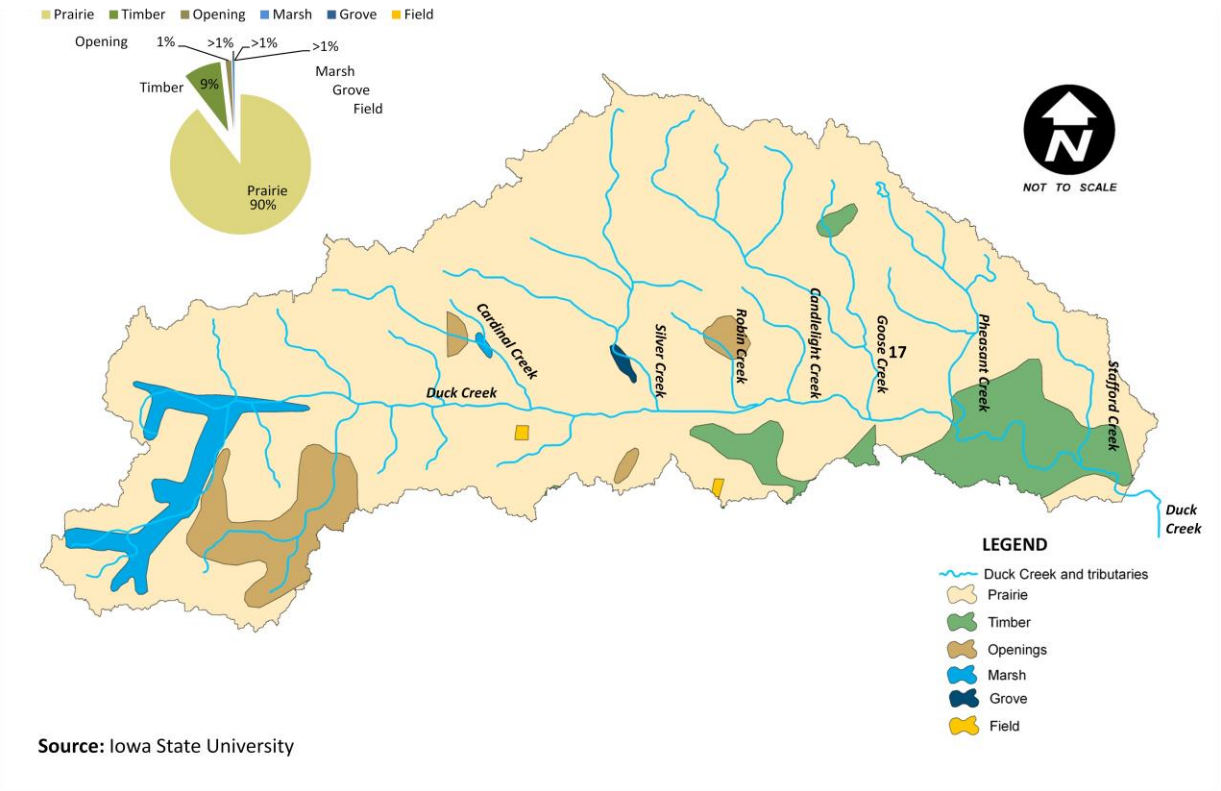
Entity	Total Population	Population in Watershed
City of Davenport	100,000	63,750 (64 %)
City of Bettendorf	33,000	16,000 (49 %)
Scott County	164,690	80,050 (49 %)

III. Land Use

i. Historic Vegetation

Ninety-percent of the vegetation in the Duck Creek watershed between 1832-1859 was prairie. Nine-percent was timber and one-percent was opening. Marsh, grove and field were present, but made up less than 1% of the watershed (Anderson, 1996). **Figure 3.1** displays a map and pie chart of the historic vegetation of the watershed. With this historic vegetation, precipitation was used by plants, evaporated into the air and infiltrated into the soil, where it entered streams, rivers, lakes and wetlands, cool and clean, as groundwater.

Figure 3.1 Duck Creek Watershed Map. Historic Vegetation (1800's)



Source: Iowa State University

ii. Current vs. Future

The Duck Creek Watershed is nearly evenly divided among rural and urban land uses, with the upstream (west) half of the watershed in agricultural uses and the lower (east) half in urban areas. The total drainage area of the watershed, from its headwaters in the agricultural area to its confluence with the Mississippi River, is approximately 64 square miles (40,786 acres). **Figure 3.2** displays the agricultural vs. urban land uses of the watershed (next page).

Figure 3.2 Duck Creek Watershed Map. Land use, agricultural vs. urban

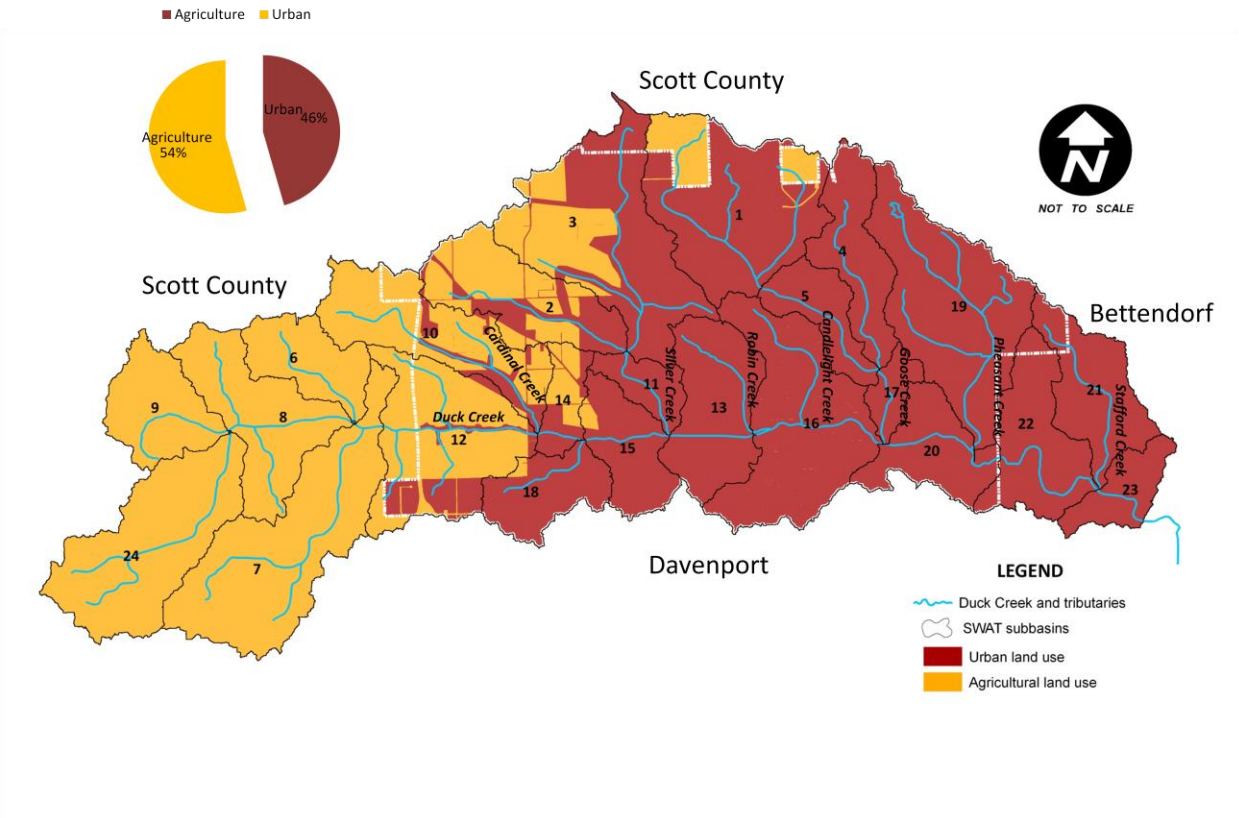


Table 3.1 is a chart detailing land use by acres and the percentage of the watershed each land use comprises.

Table 3.1: Land use composition of the Duck Creek Watershed

Land Use	Description	Acres	%
Low Density Residential	Single homes, duplex homes, townhomes and farmhouses	7,822	19
Medium/High Density Residential	Apartment and retirement complexes	971	2
General Commercial	Shopping malls and parking, office and research parks, office buildings and hotels, and retail (such as department stores, grocery stores, hardware stores)	2,271	6
Office /Business Park	See above definition	348	1
Industrial	Manufacturing and processing, warehousing and distribution centers, wholesale facilities and industrial parks	2,241	5

Institutional	Medical and health, educational, correctional, and religious facilities	1,402	3
Parks/Rec/Conservation/Preservation	Parks, golf courses, nature preserves, playgrounds and athletic fields, forested land or grassland that is under public or private ownership for the purposes of preservation of natural resources and/or recreation	1,987	5
Agriculture	Cropland, pasture, orchards, nurseries, greenhouse operations and horse farms and stables	18,616	46
Unclassified (Roads and Transport)	Roads and transportation right of way and land that is unclassified	5,204	13
Total		**40,862**	**100**

Figure 3.3 is a more detailed map of the distribution of the land uses throughout the Duck Creek Watershed.

Figure 3.3 Duck Creek Watershed Map. Current Land Use

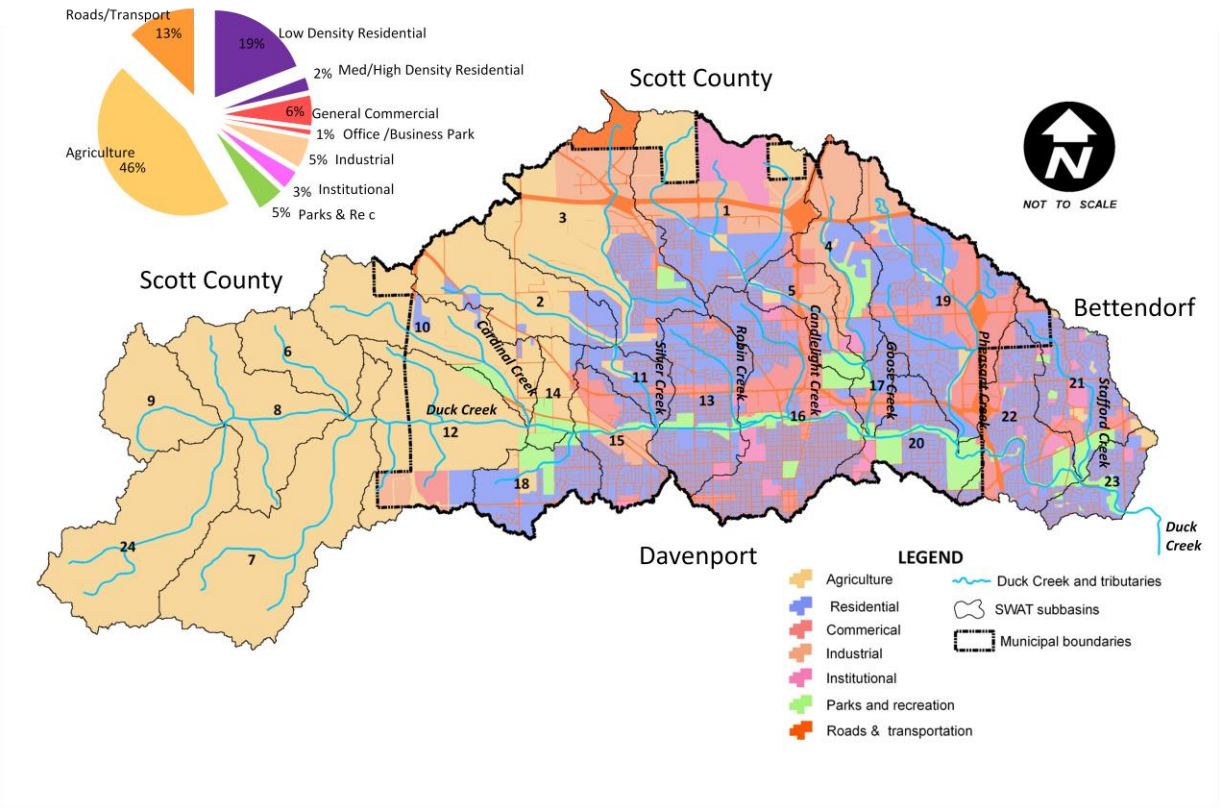


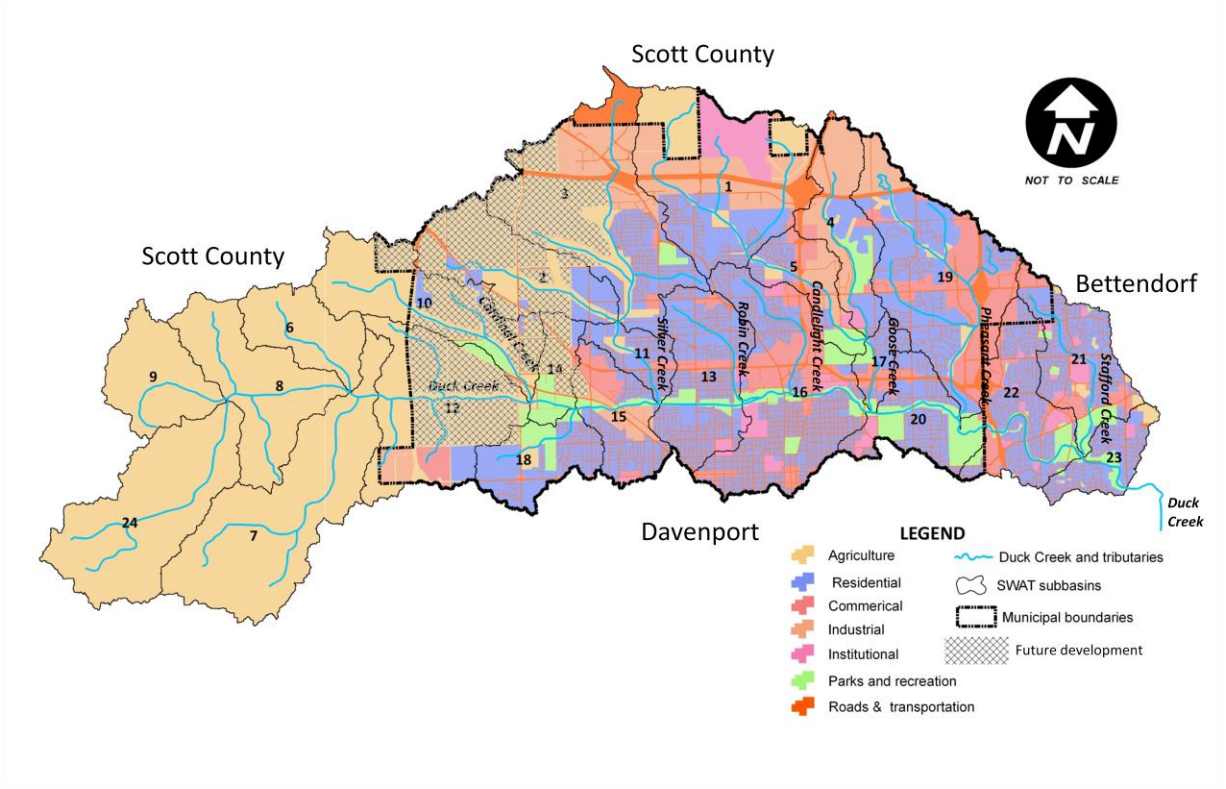
Table 3.2 is a chart showing current land use vs. anticipated future development.

Table 3.2: Current Land use vs. Anticipated Future Development

Land Use	Current Land Use/acres	Anticipated Future Land Use/acres	% of change (current vs. future)
Low Density Residential	7,822	11,318	+9
Medium/High Density Residential	971	1,047	+1
General Commercial	2,271	2,825	+1
Office /Business Park	348	430	+1
Industrial	2,241	3,369	+3
Institutional	1,402	1,470	+1
Parks/Rec/Conservation/Preservation	1,987	2,702	+2
Agriculture	18,616	17,611	-3
Unclassified (Roads and Transport)	5,204	5,204	0
Total	40,862	45,976	18

Figure 3.4 shows projected future development over the existing land use.

Figure 3.4 Duck Creek Watershed Map. Projected future land use.



Understanding land use in the watershed is valuable because different land uses contribute different nonpoint sources of bacteria to Duck Creek. Rural and agricultural land uses contribute bacteria from onsite waste water treatment facilities (septic systems) not covered by NPDES General Permit No. 4 and not designed to discharge to a surface water, livestock with direct access to the stream, pasture lands and manure application to row crop while urban land uses contribute bacteria from build up of bacteria on urban land uses resuspension of bacteria from the stream bed, undocumented wildlife deposition within the urban area and pet waste.

Understanding land use in the watershed is also vital because changes in land use from historic vegetation to agricultural and urban land uses has greatly altered the hydrology in the Duck Creek Watershed. What was once a hydrology pattern where precipitation infiltrated into the ground is now driven by an increased volume of precipitation that runs off the land carrying bacteria and other pollutants into the creek. This is particularly the case in the urban area. In order to address bacteria from urban land uses a natural, infiltration based, hydrology must be restored in the watershed by implementing infiltration practices that reduce stormwater runoff which carries bacteria to the creek.

Also, understanding future land use changes is important. As impervious areas expand, implementing infiltration practices during planning and construction is more cost effective than retrofitting areas later and should be done through incentives and policy and regulation.

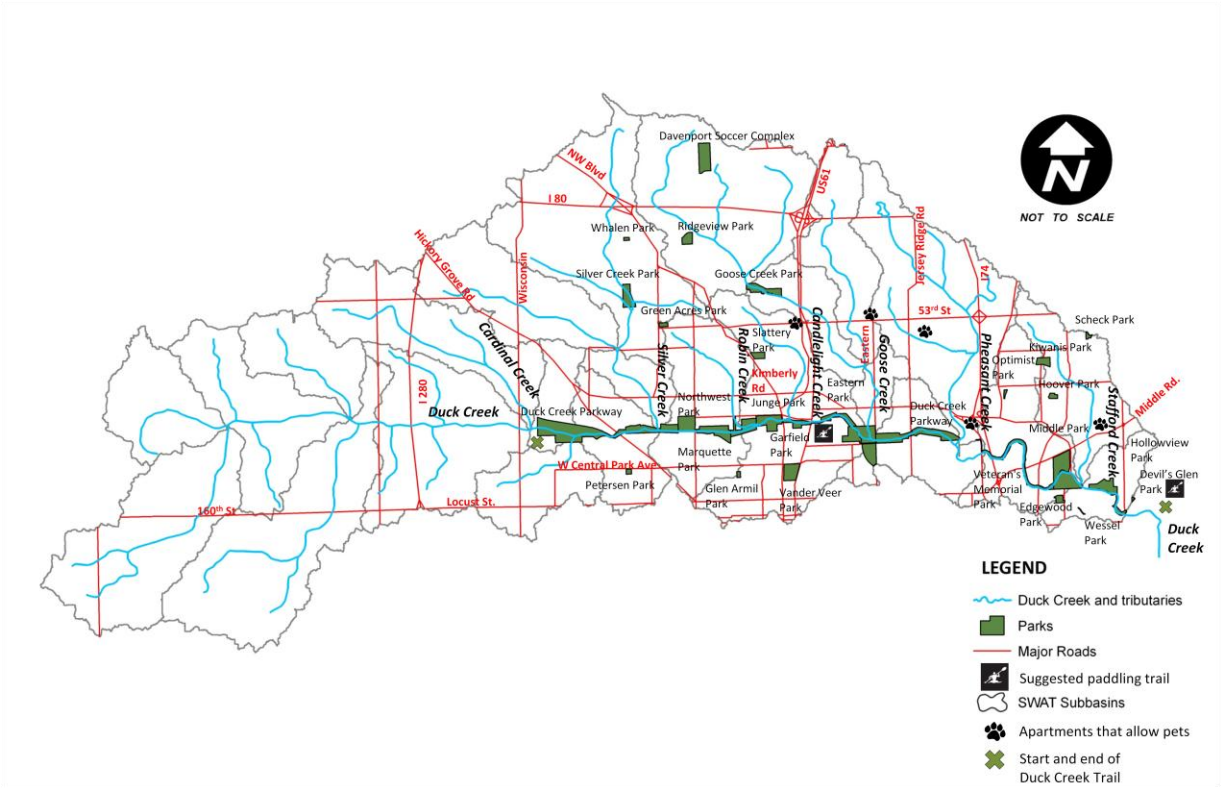
IV. Resource Characteristics

The Duck Creek watershed is the most prominent stream by name and location in the Iowa Quad Cities. There are 14 miles of multi-use trails surrounding Duck Creek that provide a wide variety of recreational opportunities, a variety of scenic vistas, urban housing areas, two golf courses and eight city parks. Local children use the creek to wade and discover the natural world. Pets and children are often seen romping along and through the creek. Duck Creek empties directly into the Mississippi River, the drinking water supply for the Quad Cities and surrounding areas. Duck Creek's prominence in the landscape and heavy public usage shows its importance to the community.

Paddling has recently become another use on Duck Creek. *Paddling Iowa*, suggest a 6.3 mile route, putting in at the Brady Street bridge in Davenport and taking out at Devil's Glen Park in Bettendorf.

"Duck Creek runs through the hearts of two cities, and yet, thanks to a green belt, its banks are splendidly wooded along nice ridges as the creek runs over rocky riffles and one fun ledge drop near the takeout. The 12-mile Duck Creek Parkway trail winds along the length of this trip, so a bike shuttle is easy to arrange. Unfortunately, Duck Creek is paddleable only after recent rains. Check the Duck Creek at DC Golf Course gauge on USGS web site listed in the introduction. More than 100 cfs will do. Being in an urban area, storm-water sewers can lead to flash flooding and dangerous paddling conditions; don't paddle during a rain" (Hoogeveen, 2006)**.** Recreational areas including parks and trail heads are shown on **Figure 4.1** (next page).

Figure 4.1 Duck Creek Watershed Map. Recreation and areas of pet concentration



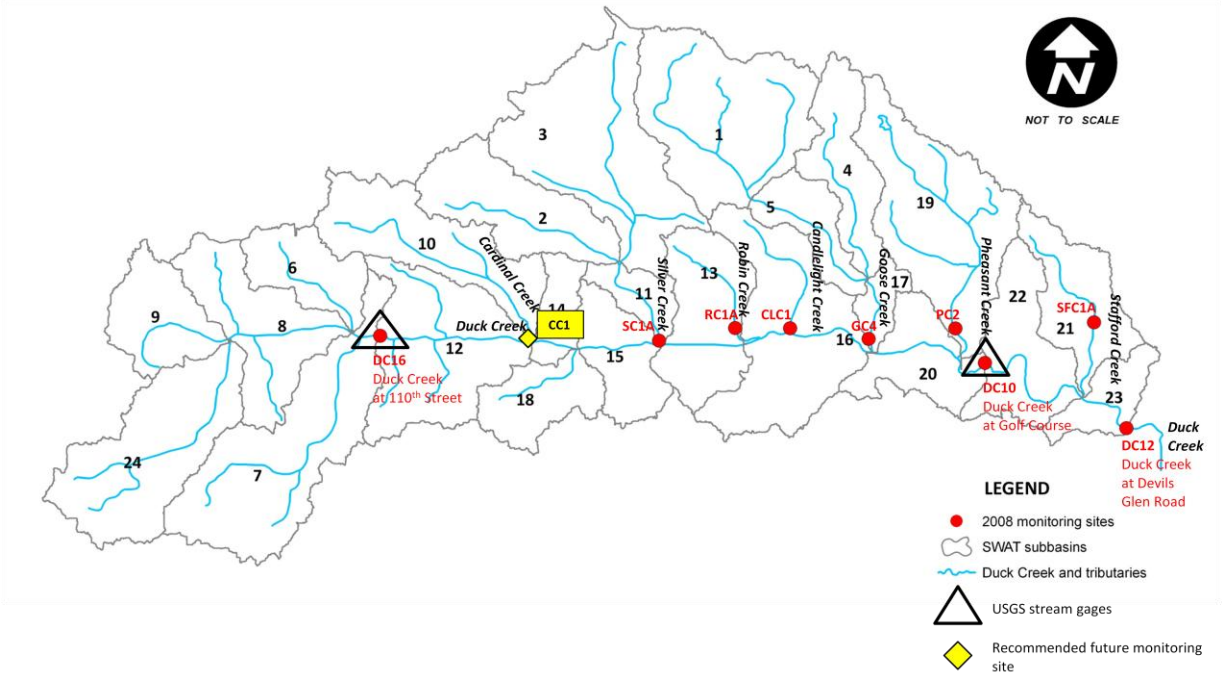
IV. Physical Characteristics

i. Hydrology

Duck Creek is a perennial stream that lies within the Copperas-Duck Hydrologic Unit Code eight-digit watershed (HUC-8). The Duck Creek watershed includes over eighty miles of streams, with Duck Creek having a total stream length of approximately 19 miles. Major tributaries to Duck Creek include Silver Creek, Goose Creek, and Pheasant Creek. A number of smaller streams also flow into Duck Creek, including Stafford Creek, Candlelight Creek, Robin Creek, Cardinal Creek and several unnamed tributaries.

The hydrology of Duck Creek has been altered significantly since the 1930's as the urban area of the watershed has grown and impervious land cover increased. During this same period, stream channelization occurred (in addition to earlier channelization during the implementation of agricultural land uses), which also affects stream hydrology. Consequently, the stream and its tributaries exhibit "flashy" hydrologic behavior and are prone to large and quick increases in flow during moderate rainfall events. The U.S. Geological Survey (USGS) maintains two stream gages on the main stem of Duck Creek. Gage locations are shown on **Figure 5.1.**

Figure 5.1 Duck Creek Watershed Map. Monitoring Locations, SWAT Subbasin Delineation, USGS gages



ii. Soils, Slope and Topography

The landscape of the Duck Creek Watershed is characterized by outcroppings of bedrock, steep side slopes, and narrow stretches of bottom land. The upland portions of the watershed include spatial till plains covered with loess. Three soil associations are present in the watershed: the Tama, Muscatine-Tama-Garwin, and Downs-Fayette associations. Of these, Tama comprises the largest portion of the watershed.

The Tama association is characterized by gentle to moderately steep slopes, well drained soils in loess, and is found primarily in upland areas. The Muscatine-Tama-Garwin association is also found in upland areas on nearly level to moderately steep slopes, and includes both well drained and poorly drained soils. The Downs-Fayette association includes gentle to very steep slopes, and is generally well-drained. The productivity of the soils and the gradual slopes in the watershed make the land desirable for crop. This will make the implementation of conservation practices a challenge. Also, the poorly drained soils require extensive subsurface drainage, which quickly carries water from fields to streams. If manure is applied to poorly drained soils, bacteria may be more quickly entering the creek through tile systems. **Table 5.1** describes the six most common minor soil types in the watershed that comprise the largest area and typical slopes found in the watershed.

Table 5.1 Predominant Soils in Duck Creek Watershed

Soil Name	Description	Typical Slopes (%)
Tama	Silty clay loam, dark brown, well drained	2-5
Downs	Silt loam, dark grayish brown, well drained	2-5
Muscatine	Silty clay loam, dark grayish brown, poorly drained	0-2
Killduff	Silty clay loam, dark brown, moderately well drained	5-14
Ackmore	Silt loam, dark grayish brown, somewhat poorly drained	0-5
Garwin	Silty clay loam, black to very dark gray, poorly drained	0-2

USDA-NRCS, 1996

Figure 5.2 maps the soils in the watershed (next page).

Figure 5.2 Duck Creek Watershed Map. Soils

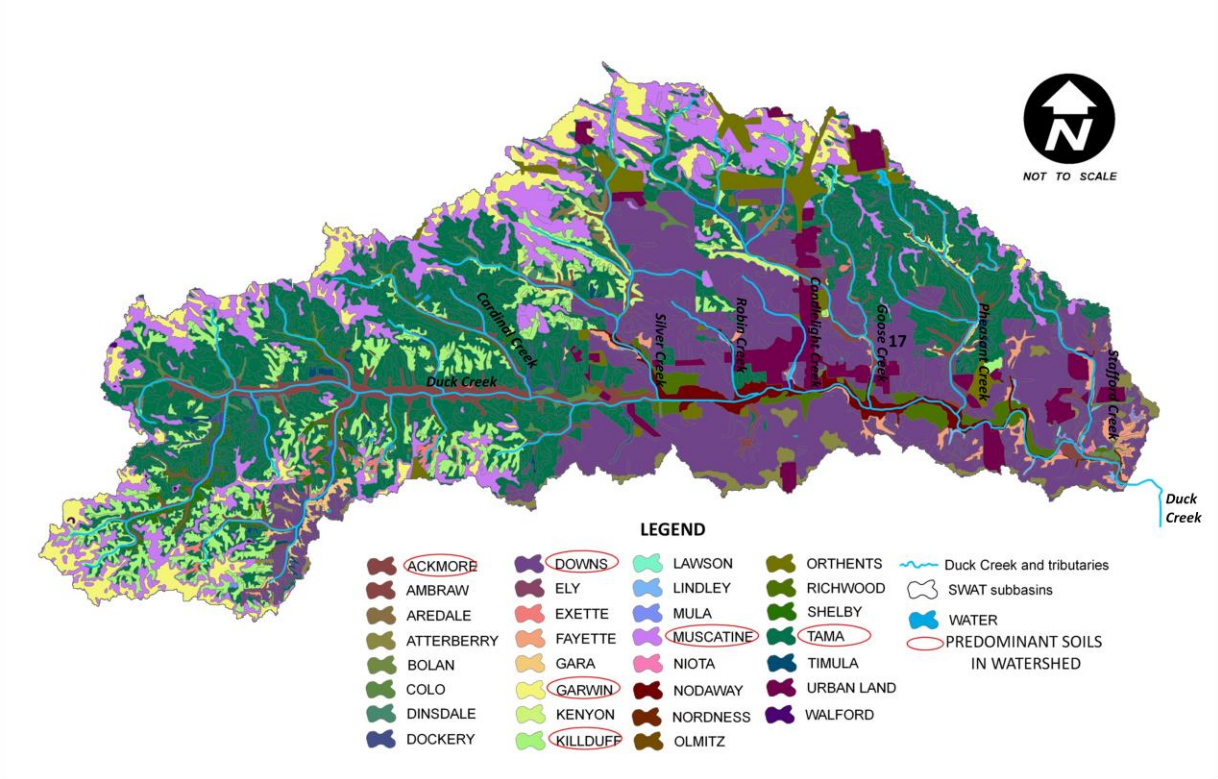
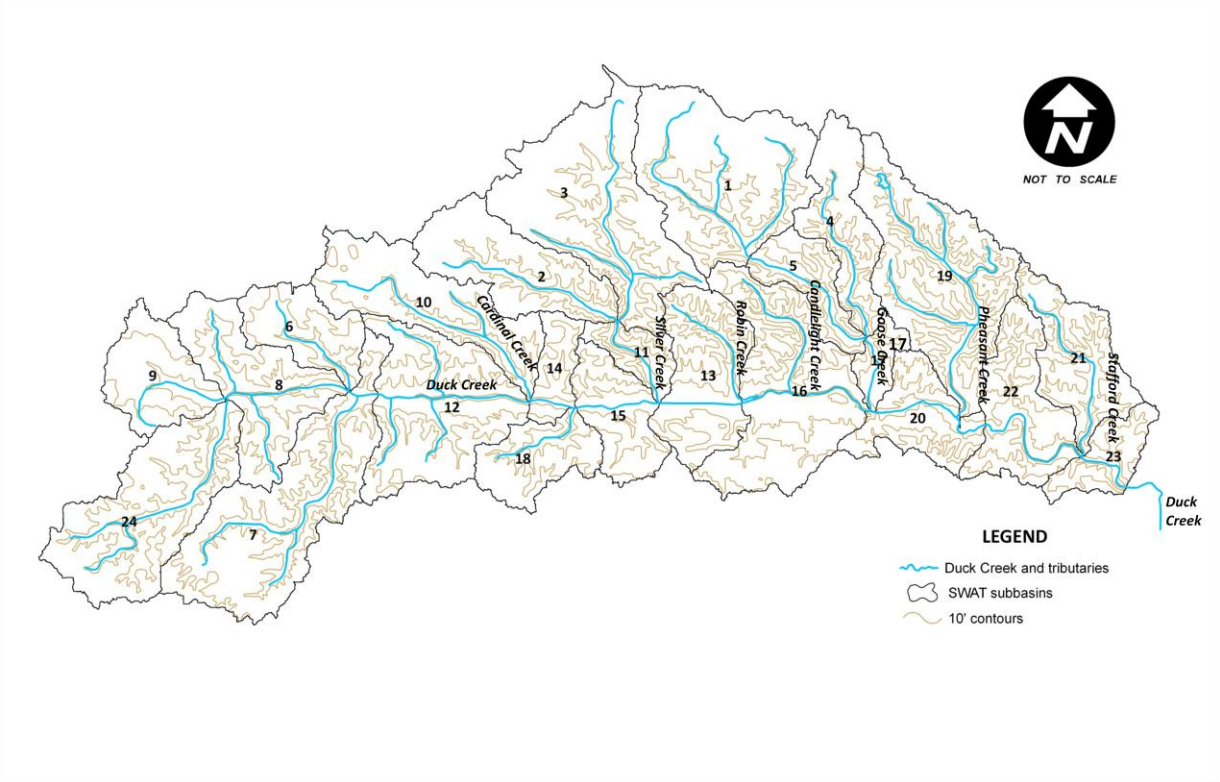


Figure 5.3 is a topography map of the watershed with 10’ contours (next page).

Figure 5.3 Duck Creek Watershed Map. Topography



iii. Geology (Morphology and Substrate)

The morphology (form, shape and structure) of Duck Creek has been highly altered since pre-settlement conditions. In the agricultural portion of the watershed, the stream is highly channelized, with little to no undisturbed meandering reaches remaining. A majority of the stream within the urban area also exhibits a high degree of channelization. This is because much of the land adjacent to Duck Creek has transitioned from agricultural to urban land uses over the past 50 years. Significant channelization occurred while the land was in agricultural production. Additionally, urban development frequently results in stream channelization for the purposes of flood reduction and construction of urban infrastructure (road, bridges, buildings, etc.)

Stream channelization and the construction of artificial drainage pathways (drain tiles, storm sewers, and concrete line channels) have increased stream erosion in Duck Creek and its tributaries. As a result, there are a number of reaches in which the stream banks are incised and unstable and where the channel is significantly degraded. In some cases, sediment deposition (channel aggradation) is occurring, which results in substrate dominated by silt deposits that can embed in underlying rocks and gravel and reduce ecological diversity of the stream. The geology of the watershed is dominated by glacial outwash materials and dolomite,

shale, and limestone bedrock. In a number of locations throughout the stream, outcroppings of underlying bedrock are visible.

iv. Climate

The climate in Scott County, Iowa is classified as humid continental. The average temperature in January is 22 degrees Fahrenheit. The average August temperature is 74 degrees Fahrenheit. Total annual rainfall is 33.42 inches, while annual snowfall averages 30.6 inches. On average, the Duck Creek Watershed receives 104 days with precipitation, with approximately 8 days with over 1" of rain.

v. Threatened and Endangered Species

The threatened and endangered species are listed below in **Table 5.2**. Threatened and endangered species are species that have declined so drastically that the US Fish and Wildlife Service has determined that federal action is necessary to protect them. The Federal Endangered Species Act of 1973 (Act) describes two categories of declining species of plants and animals that need the Act's protections – endangered species and threatened species – and provides these definitions:

ENDANGERED - any species that is in danger of extinction throughout all or a significant portion of its range;

THREATENED - any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

In simple terms, endangered species are at the brink of extinction now and threatened species are likely to be at the brink in the near future.

Candidate species are plants and animals for which the U.S. Fish and Wildlife Service (FWS) has sufficient information on their biological status and threats to the species to propose them as endangered or threatened under the Endangered Species Act (ESA), but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Figure 5.2: Threatened, endangered and candidate species for Scott County, Iowa

Common Name	Scientific Name	Status	Habitat
Western prairie fringed orchid	*Platanthera praeclara*	Threatened	Wet prairies and sedge meadows
Prairie bush clover	*Lespedeza leptostachya*	Threatened	Dry to mesic prairies with gravelly soil
Indiana bat	*Myotis sodalist*	Endangered	Caves, mines (hibernacula); small

			stream corridors with well developed riparian woods, upland forests (foraging)
Higgins eye pearly mussel	*Lampsilis higginsii*	Endangered	Mississippi River
Sheepnose mussel	*Plethobasus cyphyus*	Candidate	Rivers
Spectaclecase mussel	*Cumberlandia monodonta*	Candidate	Rivers

www.fws.gov

VI. COMMUNITY INPUT

i. Public Meetings

From **December 2008-December 2009,** River Action Inc. (a local non-profit organization) facilitated a planning committee for the creation of a **Duck Creek Watershed Plan**. The planning committee included federal, state, county and municipal agencies, corporate stakeholders, local professionals, environmental organizations and concerned landowners and citizens. The committee met monthly for one year and provided input to Conservation Design Forum, a multidisciplinary ecological design firm, who created the final document, *The Duck Creek Watershed Plan*.

The plans goals were to improve coordination between public, private and nonprofit stakeholders to implement the plan's recommendations and improve watershed resources, improve water quality, preserve and enhance stream and riparian health, implement infiltration practices, restore natural areas for habitat and implement watershed education that promotes stewardship. The plan's recommendations included: retrofitting residential, commercial, industrial and transportation land uses with infiltration practices; restore existing natural areas such as wetlands and riparian areas; stabilize stream banks and gully erosion and use low impact development principals and practices on new development.

At the time of the creation of this plan, the Iowa Department of Natural Resources (IDNR) had not completed the intense bacteria monitoring and the *Water Quality Improvement Plan* which includes the Total Maximum Daily Load (TMDL). Also, an assessment on the agricultural portion of the watershed was not completed. This Duck Creek Watershed Management Plan does not intend to duplicate the effort made through the existing watershed planning process rather it uses the new data made available by the IDNR to specifically address the *E. coli* bacteria impairment on Duck Creek.

With this plan, Scott County Soil and Water Conservation District will provide River Action with information on where the implementation of the recommendations from their plan will have the most impact on the impairment. River Action's Duck Creek Watershed Plan can be viewed at **www.riveraction.org**.

On **November 25, 2008**, an **initial public meeting** was held at the Bettendorf Fire Station, 5002 Crow Creek Road in Bettendorf, Iowa. This meeting was sponsored by the Partners of Scott County Watersheds (PSCW) and the Scott County Soil and Water Conservation District (SWCD). The goals of the meeting were to inform the public and seek feedback regarding water quality in Duck Creek.

Staff from the Iowa Department of Natural Resources presented a description of previous water quality monitoring efforts and an update of current water quality conditions in Duck Creek. IDNR also discussed the Total Maximum Daily Load (TMDL), including federal requirements, goals and objectives, and the projected timeline for TMDL development. IDNR staff emphasized that the TMDL would be available as a resource for local stakeholders, but that commitment and action by local groups (citizens, officials, and organizations) would be required to achieve significant water quality improvement in Duck Creek.

Approximately 45 individuals attended the meetings. Stakeholder groups present included public works staff from the cities of Davenport and Bettendorf, several local consulting firms, Iowa State Master Gardeners, board members from PSCW, IOWATER snapshot volunteers, and watershed residents. Representatives from IDNR, Scott County and Scott County SWCD were also in attendance.

On **February 2, 2010** a **direct mailing was sent to land owners and operators with animal feeding operations, livestock with direct access to the stream, pasture and individuals who applied manure to their land.** The letter explained that as part of Scott County Soil and Water Conservation Districts continued commitment to conservation, additional cost share and incentive fees may be available to landowners in the Duck Creek Watershed. A list of potential cost share practices were listed and those who received the letter were asked to respond if interested. No landowners responded to the letter. Individual meetings were requested and held with two of the land owners and operators with cattle access on the main stem of Duck Creek. Different options for livestock and pasture management were proposed. There was no interest in excluding or limiting livestock access to the stream at this time.

On **February 22, 2010**, **two duplicate public meetings** were held at the Bettendorf Public Library, 2950 Learning Campus Drive from Noon-1:30pm and at the Scott County Administrative Center, 600 W. 4th Street, Davenport from 5:30-7pm.

The IDNR reviewed a recent water quality study and its suggestions for improving Duck Creek. IDNR staff discussed levels and sources of bacteria entering the stream and offered potential solutions to help fix the problem. Also discussed was the use of this study to create a Duck Creek Watershed Management Plan to address the stream's *E. coli* bacteria impairment. Fifty-five individuals attended the meetings representing municipal public works, parks and planning departments, federal, state and county agencies, the QC homebuilders association, colleges and universities, businesses, corporations, environmental and paddler organizations and concerned landowners and citizens. The press attended the event as well and an article was in the Quad City Times Newspaper and stories ran on all three major local news stations.

On **March 16, 2010**, Clare Kerofsky, watershed coordinator for Duck Creek, held a **public meeting** over the Duck Creek Watershed Plan at the Bettendorf Fire Station, 5002 Crow Creek Road in Bettendorf. Specific sources in the watershed contributing bacteria to Duck Creek and recommendations to address these contributors were discussed. Twenty-nine individuals attended the meeting representing municipal staff, federal and county agencies, businesses, corporations, environmental organizations and concerned landowners and citizens. The press attended the event as well, an article was in the Quad City Times Newspaper and stories ran on all three major local news stations.

The public meetings for Duck Creek are well attended by urban residents, professionals, government officials and press. **There is a need to continue to hold public meetings as they are an effective means of providing information, receiving input and attracting press.**

On **March 31, 2010**, Clare Kerofsky, watershed coordinator for Duck Creek and Doug Johnson, Scott County Resource Conservationist with the Natural Resources Conservation Service (NRCS), held a **Duck Creek Watershed Livestock Producers Meeting** at a farm in the watershed. A direct postcard mailing was sent to all livestock producers in the watershed, RSVP's were requested and follow up calls were made to those who did not RSVP. Twenty-five individuals attended the meeting. Fourteen of those individuals were livestock producers and/or had livestock on their property. The remaining attendees were Natural Resource Conservation Service staff, Scott County Soil and Water Conservation District employees, commissioners and assistant commissioners and Iowa State University Extension staff. Scott County and NRCS staff discussed Duck Creek Watershed's *E .coli* bacteria impairment, urban and rural sources that contribute to the impairment, practices that address rural sources of bacteria and opportunities for additional incentive and cost share funding through implementation funds. **Surveys** were distributed at the beginning of the meeting. Seven surveys were returned after the meeting. Of those seven surveys, three producers had livestock with direct access to the stream. Of those three producers, two were interested in practices that related to livestock with direct access to the stream. One of the two was interested in exclusion. As of July 2010, NRCS staff is working with the two livestock producers interested in pasture practices. Of the seven returned surveys, four producers applied manure to their land, two did not and one did not respond to that question on the survey. Of the three that applied manure to land, two expressed interest in having a manure management plan or a more intensive manure management plan. The other producer did not answer yes or no, but wrote in "had one" in regards to manure management plan. All those that indicated they applied manure to land expressed interest in installing conservation practices on land where manure is applied. Of the seven surveys returned, three individuals expressed interest in a voluntary septic inspection if cost share dollars were in place for inspection, maintenance, repair and/or replacement. In addition, the individual who hosted

the meeting, who was not a livestock producer, expressed interest in the septic inspection, maintenance, repair and/or replacement cost share program. Of the remaining four surveys, two individuals were not interested and two did not respond to the question concerning septic systems. The results of the surveys are detailed in **Table 6.1** through **Table 6.3**.

Table 6.1 Survey results from Duck Creek Watershed Livestock Producers Meeting concerning livestock with direct access to stream.

Survey Respondent	Livestock with direct access to stream?	Indicate practices of interest related to livestock with direct access to stream	If no practices interest you, Why?
Producer 1	Yes	None of these practices interest me	I don't think my livestock impact the stream
Producer 2	Yes	Intensive livestock management; water sources and shade to detour livestock accessing stream; fence livestock from stream and install stream crossing	No answer
Producer 3	Yes	Fence livestock out of stream; intensive livestock management	No answer
Producer 4	No	Intensive livestock management	No answer
Producer 5	No	Intensive livestock management	No answer
Producer 6	No	No answer	No answer
Producer 7	No	No answer	No answer

Table 6.2: Survey results from Duck Creek Watershed Livestock Producers Meeting concerning manure application and management.

Survey Respondent	Manure Applied?	Interest in manure mgmt plan?	If no, Why?	Indicate practices of interest on land where manure is applied
Producer 1	Yes	No	My current plan is sufficient	Residue mgmt.; contouring (buffer strip); contouring (farming); field borders
Producer 2	Yes	Yes	No answer	Critical area planting; pasture and hay land

				planting
Producer 3	No	No answer	No answer	Residue mgmt.; filter strips; pasture and hay land planting
Producer 4	Yes	Yes	No answer	Grade stabilization structures
Producer 5	Yes	Have one	No answer	Pasture and hay land planting
Producer 6	No	No	No answer	No answer
Producer 7	No answer	No answer	No answer	No answer

Table 6.3: Survey results from Duck Creek Watershed Livestock Producers Meeting concerning septic inspection if cost share dollars were in place for inspection, maintenance, repair and/or replacement.

Survey Respondent	Interest in participating in voluntary septic inspection if cost share dollars were in place for inspection, maintenance, repair and/or replacement
Producer 1	Yes
Producer 2	Yes
Producer 3	Yes
Producer 4	No
Producer 5	No
Producer 6	No answer
Producer 7	No answer

From the livestock producers mailing, individual appointments and meeting we learned that face to face contact is most effective in gauging what practices and programs livestock producers are interested in participating in. The mailing that requested a call in response was ineffective. From the livestock producers meeting and survey we discovered there is little interest in fencing livestock out of the stream. Producers are concerned along stream fencing and non pastured stream corridors would require constant maintenance. Also, there is perception that livestock access is not affecting water quality in Duck Creek. **Additional outreach and financial incentives are needed to interest livestock owners in livestock exclusion.** There is more interest in manure management plans and the application of conservation practices on land where manure is applied than there is in livestock exclusion

from the stream. **Desired manure application management and site specific conservation practices will be presented to landowners during one-on-one meetings.**

ii. Youth input

On **January 8, 9 &10, 2010,** Clare Kerofsky and Partners of Scott County Watersheds Board members used their **booth at Bald Eagle Days, an environmental expo** that hosts 20,000-25,000 Quad City residents, to survey what youth valued about Duck Creek. Photographs of outdoor activities were on display and children were given three stickers to apply to the top three activities they valued along Duck Creek and its tributaries. One hundred and ninety-four children participated in the activity. The input was tabulated and the images and results are shown below in **Figure 6.1.**

Figure 6.1: Youth were shown these images and text and asked, "What uses do you value on Duck Creek?" The tabulated results are shown above.

Duck Creek is valued by Scott County youth for the recreational opportunities it already provides. **Projects along the creek will improve and expand on the recreational uses of the creek.**

ii. Surveys

In **February, 2010** an **online survey** was sent to an e-mail list of 400 individuals including individuals from federal, state, county and municipal agencies, corporations, businesses, college

and universities, environmental organizations, volunteers and concerned landowners and citizens. Eighty-three people completed the survey, a 20% response rate. **Figures 6.2** through **Figure 6.6** displays the results from the survey.

The survey sought to understand what individuals valued about Duck Creek, concerns individuals had about Duck Creek, perceptions of the impact of different sources on those concerns, and the interest people desired to have on future projects and programs on Duck Creek.

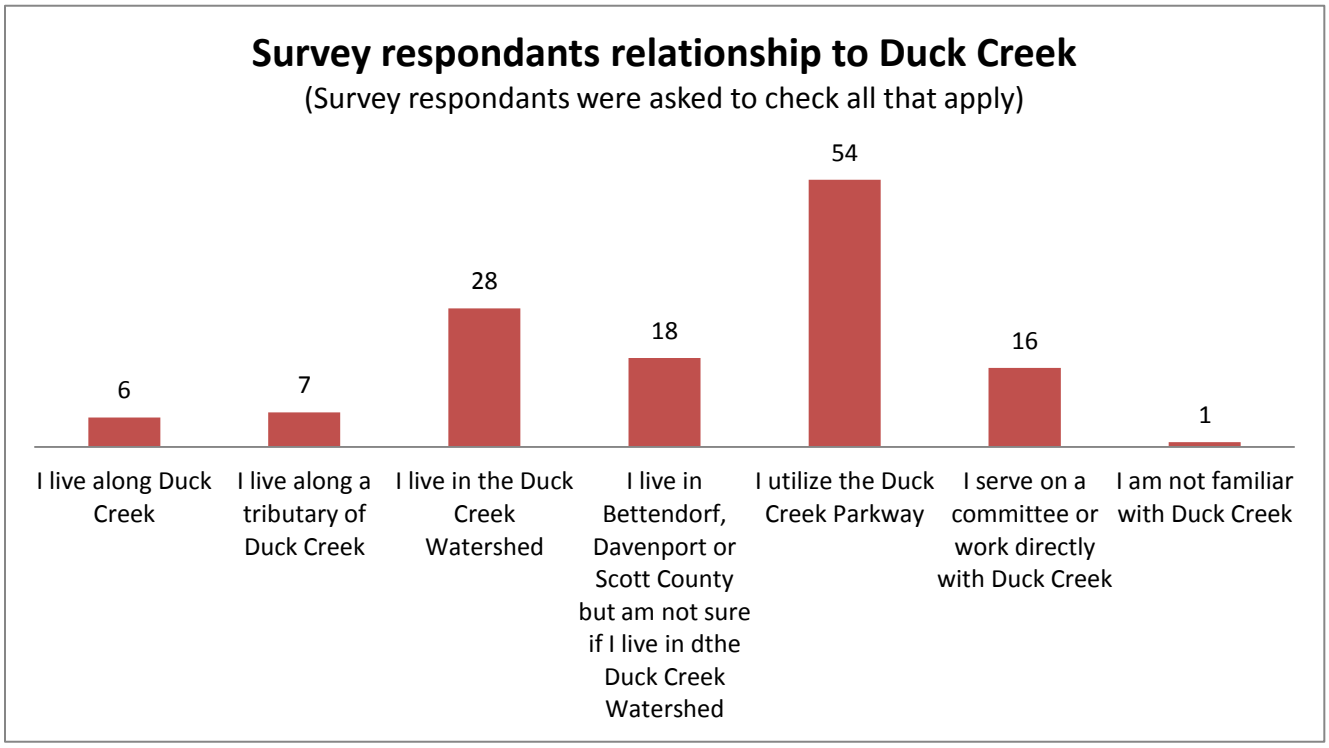


Figure 6.2: Those who took the survey were asked, "What is your relationship to Duck Creek?" The question sought to understand the connection those who took the survey had with Duck Creek.

a. Uses valued in and along Duck Creek

Near stream recreation (biking, hiking, walking pets) was valued most by survey respondents, followed closely by providing near stream habitat for wildlife (nesting areas, food sources and homes for wildlife). Below, **Figure 6.3** displays a bar graph with the results of each question concerning what uses are important to people along Duck Creek.

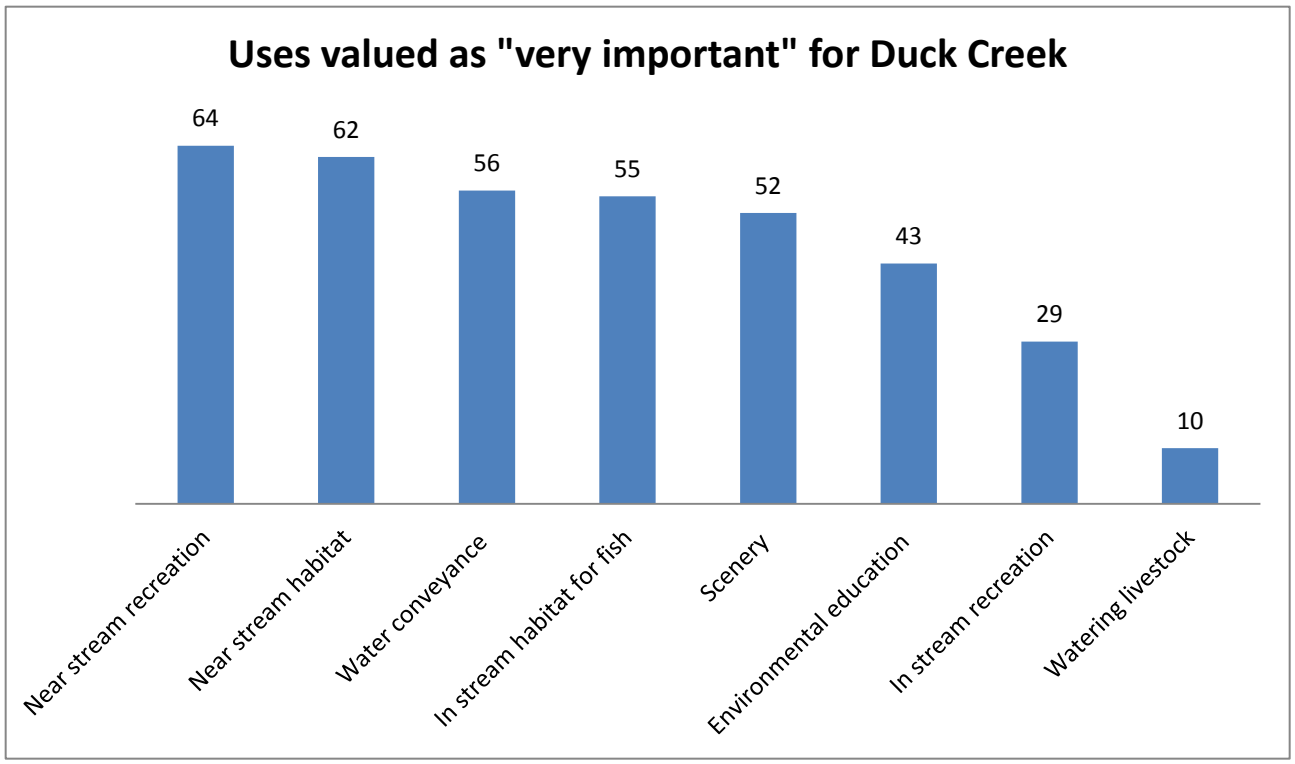


Figure 6.3: Those who took the survey were asked, "What uses are important to you in and along Duck Creek?" This figure shows how many people rated the listed uses as "very important". The question sought to understand what Duck Creek uses were of most and least value to individuals utilizing the creek.

b. Concerns with Duck Creek

Flooding, water quality and stream bank erosion were a serious concern of survey respondents. These three items were rated the highest out of all concerns and most survey respondents rated these three items of most concern with fewer than 5% considering them not a concern. The results of each question surveying concerns with Duck Creek are displayed below in **Figure 6.4.**

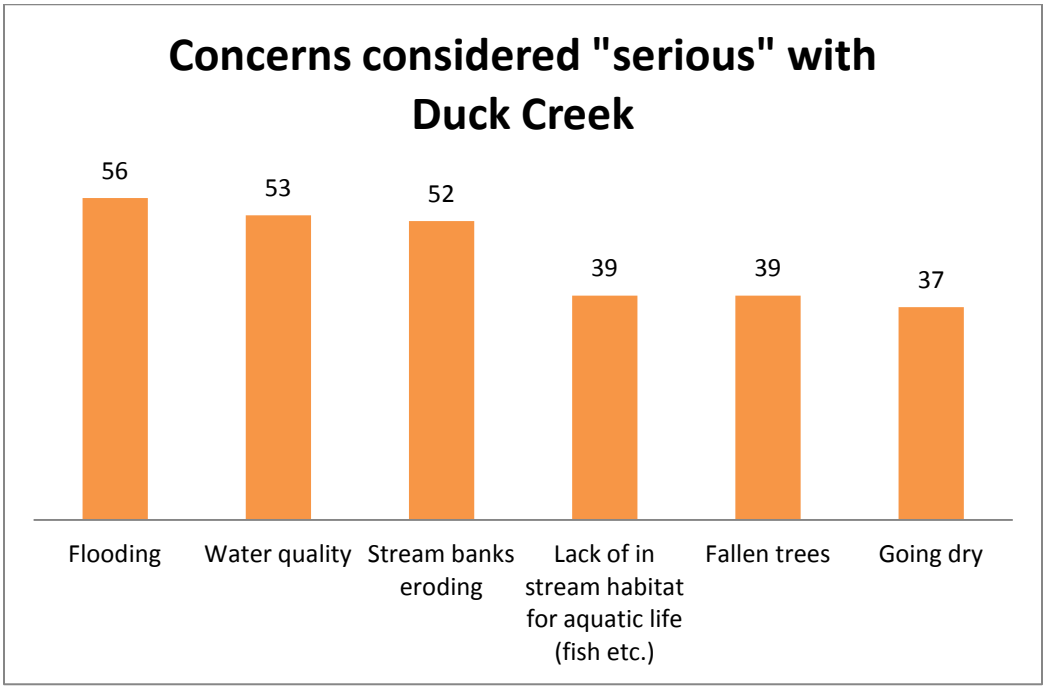


Figure 6.4: Those who took the survey were asked, "What concerns do you have about Duck Creek?" This figure shows how many people rated the listed concerns as "serious". The question sought to determine the top concerns of survey takers.

c. Causes of concerns with Duck Creek

Loss of natural areas, defined as areas that were present pre-European settlement, i.e. wetlands, prairies, forests was perceived as the most significant cause of concerns with Duck Creek. Urban land uses, agricultural land uses and rainfall, snowmelt and other weather related issues were all ranked as significant causes as well. The results of each question surveying causes of concern with Duck Creek are displayed below in **Figure 6.5.**

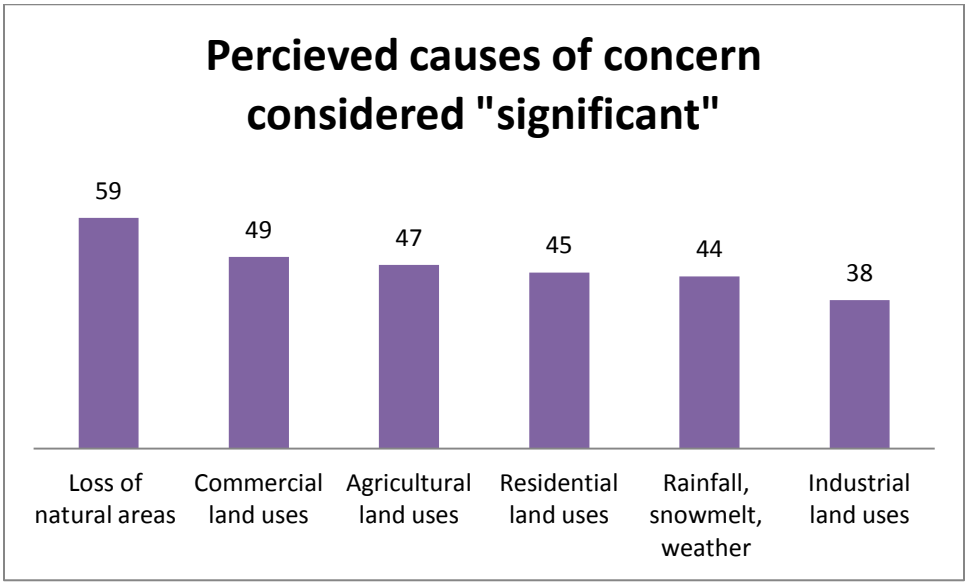


Figure 6.5: Those who took the survey were asked, "What do you think contributes to concerns with Duck Creek?" This figure shows how many people rated the listed concerns as "significant". The question sought to determine what was perceived as a cause of concerns with Duck Creek.

d. Interest in future Duck Creek activities

Most people were interested in receiving updates online, attending public meeting to provide input and assisting with activities. Respondents' interest in future Duck Creek activities is below in **Figure 6.6.**

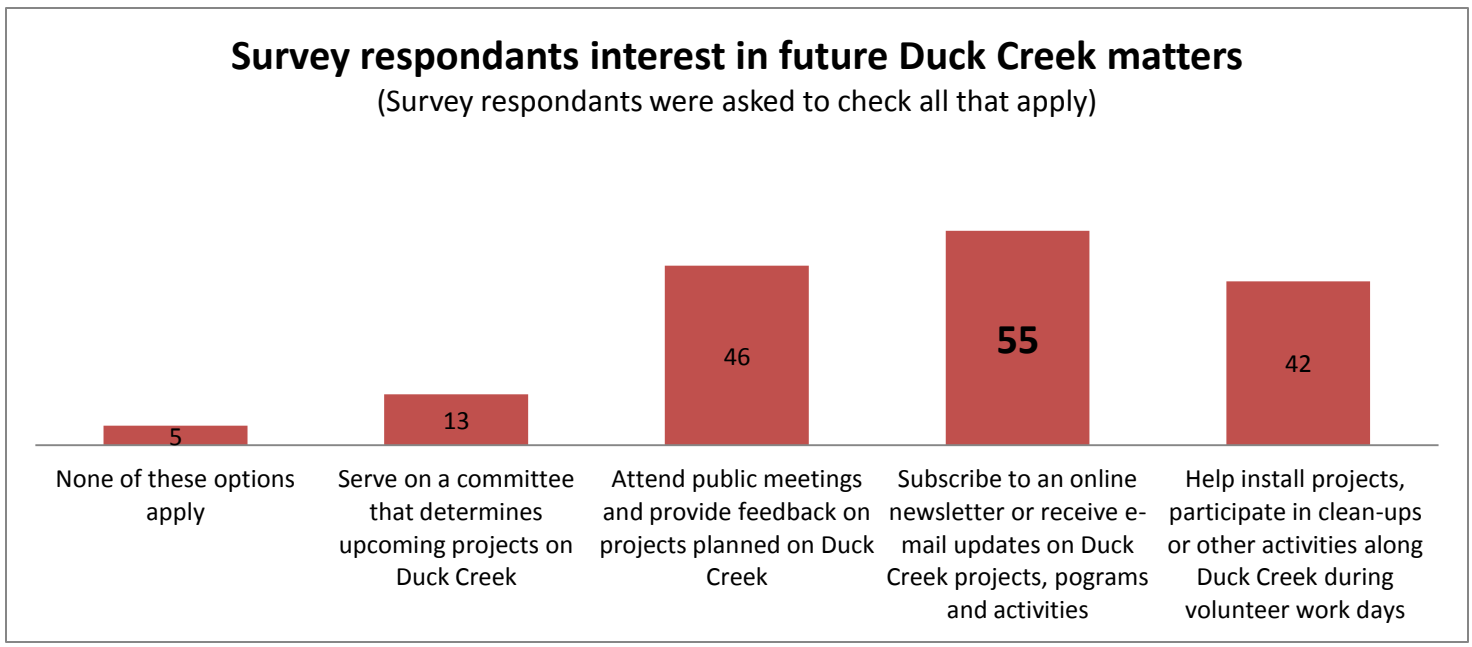


Figure 6.6: Those who took the survey were asked," What role would you like to play in developing Duck Creek?" The question sought to determine what level of involvement in Duck Creek projects and programs interested most survey takers.

Most survey respondents were urban Scott County residents who utilized the Duck Creek Parkway. Almost all the uses listed on the survey were rated "Very important" to residents. The existing along stream recreation (biking, hiking, walking pets) was considered very important to most respondents (77%). This reinforces that projects along the creek will improve and expand on the recreational uses of the creek. **This information also reveals that Duck Creek is valued for multiple purposes and all those factors (recreation, near stream and in stream habitat, scenery, environmental education) will be incorporated into projects along Duck Creek and in the watershed.** Providing water for livestock was not considered very important, likely because survey respondents were urban residents.

Much like the valued uses in and along Duck Creek, when asked about concerns with Duck Creek, most residents ranked all the concerns listed as "A serious concern". Of most concern to survey respondents were flooding (67%), water quality (64%) and eroding stream banks (63%). When asked about the perceived causes of concerns with Duck Creek, again, most residents ranked all the causes listed as "A significant cause". The causes considered significant to most residents were loss of natural areas (67%), commercial land uses (59%) and agricultural land uses (57%).

These results indicate that survey respondents have many concerns with Duck Creek. Some of these concerns are not related to the streams impairment. **Project implemented will address flooding, other water quality issues, stream bank erosion and habitat as well as the impairment**

Future and more specific surveying of watershed residents is needed to better understand the current level of understanding residents have about the impact of different land uses on the stream and to create an effective Duck Creek awareness and education campaign. The goal of a Duck Creek awareness and education campaign is to promote actions and behaviors that enhance and protect the creek. It is important for residents to understand their contribution to Duck Creek's concerns and what actions they can take.

When asked what role survey respondents desired to take in Duck Creek matters, most respondents wanted to be updated and informed on Duck Creek matters, provide feedback and assist with hands on projects. Most respondents did not want to serve on a committee that plans or decides upcoming projects. **Additional surveying will be conducted to determine how best to provide residents with Duck Creek information.** It is important to engage residents in the planning phase of Duck Creek projects and programs because it fosters ownership and

stewardship of projects and programs. Projects and programs that are created by the people are more likely to succeed. Because little interest was shown in "serving on a committee that determines upcoming projects on Duck Creek" **enticing, exciting, interactive tactics will be researched and used to engage the public in the planning process.**

VII. Pollutants

i. Stream Segment Designations and the *E. coli* bacteria impairment

In compliance with the Clean Water Act, the Iowa Department of Natural Resources (IDNR) assigns designated uses to surface waters in Iowa. These assigned designated uses determine the standard for water quality for each particular stream or river.

The 2008 Section 305 (b) water quality assessment, conducted by the IDNR, designates the downstream segment of Duck Creek (IA 01-NEM-0060_1) as Class A1 (primary contact recreation uses), Class B (WW2), (aquatic life uses), and Class HH (human health/fish consumptions). The 2008 Section 305 (b) water quality assessment, designates the upstream segment of Duck Creek (IA 01-NEM-0060_2) as Class B (WW2), (aquatic life uses) and presumptively as Class A1 (primary contact recreation uses).

It is anticipated the Use Attainability Analysis (UAA) conducted on Duck Creek in 2008 will change designations. The downstream segment of Duck Creek (IA 01-NEM-0060_1) is expected to change from Class A1 (primary contact recreation uses) to Class A3 (children's recreation). The UAA split the upstream segment of Duck Creek (IA 01-NEM-0060_2) into Class A3 (children's recreation) and A1 (primary contact recreation uses).

a. Duck Creek and the *E. coli* Bacteria Impairment

The 2006 and 2008 Section 305 (b) water quality assessment state that primary contact recreation Segment IA 01-NEM-0060_1 is "not supported" due to high levels of indicator bacteria (*E. coli*) that routinely violated state water quality standards. The 2008 305 (b) assessment also states the same for the presumptive Class A1 use for Segment IA 01-NEM-0060_2 (the next upstream segment).

b. Stream Segment Designations and state water quality standards for *E. coli* bacteria

It is important to note, the water quality standards for Class A1 and Class A3 are identical. Water quality standards for Class A2 (secondary contact recreation) are less stringent. Also, there are differences in stream segment boundaries used in the 305 (b) assessment and the UAA. The Total Maximum Daily Load (TMDL), a report detailed in the next section aimed at understanding the *E. coli* bacteria concerns of Duck Creek, was developed using the stream segments and designated uses from the 305 (b) assessment. Although the upper portion of the upstream reach of Duck Creek may eventually have a Class A2 designation with less stringent water quality standards, the short travel time to the downstream reach will require that the Class A1 and Class A3 standards be met in the upstream reach as well.

Table 7.1 summarizes the segments and designated uses as defined in the 305 (b) assessment and TMDL, compared with expected segments and designated uses of the UAA.

Table 7.1: Stream segmentation and designated use classifications

Segment	Location Description	Designated Uses
2008 305 (b)		
IA 01-NEM-0060_1 (Downstream)	From mouth at Mississippi River (S27, T78N, R4E) upstream to Hickory Grove Road (S16/21, T78N, R3E)	Class A1 Class B (WW2) Class HH
IA 01-NEM-0060_2 (Upstream)	From Hickory Grove upstream to unnamed tributary (SE ¼ S14, T78N, R2E)	Presumptive A1 Class B (WW2)
UAA		
IA 01-NEM-0060_1 (Downstream)	From mouth at Mississippi River upstream to Wisconsin Avenue (S17/S18, T78N, R3E)	Class A3 Class B (WW2) Class HH
IA 01-NEM-0060_2 (Upstream)	From Wisconsin Avenue to confluence with Unnamed Creek (SE ¼ S14, T78N, R2E)	Class A2 Class B (WW2)

Table 7.2 describes the designated use classes that apply to Duck Creek or could potentially apply in the future.

Table 7.2: Designated use classes for Duck Creek

Class Prefix	Class	Designated Use	Brief Comments
A	A1	Primary contact recreation	Supports swimming, water skiing, etc.
A	A2	Secondary contact recreation	Limited/incidental contact occurs, such as boating
A	A3	Children's contact recreation	Urban/residential waters that are attractive to children
B	B (WW2)	Warm water aquatic life-Type 2	Smaller streams where game fish populations are limited by physical conditions & flow
Other	HH	Human health	Fish are routinely harvested for human consumption

Table 7.3 shows the water quality standards for the designated uses of Duck Creek for *E. coli* bacteria during the primary contact recreation season, which runs from March 1-November 15. Standards do not apply outside of this time period.

Table 7.3: Bacteria Water Quality Standards

Designated Use	Geometric Mean	Sampling Maximum
Class A1 Primary contact, recreation uses		
March 15 - Nov 15	126 cfu/100 mL	235 cfu/100mL
Nov 15 - March 15	Does not apply	Does not apply
Class A2 Secondary contact, recreation		
March 15 - Nov 15	630 cfu/100 mL	2,880 cfu/100mL
Nov 15 - March 15	Does not apply	Does not apply
Class A3 Children's recreation		
March 15 - Nov 15	126 cfu/100 mL	235 cfu/100mL
Nov 15 - March 15	Does not apply	Does not apply

Figure 7.1 displays the Duck Creek's 305(b) segments and designated uses.

Figure 7.1 Duck Creek Watershed Map. 2008 305(b) Segments & Designated Uses

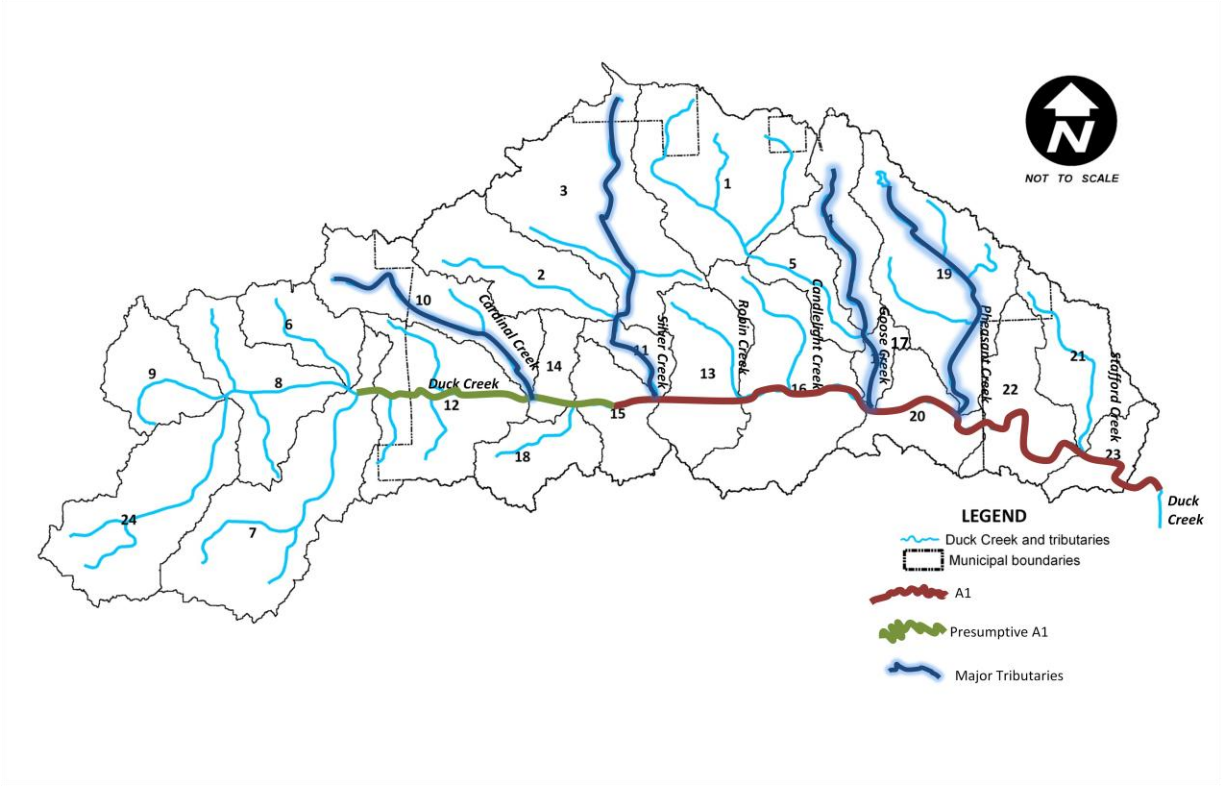
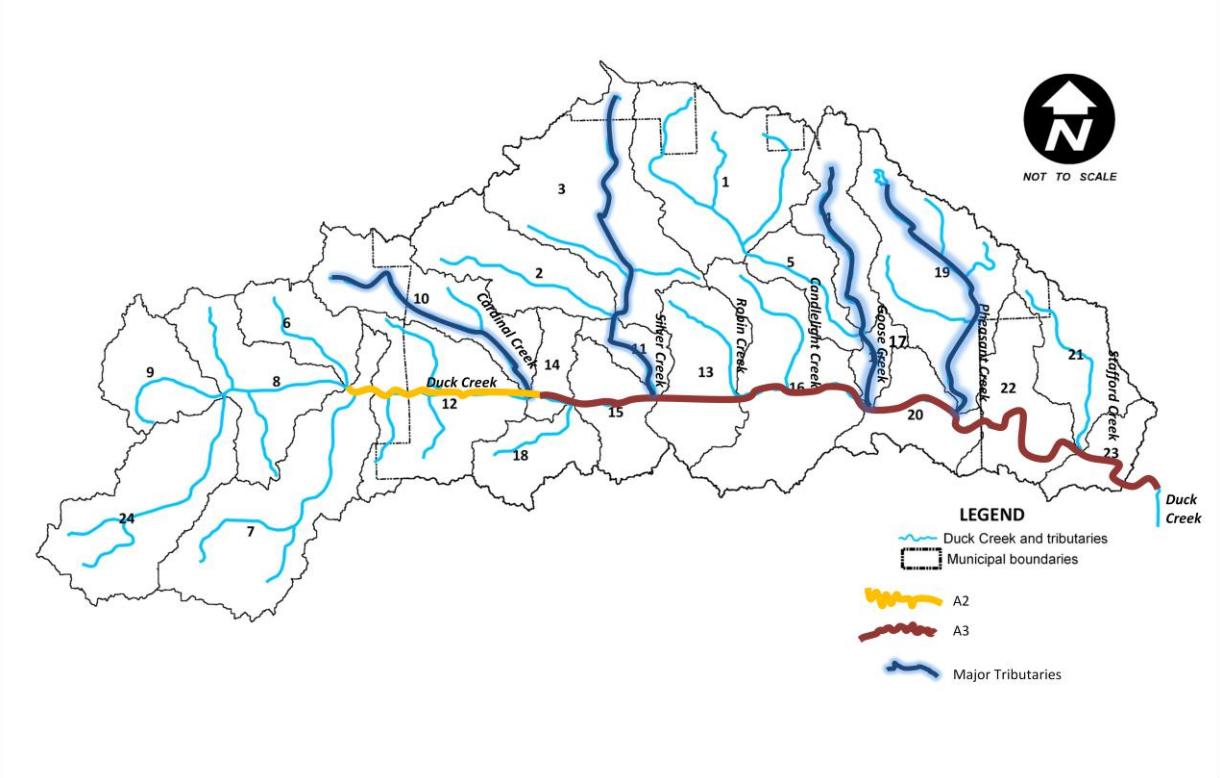


Figure 7.2 displays the Duck Creek's UAA segments and designated uses.

Figure 7.2 Duck Creek Watershed Map. UAA Segments & Designated Uses



c. *E. coli* bacteria impairment and TMDL/WQIP

The Federal Clean Water Act requires all states to develop a list of impaired waterbodies not meeting water quality standards and designated uses. This list of impaired waterbodies is referred to as the state's 303(d) list. Duck Creek is impaired for *E. coli* bacteria and is on the state's 303(d) list of impaired waters.

In addition to developing a 303(d) list, a Total Maximum Daily Load (TMDL) must be developed for each impaired waterbody included on the list. A TMDL is a calculation of the maximum amount of pollution that a waterbody can tolerate without exceeding water quality standards and impairing the waterbody's designated use.

Using data gathered weekly during the 2008 recreation season, IOWATER monitoring data results, land use, climate, flow, soils and other data, the IDNR created a Water Quality Improvement Plan (WQIP), which includes a TMDL for Duck Creek. Nine sites were sampled weekly from April to October and two 15 day sampling sessions were completed in the spring

and fall of 2008 on the three main branch locations during high and low flow events. **Figure 5.1** shows the locations monitored in 2008 (P. 16).

ii. Other pollutants, concerns and analysis

a. IOWATER Volunteer Water Quality Monitoring

IDNR's IOWATER Volunteer Water Quality Monitoring Program has been conducting "snapshots" on Duck Creek and its tributaries for seven years. A snapshot is when multiple sites throughout a geographic area are sampled within a short period of time. IOWATER snapshots are conducted on Duck Creek and its tributaries twice a year. Data collected includes; transparency, water temperature, pH, Nitrite, Nitrate, Dissolved Oxygen, Phosphate, Chloride and *E. coli* bacteria.

b. Soil & Water Assessment Tool (SWAT)

SWAT is a watershed-scale hydrology and water quality model developed by the U.S. Department of Agriculture to assess the impacts of land use and management practices on hydrology and water quality. SWAT is capable of simulating a variety of pollutants, including bacteria. SWAT modeling was conducted on the Duck Creek Watershed during the creation of the Water Quality Improvement Plan (WQIP). **Figure 5.1** shows the delineation of the subbasins using SWAT (P. 16).

c. Biological Snapshot

A biological snapshot will be organized on Duck Creek and its tributaries in the summer/fall, 2011 by the Partners of Scott County Watersheds and volunteers. Data collected will be implemented into the plan.

VIII. SOURCES DEFINED AND RECOMENDATIONS

Point sources and **nonpoint sources** contribute bacteria to Duck Creek. **Point source pollution** is pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels. Point sources are generally regulated by a federal National Pollutant Discharge Elimination System (NPDES) permit. **Nonpoint source pollution** comes from many diffuse sources. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into streams and other bodies of water. Nonpoint source pollution is not typically regulated by a permit.

Table 8.1 provides a chart of point and nonpoint source pollutants contributing bacteria to Duck Creek.

Table 8.1 Point and non point sources of bacteria pollution

Point sources of bacteria	• Onsite waste water treatment facilities (septic systems) under NPDES General Permit No. 4* discharging to a surface water
	• Three wastewater treatment facilities*
	• Sanitary sewer overflows (SSOs) not permitted by the City of Davenport's wastewater permit
	• Animal feeding operations (AFOs)*
	• Municipal separate storm sewer systems (MS4s) in the cities of Davenport and Bettendorf*
	  ◦ Illicit connections leading to dry weather flow from the storm sewer system
	  ◦ Growth and deposition of bacteria within the storm sewer system

Nonpoint sources of bacteria	• Onsite wastewater treatment facilities (septic systems) not covered by NPDES General Permit No. 4 and not designed to discharge to a surface water • Livestock with direct access to streams • Pasture land • Manure application to row crops

	• Urban miscellaneous sources
	  ◦ Build up of bacteria on urban land uses
	  ◦ Resuspension of bacteria from the stream bed
	  ◦ Undocumented wildlife deposition within the urban area
	• Pet waste
	• Wildlife

*****Permitted*

SOURCE DEFINED: On Site Waste Water Treatment Systems (Septic Systems)

Septic systems that discharge to a surface water and are permitted under NPDES (National Pollution Discharge Elimination System) General Permit No. 4 are a form of **point source pollution**. Septic systems that are not designed to discharge into a surface water and are not permitted under NPDES General Permit No. 4 are a form of **nonpoint source pollution.**

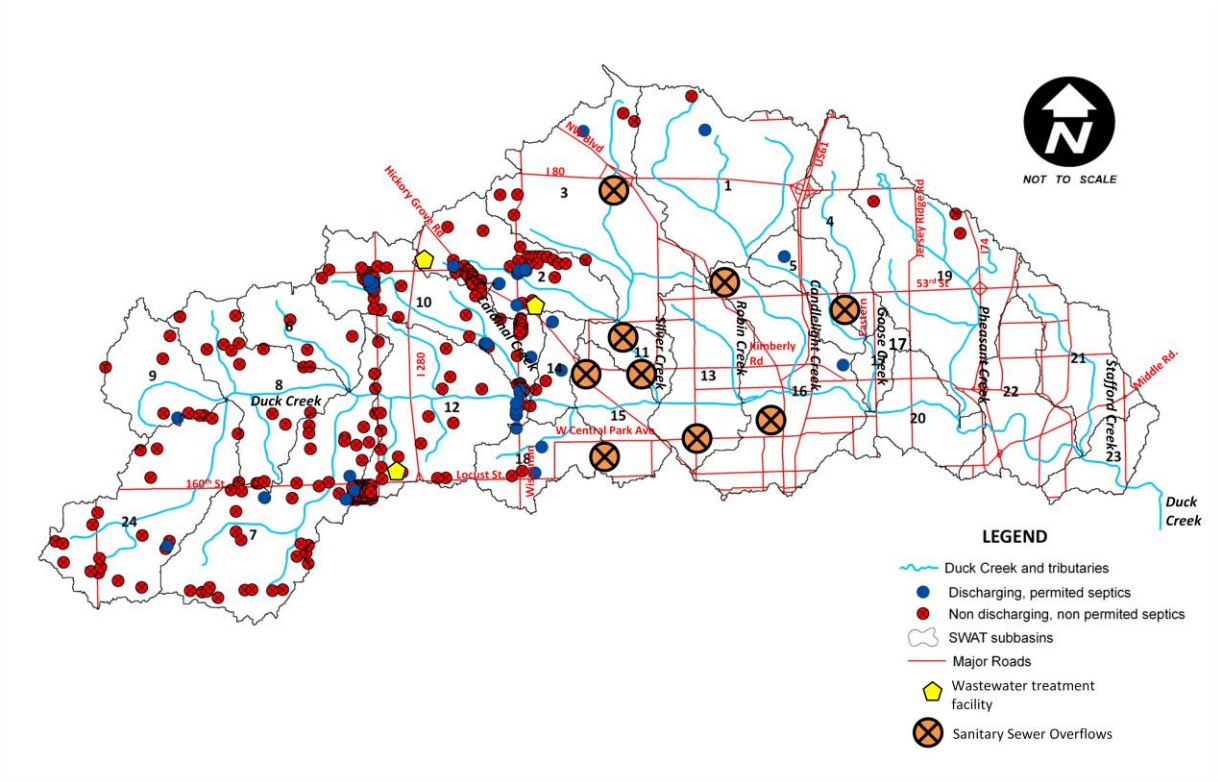
There are a total of 355 on site waste water treatment systems or septic systems in the Duck Creek Watershed.

Of these, 93 systems discharge to a surface water and are permitted under NPDES General Permit No. 4. These systems are inspected yearly by the Scott County Health Department. If the systems are failing, owners are responsible for their repair. Owners have 90 days to repair the system. Low interest loans are available for repair through the Iowa Department of Natural Resources and one bank in Scott County has made this loan available.

The other 262 systems in the watershed are not designed to discharge to a surface water, are not inspected annually and are not permitted under General Permit No. 4. Out of the 262 systems, a 10% failure rate is assumed (26 systems) (Larry Linnenbrink and Jack Hoskins, Scott County Health Department, 2010, personal communication).

Septic systems that are not properly functioning contribute bacteria to Duck Creek. **Figure 8.1** shows a map of the onsite waste water treatment systems (septic systems) in the watershed (next page).

Figure 8.1 Duck Creek Watershed Map. Septic systems, wastewater treatment facilities and sanitary sewer overflows



RECOMMENDATION: On Site Waste Water Treatment Systems (Septic Systems)

Concerning the 93 systems that discharge to a surface water and are permitted under NPDES General Permit No. 4, it is the responsibility of the Scott County Health Department and the homeowner to ensure these systems are properly functioning.

A local bank has been made the low interest loan available to residents with failing systems.

No inspection is required and no low interest loans or funding is available for homeowners with septic systems that are not permitted under the General Permit No. 4 and are not designed to discharge into a surface water. A program is needed to promote the inspection, maintenance, repair and or replacement of these systems.

A **cost share** will be put into place for the **inspection** of these 262 systems and for the **maintenance, repair or replacement of the estimated 26 systems** that are failing. Homeowners will be **identified** and sent a **direct mailing** to make them aware of program opportunities.

Everyone with a septic in the Duck Creek Watershed will be informed on their responsibilities and the resources that are available to them. **Workshops** will be conducted, *Making Septic Simple,* to improve the functioning of septic systems in the watershed.

Lastly, Chapter 69, section three of Iowa's Administrative Code states, *General regulations. a. Connections to approved sewer system. (1) No private sewage disposal system shall be installed, repaired, or rehabilitated where a publicly owned treatment works (POTW) is available or where a local ordinance requires connection to a POTW. The POTW may be considered as unavailable when such POTW, or any building or any exterior drainage facility connected thereto, is located more than 200 feet from any proposed building or exterior drainage facility on any lot or premises which abuts and is served by such POTW. Final determination of availability shall be made by the administrative authority.* **Local authorities will be made aware of their responsibility to enforce this regulation.** Local authorities will be made aware of this and other policies, programs and projects that would address Duck Creek's impairment and improve conditions on the creek through an awareness and education program aimed at local government officials. (See **Figure 8.6:** Target audiences, barriers, motivators/incentives, preferred delivery methods and evaluation measures).

SOURCE DEFINED: Wastewater treatment facilities (WWTF)

Wastewater treatment facilities are **point sources** of pollution. Wastewater treatment facilities are defined as a facility which treats wastewater for discharge to public waters according to the conditions of the facilities NPDES (National Pollution Discharge Elimination System) permit.

There are three wastewater treatment facilities in the Duck Creek Watershed, **West Locust Lagoon, West Kimberly Mobile Home Park, Lakewood Estates Mobile Home Park.**

The West Locust Lagoon wastewater treatment facility is a controlled discharge lagoon where wastewater is stored for approximately 180 days, with discharges occurring approximately twice a year in the spring and fall. A sample taken on 10/05/2009 showed *E. coli* levels at <1 CFU (Colony-forming unit)/ml, well below the standard.

The West Kimberly Mobile Home Park wastewater treatment facility is a continuously discharging facility where wastewater is discharged into a tributary to Duck Creek. The system is an activated sludge facility, a process in which sludge (accumulated, bacteria rich deposits from settling tanks or basins) is seeded into incoming wastewater. This mixture is then agitated with the presence of ample air supply. Solids are absorbed by the sludge and organic matter is oxidized by microorganisms.

The Lake Wood Estates Mobile Home Park wastewater treatment facility is a continuously discharging facility where wastewater is discharged into a tributary to Duck Creek. The system is a three cell aerated lagoon consisting of holding or treatment ponds where artificial aeration promotes the biological oxidation of wastewaters.

The three wastewater treatment facilities in the watershed are shown on **Figure 8.1.**

RECOMMENDATIONS: Wastewater treatment facilities (WWTF)

It is anticipated **future regulations** will address concerns with wastewater treatment facilities. Under the new NPDES permits for wastewater treatment facilities, **ALL** facilities will be **required to monitor for *E. coli* bacteria and comply with water quality standards for *E. coli*.** Limits will be set up by the NPDES Section of the IDNR to be consistent with the TMDL. It is likely the West Locust Lagoon will be able to meet the limits given to the facility because it is underwhelmed and because it is a controlled discharge lagoon. It is likely that West Kimberly Mobile Home Park and the Lake Wood Estates Mobile Home Park will need to disinfect to meet the *E. coli* bacteria limits. Disinfection is the treatment of the effluent from a wastewater treatment facility for the destruction of pathogens. It will be the responsibility of the owner of the facility to disinfect. Currently, West Kimberly Mobile Home Park is in violation of their current NPDES permit. A large amount of grey growth and other solids indicative of inadequately treated wastewater, frequent effluent violations and improper facility maintenance were noted in a letter to the owner dated March, 26th, 2010. Because the owner of the facility failed to submit an engineering evaluation, requested by the IDNR field office staff by June 1st, 2009 the matter was referred to the IDNR legal staff for review and appropriate action on October 15th, 2009. An order was issued in August, 2010 by the IDNR legal staff to the owner of the facility requiring an engineering report be submitted to the IDNR by September 30, 2010 and an administrative penalty of $4,000 was assigned.

As of July, 2010 (9 months later) no action has been taken by the IDNR legal department. **It is the responsibility of the plan implementer, the Duck Creek Watershed coordinator, to follow up on this issue and other issues like it.**

The West Locust Lagoon, West Kimberly Mobile Home Park and the Lake Wood Estates Mobile Home Park renewal applications have been received by the NPDES Section of the IDNR. Permit issuance is delayed pending approval of stream designations. The IDNR has made recommendations for stream designation changes and they are being reviewed by the Environmental Protection Agency. Until these designations are agreed upon and approved, these wastewater facilities will continue to operate under their current permit, which has no *E. coli* bacteria limits. **It is the responsibility of the plan implementer, the Duck Creek Watershed coordinator, to follow up on this issue, as well, and other issues like it.** It is pertinent the

coordinator stays abreast on these issues in order to let other agencies know the value of these regulations to Duck Creek and its stakeholders and in order to update Duck Creek Watershed stakeholders about the status of changing regulations.

SOURCE DEFINED: Sanitary sewer overflows (SSOs) not permitted by the City of Davenport's wastewater permit

Sanitary sewer overflows are a **point source** of pollution. Nine sanitary sewer overflows (SSOs) have been identified in the Duck Creek Watershed. Sanitary sewer overflows are unintentional discharges by municipal sanitary sewers often due to rainfall events. These discharges put wastewater directly into Duck Creek and its tributaries. Sanitary sewer leaks and breaks are of the same concern.

Nine known sanitary sewer overflows in the watershed are shown in **Figure 8.1.**

RECOMMENDATIONS: Sanitary sewer overflows (SSOs) not permitted by the City of Davenport's wastewater permit

Under the municipalities NPDES permit, SSOs, sanitary sewer leaks and breaks must be **reported by the municipality within 24 hours and repaired with 21 days where feasible**. If the repair is not feasible, municipalities must provide the IDNR with a plan to repair them (City of Davenport's NPDES Permit)

The City of Davenport's recent sanitary sewer rate increase will assist with the repair of the identified SSOs. It is possible additional SSOs exist in the watershed. Identification of these SSOs is necessary in addressing the *E. coli* bacteria impairment on Duck Creek. **Additional monitoring is needed to identify all illicit discharges that allow wastewater to enter Duck Creek and its tributaries**. (See the **MONITORING** portion of the plan for recommendations for locating SSOs).

SOURCE DEFINED: Animal Feeding Operations (AFOs)

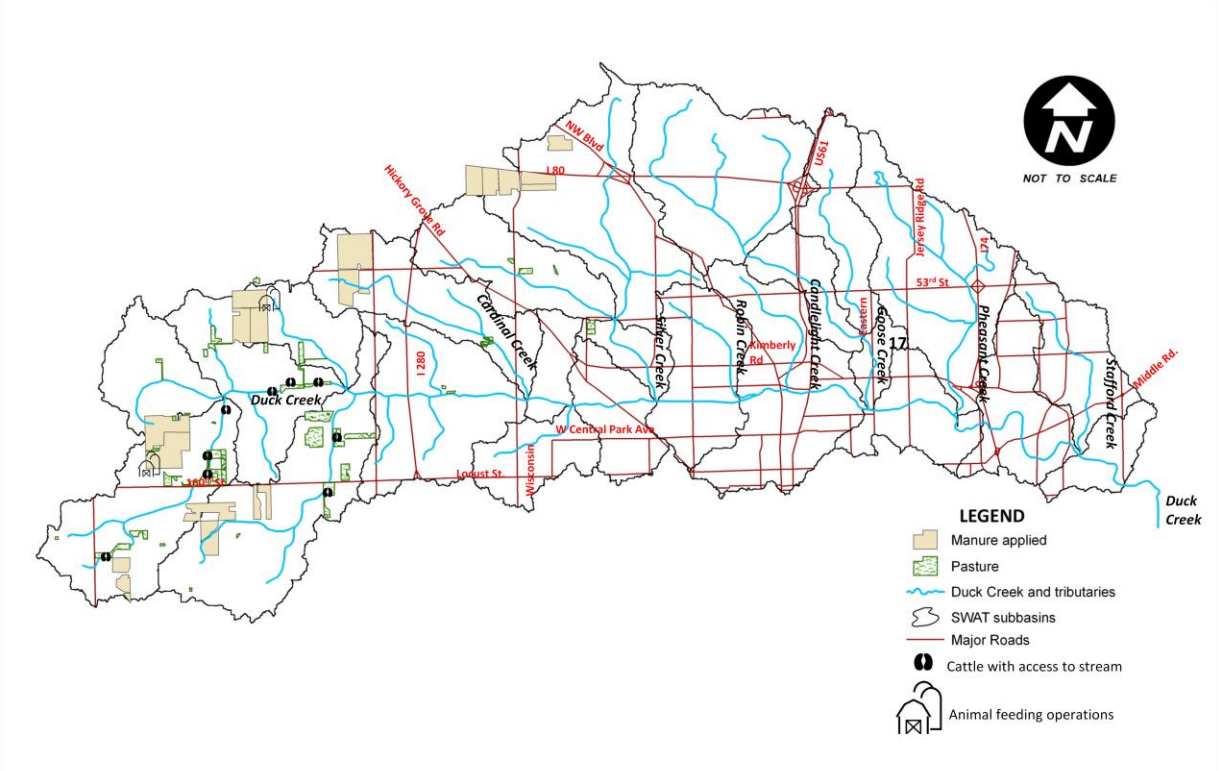
An animal feeding operation (AFO) is a **point source** of pollution. An AFO is an agricultural facility where animals are kept and raised in confined situations. There are two permitted Animal Feeding Operations (AFOs) in the watershed. Both house approximately 1500 swine, include a production area (confinement building) and a storage structure for waste (below building pits). The main aspect of AFOs that contributes bacteria to Duck Creek is the application of manure onto cropland.

The two AFOs in the watershed are identified in **Figure 8.2.**

RECOMMENDATIONS: Animal Feeding Operations (AFOs)

Both AFOs in the Duck Creek Watershed are permitted by the IDNR. Regulations under their permits do not allow the facility itself to contribute bacteria to stream. Both AFOs also have an IDNR approved nutrient management plan. Their contribution of *E. coli* bacteria to Duck Creek can be reduced through a more intensive nutrient management plan (See **Manure application to row crop).**

Figure 8.2 Duck Creek Watershed Map. Agricultural sources of bacteria



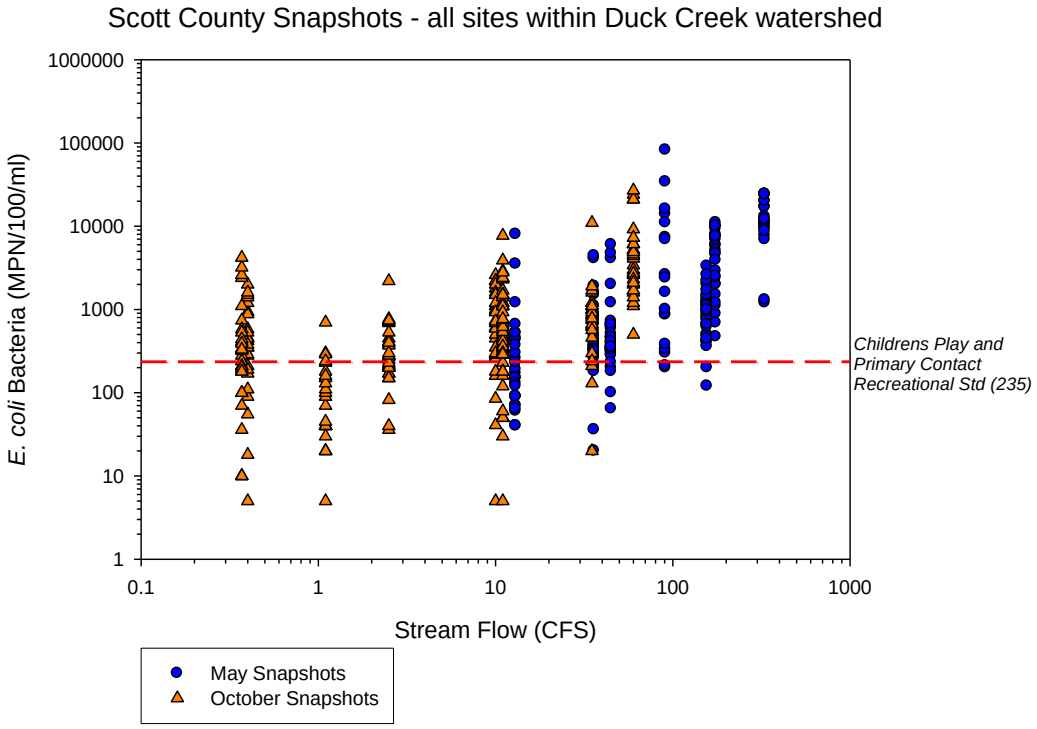
SOURCE DEFINED: Urban Miscellaneous

When bacteria from urban miscellaneous sources are on the land, it is considered **nonpoint source pollution**. When bacteria from urban miscellaneous sources enter the municipal separate storm sewer systems, it becomes **point source pollution**. Urban miscellaneous sources include nonpoint sources (build up of bacteria on urban land uses, resuspension of bacteria from the stream bed, pet waste and undocumented wildlife deposition within the urban area) and point sources (illicit connections, sanitary sewer overflows and growth, deposition, and resuspension of bacteria in storm sewer systems).

Urban miscellaneous sources are carried by storm water, off urban land uses, into municipal separate storm sewers and into Duck Creek.

According to the Water Quality Improvement Plan/Total Maximum Daily Load for Duck Creek, *E. coli* levels are generally higher during wet weather and concentrations appear to be correlated with flow (WQIP/TMDL P. 32). The seven years of semi-annual data collected on Duck Creek shows similar results. **Table 8.2.** indicates that high bacteria levels do generally occur during high flow conditions. This suggests nonpoint source pollution has a significant impact on bacteria levels (Lynette Seigley, IDNR, IOWATER, 2010). In order to address *E. coli* bacteria input from urban miscellaneous sources, natural hydrology (a hydrology pattern of infiltration) must replace the current runoff driven hydrology pattern.

Table 8.2. *E. coli* bacteria monitoring results and stream flow within the Duck Creek Watershed from seven years of IOWATER Water Quality Monitoring Data



Urban miscellaneous sources contribute 99% of the bacteria load at DC-12 and 95% of the bacteria load at DC-10 during high flow conditions. A 97.6% reduction is needed at DC-12 and a 96.9% reduction is needed at DC-10 during high flow conditions (WQIP/TMDL, 2009, P. 81, 83-84).

RECOMMENDATION: Urban Miscellaneous

To achieve this reduction natural hydrology will be restored in the watershed. Reducing stormwater runoff volumes from urban areas will prevent bacteria from entering the stream. Runoff will be reduced from **existing urban land use** and **new development** by retrofitting existing urban land use with infiltration practices and by promoting policies that require new development to install infiltration practices.

Infiltration practices (i.e. rain gardens, bioretention cells, bioswales, pervious paving and soil quality restoration) are designed to take on the regional rainfall average (1.25") which carries the most pollutants and reduce bacteria up to 100% from stormwater that enters the practice.

Reducing runoff through the use of infiltration practices will have multiple benefits to Duck Creek. In addition to the reduction of bacteria in the stream, infiltration practices reduce runoff volume, flood levels and occurrences, reduce the delivery of other pollutants such as fertilizers, herbicides, insecticides, oil, grease, toxic chemicals, salt and sediment, and reduce stream bank erosion.

Existing Development

Existing development will be **retrofit with infiltration practices.** Infiltration practices are detailed below and listed with their pollutant load reductions in **Table 9.4.**

Rainscapingiowa.org

Bioretention Cells, Bioswales and Rain Gardens: Bioretention cells, bioswales and rain gardens are shallow, landscaped depressions. Stormwater runoff collected in the upper layer of the system is filtered through the mulch layer, surface vegetation, pervious soil layer, and then, in the case of bioretention cells and swales, stored temporarily in a stone aggregate base layer where it slowly infiltrates into sub soils or exits through a subdrain. **Provides up to a 100% reduction in bacteria to stormwater that enters the practice.**

Rainscapingiowa.org

Permeable Paving: Permeable pavers are installed over a gravel base course that provides storage as runoff infiltrates through the permeable paver system into underlying permeable soils or exits through a subdrain. Modular permeable pavers are structural units, such as concrete blocks, bricks, or reinforced plastic mats, with regularly inter-dispersed void areas used to create a load-bearing pavement

surface. The void areas are filled with permeable materials (small chip or grass turf) to create a system that allows for the infiltration of stormwater runoff. Permeable pavers provide water quality benefits in addition to groundwater recharge and a reduction in stormwater volume. The use of permeable pavers results in a reduction of impermeable area on a site. **Provides up to a 100% reduction in bacteria to stormwater that enters the practice.**

Rainscapingiowa.org

Pervious Concrete and Asphalt Pavement: Pervious concrete is the term for a mixture of coarse aggregate, cementitious materials, admixtures, and water that allow for rapid infiltration of stormwater and overlays a stone aggregate reservoir. Pervious Asphalt Pavement is the term for a mixture of coarse aggregate and asphalt binder materials. An aggregate subbase reservoir provides temporary storage as runoff infiltrates into underlying permeable soils and/or out through an underdrain system. **Provides up to a 65% reduction in bacteria to stormwater that enters the practice.**

Rainscapingiowa.org

Soil Quality Restoration: The process of reducing compaction, increasing pore space, improving organic matter content, and re-establishment of soil dwelling populations (microbes, worms, insects, etc). Healthy soils have tremendous capacity for infiltrating and storing water. Healthy soils also have active microbial life that will breakdown and utilize many pollutants moving in urban non-point runoff. Soil quality restoration helps urban landscapes absorb, infiltrate and purify runoff. **Provides up to a 100% reduction in bacteria to stormwater that enters the practice.** (Iowa Statewide Urban Design and Specifications, Iowa Stormwater Management Manual, www.lowasudas.org,accessed 1 April 2011)

To achieve the needed 97.6% reduction in bacteria needed to meet the standard, specified in the WQIP/TMDL for Duck Creek with the data available as of 2011, 55,150,219 square feet of infiltration practice is needed, an estimated cost of $827,253,285. **Table 8.3.** displays a breakdown of the square feet of impervious surface in each SWAT subwatershed, the square feet of infiltration practice needed to infiltrate the regional rainfall average or “first flush” and the estimated cost to retrofit 100% of the impervious surfaces in the watershed with infiltration practices that infiltrate the regional rainfall average or “first flush’.

To determine the amount of impervious surface in the watershed, Duck Creek's land uses were separated into residential, commercial, industrial, institutional, recreational uses and roads and transport. Each land use was assigned a percent impervious surface determined using visual inspection of aerial photographs and drive through's of the watershed.

Next, 10% of the impervious surface (assumed amount of infiltration practice needed) was multiplied by $15 (the average cost for an infiltration practice per/square foot) (Wayne Petersen, Iowa Department of Agriculture and Land Stewardship, 2010, personal communication). These totals revealed cost estimates for retrofitting existing developed areas in the Duck Creek Watershed with practices that would infiltrate a 1.25" rain (the regional average rainfall and the "first flush" containing the most pollutants).

The International Stormwater Database's Fecal Indicator Bacteria Report recommends, *"Those working to address pathogen impairments on streams should focus first and foremost on source controls. This requires clear identification of the primary sources of fecal indicator bacteria relative to site-specific conditions. Focusing on controllable sources of bacteria, particularly those of human origin, is believed to be the most important first step in protecting human health* (Clary, et al. 2010). This nine year plan focuses foremost on addressing the controllable sources of bacteria including; non-permitted onsite wastewater treatment facilities (septic systems) not designed to discharge to a surface water, livestock with direct access to streams, pasture, manure application to row crops and pet waste.

The report goes on to say *"…source control alone may not be sufficient to meet ambient water quality standards"* and *"In terms of reducing overall bacteria loads to receiving waters, site designs and individual BMPs that reduce runoff volumes should reduce bacteria loading from urban runoff* (Clary, et al. 2010). Runoff volume will be reduced through the installation of infiltration practices (BMPs) initiated in the first nine years and becoming the main focus after the evaluation of this plan after year 9 for a time to be determined during that evaluation in year 2019.

To be cost efficient, Very High and High priority SWAT subbasins will be the focus of initial efforts. These subbasins have 1) the highest *E. coli* load delivered to the creek, 2) the most run off shed and 3) few other bacteria sources (i.e. septic systems, wastewater treatment facilities, livestock etc.). **Table 8.3.** shows critical urban SWAT Subbasins prioritized in this manner using the maps from **Figure 8.3 and 8.4** and other maps of the watershed that show specific sources of bacteria. The table also displays the square feet of impervious surface, square feet of infiltration practice needed to infiltrate the regional rainfall average or first flush and the total cost to install the infiltration practices.

Table 8.3. Critical urban SWAT subbasins prioritization table

SWAT Subbasin/Priority	Square feet of impervious surface	Square feet of infiltration practice needed to infiltrate regional rainfall average or first flush	Total Cost Estimate (approx. $15 /square foot)
15 (Very High)	27,486,202	2,746,621	$41,199,315
21 (Very High)	41,144,847	4,114,485	$61,717,275
23 (High)	14,052,342	1,405,234	$21,078,510
17 (High)	9,074,166	907,417	$13,611,255
16 (High)	70,452,265	7,045,227	$105,678,405
22 (Medium)	40,798,025	4,079,803	$61,197,045
5 (Medium)	20,932,402	2,093,240	$31,398,600
11 (Medium)	11,560,149	1,156,015	$17,340,225
20 (Low)	21,006,926	2,100,693	$31,510,395
19 (Low)	80,732,164	8,073,216	$121,098,240
13 (Low)	40,523,838	4,052,384	$60,785,760
18 (Low)	18,973,363	1,897,336	$28,460,040
4 (Very Low)	36,137,523	3,613,452	$54,201,780
3 (Very Low)	48,362,850	4,836,285	$72,544,275
1 (Very Low)	70,265,127	7,026,512	$105,397,680
TOTALS:	**551,502,189**	**55,150,219**	**$827,253,285**

Figure 8.3 and 8.4 were created using the SWAT model. The models identify the subbasins that are delivering the most *E. coli* bacteria in organisms per acre per day on average during the recreation seasons from 2003-2008 and the largest volume of runoff measured in depth of runoff in inches per acre from April to November of 2003 through 2008 to Duck Creek.

These practices will be installed by making **technical and financial assistance** available and will be promoted through an accompanying **awareness, education and marketing** (detailed in **AWARENESS, EDUCATION & MARKETING).**

Subwatersheds 15, 21, 23, 17 & 16 have the fewest other sources (i.e. agricultural land use, septic systems, wastewater treatment facilities, sanitary sewer overflows) yet the SWAT model has these subwatersheds delivering the most bacteria and flow to Duck Creek. IOWATER Snapshot data and samples collected by the Iowa Department of Natural Resources and the Scott County Soil and Water Conservation District confirm these tributaries have some of the highest *E. coli* bacteria levels in the watershed. Subwatersheds 15, 21, 23, 17 & 16 are the top candidates for the implementation of an urban program that offers technical and financial

assistance for the implementation of infiltration practices and is accompanied by an awareness, education and marketing campaign to promote the installation of infiltration practices.

Figure 8.3 Duck Creek Watershed Map. *E. coli* load delivered to creek, 1E+09 organisms/acre/day on average during the recreation seasons from 2003-2008

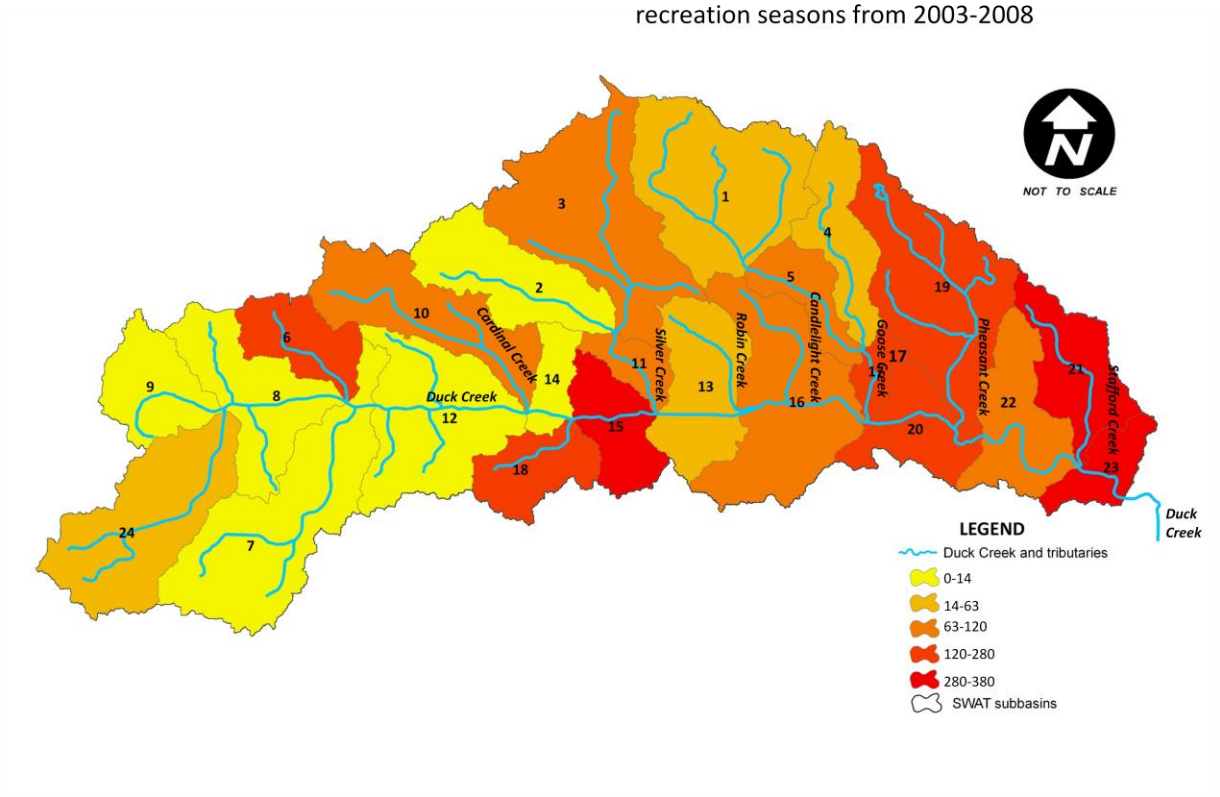
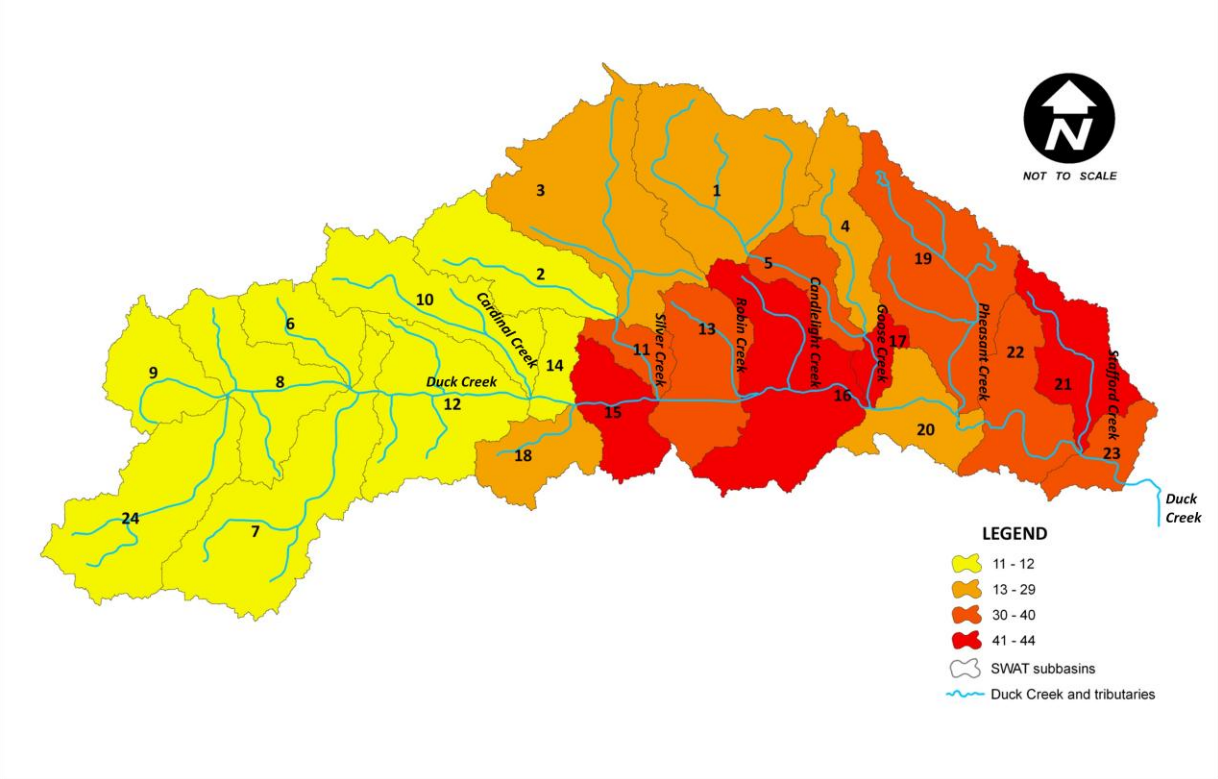


Figure 8.4 Duck Creek Watershed Map. Depth of runoff, inches per acre from April through November of 2003-2008



An urban watershed coordinator to provide **technical assistance** will be made available to residents in the Duck Creek Watershed or targeted subbasins in the watershed. The Blue Thumb campaign reported that when surveyed, *most residents who installed infiltration practices did so because of the technical assistance provided to them through the program rather than the financial assistance available* (Jay Riggs, Washington County Minnesota Conservation District, 2009, Iowa Water Conference).

Financial assistance will be in place to assist residents in installing these practices. Cost share funding available to residents has proved successful in Scott County. Since the Scott County Urban Initiative began in 2008, 74 projects have been installed. This has been accomplished without funding for awareness, education and marketing campaigns. Cost share had been offered to promote the installation of conservation practices on agricultural lands since the 1930's in response to the Dust Bowl and Great Depression. The cost share will offer 75% up to $4,000 for the implementation of infiltration practices listed in **Table 9.4.** that infiltrate at least 75% of the properties runoff. This is an increased incentive from the existing cost share available in Scott County for urban infiltration practices which is 50% up to $2,000.

New Development

The high cost of retrofitting existing urban land uses is motivation to require new development to install infiltration practices and use **Low Impact Development** techniques. Installing demonstration projects and including information about infiltration practices, Low Impact Development and ordinances that require infiltration of rain in education to local governments, Scott County home and business owners, contractors and homebuilders will increase the amount of infiltration practices installed to reduce runoff and bacteria delivery to Duck Creek.

No post construction stormwater requirements are in place at the state level (Joe Griffin, Iowa Department of Natural Resources, 2010, personal communication). The cities of Davenport and Bettendorf have post construction stormwater requirements for detention, which may have benefits in reducing flooding and bank erosion but have little to no water quality benefit. The existing requirements for new development or the expansion of existing development are as follows:

City of Davenport New Development Detention Requirements

All residential development of five acres or more and all commercial and industrial developments in excess of one acre located within the designated areas (within in the Silver Creek, Goose Creek, Pheasant Creek, Blackhawk Creek and Duck Creek Watersheds) or any development which, in the opinion of the city engineer, lacks an adequate external or internal system for the passage of stormwaters are required stormwater detention. Stormwater detention shall handle the runoff of a one hundred-year rainfall. Adding impervious surface to an existing development requires additional detention, as well.

City of Bettendorf New Development Detention Requirements

All residential development of five acres or more and all commercial and industrial developments in excess of one acre located within the designated areas on the drainage basins for Crow Creek, Spencer Creek, Pigeon Creek (East and West Forks) and Mississippi River or any development which, in the opinion of the city engineer, lacks an adequate external or internal system for the passage of stormwaters are required stormwater detention. Stormwater detention shall handle the runoff of a one hundred-year rainfall. Adding impervious surface to an existing development requires additional detention, as well.

Requiring infiltration in new development has multiple benefits to water quality, flooding and stream bank erosion. The Wisconsin Department of Natural Resources (WDNR) has an ordinance that will be used to model an ordinance in the cities of Davenport and Bettendorf to reduce the impact of new development in the Duck Creek Watershed. NR 151 is Wisconsin's

post-construction standards. The infiltration standard requires residential development to infiltrate 90% of the average annual predevelopment infiltration volume or 25% of the 2-year, 24 hour storm. Non residential development is required to infiltrate 60% of the average annual predevelopment infiltration volume or 10% of the 2-year, 24 hour storm.

SOURCE DEFINED: Livestock with direct access to streams and tributaries and pasture land

Livestock with direct access to streams contribute to bacterial pollution by defecating in the stream. Livestock trample and consume vegetation on stream banks. This vegetation protects the stream banks from erosion and slows and removes bacteria, nutrients, sediment and other pollutants from runoff. This is considered a **nonpoint source** of pollution.

There are nine locations in the watershed where livestock directly enter Duck Creek or a tributary. Approximately, 216 livestock have access to the stream on 244 acres of streamside pasture. These locations are shown on **Figure 8.2.** Livestock are grazed in these narrow pastures along the stream because the land is not suited for row crop and because the stream serves as an easy method to water livestock. There is an additional 261 acres of pasture on 21 locations in the watershed where livestock do not have direct access to the stream. These locations are shown on **Figure 8.2.** as well.

RECOMMENDATIONS: Livestock with direct access to stream and tributaries and pasture land

Livestock exclusion provides a 100% reduction of bacteria delivered to the stream from this source. This is accomplished through exclusion fencing and the installation of alternative watering facilities or the relocation of cattle to another area and the conversion of the streamside pasture to an alternative use, such as vegetated filter strips or riparian buffers. Other tactics such as implementing intensive livestock management (using temporary fencing to rotate livestock on sections of streamside pasture and improving pasture grass cover), installing fencing and stream crossings for livestock to cross stream pastures and installing alternative watering sources and shade on streamside pasture are less effective strategies for reducing livestock's impact on the *E. coli* bacteria impairment.

There is resistance among cattle producers to exclude livestock from the stream. Perceptions exist that livestock don't have an impact on the *E. coli* bacteria impairment of Duck Creek. Duck Creek is prone to flooding, which delivers debris downstream. There is concern that exclusion fencing and stream crossings would have to be constantly repaired. Relocating cattle would involve converting another land use, likely row crop, into pasture. Scott County has the highest county average for farmland value in the state **(www.extension.iastate.edu)**. Because Scott County farmland is so valuable, soil is productive and slope gentle there is reluctance to convert existing cropland into pasture. Intensive livestock management involves additional labor in

shifting the temporary fencing and there is concern that this will also need constant repair from Duck Creek's flooding and debris. Most pastures along the stream are narrow and installing exclusion fencing and alternative water facilities is perceived by some as futile. Research has not been conclusive on the success of providing shade and an alternative watering source in cattle reduction in the stream in narrow pastures.

Livestock exclusion from the stream is the aim of the Duck Creek Watershed Management Plan. The first step to achieving livestock exclusion goals in the watershed is to make livestock producers aware of the benefits of these practices to their economic objectives as well as the Duck Creek Watershed Management Plan's environmental objectives. Livestock exclusion will be recommended to livestock producers as part of a pasture improvement plan which seeks to meet the producer's operational goals and the Duck Creek Watershed Management Plan's environmental goals. Elements of a pasture improvement plan will include; implementing intensive livestock management (using temporary fencing to rotate livestock on sections of streamside pasture and improving pasture grass cover), installing fencing and stream crossings for livestock to cross stream pastures and installing alternative watering sources and shade on streamside pasture.

Awareness and education will be accomplished by conducting **pasture workshops** with Iowa State University Extension and Natural Resources Conservation Service (NRCS) Staff in the watershed. One workshop will be conducted a year. It is also necessary that the Duck Creek Watershed coordinator with NRCS staff continue to conduct **individual meetings** with livestock producers in the watershed to inform them of specific programs and associated incentives, cost share and annual payments applicable to their operations goals.

Cost share and an **incentive** will be offered to livestock owners to fence livestock from out of the stream. Livestock producers will receive 75% cost share on fence, alternative watering sources and stream crossings and an incentive payment to implement the fence. Watershed Implementation Grants, Environmental Quality Incentives Program (EQIP), Water Protection Fund (WPF) and the Watershed Protection Program Fund (WSPF) are sources of funding that provide cost share funding. The incentive payment is derived using the Ag Decision Maker on the Iowa State University Extension website for Computing a Pasture Rental Rate. Livestock producers with livestock that have direct access to the stream will receive 5 years of pasture rental rate ($235 per 200' of fence installed) in a lump sum for installing and maintaining fence for five years. Any producer who wishes to discontinue livestock operations along the stream, relocate cattle to another area and convert streamside pasture to an alternative use, such as vegetated filter strips or riparian buffers will also receive the lump sum of a 5 year pasture rental rate in addition to other annual payments from programs such as the Conservation Reserve Program (CRP).

Other livestock producers in the watershed will be targeted for improvements as well. The 261 acres of pasture in the watershed that is not located along the stream also has an impact on the bacteria levels of Duck Creek. These livestock owners will be invited to attend **pasture workshops.** The Duck Creek Watershed coordinator will meet with each of these individuals as well to inform them of specific programs and associated incentives, cost share and annual payments applicable to their operations goals through existing programs such as EQIP.

SOURCE DEFINED: Manure application to row crops

Manure applied to row crops has the potential to runoff into Duck Creek and tributaries, particularly on highly erodible land. Applied manure that enters the stream is a **nonpoint source** of bacterial pollution. In the Duck Creek Watershed, manure is applied to approximately 900 acres. The locations where manure is applied is shown on **Figure 8.2.**

RECOMMENDATIONS: Manure application to row crops

To reduce manure delivery to the stream, an **Intensive Nutrient Management Plan** will be created and implemented. A plan that outlines the amount, type, form, placement and timing of the application of manure and other amendments. Also, **conservation practices** will be placed on land, specifically highly erodible land, where manure is applied.

It is necessary that the Duck Creek Watershed coordinator with Natural Resource Conservation staff continue conducting **individual meetings** with producers who apply manure to their land in the watershed to inform them of the specific programs and associated incentives, cost share and annual payments applicable to their operation. If there is no interest after these meetings because of a lack of monetary gain, there will be an opportunity to have conversations on what **additional incentives, cost share and annual payments** would encourage the reduction of manure application and the implementation of conservation practices.

SOURCE DEFINED: Pet waste

Fourteen miles of multiuse recreational trail and eight parks are adjacent to Duck Creek. Residents utilize these areas and other parks in the watershed for walking their pets. Using population data of the watershed and American Pet Products Manufactures Association (APPMA) statistics on pet ownership there are 33,150 dogs in the watershed. Market research conducted by the American Veterinary Medical Association (AMVA), there is an average of 1.7 dogs per household (**www.avma.org).** Approximately, 19,500 households have dogs in the Duck Creek Watershed.

Pet waste makes up a portion of the urban miscellaneous sources that contribute E. coli bacteria to Duck Creek. In the urbanized area (monitoring locations DC-10 and DC-12), urban

sources of E. coli account for nearly 90 percent of the total load (Water Quality Improvement Plan / Total Maximum Daily Load, 2009, P. 79). Pet waste is assumed to account for all nonpoint sources of fecal bacteria from residential areas. (Water Quality Improvement Plan / Total Maximum Daily Load, 2009, P. 123). Residential areas make up 21% (8,793 acres) of the watershed.

RECOMMENDATIONS: Pet Waste

A **pet waste awareness and education campaign** will be implemented in the Duck Creek Watershed. **Pet waste stations** (signage, biodegradable disposal bags and receptacles) will be located near the parking or access area of each park in the watershed. Parks along the main stem of Duck Creek and its tributaries will be prioritized first for the implementation of the pet waste stations. Pet waste stations will also be located on the grounds of apartment complexes where pets are allowed. **Personal pet waste disposal systems** (biodegradable disposal bags, bag holders with clips and/or convenient scoops) with slogans such as, *I Scoop for Clean Water* and informational brochures will be distributed at booths set up along the Duck Creek Parkway. Pet store employees will be educated on the relationship between pet waste and water quality and the human health concerns associated with pet waste entering streams and will be asked to partner with the Scott County Soil and Water Conservation District to prevent pet waste from entering streams. Pet Stores, pet agencies, the Scott County Health Department and municipalities will have informational brochures to distribute. **Informational brochures** will include information on the effects of pet waste on the water quality of Duck Creek and its tributaries, the human health concerns with pet waste entering streams, the importance of picking up and properly disposing of pet waste on public, private and one's own property and the existing regulations for not properly picking up and disposing of pet waste.

The **pet waste regulations** in Scott County are as follows:

City of Davenport Pet Waste Code

- Pet waste disposed of in a creek or storm drain is considered an illicit discharge with the first offense is $250, second offense is $500 dollars and third and subsequent offenses $750.

- Pet Waste Pollution Prevention Partner Program
  - Organizations throughout the City of Davenport can receive a pet waste station (sign, pet waste bag dispensing unit, and 1 refill of bags) free of charge to help prevent pet waste pollution. Partnering organizations are

required to maintain and refill stations beyond the first free refill (approx. cost $6.00 per 100).

City of Bettendorf Pet Waste Code

- It shall be unlawful for an owner or custodian to permit an animal to discharge excrement upon any public property, common area, common thoroughfare, street, sidewalk, alley, play area, park or private property unless the excrement is immediately picked up and disposed of in an appropriate refuse container. Animal excrement shall not be placed in storm sewers or street gutters, but shall be picked up and disposed of in a sanitary manner in an appropriate refuse container.
- Whereas the first offense twenty-five dollars ($25.00), second offense thirty-five dollars ($35.00), third offense fifty dollars ($50.00), fourth or subsequent offenses two hundred dollars ($200.00).

Scott County Humane Society (Davenport, Bettendorf, and Rural Areas of Scott Co.)

- An owner or custodian of an animal shall keep all structures, pens, coops or yards wherein an animal is confined clean and free from excrement and the odor arising from excrement. Such area shall also be clean and free of vermin and any thing that is likely to become putrid, offensive, or injurious to health. An area, structure, pen, coop, or yard not maintained in a clean and sanitary condition may be declared a public nuisance.
- It shall be unlawful for an owner or custodian to permit an animal to discharge excrement upon any public property, common area, common thoroughfare, street, sidewalk, alley, play area, park or private property unless the excrement is immediately picked up and disposed of in an appropriate refuse container. If the owner of private property has given another owner or custodian permission for their animal to use their private property then this section shall not apply to that particular usage.
- Animal excrement shall not be placed in storm sewers or street gutters, but shall be picked up and disposed of in a sanitary manner in an appropriate refuse container.
- A week to comply, first offense $30.00; second offense $40.00; third offense $50.00; fourth or subsequent offense up to $200.00.

Informational brochures will be available at all county and municipal buildings and pet stores and facilities. The campaign will be promoted by Scott County Soil and Water Conservation District and partners through newsletters, utility bills, websites, press conferences and releases.

Also, **billboards** will be created and located in the Duck Creek Watershed. A **Public Service Announcement** will be created as well and ran during the evening local news for maximum viewership. A **website** with information on Duck Creek and pet waste management will be created. The URL will be put on all awareness and education campaign materials to drive people to the website for additional information.

SOURCE DEFINED: Wildlife

Wildlife defecating in and near the stream, its tributaries or in storm drains and lines contributes bacteria to Duck Creek. Deer, raccoons, opossums, muskrats, beavers, groundhogs, squirrels, chipmunks, foxes and coyotes are animals that have been identified in the watershed.

RECOMMENDATIONS: Wildlife

The first step is to determine if wildlife is significantly contributing to Duck Creek's bacteria levels through **monitoring** (See the MONITORING PLAN).

Through genetic testing researchers of the Southeast White Oak River Shellfish Restoration Project, Final Report, March 2009, found their bacteria impairment came from wildlife.

The University of North Carolina's Institute of Marine Sciences in Morehead City confirmed the partner's suspicions. It volunteered to do limited genetic testing on 15 samples with the highest bacteria levels. Those tests confirmed that the bacteria came from animals, not humans.

The study's partners concluded that trying to reduce the sources – deer, raccoons, or pets—was unreasonable. They, instead, turned their attention to the land. Fixing the land by attempting to mimic natural drainage patterns would reduce the flow of runoff into the creeks. It was a more practical alternative and offered a reasonable chance of meeting the study's goals. Restoring natural drainage patterns to reduce the flow of runoff became the focus of the watershed plants that were devised to meet the TMDL's." (P. 8).

Restoring natural hydrology to reduce the flow of runoff to Duck Creek is the tactic that will be used to address bacteria inputs from wildlife.

RECOMMENDATION: AWARENESS, EDUCATION AND MARKETING

A **marketing campaign** must be developed for those in the Duck Creek Watershed or targeted subbasins in the watershed to promote the recommendations in this plan. The campaign will

include **stewardship events, stormwater art, a website, billboards, public service announcements and printed resources** and other **accompanying materials. Figure 8.5** displays images of targeting marketing campaign elements.

Figure 8.5: Targeted marketing campaign elements

Stormwater Art in Portland Oregon

Storm drain art in Brazil

Billboard for Blue Thumb Campaign, in Minnesota, an outreach program to meet water quality goals identified in their strategic plan and to help their cities meet their federal Clean Water Act mandates.

The campaign will use existing campaigns (Minnesota's Blue Thumb Campaign) and proven concepts (The Psychology of Sustainable Behavior, Manning, 2009) as a model.

The development of a marketing campaign will include identifying and targeting audiences in the watershed or subwatersheds. Target audiences, barriers, motivators/incentives, preferred delivery methods and evaluation measures are shown on **Figure 8.6.**

Figure 8.6: Target audiences, barriers, motivators/incentives, preferred delivery methods and evaluation measures

Audience: Septic system owners
Message: Properly functioning septic systems are pertinent to clean water and human health.
Barriers:
Expense
Lack of understanding
Motivators and Incentives: Cost share program
Delivery Method: Informational mailings, workshops

Evaluation Measures: Amount of people who participate in the cost share program, attendance at workshops

Audience: Livestock Producers
Message: Excluding cattle from the stream has economic as well as environmental benefits.
Barriers:
Perceptions livestock do not impact water quality in Duck Creek
Fear stream will damage or destroy exclusion fencing
Not being able to mow conservation practices
High land value of Scott County farmland
Installing exclusion fencing and alternative water facilities is perceived by some as futile with such narrow pastures
No perceived economic benefit to livestock producers
Motivators and Incentives: Incentives, cost share, annual payment, information delivered from other livestock producers
Delivery Method: one-on-one meetings, prepare documents with incentives, cost share and annual payment available specific to their operation, pasture walks and workshops with ISU extension staff, testimonies from other livestock producers who have excluded livestock from their streams, seek press coverage on livestock producer excluding livestock from stream
Evaluation Measures: Keep track of responses from individual meetings, ask livestock producers with no interest in excluding livestock to fill out a survey after one-on-one meetings to describe why, attendance at pasture walks and workshops

Audience: Homeowners and business owners
Message: Installing infiltration practices protect and improve water quality and provide homeowners with a low maintenance, aesthetically pleasing landscape that can address drainage issues.
Barriers:
Cost
Have never seen an infiltration practice before
Lack of knowledge on their impact on water quality and infiltration practices
Perceptions that stormwater utility fees mitigates their impact
Concern practice will look unkempt
Motivators and Incentives: Cost share, information specific to their residence concerning their impact on water quality and infiltration practice applicability, opportunity to view infiltration practices
Deliver Method: Technical assistance at residence, infiltration drive by list or tour, stewardship events, educational forums, press, PSA's, website, billboards, stormwater art, signage, printed materials
Evaluation Measures: Track amount of site visits to residences, attendance at stewardship events and educational forums, send follow up survey to all residents and attendees, include

question concerning how they received infiltration practice information, website hits

Audience: Pet Owners
Message: Picking up after your pet is important to water quality and human health.
Barriers:
Lack of knowledge on pet wastes impact on water quality
Lack of disposal locations
IT'S GROSS!
Motivators and Incentives: Information on how pet waste impacts water quality and human health, disposal made easy
Delivery Method: Press, PSA's, website, billboards, signage, printed materials, disposal devices
Evaluation Measures: Amount of materials distributed, website hits, use of public disposal stations

Audience: Landscape contractors, developers, homebuilders
Message: Installing infiltration practices and native landscaping has benefits for the customer and your business.
Barriers:
Lack of knowledge about infiltration practices and native landscapes
Lack of growers to purchase native plants from
Perceptions native plants and infiltration practices appear unkempt
Motivators and Incentives: Can use "environmentally friendly" and "low maintenance" as selling points, less plant replacements, increase the value of property, less calls and complaints about drainage problems, purchasing from local growers drops shipping charges, simple resources (ex. guides giving native alternatives to nonnative plants with a list of local growers contact information)
Delivery Method: Direct mailings, workshops, on site demonstrations, resources and guides, one-on-one contact
Evaluation Measures: Attendance at workshops, follow ups on resources and guides sent, increase in purchase of local native plants, increase in infiltration practices and native landscaping

Audience: Local governments (department heads, staff, alderman, officials)
Message: Enforcing current ordinances, creating new ordinances, increasing stormwater fees and installing and promoting infiltration practices that will protect and enhance Duck Creek
Barriers:
Disconnect between regulations and their impacts on water quality
Fear of upsetting constituents/voters
Detouring economic growth
Motivators and Incentives: Success stories from other municipalities, mandates from EPA/DNR,

funding, economic and environmental benefits to areas downstream, environmental impact benefit analysis, constituent/voter demand
Delivery Method: workshops with success stories, on site demonstrations, resources and guides, one-on-one contact
Evaluation Measures: Attendance at workshops, follow ups on resources and guides sent, increase in enforcement of ordinances, creation and enforcement of new policies and programs, increase in infiltration practices

In promoting audiences to take actions to protect and improve Duck Creek, residents must see the creek as something to value because of what it offers them. Stewardship events are a way to promote care for Duck Creek.

Stewardship events including educational forums, trash cleanups, creek naming and sign installation, storm drain marking, invasive species removal, garden parties at homeowners properties where infiltration practices are installed, water sampling, biological sampling, bio blitz's, infiltration practice tours, geocaching, festivals, expos and fairs foster a viewpoint that streams are a valuable natural resource worth protecting and enhancing. The Blue Thumb campaign reported *half of the people who attended a "garden party" (a party organized on a homeowner's property who had installed infiltration practices), requested technical assistance at their own residence and half of the residents who requested technical assistance installed a practice* (Jay Riggs, Washington County Minnesota Conservation District, 2009, Iowa Water Conference).

In addition to providing opportunities for residents to realize the values of Duck Creek, those living in the watershed must realize how their actions impact the stream. Providing awareness and education to residents on the importance of picking up after their pets, improving their soil quality and installing infiltration practices is vital.

Lastly, a successful marketing campaign has measurable results so that it can prove its effectiveness and be a model for other communities. Initial analysis will be conducted on a targeted level to estimate the impact of the campaign and evaluation methods will be determined prior to the initiation of the campaign. It is absolutely vital to constantly survey the audience being targeted in order to evaluate the campaign's effectiveness.

Potential Local Marketing Campaign Initiatives

Below is a list of marketing campaigns that will be applied in the Duck Creek Watershed.

Making Septic Simple: With the goal of improving the functioning of septic systems, the campaign includes direct mailing, workshops and cost share for inspection, maintenance, repair

and replacement. (Details under SOURCES DEFINED and RECOMMENDATIONS for septic systems)

Green Gardening (Modeled after Blue Thumb): Gardening is the number one hobby in the United States. Green Gardening would promote gardening methods that promote clean water including; the reduction of lawn, the installation of no mow or low mow mixes and native landscapes, the use of organic fertilizing and pest management techniques, properly managing pet waste, disconnecting downspouts and installing infiltration practices.

Rainscaping: Rainscaping Iowa is a statewide educational campaign that promotes urban stormwater management practices to protect water quality and reduce runoff. This program would be aimed at landscape contractors, developers, homebuilders but would not exclude the general public. The program would seek to certify members of the targeted audience as rainscapers through training courses, a written exam and the installation of two infiltration practices. An incentive will be that one member of staff must be a rainscaper in order to be added to the list of contractors distributed to residents interested in the cost share.

Parishioners for Prairies and Kids for Clean Water: Civic and institutional facilities including churches and schools often have an abundance of land and a willingness to implement infiltration practices for moral and educational reasons. Often these facilities have enough land to infiltrate their own stormwater runoff and runoff from land uses around them. Projects at these sites offer opportunities for viewing that may not be applicable on residential properties.

Profitable Pastures: An educational series for livestock producers in the Duck Creek Watershed. Aimed at meeting economic goals of the producer and environmental goals as well.

A pet waste awareness and education campaign: Aimed at pet owners with the goal of encouraging proper pick up and disposal, the pet waste awareness and education campaign is detailed under SOURCES DEFINED and RECOMMENDATIONS for pet waste.

Fees and costs

Stormwater utility fees are a way to fund projects and programs to improve the situation on Duck Creek. Increasing existing stormwater fees would fund projects to improve Duck Creek. Reductions in stormwater utility fees for those who install infiltration practices would promote the installation of these projects. The importance of stormwater utility fees for funding programs and projects that improve Duck Creek, the low fee of the municipalities in the watershed compared to like communities and the opportunity for businesses in Davenport to receive stormwater utility credits for implementing infiltration practices and stormwater education will be presented to local governments, department heads, staff, alderman, officials,

business owners and Scott County residents through **awareness, education and marketing programs.**

Existing Stormwater Utility Fees and Credit Programs

The City of Davenport charges single family property owners $1.60 per month and residents of duplexes $0.80 per month. The average impervious area of homes in Davenport is 2600 square feet. No property is exempt from this fee. All non-residential properties pay a fee based on the amount of impervious area that is on the property. The square footage of the impervious surface is divided by 2600 (1 Equivalent Residential Unit [ERU]) then multiplied by $1.60 to determine the monthly fee.

To put this into perspective, North Park Mall is approximately 100 acres of impervious surface (4,356,000 square feet / 2600 (ERU) = 1675 x $1.60 = $2,681.00 per month x 12 months = $32,167.00). North Park Mall pays approximately $32,000.00 per year in stormwater utility fees. They, like all other non residential properties, are applicable for fee adjustments. If North Park Mall was in Bettendorf, they would pay $23,760.00 in stormwater utility fees per year.

The City of Davenport has a stormwater utility credits program available to non residential properties. The City may make an adjustment to the baseline fee for any eligible non-residential customer who implements infiltration practices and/or educational awareness programs that reduce waterway pollutants.

Water quality education credits are also available for K-12 schools in Davenport.

The City of Bettendorf charges a flat rate ($1.50 per month) for residential properties with impervious areas between 1600 and 6000 square feet. Properties less than 1600 square feet are charged $0.60 per month. All non-residential properties pay a fee based on the amount of impervious area that is on the property. The square footage of the impervious surface is divided by 2200 (1 Equivalent Residential Unit [ERU]) then multiplied by $1.50 to determine the monthly fee.

To put this into perspective, Lindquist Ford is approximately 9 acres of impervious surface (388,900 square feet / 2,500 (ERU) = 156 ERU x $1.50 = $234.00 per month x 12 months = $2,808.00). Lindquist Ford pays approximately $2,808.00 per year in stormwater utility fees. If Lindquist Ford was in Davenport they would pay approximately $2,880.00 in stormwater utility fees per year.

Tax exempt properties, which make up approximately 19% of all property, generate stormwater but do not contribute revenue toward stormwater management.

There is no stormwater utility credits program in Bettendorf.

Comparing fees

The stormwater utility fees in Davenport and Bettendorf are relatively low compared to other communities. **Figure 8.4** gives a comparison of regional community commercial stormwater utility fees.

Table 8.4: Comparison of regional community commercial stormwater utility fees

North Park Mall, Davenport, Iowa	
City	**Stormwater Utility Fee per/yr**
Davenport, Ia	$32,167
Bettendorf, Ia	$31,363
Moline, Il	$571,535
Rock Island, Il	$714,996
East Moline, Il	$551,232
Madison, Wi	$947,004
Linquist Ford, Bettendorf, Iowa	
City	**Stormwater Utility Fee per/yr**
Bettendorf, Ia	$2,808
Davenport, Ia	$2,880
Moline, Il	$4,630
Rock Island, Il	$6,434
East Moline, Il	$4,961
Madison, Wi	$8,532

Table 8.5 gives a comparison of regional community residential stormwater fees. Raising stormwater fees would provide funding to address the concerns on Duck Creek.

Table 8.5 Comparison of regional community residential stormwater fees

Residential	
City	**Stormwater Utility Fee per/mo**
Davenport, Ia	$1.60
Bettendorf, Ia	$1.50
Moline, Il	$5.84-$23.07
Rock Island, Il	$4.39
East Moline, Il	$2.32-$5.80
Madison, Wi	$6.00

IX. Targets and Load Reductions

The Water Quality Improvement Plan (WQIP) and Total Maximum Daily Load (TMDL) created by the IDNR provides reductions in *E. coli* bacteria that must be accomplished in order for Duck Creek to meet the water quality standard. **Figures 9.1-9.3** are bar charts that display impact of each source at each monitoring point during each flow condition. **Tables 9.1-9.3 are** tables that list the load reduction needed during each flow condition.

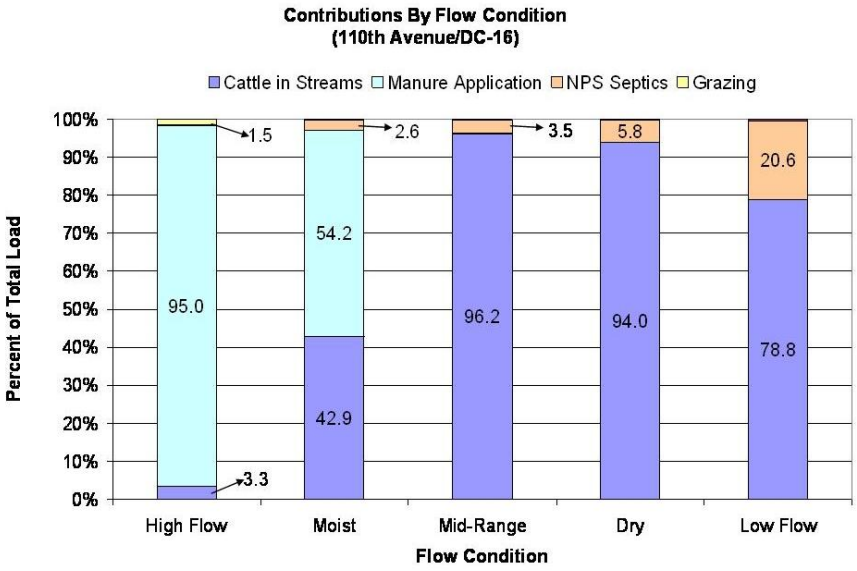


Figure 9.1: Source Inventory for each flow condition at DC-16

Table 9.1: Load reductions needed at DC16 for each flow condition

Flow ⟶	High	Moist	Mid	Dry	Low
Load reduction ⟶ needed	98.3%	99.7%	99.7%	99.8%	99.4%

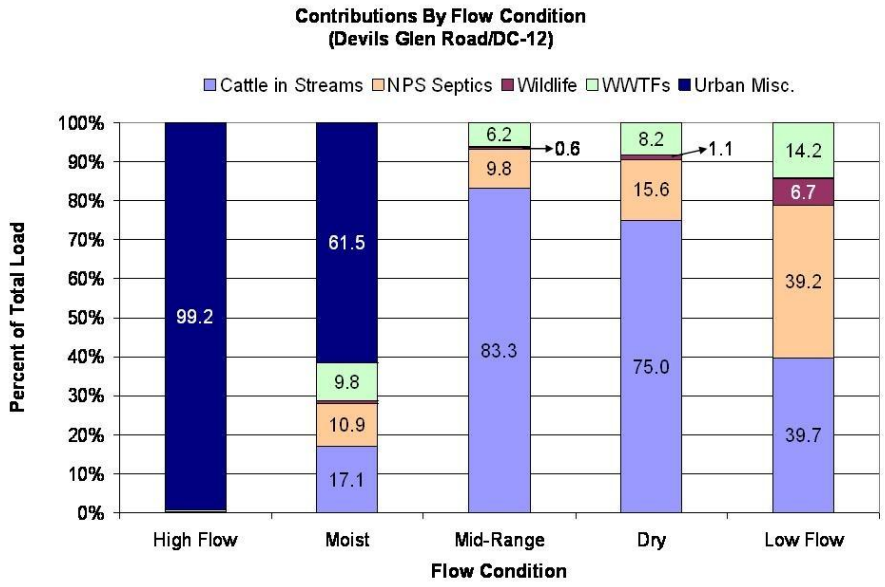


Figure 9.2: Source Inventory for each flow condition at DC-12

Table 9.2: Load reductions needed at DC12 for each flow condition

Flow ⟶	High	Moist	Mid	Dry	Low
Load reduction ⟶ needed	96.7%	97.8%	99.3%	98.8%	93.1%

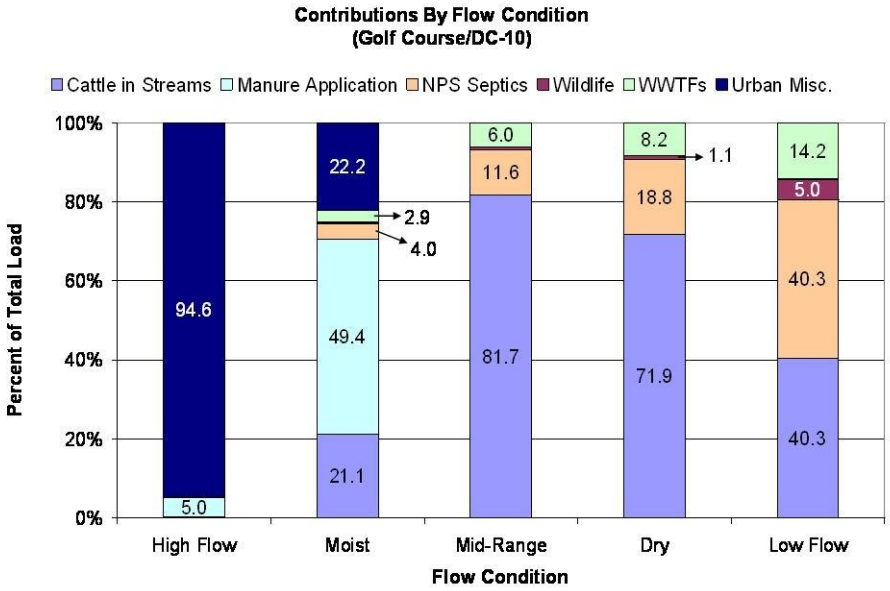


Figure 9.3: Source Inventory for each flow condition at DC-10

Table 9.3: Load reductions needed at DC10 for each flow condition

Flow ⟶	High	Moist	Mid	Dry	Low
Load reduction ⟶ needed	97.2%	99.0%	100%	100%	94.8%

Each recommendation made in the plan has an individual removal percentage. **Table 9.4** has each source contributing bacteria to Duck Creek, the recommendation made in the plan to address each source and percentage of bacteria removal the recommendation is capable of.

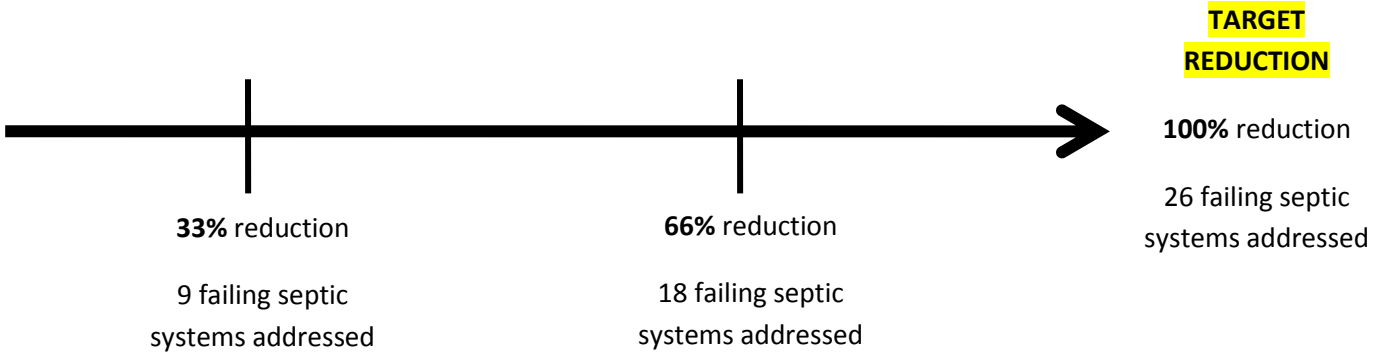
Table 9.4: Source of bacterial pollution, recommendation and pollutant (bacteria) removal of recommendation

Source of bacteria	Recommendation	Bacteria Removal %
Point source		
Onsite waste water treatment facilities (septic systems) under NPDES General Permit No. 4 discharging to a surface water	Septic system awareness and education campaign	Up to 75%
Sanitary sewer overflows (SSOs) covered by the City of Davenport's wastewater permit	Locate and eliminate	Up to 100%
Animal feeding operations (AFO's)	Intensive manure management plans	Up to 90%
Municipal separate storm sewer systems (MS4s) in the cities of Davenport and Bettendorf ◦ Illicit connections leading to dry weather flow from the storm sewer system ◦ Growth and deposition of bacteria within the storm sewer system	Locate and eliminate	Up to 100%
Nonpoint Sources		
Non-permitted onsite wastewater treatment facilities (septic systems) not discharging to a surface water	Septic System Education and Awareness Campaign Locate and eliminate	Up to 75% Up to 100%
Cattle with direct access to	Exclude livestock from	Up to 100%

streams	streams	
Pasture lands	Pasture conservation plans Manure storage	Up to 100%
Manure application to row crops	Intensive manure management plans Vegetated filter strips Riparian buffers	Up to 90% 43-57% Up to 40%
Urban miscellaneous sources ° Build up of bacteria on urban land uses ° Resuspension of bacteria from the stream bed ° Undocumented wildlife deposition within the urban area	Install infiltration practices: Bioswales, bioretention, raingardens, infiltration trenches Pervious concrete, porous asphalt Permeable pavers Soil quality restoration	 69-99% 30-65% 65-100% 30%-100%
Pet waste	Pet waste management awareness and education campaign	Up to 75%

Non-permitted onsite wastewater treatment facilities (septic systems) not designed to discharge to a surface water have the most impact on *E. coli* bacteria levels at monitoring location DC10 at low flow. These systems make up 40.3% of the total *E. coli* bacteria load at DC10 at low flow. A 100% reduction of bacteria input from these septic systems is the aim of the Duck Creek Watershed Management Plan. This will be accomplished through a direct mailing to these homeowners, septic system awareness and education campaign and a cost share on inspection and maintenance, repair and replacement. **See Figure 9.4.**

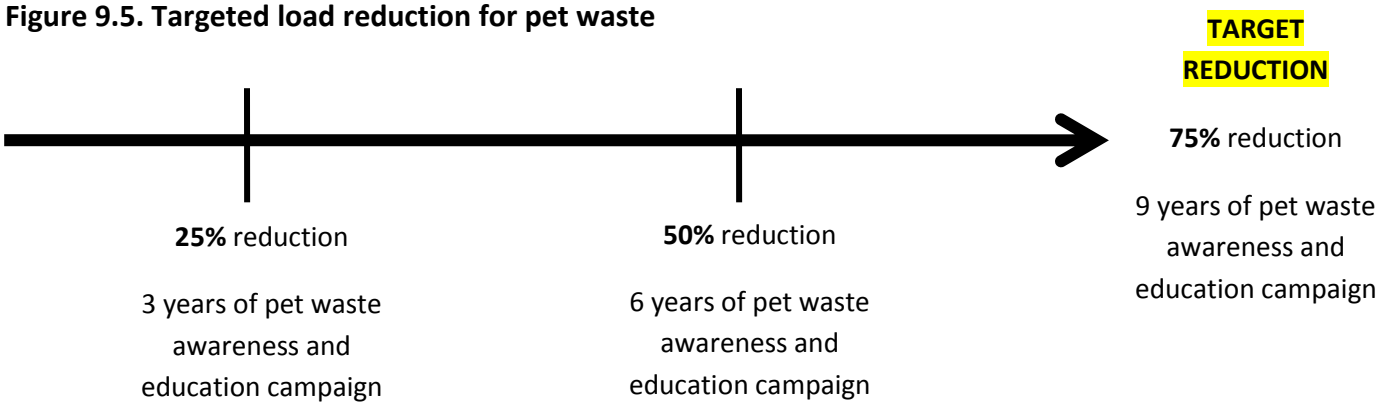
Figure 9.4: Targeted load reduction for non-permitted onsite wastewater treatment facilities (septic systems) not designed to discharge to a surface water



Urban miscellaneous sources have the most impact on *E. coli* bacteria levels at monitoring location DC12 at high flow. Urban miscellaneous sources include; build up of bacteria on urban land uses, resuspension of bacteria from the stream bed, pet waste and undocumented wildlife deposition within the urban area. Urban miscellaneous sources contribute 99% of the bacteria load at DC-12 and 95% of the bacteria load at DC-10 during high flow conditions. A 97.6% reduction is needed at DC-12 and a 96.9% reduction is needed at DC-10 during high flow conditions (WQIP/TMDL, 2009, P. 81, 83-84). This will be done through the restoration of natural hydrology patterns in the watershed. To achieve the needed 97.6% reduction in bacteria needed to meet the standard, specified in the WQIP/TMDL for Duck Creek with the data available as of 2011, 55,150,219 square feet of infiltration practice is needed, an estimated cost of $827,253,285. The implementation of infiltration practices will begin during years 1-9 and become the main focus of efforts to meet the water quality standard after year 9. SWAT subbasins of Very High and High priority, shown on Table 8.3., will be the focus of initial efforts.

A **pet waste** awareness and education campaign would reduce the pollutant load from pet waste up to 75%. (Water Quality Improvement Plan / Total Maximum Daily Load, 2009, P. 87). A **75%** reduction of bacteria input from pet waste is the aim of the Duck Creek Watershed Mangement Plan. **See Figure 9.5.**

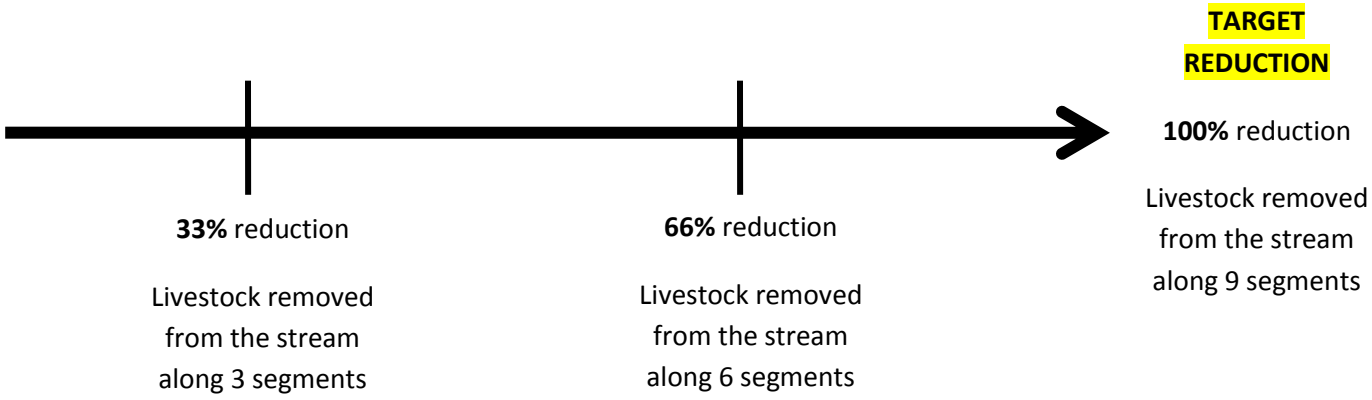
Figure 9.5. Targeted load reduction for pet waste



Locating and eliminating **illicit discharges and sanitary sewer overflows** would result in a reduction of bacteria input from this source. Discoveries made through monitoring will be shared with municipalities and they will be responsible for addressing them.

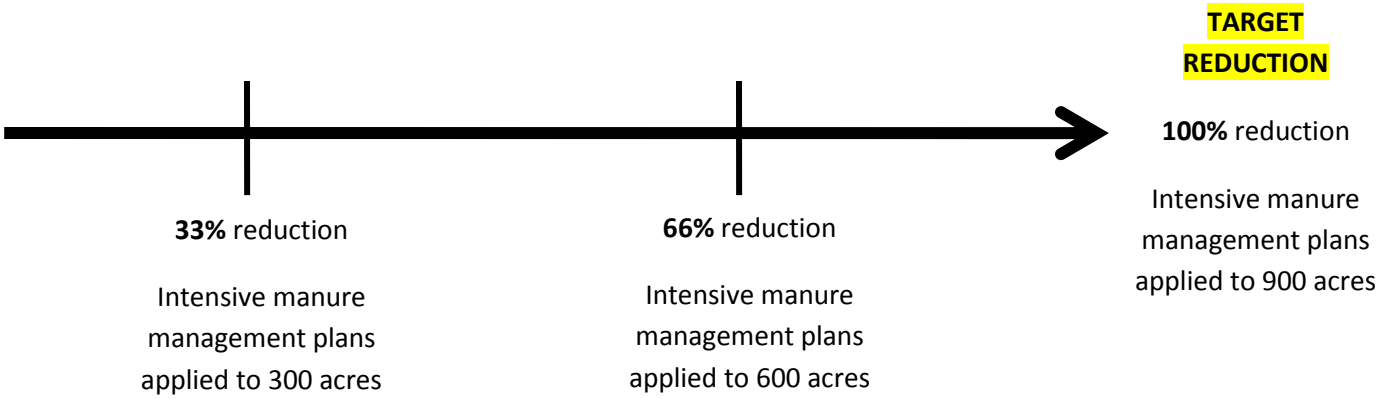
Livestock with direct access to the stream have the most impact on *E. coli* bacteria levels at monitoring location DC16 at midrange flow. Livestock in the stream make up 96.2% of the total *E. coli* bacteria load at DC16 at midrange flow. The WQIP and TMDL specifies a 95.6% reduction of bacteria needed from livestock with direct access to the stream. A 100% reduction of livestock access to the stream is the target of this plan. **See Figure 9.6.**

Figure 9.6: Targeted load reduction for livestock with direct access to the stream



Manure application has the most impact on *E. coli* bacteria levels at monitoring location DC16 at high flow. Manure application makes up 95% of the total *E. coli* bacteria load at DC16 at high flow. The WQIP and TMDL specifies a 94% reduction of bacteria required from manure application. A 100% reduction of manure delivered to the stream is the target of this plan. **See Figure 9.7.**

Figure 9.7: Targeted load reduction for manure application



X. GOALS AND OBJECTIVES

From water quality data and community input, the goals for Duck Creek were formulated. Below are the goals of the plan and the objectives to meet each goal. Tasks are located on the next page within the budget information.

GOAL 1:

Gain a better understanding of Duck Creek concerns and impairment.

OBJECTIVE:

Implement monitoring on Duck Creek to better understand the impairment.

Conduct biological monitoring on Duck Creek to determine if other concerns exist.

GOAL 2 (PRIMARY GOAL):

Remove the bacteria impairment on Duck Creek

OBJECTIVES:

Reduce bacteria input from septic systems.

Reduce runoff from urban land uses and bacteria input from urban miscellaneous sources.

Reduce bacteria input from livestock with direct access to creek and tributaries.

Reduce bacteria input from pasture land.

Reduce bacteria input from manure application to row crop.

Reduce bacteria input from pet waste.

GOAL 3:

Engage watershed residents to participate in projects and programs.

OBJECTIVES:

Accompany projects and programs with an awareness and education marketing campaign.

Survey watershed residents before, during and after implementation of Duck Creek Watershed Management Plan to determine effectiveness of awareness, education, and marketing campaign and on the ground projects.

XI. BUDGET

Below is the budget for the Duck Creek Watershed Mangement Plan. **Figure 11.1** lists: 1) tasks to conduct in order to meet the objectives and goals of the plan, 2) Costs associated with each task and 3) funding sources. The figure is organized by the plans 3 three year phases.

Figure 11.1: Tasks, costs and funding sources for phases of plan

OBJECTIVE/TASK/PHASE/3YRS	Cost (Phase 1) Yr. 1-3	Cost (Phase 2) Yr. 4-6	Cost (Phase 3) Yr. 7-9	Funding Source
Duck Creek Watershed Coordinator Salary (20-40hrs, Rural & Agricultural responsibilities) $10-$20hr, 5% annual increase, Health insurance, $300/month, $3,600/yr Employee costs, $8,840/year	$65,572 (salary) (yr 1: 20,800, yr 2: 21,840, yr 3: 22,932) $10,800 (insurance) $26,520(admin) **TOTAL: $103,892**	$75,909 (salary) (yr 4: 24,079, yr 5: 25,283, yr 6: 26,547) $10,800 (insurance) $26,520(admin) **TOTAL: $113,229**	$87,873 (salary) (yr 7: 27,874, yr 8: 29,268, yr 9: 30,731) $10,800 (insurance) $26,520(admin) **TOTAL: $125,193**	Implementation Grant
Urban Watershed Coordinator (36-4hrs, Urban & Monitoring responsibilities) $20hr, 5% annual increase Health insurance, $300/month, $3,600/yr Employee costs, $8,840/year	$131,144 (salary) (yr 1: 41,600, yr 2: 43,680, yr 3: 45,864) $10,800 (insurance) $26,520(admin) **TOTAL: $168,464**	$151,815 (salary) (yr 4: 48,157, yr 5: 50,565, yr 6: 53,093) $10,800 (insurance) $26,520(admin) **TOTAL: $189,135**	$175,745 (salary) (yr 7: 55,748, yr 8: 58,535, yr 9: 61,462) $10,800 (insurance) $26,520(admin) **TOTAL: $213,065**	Implementation Grant & Partners of Scott County Watersheds (Cities of Davenport & Bettendorf, Scott Co. SWCD, Scott Co., Q.C. Homebuilders Assoc.)
OBJECTIVE: *Implement monitoring on Duck Creek to better understand the impairment* **TASK:** Purchase flow meter, wading rod, turbidimeter	$5,800 (yr 1)	**********	**********	Implementation Grant
TASK: Conduct 4 snapshots a year at 25 sites in the watershed *(transparency, temperature, pH, nitrate-nitrite, dissolved oxygen, phosphate, chloride & E. coli bacteria)*	$5,550 ($1,850/yr)	$5,550 ($1,850/yr)	$5,550 ($1,850/yr)	DNR WM&A Program*
TASK: Monitor 10 sites bi-weekly during recreation season, (May 15th-Nov.15th), for: -Flow (flow meter) -Turbidity (turbidimeter) -E. coli bacteria ($15.00 per sample) -Chloride ($1 per sample) 180 samples/year; 540 samples/3 years; Shipping: $32.00 per parcel	$8,640 ($2,880/yr) $1,728 ($576/yr)	$8,640 ($2,880/yr) $1,728 ($576/yr)	$8,640 ($2,880/yr) $1,728 ($576/yr)	DNR WM&A Program Implementation Grant
TASK: Monitor 25 sites semi annually during low flow for: -Flow (flow meter)				

-Turbidity (turbidimeter) - Optical brighteners ($20.00 per sample) -E. coli bacteria ($15.00 per sample) 50 samples/year; 150 samples/3 years	$5,250 ($1,750/yr)	$5,250 ($1,750/yr)	$5,250 ($1,750/yr)	DNR WM&A Program
TASK: Conduct source tracking/MST during year 3 during high and low flow events ($300.00 per sample)	$1,800 (yr 3)	$1,800 (yr 6)	$1,800 (yr 9)	Implementation Grant
TASK: Monitor storm sewer outfalls during dry flow for: -E. coli bacteria($15.00 per sample) -Chloride ($1 per sample) - Optical brighteners ($20.00 per sample) 100 samples/year 300 samples/3 years Shipping: $32.00 per parcel	$10,800 ($3,600/yr) $768 ($256/yr)	$10,800 ($3,600/yr) $768 ($256/yr)	$10,800 ($3,600/yr) $768 ($256/yr)	DNR WM&A Program/ Municipalities
TASK: Contract Environmental Canine Services, LLC to locate illicit discharges for 3 days during year 3 ($1,566 per/day for 3 days)	$4,698 (yr 3)	$4,698 (yr 6)	$4,698 (yr 9)	Municipalities
TASK: Conduct a biological snapshot once a year during the summer	$0 **TOTAL: $45,034**	$0 **TOTAL: $39,234**	$0 **TOTAL: $39,234**	DNR WM&A Program
OBJECTIVE: *Reduce bacteria input from septic systems not permitted under general permit No. 4 and not designed to discharge to a surface water.*				
TASK: Conduct one direct mailing	$125 (yr 1)	$125 (yr 4)	$125 (yr 7)	
TASK: Conduct one workshop with Scott County Health Department	$0	$0	$0	Implementation Grant/WPF/ WSPF
TASK: Offer 50 % cost share, up to $100, on inspection of 87 septic system inspections, 29 per year	$17,400 ($5,800/yr)	$17,400 ($5,800/yr)	$17,400 ($5,800/yr)	
TASK: Offer 50% cost share, up to $3,250, on maintenance/repair/replacement of 9 failing systems, 3 per year	$58,500 ($19,500/yr) **TOTAL: $76,025**	$58,500 ($19,500/yr) **TOTAL: $76,025**	$58,500 ($19,500/yr) **TOTAL: $76,025**	
OBJECTIVE: *Reduce runoff from urban lands uses and bacteria input from urban miscellaneous sources*				
TASK: Install 10,000 sq' of urban infiltration practices in critical areas (3,333 sq'/yr)	$150,000($50,000/ yr) **TOTAL: $150,000**	$150,000($50,000/ yr) **TOTAL: $150,000**	$150,000($50,000/ yr) **TOTAL: $150,000**	WSPF*/ REAP*/ Homeowner

OBJECTIVE: *Reduce bacteria input from livestock with direct access to creek and tributaries.* **TASK:** Conduct 3 workshops, one a year **TASK:** Offer incentive payment ($235/200'/yr, 5 year up front payment) for installing livestock exclusion fencing at 3 locations **TASK:** Offer 50% cost share on exclusion fencing, pumps, stream crossing & water line	$1,200 $62,158 (10,580 feet of stream) $54,936 **TOTAL: $118,294**	$1,200 $38,776 (6,600 feet of stream) $38,220 **TOTAL: $78,196**	$1,200 $28,964 (4,930 feet of stream) $31,206 **TOTAL: $61,370**	WPF* WSPF EQIP*/ Landowner
OBJECTIVE: *Reduce bacteria input from pasture land.* **TASK:** Work with 3 pasture owners/year to create and implement conservation plans & manure storage on 87 acres	$9,000 (87 acres) **TOTAL: $9,000**	$9,000 (87 acres) **TOTAL: $9,000**	$9,000 (87 acres) **TOTAL: $9,000**	EQIP/Landowner
OBJECTIVE: *Reduce bacteria input from manure application to row crop.* **TASK:** Offer incentive to 3 landowners for creating & implementing Manure Management Plan on 300 acres of cropland/3yrs **TASK:** Printing of 3 Manure Management Calendar/3yrs	$3,000 ($1,000/yr) $60 ($20/yr) **TOTAL: $3,060**	$3,000 ($1,000/yr) $60 ($20/yr) **TOTAL: $3,060**	$3,000 ($1,000/yr) $60 ($20/yr) **TOTAL: $3,060**	EQIP WPF
OBJECTIVE: *Reduce bacteria input from pet waste.* **TASK:** Install 15 pet waste stations (signage, bag dispensers and receptacles) along the Duck Creek Parkway **TASK:** Create and distribute 1,000 informational brochures to Scott County Health Department, Humane Society and Pet Stores **TASK:** Set up a three booths, once a year, along Duck Creek Parkway and distribute 300 brochures and 300 personal pet waste disposal systems (100/yr)	$6,000 (15 pet waste stations along creek parkway) $1,520 (yr 1) $456 (brochures) $7,500 (personal pet waste disposal systems) **TOTAL: $15,476**	$6,000 (15 pet waste stations at parks in watershed) $1,520 (yr 4) $456 (brochures) $7,500 (personal pet waste disposal systems) **TOTAL: $15,476**	$6,000 (15 pet waste stations at apartment complexes) $1,520 (yr 7) $456 (brochures) $7,500 (personal pet waste disposal systems) **TOTAL: $15,476**	Implementation Grant WPF WPF Implementation Grant
OBJECTIVE: *Accompany projects and programs with an Awareness & Education Marketing Campaign.* **TASK:** Create website **TASK:** Create and display an exhibit at local Scott County	$3,500 (yr 1)	**********	**********	

events ($120 for display, $460 in annual booth fees)	$1,500 (yr 1, $580, yr 2&3, $920)	$1,380	$1,380	WPF
TASK: Install one billboard a year	$1,800 (600/yr)	$1,800 (600/yr)	$1,800 (600/yr)	
TASK: Create and run a public service announcement	$3,000 (yr 2)	**********	**********	
TASK: Survey watershed residents	$0 (ongoing)	$0 (ongoing)	$0 (ongoing)	
	TOTAL: $9,800	**TOTAL: $3,180**	**TOTAL: $3,180**	

*Iowa Department of Natural Resources Watershed Monitoring & Assessment Program
*Watershed Protection Fund
*Resource Enhancement and Protection
*Water Protection Fund
*Environmental Quality Incentives Program

Listed below is detailed information about each phase and the amount of funding needed from each funding source.

PHASE 1 (Yr. 1-3)

IMPLEMANTION GRANT
$103,892 (Duck Creek Watershed Coordinator Salary)
$94,964 (Urban Watershed Coordinator Salary)
$9,328 (Monitoring)
$38,075 (Septic system mailing/inspection/maintenance/repair/replacement cost share)
$13,500 (Pet waste stations/personal disposal systems)
$259,759

WPF
$1,200 (Livestock/pasture workshop)
$60 (Intensive manure management calendar)
$1,976 (pet waste brochures)
$9,800 (Awareness and education marketing campaign)
$13,036

WSPF
$60,000 (Urban infiltration practices)
$62,158 (Livestock exclusion incentive)
$122,158

REAP FUNDS
$15,000 (Urban infiltration practices)
$15,000

PARTNERS OF SCOTT COUNTY WATERSHEDS
$73,500 (Urban Watershed Coordinator Salary)
$73,500

DNR WM&A PROGRAM
$30,240 (Monitoring)
$30,240

MUNICIPALITIES
$5,466 (Monitoring)
$5,466

LANDOWNER
$37, 950 (Septic system owners inspection/maintenance/repair/replacement cost share)
$75,000 (Urban landowners/infiltration practice cost share)
$27,468 (Livestock exclusion elements: fence, pumps, stream crossing & waterline)
$4,500 (Pasture conservation plans and manure storage)
$3,000 (Intensive manure management plan incentives)
$147,918

EQIP
$27,468 (Livestock exclusion elements: fence, pumps, stream crossing & waterline)
$4,500 (Pasture conservation plans and manure storage)
$31,968

TOTAL: $699,045

PHASE 2 (Yr. 4-6)

IMPLEMANTION GRANT
$113,229 (Duck Creek Watershed Coordinator Salary)
$115,635 (Urban Watershed Coordinator Salary)
$3,528 (Monitoring)
$38,075 (Septic system mailing/inspection/maintenance/repair/replacement cost share)
$13,500 (Pet waste stations/personal disposal systems)
$283,967

WPF
$1,200 (Livestock/pasture workshop)
$60 (Intensive manure management calendar)
$1,976 (pet waste brochures)
$3,180 (Awareness and education marketing campaign)
$6,416

WSPF
$60,000 (Urban infiltration practices)

$38,776 (Livestock exclusion incentive)
$6,416

REAP FUNDS
$15,000 (Urban infiltration practices)
$15,000

PARTNERS OF SCOTT COUNTY WATERSHEDS
$73,500 (Urban Watershed Coordinator Salary)
$73,500

DNR WM&A PROGRAM
$30,240 (Monitoring)
$30,240

MUNICIPALITIES
$5,466 (Monitoring)
$5,466

LANDOWNER
$37, 950 (Septic system owners inspection/maintenance/repair/replacement cost share)
$75,000 (Urban landowners/infiltration practice cost share)
$19,110 (Livestock exclusion elements: fence, pumps, stream crossing & waterline)
$4,500 (Pasture conservation plans and manure storage)
$3,000 (Intensive manure management plan incentives)
$139,560

EQIP
$19,110 (Livestock exclusion elements: fence, pumps, stream crossing & waterline)
$4,500 (Pasture conservation plans and manure storage)
$23,610

TOTAL: $676,535

PHASE 3 (Yr. 7-9)

IMPLEMANTION GRANT
$125,193 (Duck Creek Watershed Coordinator Salary)
$139,565 (Urban Watershed Coordinator Salary)
$3,528 (Monitoring)
$38,075 (Septic system mailing/inspection/maintenance/repair/replacement cost share)
$13,500 (Pet waste stations/personal disposal systems)
$319,861

WPF
$1,200 (Livestock/pasture workshop)
$60 (Intensive manure management calendar)
$1,976 (pet waste brochures)
$3,180 (Awareness and education marketing campaign)
$6,416

WSPF
$60,000 (Urban infiltration practices)
$28,964(Livestock exclusion incentive)
$88,964

REAP FUNDS
$15,000 (Urban infiltration practices)
$15,000

PARTNERS OF SCOTT COUNTY WATERSHEDS
$73,500 (Urban Watershed Coordinator Salary)
$73,500

DNR WM&A PROGRAM
$30,240 (Monitoring)
$30,240

MUNICIPALITIES
$5,466 (Monitoring)
$5,466

LANDOWNER
$37, 950 (Septic system owners inspection/maintenance/repair/replacement cost share)
$75,000 (Urban landowners/infiltration practice cost share)
$15,603 (Livestock exclusion elements: fence, pumps, stream crossing & waterline)
$4,500 (Pasture conservation plans and manure storage)
$3,000 (Intensive manure management plan incentives)
$136,053

EQIP
$15,603 (Livestock exclusion elements: fence, pumps, stream crossing & waterline)
$4,500 (Pasture conservation plans and manure storage)
$20,103

TOTAL: $695,603

XII. IMPLEMENTATION SCHEDULE

The implementation applies a timeline to the tasks, milestones, outcomes and pollutant load reductions to be accomplished in the plan to meet the standard for E. coli bacteria. The plan and implementation schedule will be reviewed annually to ensure tasks, milestones, outcomes and pollutant load reductions are being met.

IMPLEMENTATION SCHEDULE		Milestone metric	Milestone totals	Phase 1 (Yr. 1-3)	Phase 2 (Yr. 4-6)	Phase 3 (Yr. 7-9)	Project Outcome	Estimated Load Reductions
Task 1:	Implement a monitoring program on Duck Creek	Pollutants monitored for	*E. coli*, detergent, flow, DNA, chloride	*E. coli*, detergent, flow, DNA, chloride	*E. coli*, detergent, flow, DNA, chloride	*E. coli*, detergent, flow, DNA, chloride	A better understanding of Duck Creek's impairment	Monitoring is part of all projects and programs pollutant load reductions
Task 2:	Maintain, repair, replace failing septic systems	# off fully functioning septic systems	27	9	9	9	Eliminate bacteria contribution from septic systems	Phase 1: 33.3% Reduction Phase 2: 33.3% Reduction Phase 3: 33.3% Reduction Estimated bacteria reduction of 100%
Task 3:	Implement urban infiltration practices in critical areas	# of square feet	30,000 sq'	10,000 sq'	10,000 sq'	10,000 sq'	Reduce runoff from urban areas and bacteria contributions from urban misc. sources	30,000 sq' of urban infiltration practices installed
Task 4:	Exclude livestock from the creek and its tributaries	# of areas and stream length livestock is excluded	9 areas 22,110	3 areas 10,580'	3 areas 6,600'	3 areas 4,930	Eliminate bacteria contribution from livestock	Phase 1: 48% Reduction Phase 2: 30% Reduction Phase 3: 22% Reduction Estimated bacteria reduction of 100%
Task 5:	Implement conservation plans and manure storage on pastures in the watershed	# of pastures and acres with conservation plans implemented	9 pastures 261 acres	3 pastures 87 acres	3 pastures 87 acres	3 pastures 87 acres	Eliminate bacteria contribution from pasture	Phase 1: 33.3% Reduction Phase 2: 33.3% Reduction Phase 3: 33.3% Reduction Estimated bacteria reduction of 100%

IMPLEMENTATION SCHEDULE cont.		Milestone metric	Milestone totals	Phase 1 (Yr. 1-3)	Phase 2 (Yr. 4-6)	Phase 3 (Yr. 7-9)	Project Outcome	Estimated Load Reductions
Task 6:	Create and implement intensive manure management plans	# of intensive manure management plans created and implemented # of acres	9 pastures 900 acres	3 pastures 300 acres	3 pastures 300 acres	3 pastures 300 acres	Eliminate bacteria contribution from manure applied to row crops	Phase 1: 33.3% Reduction Phase 2: 33.3% Reduction Phase 3: 33.3% Reduction Estimated bacteria reduction of 100%
Task 7:	Implement pet waste management campaign	# of pet waste stations installed, # of brochures distributed, # of partners, # of personal pet waste dispensers	30 pet waste stations, 3,900 brochures 15 partners 900 personal pet waste dispensers	15 pet waste stations, 1,300 brochures 15 partners 300 personal pet waste dispensers	15 pet waste stations, 1,300 brochures 15 partners 300 personal pet waste dispensers	15 pet waste stations, 1,300 brochures 15 partners 300 personal pet waste dispensers	Reduce bacteria contribution from pet waste	Estimated bacteria reduction of 75% (WQIP/TMDL)
Task 8:	Accompany all projects and programs with an awareness and education campaign	# of website hits, # of billboards installed, # of expos exhibited at, # of times public service announcement is ran, # of residents who sign up for e-mail updates on Duck Creek	60,000 (75% of watershed population) website hits, 9 billboards installed, 15 expos exhibited at, run public service announcement 468 times, 60,000 75% of watershed population) residents signed up for e-mail updates on Duck Creek	20,000 (25% of watershed population) website hits, 3 billboards installed, 5 expos exhibited at, run public service announcement 156 times (weekly), 30,000 (25% of watershed population) residents signed up for e-mail updates on Duck Creek	20,000 (25% of watershed population) website hits, 3 billboards installed, 5 expos exhibited at, run public service announcement 156 times (weekly), 30,000 (25% of watershed population) residents signed up for e-mail updates on Duck Creek	20,000 (25% of watershed population) website hits, 3 billboards installed, 5 expos exhibited at, run public service announcement 156 times (weekly), 30,000 (25% of watershed population) residents signed up for e-mail updates on Duck Creek	Awareness of Duck Creek projects and programs	Awareness and education campaign is part of all above projects and programs pollutant load reductions

XIII. MONITORING PLAN

Initially, water quality monitoring is necessary to **better understand what sources are contributing bacteria to Duck Creek.**

Bi-weekly snapshots of flow, turbidity, *E. coli* bacteria and chloride will be taken throughout the **27 week recreation season (May 15th-November 15th)** at the **nine sites** monitored in 2008 by the University Hygienic Lab (UHL) and the Partners of Scott County Watersheds (PSCW) for the development of the Water Quality Improvement Plan (WQIP). An **additional site** will be added to this monitoring regimen per recommendation of the WQIP. A total of 270 samples will be taken a year. A **flow meter, wading rod** and **turbidimeter** will be necessary to conduct this sampling. This sampling will be ongoing.

Secondly, **flow, turbidity, E. coli bacteria** and **optical brighteners** will be monitored for **semi annually during low flow** events at **25 sites in the watershed** (including the nine sites monitored in 2008 by the UHL and PSCW, the additional site recommended in the WQIP and the 15 sites previously monitored in the watershed during IOWATER snapshots). This monitoring will help determine the impact of septic systems and illicit sanitary sewer connections, combinations or breaks have on the bacteria load in Duck Creek at different locations.

Source tracking monitoring will be conducted **once every three years** during **high and low flow events** at the **three sites along the main stem of Duck Creek** that were part of the nine sites monitored in 2008 by the UHL and PSCW. Source Tracking would help determine the impact that distinct sources, such as humans, hogs, cattle, pets, deer, waterfowl, and other wildlife might have on the water quality of Duck Creek.

***E. coli* bacteria, chloride and optical brightener monitoring** will be conducted in collaboration with **municipal dry weather flow inspections of stormwater outfalls**. Dry weather sampling at stormwater outfalls would help determine the presence of illicit sanitary sewer connections to the storm sewer system. If sustained flows with *E. coli* bacteria, chloride concentrations or detergent are present, it is likely illicit connections are present. The City of Davenport has 890 stormwater outfalls in the Duck Creek Watershed. The City of Bettendorf has 158 stormwater outfalls in the Duck Creek Watershed.

Illicit discharges, discharges to the separate storm water system that is not composed entirely of storm water or uncontaminated groundwater is a concern in the watershed. Illicit discharges allow wastewater and sewage into storm lines, drains and streams. Identifying illicit discharges is needed in order to create a plan to reduce their impact on Duck Creek's bacteria impairment. Innovative methods will be used to locate illicit discharges. **Environmental Canine Services,**

LLC, out of Lansing, Michigan, offers a unique service to identify where illicit discharges are entering storm sewer systems. Sable, the sewage sniffing dog, is able to detect the presence of raw human sewage and detergents, allowing him to track illicit connections to storm sewer systems. **This will be conducted during years 3, 6 and 9.**

The TMDL states, "Some of the features of Duck Creek suggest that it may be impaired by other pollutants in addition to bacteria. The stream is extensively channelized, and in some reaches significant incision can be observed. Urban streams often lack the physical, chemical, and biological qualities needed to support a diverse array of aquatic organisms. Biological monitoring to assess the diversity and population of fish and invertebrate communities would indicate the presence or absence of a healthy ecosystem, and could lead to the detection of additional pollutants detrimental to water quality. Biological monitoring would be a first step in helping to identify other potential pollutants in Duck Creek" (Water Quality Improvement Plan/Total Maximum Daily, 2009, P.94).

A **volunteer biological snapshot** will be organized by the Partners of Scott County Watershed on Duck Creek and tributaries in late summer of 2011. Data collected will be implemented into the watershed plan. Biological data will be collected at the **most, the nine sites monitored in 2008** (with additional site per recommendation of the WQIP) and at a **minimum the three sites along the main stem of Duck Creek** that were part of the nine sites monitored in 2008 by the UHL and PSCW. This will be used to determine if the watershed coordinator should request the IDNR begin the process of determining if a biological impairment is present on Duck Creek.

The **IDNR's IOWATER Volunteer Water Quality Monitoring Program** has been conducting "snapshots" on Duck Creek and its tributaries for seven years. A snapshot is when multiple sites throughout a geographic area are sampled within a short period of time. IOWATER snapshots are conducted on Duck Creek and its tributaries twice a year. Data collected includes; transparency, water temperature, pH, Nitrite, Nitrate, Dissolved Oxygen, Phosphate, Chloride and *E. coli* bacteria. The monitoring results are gathered by trained volunteers and seeks to protect and improve Iowa's water quality by raising citizen awareness about Iowa's watersheds, supporting and encouraging the growth and networking of Iowa's volunteer water monitoring communities, and promoting water monitoring activities as a means of assessing and understanding Iowa's aquatic resources. This program is necessary to gain a better understanding of water quality concerns with Duck Creek and to keep residents engaged in protecting and improving the creek.

All monitoring efforts will include an approved water quality monitoring plan called a **Quality Assurance Project Plan (QAPP)**, in accordance with Iowa Administrative Code (IAC) 567 – 61.10

(455B) through 567 – 61.13 (455B). All future data collected must satisfy the Iowa's Credible Data Law. Without this, gathered data can be deemed unreliable.

As stated in the WQIP, "Monitoring plans should be continually evaluated. Adjustment of parameters, sampling intervals, and or/monitoring locations should be based on newly discovered or suspected pollutant sources, infiltration practice placement/installations, and other dynamic factors. The IDNR Watershed Improvement Section can provide technical support to locally led efforts in collecting and analyzing further water quality and flow data in the Duck Creek Watershed".

Table 13.1: Recommended monitoring plan for Duck Creek

Parameters	Sampling Interval	Sampling Duration	Locations
Transparency, water temperature, pH, Nitrite, Nitrate, Dissolved Oxygen, Phosphate, Chloride, *E. coli* bacteria, in stream and around stream physical characteristics of importance	Semi-annually	May & October	25 sites in Duck Creek Watershed previously sampled (includes 10 sites recommended in TMDL/WQIP)
E. coli bacteria, chloride, turbidity & flow	Bi-weekly	During 27 weeks of recreation season (May 15th-November 15th)	10 sites recommended in TMDL/WQIP (DC16, CC1, SC1A, RC1A, CLC1, GC4, PC2, DC10, SFC1A and DC12)
E. coli bacteria, chloride, turbidity, flow and optical brighteners	Twice per year	Semi annually during low flow	25 sites (all sites in Duck Creek Watershed included in snapshot, includes 10 sites recommended in TMDL/WQIP)
Conduct source tracking/MST during high and low flow events	Once every 3 years	Once during high and low flow events	3 sites (DC16, DC12 and DC10)
E. coli bacteria, chloride and optical brighteners	During municipal dry flow storm sewer outfall inspections	Throughout the year	Selected stormwater outfalls in Davenport and Bettendorf

Environmental Canine Services LLC	During municipal dry flow storm sewer outfall inspections	One week during low flow	Selected stormwater outfalls in Davenport and Bettendorf
Biological monitoring	Snapshot	Once during dry weather within recreation season	Minimum 3 sites along main stem (DC 10, DC12, DC16), maximum of 10 sites recommended in WQIP

XIV. RESOURCES

i. Technical

Duck Creek Watershed Coordinator and Duck Creek Watershed Management Plan Advisory Council

Primary Role: Seek funding to implement the recommendations in the Duck Creek Watershed Plan, update plan as new information arises

The Duck Creek Watershed Coordinator facilitates the Duck Creek Watershed Management Plan Advisory Council and the implementation of the Duck Creek Watershed Plan. The coordinator is responsible for creating partnerships and seeking funding to implement the recommendations within the plan. The coordinators is also responsible for updating the plan as new information is discovered through water quality monitoring and as projects and programs are implemented. The coordinator will receive training in nutrient management plans, biological water quality monitoring, agricultural conservation practices, urban infiltration practices, etc.

Bi-State Regional Commission

Primary Role: Assist with identifying funding sources and grant writing; include recommendations from the Duck Creek Watershed Plan in future planning efforts.

Bi-State Regional Commissions mission is to serve as a forum for intergovernmental cooperation and delivery of regional programs and to assist member local governments in planning and project development. Scott County and the Cities of Davenport and Bettendorf are members of the commission. Staff can assist in identifying and obtaining funding for Duck Creek Watershed projects. Future planning conducted by Bi-State Regional Commission should take into account concerns with Duck Creek and recommendations for its improvement.

Colleges, Universities & Extension Offices

Primary Role: Assist with implementation of awareness and education program.

These facilities can assist with awareness and education programs identified in the Duck Creek Watershed Plan. Scott Community College has a large reach, enrolling over 4,000 students each fall. St. Ambrose University is in the watershed and can continue to implement demonstration infiltration projects. The Iowa State University Extension Office can assist with watershed education for rural and urban residents. Western Illinois University has recently enhanced its presence in the Quad Cities and has shown interest in the Iowa-Quad Cities as well as Illinois.

Students can assist with stewardship events and future monitoring. Other aspects of awareness and education programs can be incorporated into environmental curriculum.

Developers, Contractors and Homebuilders

Primary Role: Responsibly manage stormwater on active and post construction sites.

Developers and homebuilders can have a large impact on streams. During construction a site should be properly managed so sediment and other pollutants associated with construction do not runoff into our streams. Incorporating infiltration practices into the design and construction of new development can have a large, positive impact on Duck Creek. The Quad City Home Builders Association (QCHBA) and the Associated General Contractors of the Quad Cities (AGC/QC) can be a partner in providing awareness and education to developers and homebuilders or making them aware of upcoming educational opportunities. Landscape contractors play a particularly important role in the Duck Creek Watershed. There is an opportunity to educate landscape contractors on the use of infiltration practices to solve drainage problems.

Environmental Protection Agency (EPA)

Primary Role: Creating and enforcing regulations that protect and improve water resources, provide funding to address impairment on Duck Creek.

The Environmental Protection Agency creates and enforces regulations that protect and enhance water resources. The EPA also is the main source of funding through the Clean Water Act. They are constantly researching water quality issues and concerns as well and those data can be valuable to the development of new technologies to protect and enhance Duck Creek.

Federal Emergency Management Agency (FEMA)

Primary Role: Provide assistance with floodplain management, usage, regulation and flood mitigation projects.

FEMA is the primary federal agency involved with flood mitigation, preparedness, response, recovery, education and information. The agencies duties include developing floodplain maps, assisting with the development and enforcement of floodplain ordinances and providing funding for mitigation projects and for post flood assistance. Projects along Duck Creek that meet FEMA's flood prevention goals could be applicable for technical and financial assistance from FEMA. For example, homes subject to constant flooding from Duck Creek or its tributaries could be bought out and converted into natural areas.

Iowa American Water

Primary Role: Provide water monitoring and technical data and guidance and financial assistance.

Iowa American Water provides drinking water to all communities in the Duck Creek Watershed. They consistently monitor water from the Mississippi River and ground water sources. They have a variety of staff members with expertise in many aspects of water, public education, advertising and marketing, which would be helpful in carrying out the tasks in the Duck Creek Watershed. They also provide funding through their environmental grant program for innovative, community-based environmental projects that improve, restore or protect the watersheds, surface water and/or groundwater supplies in our local communities.

Iowa Department of Agriculture and Land Stewardship (IDALS)

Primary Role: Provide technical and financial assistance on urban infiltration practices and agricultural conservation practices.

IDALS has wealth of employees with expertise in Iowa's water resources. They offer technical assistance to rural landowners and urban residents in installing conservation and infiltration practices. Also, IDALS offers grants that would be applicable for projects in the Duck Creek Watershed Plan.

Iowa Department of Natural Resources (IDNR)

Primary Role: Technical assistance, water quality monitoring assistance, enforcement of regulations that impact water quality.

The IDNR created the Water Quality Improvement Plan and Total Maximum Daily Load and can continue to provide technical assistance associated with water quality monitoring. DNR's IOWATER has facilitated volunteer water quality monitoring events on Duck Creek and its tributaries for the last 7 years. The DNR is also responsible for enforcing regulations that greatly impact water quality including NPDES permits for municipalities and wastewater treatment facilities.

Iowa Department of Transportation (DOT)

Primary Role: Responsibly manage stormwater and pollutants road planning, construction and maintenance, incorporate conservation and infiltration projects on roads and road right of ways.

The DOT is responsible for managing portions of the roads and right of ways in the Duck Creek Watershed. The DOT's road plans, construction and maintenance can impact Duck Creek. Roads transport bacteria and other pollutants to streams. There is an opportunity to partner with the DOT in planning projects that infiltrate stormwater runoff from roads.

Interstate Resource Conservation and Development (IRCD)

Primary Role: Assist with identifying funding sources and grant writing.

IRCD mission is to provide assistance for economic and community development, land conservation, water management, natural resources and education. IRCD's five county area includes Scott County. There is an opportunity to have IRCD assist in identifying and obtaining funding for projects.

Landowners

Primary Role: Make responsible decisions on land management

Urban residential, commercial, industrial, civic and agricultural landowners impact the Duck Creek. The land management plans they implement can impact the creek in a positive or negative way. Having large expanses of mowed lawn, failing to pick up after pets, putting fertilizers and herbicides on the land can have negative impacts on the creek while implementing infiltration practices and native landscaping can have positive impacts.

Municipalities (Cities of Davenport and Bettendorf)

Primary Role: Add stormwater projects into the budget, push for ordinances and utility fee increases to benefit Duck Creek, provide support for in-the-ground projects that improve Duck Creek, partner on awareness and education program, make responsible decisions in the development, management and maintenance of land in the watershed.

Municipalities potentially play the largest role in protecting and improving Duck Creek and its tributaries. The public works/natural resources departments develop, manage and maintain the streams, sanitary and storm sewers, roads and other critical infrastructure in the watershed. The parks and recreation department has jurisdiction over areas significant to the watershed health including the extensive parkway system along the main stem. The wastewater department maintains the sanitary sewer system in the watershed. Land planning decisions, sanitary sewer and stormwater ordinances and budgets are all determined by municipal staff and city council members. Projects and programs supported by the cities would have the biggest impact.

Not for profit and Environmental Organizations

Primary Role: Partner with awareness and education program efforts, provide support for in-the-ground projects that improve Duck Creek, assist landowners with setting aside land for conservation.

Not for profit organizations such as Partners of Scott County Watersheds, Living Lands and Waters, Izaak Walton League, River Action, Iowa Natural Heritage Foundation, Natural Land Institute, Nature Conservancy, Sierra Club and Trees Forever can assist with the Duck Creek awareness and education program. Members and volunteers of these organizations can assist with stewardship events and the installation of infiltration practices. Also, certain organizations can works with landowners to set aside land into conservation in the watershed.

Scott County Board of Supervisors

Primary Role: Make responsible decisions concerning land use in unincorporated areas and other policies that impact the Duck Creek Watershed.

The Scott County Board of Supervisors makes decisions that impact the Duck Creek Watershed. Budget, policy and land use planning decisions made with the Duck Creek Watersheds concerns in mind would have a positive impact on the stream.

Scott County Conservation Board and Department

Primary Role: Pursue and promote programs and projects in their jurisdiction that address concerns with the Duck Creek Watershed.

The Scott County Conservation Board are charged with the responsibility of conserving the natural resources of the county, preserving scenic and historic sites, developing recreational facilities to provide opportunities for the residents of the county, their guests and tourists to enjoy themselves. There is an opportunity to implement projects that meet the goals of the board and department while improving Duck Creek.

Scott County Health Department

Primary Role: Ensure septic systems in the watershed are properly functioning.

The Scott County Health Department is responsible for onsite waste water treatment facilities (septic systems) for existing and planned development. These services include inspection, sampling and enforcement of regulations. Ensuring these systems are functioning and planned properly is essential to keeping bacteria and other harmful waste out of Duck Creek.

Scott County Humane Society

Primary Role: Assist with the proper pet waste disposal campaign.

The Scott County Humane Society is able to enforce improper proper pet waste disposal on public in private lands in all of Scott County. With over 1,000 dogs adopted from the Scott County Humane Society a year, there is an opportunity to partner with them in the dissemination of materials related to the proper pet waste disposal campaign.

Scott County Natural Resources Conservation Service/Soil and Water Conservation District

Primary Role: Provide technical and financial assistance on urban infiltration practices and agricultural conservation practices.

Scott County Natural Resources Conservation Service and Soil and Water Conservation District provide technical and financial assistance to rural and urban landowners on conservation practices that protect and improve water quality, filter out sediment, bacteria and other pollutants, control erosion and provide habitat for wildlife. Educating landowners on these practices and promoting their installation has a large, positive impact on Duck Creek.

Scott County Planning and Development

Primary Role: Make responsible decisions concerning land use in unincorporated areas that impact the Duck Creek Watershed.

Scott County Planning and Development is responsible for the current and future land uses in all unincorporated areas of Scott County. The department regulates all non agricultural land uses in these areas. Unincorporated areas in Scott County make up almost half of the Duck Creek Watershed. New development in the watershed will have an impact on Duck Creek. The development of new ordinances and policies that further promote responsible stormwater management on new development in unincorporated areas would lessen the stress new development puts on Duck Creek.

Scott County Waste Commission

Primary Role: Provide environmentally responsible waste disposal and education.

The Waste Commission of Scott County is committed to providing environmentally sound and economically feasible solid waste management for residents and businesses in our community. The commission encompasses the landfill, recycling center, household hazardous material and electronic demanufacturing facilities and numerous educational projects and programs. iLivehere is Waste Commission of Scott County's environmental outreach program. The

program seeks to empower residents with information, activities and resources so they can become better stewards of the environment in our community. Proper waste disposal keeps hazardous waste out of Duck Creek. Being involved in the many environmental activities the commission hosts can be a conduit for the Duck Creek Watershed awareness and education program.

U.S. Army Corps of Engineers (USACE)

Primary Role: Make responsible decisions concerning the allowance of stream bank projects along Duck Creek and tributaries, technical assistance for projects.

The USACE is responsible for approving stream bank stabilization and in stream habitat projects. They are also one of the predominant agencies responsible for wetland protection. The USACE's decisions can greatly impact Duck Creek and its tributaries. USACE staff can also provide technical assistance to water quality improvement projects.

U.S. Department of Agriculture (USDA)

Primary Role: Promote the installation of agricultural conservation practices through funding programs.

The USDA has multiple programs that provide agricultural producers with technical assistance, incentives, cost share and annual rental payments to implement conservation practices. These practices protect water, soil and wildlife resources.

U.S. Fish and Wildlife Service (USFWS)

Primary Role: Provide technical and financial assistance for projects in the watershed that seek to provide habitat for wildlife.

The USFWS provides technical and financial assistance to projects related to wetlands, habitat restoration, protection of endangered and threatened species, and in stream fish habitat and passage projects. The USFWS could assist with projects in the Duck Creek Watershed that meet their goals.

ii. Financial

Urban Project Grants

Alderman Funds (City of Davenport)

Each alderman in the City of Davenport is allocated a certain amount of funding for projects in their ward. Residents can contact their alderman to lobby for a project in their neighborhood.

American Water Environmental Grant Program

American Water offers funds for innovative, community-based environmental projects that improve, restore or protect the watersheds, surface water and/or groundwater supplies in our local communities. Grants are due in March.**www.amwater.com**

Community Foundation of the Great River Bend

Community Foundation of the Great River Bend seeks to be a responsive and proactive community partner and, through its grantmaking program, works strategically to address existing and emerging issues through its Community Impact Fund (ongoing), Fast Track Grant (deadline anytime) and Opportunity Grant (May 15 and November 21). Grants are given to Section 501(c)(3) of the Internal Revenue Code, a government entity, or a charitable program. Organizations working in the field(s) of health and human services, education, the arts, the environment, youth services, social services and any other charitable field are eligible to receive grants from the Community Impact Fund. **www.cfgrb.org**

Kodak American Greenway

The Program operated by The Conservation Fund invites land trusts, local governments, and other organizations to submit proposals for small greenway project grants. Funded projects typically advance one or more of the following program goals: catalyzing new greenway projects, assisting grassroots greenway organizations, leveraging additional money for conservation and greenway development and/or promoting use and enjoyment of greenways. Due in June. **www.conservationfund.org/kodak_awards**

River Boat Development Authority (RDA)

RDA accepts grant proposals from non-profit agencies, educational institutions and government departments for programs benefiting residents of Scott County, Iowa. Grants are due April and October. **www.riverboatauthority.com**

Scott County Regional Authority (SCRA)

SCRA provides funding for numerous non-profit organizations, education institutions and government entities through the grant process. Grants are due April and October. **www.scottcountyregionalauthority.com**

Scott County Urban Initiative

The Scott County Soil and Water Conservation District has funding available for urban infiltration practices. Funding comes from the IDNR's REAP Program. Landowners are eligible

for a 50% cost share up to $2,000 for implementing infiltration practices including, but not limited to, rain gardens, bioretention cells, bioswales, pervious pavement, infiltration trenches, soil quality restoration.

Agriculture Project Grants

Conservation Innovation Grant (CIG)

Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Ongoing. **www.ia.nrcs.usda.gov/programs/CIG.html.**

Conservation Reserve Program (CRP)

The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. CRP encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices. Ongoing.
www.nrcs.usda.gov/programs/crp/

Conservation Stewardship Program (CSP)

CSP is a voluntary program that provides financial and technical assistance to producers who advance the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes. The Conservation Stewardship Program (CSP) is a voluntary program that encourages agricultural and forestry producers to address resource concerns by (1) undertaking additional conservation activities and (2) improving and maintaining existing conservation systems. CSP provides financial and technical assistance to help land stewards conserve and enhance soil, water, air, and related natural resources on their land. CSP pays participants for conservation performance—the higher the performance, the higher the payment. It provides two possible types of payments. An annual payment is available for installing new conservation activities and maintaining existing practices. A supplemental payment is available to participants who also adopt a resource conserving crop rotation. Ongoing. **www.ia.nrcs.usda.gov/programs/csp2010.html.**

Environmental Quality Incentives Program (EQIP)

EQIP provides a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. These contracts provide financial assistance to implement conservation practices. EQIP provides payments up to 75 percent of the incurred costs and income foregone of certain conservation practices and activities. Ongoing. **www.nrcs.usda.gov/PROGRAMS/eqip**

Grassland Reserve Program

The Grassland Reserve Program (GRP) is a voluntary conservation program that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of eligible grassland under threat of conversion to other land uses. Participants voluntarily limit future development and cropping uses of the land while retaining the right to conduct common grazing practices and operations related to the production of forage and seed. Ongoing. **www.ia.nrcs.usda.gov/programs/grasslandreserve.html**

Iowa Financial Incentives Program (IFIP)

IFIP provides cost-share or financial incentives to private landowners for the implementation of permanent and management soil and water conservation practices in Iowa to control erosion and reduce sediment. SWCDs set priorities for practices to fund including terraces, waterways, erosion control structures and other conservation practice applications. Ongoing. **Scott County SWCD.**

Resource Enhancement and Protection Funds (REAP) Water Quality Protection Projects

REAP seeks to bring landowners and other partners together within a watershed to protect the state's water resources from point and non-point sources of contamination by targeting and preventing off-site sediment, nutrient and livestock waste pollution problems. SWCDs set priorities for practices to fund including terraces, waterways, erosion control structures and other conservation practice applications. Ongoing. **Scott County SWCD.**

Scott County Funds

Scott County Soil and Water Conservation District receives funding from the Scott County Board of Supervisors for conservation practices in the county. **Scott County SWCD.**

Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program that provides financial assistance to private and public landowners to establish wildlife habitat. The Natural Resources Conservation Service (NRCS) works with participants to develop a wildlife habitat management plan. This plan becomes the basis for entering into a 5 to 10 year agreement with landowners to implement the plan. Projects that focus on establishing habitat for threatened and endangered species or declining species receive a higher priority. Ongoing. **www.ia.nrcs.usda.gov/programs/whip.html**

Wetlands Reserve Program (WRP)

Wetlands were restored or enhanced on 3,221 acres in Iowa during FY2009 with assistance from the Wetlands Reserve Program (WRP). These restored wetlands provide important flood reduction as well as wildlife habitat and other environmental benefits. More than 140,000 acres have been restored or are in the process of being restored under wetland easement programs in Iowa since 1992. **www.ia.nrcs.usda.gov/programs/wetlandreserveprogram.html**

Watershed Grants

Watershed Implementation Grants

The IDNR/EPA offers Iowa groups looking to improve our state's waters the opportunity to apply for grants. Watershed Implementation Grants help local groups and organizations put watershed management plans into action to improve the quality of water entering our rivers, streams and lakes. Grants are due April 1. **www.iowadnr.gov/water/nonpoint/app.html**

Watershed Improvement Review Board Grants (WIRB)

The Watershed Improvement Review Board (WIRB) is a 15-member board composed of representatives of environmental, agricultural, commodity, and water-related organizations and groups; a representative from the Iowa Department of Natural Resources; a representative from the Iowa Department of Agriculture and Land Stewardship; two state representatives; and two state senators. Projects that improve water quality and reduce flooding on a watershed scale are applicable for funding. Due in July. **www.agriculture.state.ia.us/IWIRB.asp**

Water Protection Fund (WPF) and the Watershed Protection Program Fund (WSPF)

WPF assistance may only be used to address water quality related concerns, WSPF assistance may be used to address a variety of natural resource concerns, including water quality, flooding, erosion control, etc. The WPF and WSPF are administered by the Iowa Department of

Agriculture and Land Stewardship-Division of Soil Conservation (IDALS-DSC). They are commonly used to match Implementation (319) funding.
www.iowaagriculture.gov/requestForApplications.asp

Habitat Grants

National Fish and Wildlife Foundation (NFWF)

NFWF administers multiple grant programs that seek to sustain, restore, and enhance our Nation's fish, wildlife, and plants and their habitats. Applicable grants include rovides modest financial assistance on a competitive basis to support community-based wetland, riparian, and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities. Application Deadline**:** February and the Native Plant Conservation Initiative, which supports on-the-ground conservation projects that protect, enhance, and/or restore native plant communities, including pollinators, on public and private lands. Projects fall into one of six categories: conservation, education, restoration, research, sustainability, and creating data linkages for native plant conservation in North America. Application Deadline: July. **www.nfwf.org**

USFWS National Fish Passage Program

USFWS provides funding for the removal of barriers such as dams and culverts to reconnect fragmented habitats. **www.fws.gov/fisheries/fwco/fishpassage/**

USFWS Partners for Fish and Wildlife Programs

USFWS assist private landowners in restoring habitat in accordance with USFWS goals. Funding assist with direct technical and financial assistance to private landowners interested in restoring, enhancing, and managing fish and wildlife habitats on their own lands. Activities include restoration of wetland hydrology, use of prescribed burns and planting with native vegetation. Wetlands are the primary focus of the program in Iowa. **www.fws.gov/partners**

Others

Resource Enhancement and Protection (REAP)

REAP funds go to eight different program that enhance and protect the state's natural and cultural resources including; city parks and open space, conservation education, county conservation, DNR administration, DNR land management, historical resource development program, open space acquisitions and development, roadside vegetation and soil and water enhancement. Each program has different due dates. www.iowadnr.gov/reap/index.html

Environmental Education Grants (EE)

The Environmental Protection Agency supports environmental education projects that enhance the public's awareness, knowledge, and skills to help people make informed decisions that affect environmental quality. EPA awards grants each year based on funding appropriated by Congress. Annual funding for the program ranges between $2 and $3 million. Most grants will be in the $15,000 to $25,000 range. Due December. **www.epa.gov/enviroed/grants.html**

Iowa Water Quality Loan Fund

The Iowa Water Quality Loan Fund brings to Iowa a new source of low-cost financing for farmers and landowners, livestock producers, businesses, homeowners, community groups, watershed organizations, and others. The program offers four programs to target Iowa's non-point source water quality problems and provides financing to address them. Ongoing. **www.iowadnr.gov/water/srf/wq_loanfund.html**

XV. LITERATURE CITED

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XVI. LIST OF FIGURES AND TABLES

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